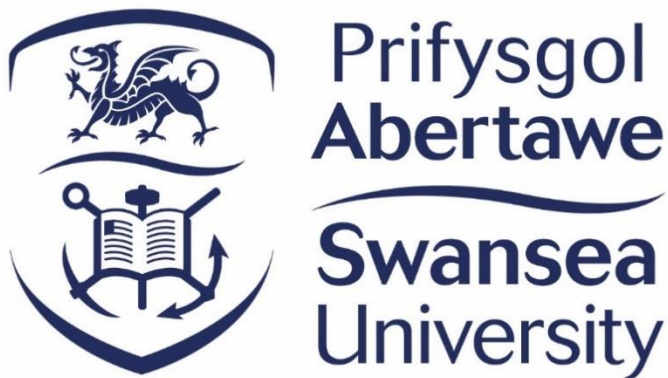


Policy implementation without evidence: a multi methods study of emergency admission risk stratification in primary care



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Submitted to Swansea University in fulfilment of the requirements for the Degree of Doctor of Philosophy

Swansea University, 2023.

Declarations

I confirm this work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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This thesis is the result of my own investigations, except where otherwise stated. Where correction services have been used, the extent and nature of the correction is clearly marked in the footnote(s).

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Thesis Summary

Despite an uncertain evidence base, emergency admission risk stratification tools have been widely promoted in the NHS. These tools are underpinned by algorithmic models using routine health data to calculate one year admission risk for all patients in a health community (typically a general practice). The tools allow practitioners to identify at-risk individuals to target for preventative care, with the ambition to improve care, and reduce admissions/costs. This study explored why, how and to what extent emergency admission risk stratification tools were introduced in UK primary care, and stakeholder views. I undertook a multi-methods study incorporating systematic literature review; survey of 171 primary care commissioning organisations; follow-on interviews with a sample of commissioners (n=20); a user experience study of tool users (n=29) and a focus group with patients (n=9).

The review found that although accuracy of the tools had been addressed, there was little underpinning evidence of effectiveness. Nonetheless, the survey confirmed largescale implementation across the UK; 86.5% of organisations had introduced a tool to general practice. Research evidence had little influence over decisions to implement, but the desire to align with policy recommendations was apparent. Interviews confirmed a complex landscape of tool introduction and use, but often as short-term pilots with few incorporating robust evaluation. I found that implementation challenges were prominent, including a lack of clarity over models of care for identified patients. Most tool users found them acceptable, were willing to use them (often on a trial basis) but reported usability and capacity issues. Patients saw opportunities for admission risk to be communicated in patient/clinician discussions, but I found no evidence that this approach was widespread.

I conclude that the promotion and use of the tools was driven by optimism rather than evidence, and there remains a need to better integrate research, policy, and practice.

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Publications and outputs during candidature (relating to topic area)

Publications

2021 Bridie Angela Evans, Jeremy Dale, Jan Davies, Hayley Hutchings, Mark Rhys Kingston, Alison Porter, Ian Russell, Victoria Williams, Helen Snooks Implementing emergency admission risk prediction in general practice: a qualitative study. *British Journal of General Practice* 2021; BJGP.2021.0146. DOI: 10.3399/BJGP.2021.0146

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Relevant Grant Awards

PRISMATIC – Predictive Risk Stratification: a trial in chronic conditions. *NIHR HS&DR programme* £691,101. 2010 (Co-applicant)

The uptake of emergency admission s risk prediction tools in UK primary care: a cross sectional survey. *ABMU Pathway to Portfolio*, £10,500. 2015. (Co-chief Investigator)

The use of Emergency Admissions and Frailty Risk Prediction Tools in UK primary care: a qualitative study. *ABMU Pathway to Portfolio*, £9,000. 2016. (Co-chief Investigator)

PRISMATIC2 – Predictive Risk Stratification Models: Assessment of Implementation Consequences. *NIHR HS&DR programme* £830,000 2022 (Co-applicant)

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Conference Presentations

Implementation of emergency admission risk tools: a study of user experience. *Swansea University Faculty of Medicine, Health and Life Sciences Postgraduate Conference*. 2023 **(Runner up - Best Oral Presentation)**

Emergency admission risk stratification (EARS) – qualitative study of implementation in primary care. *Swansea University Medical School Postgraduate Conference*. 2019

Implementation of emergency admission risk prediction tools: A cross sectional survey of 171 UK health boards and Clinical Commissioning Groups (CCGs). *Swansea University Medical School Postgraduate Conference*. 2017 **(Winner - Best Oral Presentation)**

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Clinical Effectiveness of a predictive risk model. *HTAi Annual Meeting*, Rome, June 2017 / Cost Effectiveness of a predictive risk model. *HTAi Annual Meeting*, Rome. June 2017

Introducing the PRIDAL model for linking routine health and identifiable patient reported questionnaire data. *International Population Data Linkage Conference*, Swansea. August 2016.

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Author contributions

Results chapters within this thesis are based upon published or planned journal publications. Although I led each of these chapters, the valued input of co-authors is acknowledged for some, as clarified on this page, and indicated in the use of the 'we' pronoun in appropriate places in this document.

Chapter 5 – Systematic Review of the costs, effects and implementation of emergency admission risk prediction models in primary care

The systematic review was carried out on a dual-purpose basis – for this thesis, but also to inform the National Institute for Health Research (NIHR) funded PRISMATIC study (CI Helen Snooks, HS). I undertook the review when trial manager for PRISMATIC. As first author, I led the writing and subsequent publication of the review protocol (Kingston, Evans et al 2016), incorporating the search strategy, with contributions from co-authors. In line with systematic review best practice, I shared abstract and title screening and data extraction, with (two) colleagues – Hayley Hutchings (HH) and Bridie Evans (BE). I also led the writing the systematic review chapter of the report published in the NIHR journal (Snooks, Bailey-Jones et al, 2018), with input from co-authors, and responded to reviewer comments.

Chapter 6 – Emergency Admission Risk Stratification in UK primary care: national survey of access and use

I conceived and led the design and development of this study, including the study protocol. I was successful in applying for a small funding grant from Abertawe Bro Morgannwg University Health Board to undertake this work, with the application submitted in partnership with a clinical colleague within the health board (Deborah Burge-Jones, DBJ). I managed data collection, supported by a colleague. I led the writing and analysis of the resultant publication in the British Journal of General Practice (Kingston, Griffiths et al, 2020) with input from co-authors. I responded to reviewer comments.

Chapter 7 – Commissioner Interviews

I conceived and led the design and development of this study, including the study protocol. As with the previous survey, I was successful in applying for a small funding grant from Abertawe Bro Morgannwg University Health Board to undertake this follow up work. The funding application was submitted in partnership with a clinical colleague within the health board (DBJ). I undertook the majority of interviews, with additional interviews undertaken by colleagues thanks to the grant funding (Kayleigh Nelson, KN, Alison Porter, AP). I led analysis with input from a colleague (Chris Horn, CH).

Chapter 8 – Implementation of emergency admission risk stratification: a multi-methods study of user experience and usability

The data collection for this study was undertaken within the PRISMATIC trial (CI – HS). With this PhD in mind, I included a validated usability assessment tool (the System Usability Scale - SUS) in a questionnaire for primary care staff. Some data from the questionnaire, which I collected and analysed, was used within PRISMATIC but much of it is reported here for the first time – including the SUS data. I also conducted secondary analysis of primary care staff interviews undertaken on the PRISMATIC trial. As trial manager I contributed to the design of the interview guide, undertook approximately half of the interviews and was part of the analysis team. A colleague on the PRISMATIC trial team (BE) led the writing of a paper based on the PRISMATIC analysis, which I supported as a co-author (Evans, Dale et al. 2022). I led the secondary analysis reported herein.

Author contributions - references

Evans, B. A., J. Dale, J. Davies, H. Hutchings, M. R. Kingston, A. Porter, I. Russell, V. Williams and H. Snooks (2021). "Implementing emergency admission risk prediction in general practice: a qualitative study." British Journal of General Practice: BJGP.2021.0146.

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Chapter 1: Introduction

This chapter presents a brief overview of the origins of this study, and the reasons why I felt the topic was worthy of attention, in the form of a problem statement. I list the aim and objectives, and summarise how these are addressed, and provide an overview of the thesis structure.

Thesis origins

I have been interested in emergency admission risk stratification (EARS) tools for some time, since encountering them in an evaluation support role for the Chronic Conditions Management Demonstrator programme in Wales – a national (to Wales) scheme aimed at testing new initiatives to support patients with one or more chronic conditions in three health board led ‘demonstrator’ sites. This was around 2011, and I was aware through this work of a great deal of momentum and excitement around such risk tools, and their potential to support admission avoidance. This was reflected for example in an annual Four Nations Risk Summits organised by the Nuffield Trust, bringing together EARS experiences from across the UK. At this time Wales was testing its own EARS tool – PRISM – ahead of a planned national roll out of the tool to all general practices in the country. The demonstrator sites were involved in this testing, as they had capacity to explore use at general practices (individual sites or groups of) and health board level. When linking with these sites, there were some key issues and questions regarding EARS that regularly arose – not least around its purpose and where it fits into clinical practice, and what should be done for patients identified at various levels of risk? Additionally, it was apparent that there were technical challenges introducing the tool into individual practices, and their clinical systems, as well as performance issues associated with use (e.g., server problems). At times clinicians could not access the risk data at all, which was limiting their enthusiasm and willingness to fit the tools into their practice, reducing any potential patient benefits.

A few years later I became the study manager for the PRISMATIC trial (Box 1), with further exposure to EARS tools, and in due course, to further issues with their implementation and perceived value and fit. In light of these issues, I was intrigued by continued promotion of the tools in policy, and keen to explore the background, in terms of the rationale and evidence behind them. What was driving the promotion, for it did not seem to be based on research evidence or user experience.

I developed a thesis proposal to explore these issues, recognising the chance to link synergistically with the PRISMATIC study (and my full-time role), and to contribute to the evidence around EARS through a broadening of perspectives in terms of organisations, geography and viewpoints. I was for example keen to understand the extent EARS tools had

gained traction around the UK. I also wanted to undertake research directly with patients – even more so following informal discussions with patient representatives which identified strong and consistent views on EARS (which tally strongly with the findings I report here in Chapter 9).

Predictive risk stratification model: a randomised stepped-wedge trial in primary care (PRISMATIC). NIHR funded, led by Swansea University.

The aim of the PRISMATIC trial was to ascertain the impact of the introduction of an EARS tool (PRISM) on patient care, costs and health outcomes. It was a randomised stepped-wedge trial with economic and qualitative components. The trial involved 32 general practices in South Wales who were randomised to receive the EARS tool over a year. Anonymised health data for 230,000 patients, and self-reported quality of life outcomes were monitored for the following year to see what effects the intervention had on hospital admissions, use of other services, health outcomes and costs. At the time of the introduction of the tool, a general practice contract target (Quality and Outcomes Framework – QOF) encouraged practices to identify and manage those patients at highest risk of emergency admission to hospital. Within this dynamic context, we therefore evaluated the combined effects of PRISM and this contemporaneous policy initiative.

We found that PRISM use was largely restricted to QOF – although reports of changes to care were limited. Issues with usability and implementation were important barriers to use. A willingness to trial PRISM and financial incentives associated with QOF were important facilitators. We found that PRISM implementation increased use of health services: emergency hospital admission rates by 1%; emergency department (ED) attendance rates by 3%; outpatient visit rates by 5%; the proportion of days with recorded GP activity by 1% and time in hospital by 3%. NHS costs per participant increased by £76 per year.

These findings prompted a cancellation of the planned Welsh Government roll-out of the PRISM software.

Health interventions do not always have effects that are intended. It is important to carry out robust evaluation of new technologies and treatments in pragmatic trials in order to understand effects in practice. Working closely with policy makers in Wales allowed the PRISMATIC trial team to ensure that findings had an impact in the real world and that in this case, health policy in primary care in Wales is evidence based.

Box 1: The PRISMATIC trial: Summary by Mark Kingston based on (Snooks, Bailey-Jones et al, 2018)

Problem Statement

Emergency admission risk stratification (EARS) tools have been consistently promoted and introduced across international settings as a means of supporting proactive preventative care that targets individuals rather than diseases and supports enhanced patient participation in their care. Their introduction across the developed world is aligned to the common and interrelated challenges of rising multimorbidity, demand, costs, and emergency admissions. The tools enable a population to be stratified based on future risk of an admission, and personalised care provided that responds to patient's risk, needs and

circumstances. Although differing from traditional demand led healthcare models, the use of clinical prediction tools has precedents in screening and the use of disease specific risk models, such as those for heart disease. Yet how clinicians and patients respond is poorly understood.

EARS is often part of a complex intervention, with tool outputs allied to intervention/s and implementation strategies aimed at supporting patients. Despite an uncertain evidence research base and the failure of pilot schemes to yield positive results, UK, policy has encouraged the widespread introduction of EARS tools – particularly to general practices. This has significant cost and opportunity cost implications. How different UK areas have responded is unclear, and there has been little formal stakeholder engagement with clinicians and patients, despite suggestions of issues with tool usability, and the supposed central role of patients in tool use. If the planned introduction of EARS lacked a robust evidence base, then a logical hypothesis suggests that factors other than evidence may have been influential – but what were they?

As reflected in Figure 1 and the aims and objectives below, I sought to respond to this context, and address some of these knowledge gaps:

Aim

The aim of this thesis was to explore how, why and to what extent EARS tools were introduced into primary care in the UK.

Objectives

1. Describe the policy rationale for EARS in the UK
2. Review the evidence for EARS prior to implementation
3. Describe the uptake of EARS in the UK
4. Explore commissioner views and experiences of EARS
5. Explore views and experiences of EARS tool users
6. Explore patient perspectives on EARS tools



Figure 1: Spectrum of literature on EARS and principal areas of interest in the thesis

[Figure created in Microsoft Word by Mark Kingston 2023]

Thesis structure

This thesis was conceived as a coherent programme of work incorporating self-contained, related components that correspond to chapters in this thesis. This is reflected in the structure of the result chapters (5 to 9) which feature the classical IMRaD format of introduction, methods, results and discussion. These chapters are bookended by the introduction and background chapters, and a final discussion chapter which builds on individual chapters, adding a summative perspective and synthesis and considering some of the wider implications.

A brief chapter 'road map' of the thesis is as follows:

The next three chapters (**Chapters 2 - 4**) set out the background and provide the context to this thesis. The first of these chapters addresses the nature and role of evidence in health care policy and practice, before focussing on implementation research and the theoretical context for its study. The next chapter addresses the demographic, epidemiological and political background from which EARS tools emerge. The last of these three contextual chapters provides an overview of EARS tools, and addresses their origins, development, functions and appearance.

Chapter 5 presents a systematic review of the implementation and effectiveness of emergency admission risk prediction tools, to help understand what the evidence was for EARS introduction.

Chapter 6 reports a cross-sectional survey of UK primary care commissioning organisations – health boards and clinical commissioning groups. The survey sought to understand the spread of EARS tools in the UK and inform understanding of factors that influence their uptake.

Chapter 7 follows up a sample of those surveyed to explore commissioner perspectives on the rationale for EARS tool introduction, the role of evidence, implementation barriers and facilitators, and expectations for future EARS use.

Chapter 8 looks at the user perspective, through a multi-method user experience study of a group of PRISM users, undertaken alongside the PRISMATIC study.

In **Chapter 9**, I complete the thesis stakeholder engagement by reporting on a focus group with patients, which explored their views on the role of EARS in patient care.

Finally, in **Chapter 10** I discuss the overarching findings and conclusions.

To further support thesis navigation, I provide an overview of the thesis objectives, chapters and methods in

Table 1, and a chapter flowchart in Figure 2.

Table 1: Overview of research objectives, chapters and methods

[Table created in Microsoft Word by Mark Kingston 2023]

Research objective	Chapter	Chapter aim/objectives	Method/s
1 Explore the policy rationale for EARS in the UK	3: Background and Context – Policy context		Review of NHS and government policy documentation.
2 Review the evidence for EARS (prior to implementation)	5: Systematic Review of the costs, effects and implementation of emergency admission risk prediction models in primary care	(research question) What are the effects, costs and facilitators of, and barriers to, implementing emergency admission risk prediction models in primary care for patients with, or at risk of, chronic conditions?	Systematic review.
3 To describe the uptake of EARS in the UK	6: Emergency Admission Risk Stratification in UK primary care: national survey of access and use	To describe access to EARS tools and their use across the four UK nations; and identify factors perceived to influence access and use.	Online survey of UK primary care management and commissioning organisations.
4 To explore commissioner views and experiences of EARS	7: Commissioner interviews	To understand the rationale for commissioning EARS tools, including the role of evidence in decision making, and to describe implementation approaches and experiences.	Telephone interviews with members of primary care management and commissioning organisations.
5 To explore views and experiences of EARS tool users	8. Implementation of predictive risk stratification to reduce emergency admissions to hospital: a multi methods study of user experience and usability	To explore the user experience (UX) of practice staff with the PRISM emergency admission risk stratification tool, including barriers and facilitators to use.	Telephone interviews with clinicians using EARS tools. Usability survey. Usage data.
6 To explore patient perspectives on EARS tools	9: Patient perspectives on the role and value of emergency admission risk scores	To explore patient views about acceptability, benefits, challenges and risks of communicating information on emergency admission risk, derived from EARS, during patient and GP encounters.	Focus group with patients.

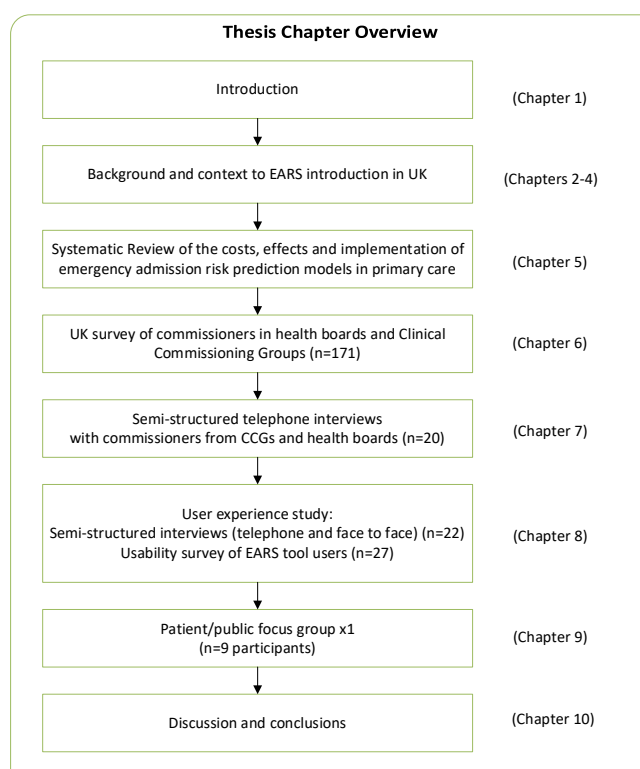


Figure 2: Flowchart of chapters, methods and participants

[Figure created in Microsoft Visio by Mark Kingston 2023]

Research background of author (he/him)

To further position the work reported herein, I briefly summarise my own background, training and experience. In terms of education, this part time PhD follows an MSc in Social Research (Swansea University), which included modules on health and social care research methods across quantitative and qualitative approaches. I also have a diploma in management (Gower College Swansea), which built on a portfolio of project management work in health services research, evaluation and quality improvement. I have completed further training and development consistent with the needs of both the PhD and my research and project manager job roles. These include, for example, further training in systematic reviews (York Centre for Reviews and Dissemination), statistics (Swansea University) and trial management and good clinical practice (various). Over the past fifteen years I have applied my learning to a wide range of projects in the health and social care space, in lead and team roles. As a self-identifying mixed methods researcher, I have experience in a wide range of research methods, and would describe myself, for example, as an experienced facilitator (e.g., of focus groups and workshops), qualitative interviewer, survey practitioner and routine data advocate.

Chapter References

Snooks, H., K. Bailey-Jones, D. Burge-Jones, et al. (2018). Predictive risk stratification model: a randomised stepped-wedge trial in primary care (PRISMATIC). Southampton (UK), [NIHR Journals Library](#). 2018;6(1)

Chapter 2: Evidence and real-world settings: Part 1: Evidence

Introduction

In this section I consider the role of research and evidence in clinical practice and health policy decision making. I address some of the key concepts and debates, and illustrate that research and evidence mean different things to different groups and individuals. I start with definitions of research, the 'systematic inquiry to generate new knowledge and/or refine or validate existing knowledge' (Oxford English Dictionary 2022), and evidence which relates to facts, information or data contributing to a belief that something is or is not true (Chartered Society of Physiotherapy 2021). Within these definitions there is an important distinction – that research produces evidence, but evidence need not be produced from research.

However, research evidence, produced from systematic and scientific methods, is a fundamental component of any healthcare system that strives for high quality care. Historical overviews, such as those by Collier (Collier 2009), and Bhatt (Bhatt 2010) confirm the longstanding association of these elements through famous examples. These include: an account in the Bible (Book of Daniel) of an experimental study of two citizen groups under King Nebuchadnezzar whereby the groups were allocated differing diets (meat vs pulses) and results compared: James Lind's 1747 scurvy 'trial' which found that sailors allocated lemon juice recovered better than those on other diets, a study now celebrated each year on International Clinical Trials Day - 20th May; and the first randomised controlled trial (of streptomycin in pulmonary tuberculosis) by the Medical Research Council in 1946 (Collier 2009). The case for research is made eloquently by the World Health Organization:

To improve health and well-being...we need better evidence for better decisions. There are moral, socioeconomic and political arguments to increase the use of research in decision- and policy-making. By leveraging the best available evidence, we can improve the effectiveness, efficiency and equity of health policies and interventions, enhance the effective use of scarce public resources, and increase the transparency and accountability of policies and interventions. (World Health Organization 2022)

Thus, research evidence can provide information about disease trends and epidemiology, risk factors, outcomes of treatment or intervention, patterns of care and health costs (Institute of Medicine 2009). Research commonly reveals that interventions do not work as expected, typically with outcomes less than or even contrary to expectations (unintended consequences). It can also help stakeholders such as policy makers, health managers and clinicians evaluate new and existing services or innovations, identify where improvements are needed, and develop new policies and services based on cumulative learning from successes and failures (Sibbald and Walshe 2010, Bjorndal 2018).

The Translation Gap

As appreciation of the value and role of research evidence has increased, so has the research infrastructure, capacity and funding to support research delivery. A report for the UK Clinical Research Collaboration (UK CRC) estimated UK expenditure on health research had reached £8.67 billion in 2018 (UK Clinical Research Collaboration 2020). The same report notes that the highest proportional increase in recent years investment was for activities related to research or knowledge translation i.e., research that aids the translation of scientific discoveries into new treatments and healthcare benefits (UK Clinical Research Collaboration 2020). This is indicative of the increased importance attached to the transfer of high-quality evidence from research into effective changes in health policy, clinical practice, or products (Lang, Wyer and Haynes 2007). The desire for improvements to translation of research evidence was also a headline finding of David Cooksey's review of health research funding as commissioned by the UK government (Black 2006, Cooksey 2006). Indeed this report identified two translation gaps, in the translation of research into products and treatment strategies, *and* into implementing these into clinical practice (Cooksey 2006). More recently a third gap has been proposed – from clinical practice into acceptance and uptake by patients and carers (Exeter University: College of Medicine and Health 2022).

The translation gap is critically important as health care delivered in ignorance of available research evidence foregoes the opportunity to apply that learning. This potentially misses opportunities to benefit patients and health service efficiency and effectiveness, and may result in significant harm (Dopson, Mant and Hicks 1994). Nonetheless, research translation is challenging, and even when it occurs can take an average of 17 years for research evidence to reach clinical practice (Trochim 2010, Morris, Wooding and Grant 2011).

The extent to which most clinical practice is evidence based is much debated, but it is accepted that much of it is not (Makic, Rauen et al. 2014, Cochrane UK 2021). Cochrane UK highlight two examples of common practice where accumulating research evidence led to the withdrawal of licenses for HRT for stroke and heart attack prevention which was found to actually increase risk, and for Evening Primrose Oil for treatment of eczema, following research findings of no positive effects (Cochrane UK 2021). One interesting attempt to numerate the evidence shortage in primary care was undertaken by Ebell et al. in 2017. They assessed 3521 recommendations in each of 721 chapters of an online medical reference resource for generalists (*Essential Evidence*, Wiley), using the Strength-of-Recommendation Taxonomy (SORT) (Ebell, Siwek et al. 2004, Ebell, Sokol et al. 2017). SORT A represents consistent and good quality patient-oriented evidence (outcomes that matter to patients, such as morbidity, mortality, quality of life or symptom reduction); SORT B is inconsistent or limited quality patient-oriented evidence and SORT C is expert opinion,

usual practice or recommendations relying on surrogate or intermediate outcomes (Ebell, Siwek et al. 2004). They determined that 51% of recommendations were based on studies reporting patient-oriented outcomes but only 18% were based on patient-oriented evidence from consistent, high-quality studies.

Evidence Based Medicine

One of the ways in which the translation gap has been addressed is through evidence-based medicine (EBM), evidence-based practice (EBP), and evidence-based policy. Evidence-based medicine (EBM) refers to attempts to identify evidence that can be applied by health professionals through a conscientious, explicit and judicious process to make decisions about the care of individual patients (Sackett, Rosenberg et al. 1996). The approach is founded on the use of high-quality research to address a clinical issue and guide care, weighing up risks and benefits of proposed treatments, using research, alongside common sense to guide care (Farlex Medical Dictionary 2012). The aim is to find out what kind of care is most suitable for a patient, ideally incorporating individual preferences and circumstances into the treatment decision (Institute for Quality and Efficiency in Health Care 2022).

Evidence Based Practice

Although, evidence-based medicine and evidence-based practice are related, and sometimes conflated, EBP expands the definition of EBM, broadening the principle to non-medical practitioners and their 'practice' and reinforcing the roles of the patient and practitioner in the process (Dawes, Summerskill et al. 2005).

EBP encourages integration of the best research evidence with clinical expertise (experience, skills and training), the patient's individual values and circumstances (e.g. social support), and the characteristics of the practice in which the health professional works (e.g. capacity, funding, service availability) (Mayer 2010, Hoffman 2013).

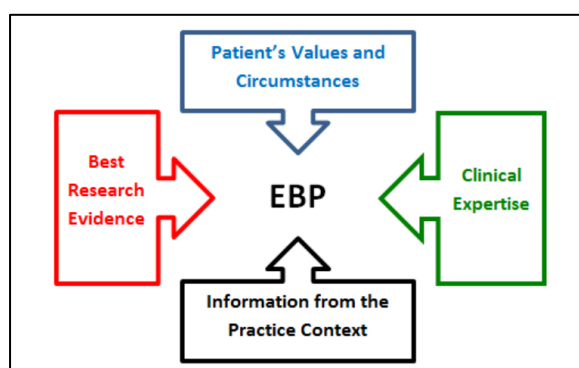


Figure 3: Evidence Based Practice – clinical reasoning model (Turner 2014)

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Proponents of EBP propose that for each clinician/patient encounter, the relative contribution of each of these 'evidence source' may vary within what has been described as an overall clinical reasoning model - see Figure 3. In many cases, there is no clearly correct decision, but the use of evidence in this model is based on reducing uncertainty by using the 'explicit knowledge obtainable from research information' (Dawes, Summerskill et al. 2005).

Barriers to EBM/EBP

Achieving EBM or EBP is challenging as it relies on the evidence being available, in a format conducive to access and use, and practitioners willing and able to keep abreast (Brownson, Chiqui and Stamatakis 2009). Studies of obstacles to EBM/EBP have been widespread, and include a prominent model that considers the barriers to evidence uptake (at the individual, departmental, and institutional levels) in three domains of knowledge, attitude and behaviour - Figure 4:

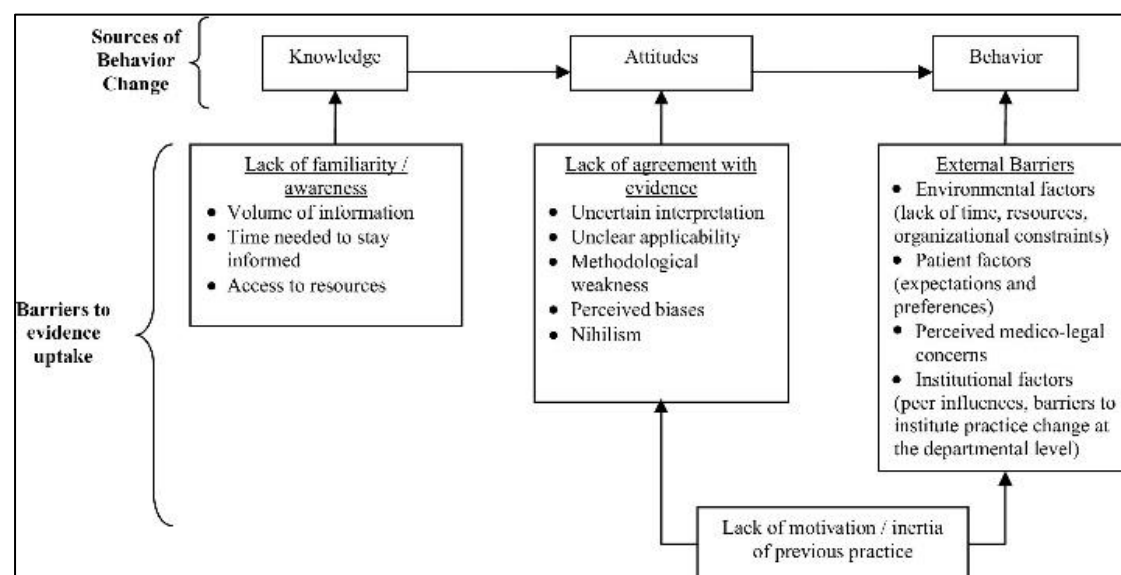


Figure 4: Barriers to evidence uptake (Lang, Wyer and Haynes 2007), adapted from (Cabana, Rand et al. 1999)

Reprinted with permission from Elsevier from: *Annals of Emergency Medicine*. 2007 Mar;49(3):355-63. Lang ES, Wyer PC, Haynes RB, *Knowledge translation: closing the evidence-to-practice gap*.

The premise underlying the model is that innovation and change in a clinician's practice are dependent on a combination of the three domains, each of which may encounter opposing forces (Cabana, Rand et al. 1999).

Although the importance of evidence informing healthcare is well established there has been a longstanding debate around the practical value of EBM and EBP – see for example in the BMJ (Accad and Francis 2018) or in physiotherapy (Veras, Kairy and Paquet 2016). Much of the debate links to philosophical and practical deliberations over the nature and application of evidence. For example, some question the extent to which research evidence can capture scientific truth (i.e. a rejection of a positivist perspective), and therefore how usefully it can be applied in practice (Goldenberg 2006). Another criticism relates to the consequences of

potential biases in research funding and conduct – particularly around the role of pharmaceutical companies (Spence 2014) – prompting Trish Greenhalgh to comment that ‘the evidence based “quality mark” has been misappropriated by vested interests’ (Greenhalgh, Howick and Maskrey 2014). A further criticism – particularly of EBM is that its application can be formulaic and leave no room for clinical discretion or judgement, or accounting for complexity and multimorbidity (see Box 2 for problems when applying evidence-based guidelines). This can result in over diagnosis and overtreatment (Spence 2014). The reframing as EBP attempts to counter some of this criticism by encouraging the clinical reasoning model (Figure 3).

- Randomised trials often exclude patients with comorbidities.
- Guidelines describe the evidence for single conditions; real patients often have several comorbidities.
- Individual patients may have different values and preferences from their clinician and the people creating the evidence.
- Guidelines may not cover aspects of care important to patients.
- Guidelines may make recommendations, quite often based solely on expert opinion, when individual patients would make a different choice; this perpetuates the power imbalance between patients and clinicians.
- Risk, benefits and downsides of management options may be viewed differently at the level of the population than from the perspective of an individual.
- Shared decision making is not clearly enabled in contemporary practice.

Box 2: Problems applying population-based evidence to individuals (McCartney, Treadwell et al. 2016)

Reproduced from *Making evidence-based medicine work for individual patients*. McCartney, M., J. Treadwell, N. Maskrey and R. Lehman BMJ 353 (2016), page 1, 2024 with permission from BMJ Publishing Group Ltd.

Evidence Hierarchies

EBM/EBP has been criticised for a “*dogmatic adherence to the RCT*” (Tracy, Dantas and Upshur 2003), and this reflects wider debates about the quality, types and relative merits of evidence used by practitioners and policy makers. Associated with this debate are the hierarchical approaches to evidence which are strongly focussed on study design, with designs arranged in order of decreasing internal validity (and abundance) in a hierarchy or pyramid - Figure 5.

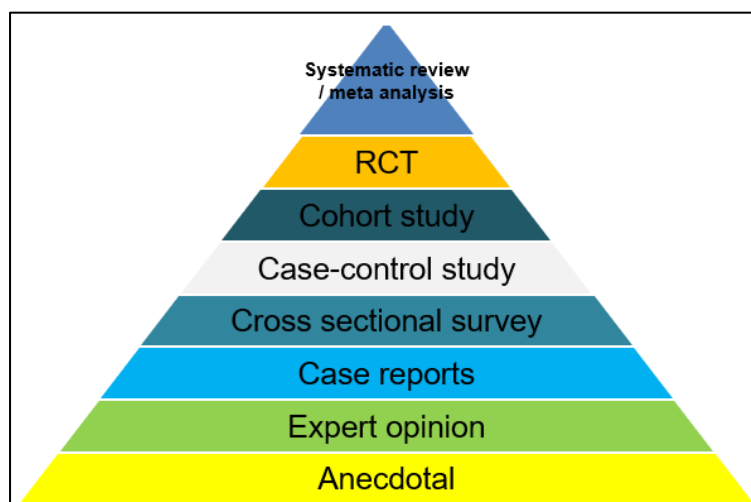


Figure 5: Hierarchies of evidence

[figure created by Mark Kingston in Microsoft PowerPoint 2023]

Levels of evidence, as developed by (for example) the Oxford Centre for Evidence Based Medicines (OCEBM Levels of Evidence Working Group 2011), have been described as a ‘cornerstone’ of EBP, encouraging healthcare practitioners to find the highest level of evidence to answer clinical questions (Burns, Rohrich and Chung 2011). There is increasing acknowledgement however, that the best study design varies according to the question that needs answering, such as ‘does it work?’, ‘how does it work?’, ‘is it safe?’. While randomised controlled trials (RCTs) and systematic reviews of RCTs are best for questions of effectiveness (‘does doing this work better than doing that?’), other questions require different study designs (Petticrew and Roberts 2003). For example, to understand how an intervention works or fails to work, or how patients and other stakeholders experience it, qualitative studies are more suited (Institute for Quality and Efficiency in Health Care 2022). While systematic reviews and meta-analyses remain important data sources for advisory bodies such as the National Institute for Health and Care Excellence (NICE), and the Cochrane Collaboration, there is an increasing recognition of the value of multiple types of evidence, from different and potentially complementary study designs. This includes evidence from across the research pipeline (Figure 6) of *efficacy* studies (under controlled conditions to maximise chances of observing an intervention effect), *effectiveness* studies (does an intervention work in real world conditions – better accounting for patient, provider

and system factors that may moderate effects) and implementation research (what happens following translation into practice) (Singal, Higgins and Waljee 2014, Bauer and Kirchner 2020).

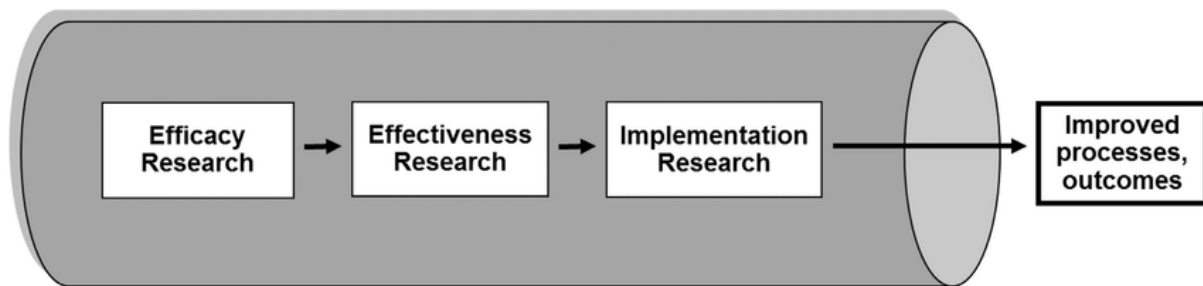


Figure 6: Research to impact pipeline (Landes, McBain and Curran 2019).

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Evidence based (or informed) policy

Despite the epistemological debates over specific elements of EBM and EBP, their fundamental starting point - that research evidence should be reflected in clinical practice remains a fundamental principle of quality in healthcare (Chalmers 2003, Malekinejad, Horvath et al. 2018). But responsibility for considering evidence also falls upon those influencing practice at a higher level e.g., policy makers. Although many health providers, including the NHS, have made great strides in evidence-based medicine, evidence-based policy making has consistently lagged behind (World Health Organization 2022). There is, it is argued, a considerable gap between what research shows is effective and the policies that are enacted and enforced (Brownson, Chiqui and Stamatakis 2009).

Over 25 years ago, Chris Ham argued that the prioritising of research and development in health needed to be translated into a 'culture of evidence-based policymaking' rather than 'driven more by values than by facts' (Ham, Hunter and Robinson 1995). As with EBM and EBP there is a moral and ethical imperative for governments and organisations to seek evidence-based approaches, not least due to the ambition to allocate scarce resources appropriately.

Things have improved, marked by the emergence of the field of health services research and health technology assessment (HTA), and increased evidence scrutiny (in the UK) from bodies like the Nuffield Trust, Kings Fund, Care Quality Commission, alongside NICE, Cochrane and others. Furthermore, there is increased public awareness vis a vis the role of scientific evidence in health policy (Malekinejad, Horvath et al. 2018) – in line with a general trend towards what has been termed a knowledge society (Meier 2012). However, the relationship of evidence to policy is complex, as highlighted by Greenhalgh and Russell:

A narrowly "evidence-based" framing of policymaking is inherently unable to explore the complex, context-dependent, and value-laden way in which competing options are negotiated by individuals and interest groups. (Greenhalgh and Russell 2009).

Policy makers do not consider evidence in the same way as researchers or individual practitioners – these are all groups which represent different communities with different values (Garrido, Kristensen et al. 2008). Lomas and colleagues identify three types of evidence, ideally complementary, that are used in healthcare decision making (Lomas, Culyer et al. 2005).

- *scientific evidence on effectiveness* - evidence that helps determine the potential benefit/efficacy and safety of the health technology, typically including randomised controlled trials (RCTs).
- *scientific evidence on context* - evidence on effectiveness specific to particular real world scenarios (less likely to be generalizable).
- *colloquial (or tacit) evidence* - evidence that helps support, supplement or refute the scientific evidence and is often used to augment an evidence landscape. Colloquial evidence consists of different types of data including informal expert opinion from clinicians and/ or patients, their views and narratives, electronic data from websites, policy documents, and reports. It has been suggested that colloquial evidence should be understood as the additional “*knowledge*” or “*factors*” alongside scientific evidence, which is considered in a deliberative process.

Variation in the use and acceptance of colloquial/tacit evidence in policy making is one of the ways in which knowledge differences between researchers or the scientific community and policy makers have been characterised (Garrido, Kristensen et al. 2008). The conceptual divergences between researchers and policy makers help to explain differences in notions of knowledge between the groups – see Table 2. These factors also contribute to growing recognition that the impact of research on policy making is complex, nuanced, and rarely linear (Boswell and Smith 2017), (Garrido, Kristensen et al. 2008) (Cairney, 2016). Instead, models that propose a gradual inculcation of evidence, such as the ‘enlightenment’ model (Weiss 1977) (Brownson, Chriqui and Stamatakis 2009), have gained prominence. In contrast, in the UK, the Research Excellence Framework, the national appraisal mechanism for assessing university research, has been criticised for its uncomplicated model of research to policy translation (Boswell and Smith 2017).

Table 2: Policy and research communities: different notions of knowledge – adapted from Davies 2005 (Garrido, Kristensen et al. 2008:p29)

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	Policy	Research
Understanding of knowledge	Colloquial	Scientific
Time frame for production of knowledge	On time, timely	Systematic, as long as it takes
Relevance of knowledge	Policy relevant	Research relevant, theoretically driven
Criteria for validity of knowledge	Anything that seems reasonable	Proven empirically
Format of knowledge	Short and to the point, clear messages	Thorough

Barriers and facilitators to research uptake in policy

Barriers and facilitators to research uptake in policy have been widely studied and reported, notably in health service focused systematic reviews (Merino and Lema (in (Garrido, Kristensen et al. 2008: pp 137-155)), (Innvaer, Vist et al. 2002), (Oliver, Innvar et al. 2014). Findings of these reviews were consistent with one another. The latter review (Oliver, Innvar et al) provides the latest and broadest overview (including 145 papers in a qualitative synthesis) from which I summarise the barriers and facilitators in Table 3 and in the domain taxonomy below.

Contact and collaboration between research producers and users: This domain was about the interaction and synergy of researchers and decision makers. A collaborative approach to research was found to be a major facilitator of research use, whereas timing and opportunities for contact were common barriers. There was also evidence that research scepticism and mutual trust were important.

Organisational resources: This domain emphasised the accessibility, relevance and cost of research and research outputs as well as the extent of managerial support, leadership, influence of professional bodies, and material and personnel resources.

Policy maker and practitioner characteristics: Characteristics that influenced research use (positively or negatively) included research skills and awareness; beliefs about research usefulness and personal experiences and values. However, Oliver et al. report that these findings were nearly all (91%) based on studies of perceptions, of which half were perceptions of researchers.

Research and researcher characteristics: Characteristics of research evidence were widely reported as factors affecting uptake of research, with clarity, perceived quality, format, and reliability of research findings reported as important factors. The use of dedicated research dissemination roles and strategies were a facilitator of research uptake.

Researcher understanding of the policy process and the context surrounding policy priorities was supportive of research uptake. A barrier was where researchers were described as having different priorities from policymakers, e.g., with pressure to publish in peer-reviewed journals. Researchers were valued more when it was clear they were non-partisan.

Policy characteristics: Competing pressures (economic, political, social, and cultural factors) were seen to impact on the policy process and hinder the development of evidence-based policy. Legal support and guidelines for evidence use were scarcely reported influences on evidence use.

Table 3: Barriers and Facilitators to research uptake in policy – themes (n = number of studies) (Oliver, Innvar et al. 2014)

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Seen as barrier	Factor	Seen as facilitator
85	Contact and collaboration	98
8	Collaboration	49
42	Timing/opportunity	24
8	Relationship with policymakers	39
8	Relationship with researchers/info staff	37
8	Contact with researchers/info staff	31
9	Contact with policymakers	30
2	Other	1
92	Organisation and resources	99
63	Availability and access to research/improved dissemination	65
25	Costs	11
3	Managerial support (practical)	22
11	Professional bodies	15
11	Material resources available	12
14	Staff or personnel resources	10
3	Managerial will	5
9	Staff turnover/continuity of employment	3
9	Other	9
85	Research and researcher characteristics	95
54	Clarity/relevance/reliability of research findings	46
18	Format of research findings	26
9	Importance of research findings	10
25	Other	32
62	Policymaker characteristics	69
26	Policymaker research skills	22
24	Policymaker research awareness	10
13	Political support (will)	21
4	Political support (practical)	12
15	Practitioner research skills/awareness	6
6	Other	11
28	Policy characteristics	33
6	Guidelines or policy statement	9
9	Importance of policy	11
5	Legal or legislative support	3
26	Other pressures on policy	5
4	Other	4
10	Other	1
105	All factors (total)	124

Implicit in the barriers and facilitators, and in the wider research and policy (and practice) debate is that many healthcare initiatives simply do not have an evidence base at all, especially in the case of innovations which are, by their very nature, new. In such circumstances, there is a case for policy makers and researchers to generate appropriate

evidence across the research to practice pipeline (Figure 6). However, while this is the ideal scenario, other factors influence the extent that this happens.

Other influences on policy decision-making

When making decisions about patient care, and the organisation and delivery of health services, decision-makers are usually considering research evidence alongside a whole. Thus research evidence is frequently contested and negotiated and the extent to which it is useful and used depends upon how well it 'fits' into the particular setting. (Ferlie, Gabbay et al. 2001).

As highlighted in the quotation above, policy level decision making incorporates a number of competing influences, to the extent that evidence often plays a rather limited role (Boswell, 2009a) (Hunter 2009). A host of influencing factors have been identified – including: other knowledge sources, local priorities, resources availability, political saliency, patient needs and preferences, policy and regulatory requirements ideology, financial stringency, political theory, and intellectual fashion (Davis and Howden-Chapman 1996) (Black 2001). A 2004 review of health policies concluded that government programmes were largely driven, not by evidence but by 'informed guesswork, expert hunches' and 'political and other imperatives' (Coote, Allen and Woodhead 2004).

Arguments have been made to better reflect the role of evidence, through a shift in terminology from 'evidence-based' to 'evidence-informed' decision- and policy-making (World Health Organization 2022). Such a position maintains the desire for research translation to bridge the evidence to policy gap but acknowledges the varied and context specific influences on policy decision-making at national and local levels. Given the challenges discussed in this chapter, at present either definition remains an ambition in the UK.

Summary

In this section I have introduced research and evidence and discussed their role in healthcare practice and policy. While there remains a desire for these aspects to be closely aligned, that is not always the case. Attempts to embed research and evidence in EBM, EBP and policy through research translation have identified many barriers and facilitators to use. These include the availability and characteristics of evidence, contrasting stakeholder views and characteristics, and influences of culture and context (local and wider). Thus, research and evidence use is rarely anything but complex at the various levels of healthcare (e.g. individual patient/clinician encounter, organisation, policy level). One of the approaches to untangling this complexity is to use tools of implementation research – the subject of the companion part of this chapter that follows.

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Chapter 2: Evidence and real-world settings: Part 2: Implementation Research

Introduction

One of the basic inferences underpinning this thesis, is recognition of the complexity associated with the introduction of EARS into health services, in contrast, for example with their development in computer laboratories. This complexity comes from application within different settings, and the involvement of multiple stakeholders across different levels of the health system – e.g., policy makers, service providers, practitioners and patients. All with various interests, influences and experiences that shape their decisions around introducing and using EARS tools. One methodological approach to tackling this complexity and contextual variation is to use the tools of implementation research to help us understand some of the influences at play.

Origins of implementation research

Although implementation research is a relatively new area of scientific enquiry. Its origins are multi-faceted and include the following drivers:

- The translation gap between research and practice whereby even evidence-based interventions may not get adopted into clinical practice. Using traditional clinical trial approaches and 'pushing them into real world conditions is not sufficient to guarantee public health impact (Bauer and Kirchner 2020). New approaches were needed to overcome the gap.
- Recognition that most interventions are complex, and especially in health care, are introduced into complex environments with many 'actors' and interactions (Craig, Dieppe et al. 2008). New approaches and theories were needed to account for this complexity and multiplicity of stakeholders.
- Two-thirds of organisations' efforts to implement change fail (Damschroder, Aron et al. 2009) and most clinical innovations never make it to routine practice (Olson and Rootkin 2022). Those that do will often have a significant lag until uptake – commonly estimated at 17-20 years (Grant, Green and Mason 2003, Morris, Wooding and Grant 2011). The problem is longstanding – the scurvy trial of 1747 considered earlier did not result in routine citrus provision in the Royal Navy for nearly 50 years (Mosteller 1981).

- Challenges of replicating research findings from research studies (which usually have additional staffing or other resources, and a focus on controlling and monitoring influencing factors) into routine practice in varied ‘real world’ settings.
- Challenges in determining effectiveness of poorly specified or delivered interventions. In healthcare interventions, such ambiguity leads to a potential lack of understanding over questions (for example) of what was delivered, how often, and to whom – with consequences for our understanding of what works.
- Recognition that implementation of an intervention is not easy or straightforward and is subject to a range of influencing factors that depend on the place, time and circumstances – i.e., the context in which the intervention is introduced. It is, some have argued, the contextual factors, rather than treatment effectiveness that determine *“whether and how quickly a clinical innovation will become widely used”* (Colditz and Emmons 2012), (Bauer and Kirchner 2020). The latest MRC framework for the development and evaluation of complex interventions emphasised.... *“the value of understanding interventions as ‘events in systems’ that produce effects through interactions with features of the contexts in which they are implemented.”* (Skivington, Matthews et al. 2021). Eminent implementation scientist Trish Greenhalgh describes the implementation of new healthcare practices as *“relentlessly contextual”* (Greenhalgh cited in (Simon 2017)).
- A drive to maximise spending efficiency in research and service delivery has resulted in an increased focus (from research funders and health service commissioners) on the implementation factors influencing success of clinical innovations (Berwick, Nolan and Whittington 2008, Bauer, Damschroder et al. 2015).

Implementation research – what is it & why do we need it?

In response to these drivers, implementation research has emerged as a research discipline concerned with what, why, and how interventions work in “real world” settings and efforts to improve them (Peters, Adam et al. 2013). Turning evidence, ideas, and policies into practice involves activities and processes that implement these elements into real-world settings.

Implementation research has been defined as:

The scientific inquiry into questions concerning implementation – the act of carrying an intention into effect, which in health research can be policies, programmes, or individual practices (collectively called interventions) (Peters, Adam et al. 2013)

Although the description above is my favoured definition, variants exist which incorporate an explicit notion of evidence-based medicine and research translation. Take for example, that proposed in the first edition of the journal Implementation Science, which defined its subject matter as:

The scientific study of methods to promote the systematic uptake of research findings and other evidence-based practice into routine practice and, hence, to improve the quality and effectiveness of health services. (Eccles and Mittman 2012)

However, what this definition (and others like it) lacks, is acknowledgement that many interventions have not been subject to a rigorous pipeline of efficacy (controlled studies) and effectiveness research (real world/practice based) – but still get implemented. Indeed, evidence for (or against) an intervention is often equivocal or contested. Whereas a strong research basis for an intervention is preferable, it is not necessarily what happens in practice, but implementation research addresses this through attempts to understanding why things are adopted (a decision is made to introduce an intervention) – including therefore the role of evidence. But implementation research can explore any aspect of implementation, such as descriptions of what is implemented, factors affecting implementation (barriers and facilitators across multiple levels of context and ways and means to address them), the processes of implementation, and the results, including how to introduce potential solutions into a health system or how to promote their large-scale use and sustainability (Peters, Adam et al. 2013) (Bauer and Kirchner 2020). Findings of implementation research can be of great utility for practitioners and those implementing programs, policies and practice, as well as providing broader generalisable knowledge and theoretical insights about implementation experiences.

Principles of implementation research

A concern for context

Implementation research is grounded in the heterogeneity of the real world and investigators examine how interventions are adapted to specific contexts and how context influences intervention effectiveness (Hoke T 2018). It is distinct from clinical research because it is much more practically orientated (Bjorndal 2018) and actively engages with the '*context into which a clinical innovation is introduced, rather than controlling (efficacy studies) or simply tolerating (effectiveness studies) that context*' (Bauer and Kirchner 2020). Implementation research confronts the multi-faceted and complex nature of organisations, systems, processes and people that coalesce in a given place and time. This context is not merely a backdrop, but the set of circumstances or factors that surround a particular implementation effort (Bauer, Damschroder et al. 2015). Context includes the demographic, social, cultural, economic, political, and legal environment and the setting (Peters, Adam et al. 2013). The structure of health systems is particularly important for implementation research on health (Peters, Adam et al. 2013). Structural layers of contextual influence are reflected in common delineation into categories of *micro*, *meso* and *macro*. *Micro* relates to a local project setting (such as a ward or general practice); *meso* to the wider organisation (e.g. hospital or health

board) and *macro* to the broad health system and policy context (Caldwell and Mays 2012) (Damschroder, Aron et al. 2009)).

Complexity

Implementation itself describes a wide range of activities, behaviours and interactions, that are associated with innovation, with change, and a rejection of the status quo. It can be a relatively messy and complex process (Stetler, Legro et al. 2006). Implementation research, by engaging in this context and complexity, addresses some of the details of intervention inputs and tactics, and organisational factors that traditional intervention research can fail to capture (Stead, Hastings and Eadie 2002).

There is a role for implementation research alongside or indeed instead of effectiveness research, as reflected in Medical Research Council guidance for the evaluation of complex interventions – which are defined as those with several interacting components, or where they are dependent on the behaviours of those delivering and receiving the intervention, there are a range of possible outcomes, or there is a need to tailor the intervention to different contexts and settings (Craig, Dieppe et al. 2008). The updated MRC guidance emphasises that improving theories and understanding of how interventions contribute to change, “*including how they interact with their context and wider dynamic systems*” is imperative (Skivington, Matthews et al. 2021).

A multi-stakeholder awareness

Whereas effectiveness research is likely to focus on individuals or group of patients, implementation research accounts for the influence of a range of potential stakeholders on what is adopted, planned and delivered, as well as subsequent outcomes. Thus, targets of implementation research may include patients, but also providers, organisations, managers, decision makers and users (Damschroder, Aron et al. 2009, Harvey and Kitson 2016).

Implementation research methods and outcomes

Implementation research can employ quantitative and qualitative designs, or both. An implication of studying complex systems is that the research may need to use multiple methods and different sources of information to understand an implementation problem (Peters, Adam et al. 2013). In implementation research the research design should be led by the questions and outcomes of interest. Implementation objectives are typically expressed in terms of exploring, describing, explaining, or predicting and can be operationalised in a wide range of study types (e.g., pragmatic trial, quality improvement, mixed methods) (Peters, Adam et al. 2013). Implementation specific outcomes have been developed, notably by Proctor et al. (2011) to support efforts to determine the success of any implementation. The

eight outcomes identified were *acceptability, adoption, appropriateness, feasibility, fidelity, implementation cost, penetration, and sustainability* (Proctor, Silmere et al. 2011). I include definitions for each in Table 4, alongside details of indicative methodologies aligned to these outcomes. So, for example, implementation studies of healthcare technologies might incorporate qualitative interviews with managers to understand adoption decisions, and users or patients to assess acceptability and appropriateness. Alongside these implementation specific outcomes, attention to the components of the implementation strategy and contextual factors that support or hinder the achievement of impacts, are important concerns for implementation research (Skivington, Matthews et al. 2021).

Table 4: Implementation outcomes and associated methods – adapted from (Proctor, Silmere et al. 2011) and (Peters, Adam et al. 2013)

Adapted in line with licenses (<https://creativecommons.org/licenses/by-nc/2.0>)

Implementation outcome	Working definition	Related terms	Common methodological approaches
Acceptability	The perception among stakeholders (for example, consumers, providers, managers, policy makers) that an intervention is agreeable	Factors related to acceptability (for example, comfort, relative advantage, credibility)	Survey Semi-structured interviews Focus groups Administrative data Refused/blank Usability /user experience
Adoption	The intention, initial decision, or action to try to employ a new intervention	Uptake, utilisation, intention to try	Administrative data Observation Semi-structured interviews Focus groups Survey
Appropriateness	The perceived fit or relevance of the intervention in a particular setting or for a particular target audience (for example, provider or consumer) or problem	Relevance, perceived fit, compatibility, perceived usefulness or suitability	Survey Semi-structured interviews Focus groups Usability /user experience
Feasibility	The extent to which an intervention can be carried out in a particular setting or organisation	Practicality, actual fit, utility, trialability	Survey Administrative data
Fidelity	The degree to which an intervention was implemented as it was designed in an original protocol, plan, or policy	Adherence, delivery as intended, integrity, quality of programme delivery, intensity or dosage of delivery	Observation Checklists Self-report
Implementation cost	The incremental cost of the implementation strategy. The total cost of implementation would also include the cost of the intervention itself	Marginal cost, total cost	Administrative data
Coverage	The degree to which the population that is eligible to benefit from an intervention actually receives it.	Reach, access, service spread or effective coverage (focusing on those who need an intervention and its delivery at sufficient quality, thus combining coverage and fidelity), penetration (focusing on the degree to which an intervention is integrated in a service setting)	Case audit Checklists
Sustainability	The extent to which an intervention is maintained or institutionalised in a given setting	Maintenance, continuation, durability, institutionalisation, routinisation, integration, incorporation	Case audit Semi-structured interviews Questionnaires Checklists

Implementation research models

Most implementation research studies are grounded in a conceptual theory or framework that guides lines of inquiry and proposes a theory of change (Hoke T 2018). A multitude are available. A 2012 review by Tabak et al, identified 61 different published theories and frameworks (which they collectively called 'models') (Tabak, Khoong et al. 2012).

Tabak et al. outline the theoretical value of these models as enhancing implementation and implementation research; through use either as part of an implementation strategy to guide the implementation process and increase the likelihood of success, or as a framework for evaluation (Tabak, Khoong et al. 2012). In the latter case, use of existing models enables distillation and improved understanding of its constructs, (Tabak, Khoong et al. 2012), (Sales, Smith et al. 2006) and its overall utility, applicability and content and construct validity (McEvoy, Ballini et al. 2014).

Within the 61 models that Tabak identified, a number stand out in terms of their prominence, empirical testing, and relevance to the issues explored in this thesis. These are summarised over the following pages.

Diffusion of innovations

Most overviews of implementation research, see for example (Bauer, Damschroder et al. 2015) or (Greenhalgh, Robert et al. 2004), correspond its nascent stage with the work of Everett Rogers and the publication of his seminal *Diffusion of Innovations* in 1962. This work was itself informed by antecedents from a range of disciplines including agriculture, anthropology, industry and to a lesser degree healthcare (Rogers 2003). Rogers' theory has gone on to become the most influential of all models, and an important foundation for those that have followed. In this section, I summarise its main features.

Diffusion of innovations theory considered the way in which individuals and organisations adopt innovations – prompted initially by Rogers own experience on his father's farm (Rogers 2003). Rogers defined *innovation* as “an idea, practice or object that is perceived as new by an individual or other unit of adoption”; and *diffusion* as the process through which an innovation is communicated (or spread) through certain channels over-time among the members of a social system (Rogers 2003). The end result of this diffusion is that people, as part of a social system, adopt (or decide not to) a new idea, behaviour, or product: *Adoption* means that a person does something differently than what they had previously (i.e., purchase or use a new product, acquire and perform a new behaviour, etc.). The key to adoption is that the person must perceive the idea, behaviour, or product as new or innovative. It is through this that diffusion is possible (Rogers 2003).

Rogers' theory considers how, why, and at what rate new ideas, processes, and technology spread through a population or community. Drawing on a synthesis of over 500 studies,

Rogers conceptualized the diffusion of innovations as a social process with multiple determinants well beyond the evidence supporting the innovation itself (Rogers 2003). Rogers' work was particularly influential as it was one of the first empirically tested theories around implementation (Bauer and Kirchner 2020).

Trish Greenhalgh and colleagues revisited Rogers work from an explicit health services perspective in their systematic review commissioned by the Department of Health (Greenhalgh, Robert et al. 2004). They explored and refined the theories and further cemented the prominence of diffusion of innovations, and of implementation research more generally.

Variables influencing diffusion of innovation

Diffusion or the lack thereof can be explained by three general sets of variables: an ***innovation's*** attributes; the ***characteristics of adopters*** – (individuals or organisations), especially potential adopters' perceptions of opinion leaders' reactions, or social influence; and the ***larger social and political context***, including the salience of issues related to the innovation, how proponents and opponents frame the meaning of the innovation, and the timing of its introduction (Dearing and Cox 2018).

Innovation attributes

Rogers emphasises five perceived attributes of innovations that influence whether and how fast an innovation is adopted. These were relative advantage, compatibility, complexity, trialability and observability. Rogers concluded that between 49 and 87 percent of the variance in the rate of adoption can be explained by these attributes (Rogers 2003: p221). Greenhalgh et al. reconfirmed the importance of these attributes but emphasised that they were not stable features of an innovation – but subject to variation and modification over time, and influenced by interactions between adopters and the context (Greenhalgh, Robert et al. 2004). Greenhalgh et al. also added attributes from their systematic review that they determined to be important in the adoption process – see Box 3.

Relative Advantage: The perceived relative advantage of an innovation is the degree to which it is perceived as improving on a previous innovation. Innovations that have a clear, unambiguous advantage in either effectiveness or cost-effectiveness are more easily adopted and implemented.

Compatibility: The perceived compatibility of an innovation describes how consistent it is with regard to an individual's values, experiences, and needs. The degree of compatibility determines the change in behaviour required to adopt an innovation. Thus, instead of introducing an incompatible innovation into a social system, adoption can be easier when the innovation is broken up into several more compatible innovations that can be adopted in sequence — each requiring only a minor behaviour change. Compatibility is positively related to an innovation's rate of adoption.

Complexity: The perceived complexity of an innovation describes how difficult it seems to comprehend and use the innovation. A high degree of complexity can be a strong barrier against adoption. Complexity is perceived by users, and part of their user experience (UX) — which has emerged as an approach concerned with exploring complexity and usability of innovations. Complexity is negatively related to an innovation's rate of adoption.

Trialability: The perceived trialability of an innovation is the degree to which it can be tried on a probationary basis. A personal trial of an innovation is an effective way to reduce uncertainty about an innovation. As such, trialability is positively related to an innovation's rate of adoption.

Observability: The perceived observability of an innovation is the degree to which others can observe the results of an innovation. Observing a peer can be a proxy for a trial of an innovation. Observability is positively related to an innovation's rate of adoption.

Reinvention: If potential adopters can adapt, refine, or otherwise modify the innovation to suit their own needs, it will be adopted more easily.

Fuzzy Boundaries: Complex innovations in service organisations can be conceptualized as having a “hard core” (the irreducible elements of the innovation itself) and a “soft periphery” (the organisational structures and systems required for the full implementation of the innovation); the adaptiveness of the “soft periphery” is a key attribute of the innovation. The concept of a soft periphery links with Rogers's concept of reinvention and with “innovation-system fit” as an important feature of system readiness.

Risk: If the innovation carries a high degree of uncertainty of outcome that the individual perceives as personally risky, it is less likely to be adopted

Task: If the innovation is relevant to the performance of the intended user's work and if it improves task performance, it will be adopted more easily. Interventions to enhance task relevance improve the chances of successful adoption. If the innovation is feasible, workable, and easy to use, it will be adopted more easily.

Knowledge Required to Use It: If the knowledge required for the innovation's use can be codified and transferred from one context to another, it will be adopted more easily

Augmentation/Support: If a technology is supplied as an “augmented product” (e.g., with customization, training, and a help desk), it will be assimilated more easily.

Box 3: Innovation attributes in diffusion of innovations adapted from (Rogers 2003), (Greenhalgh, Robert et al. 2004), (Singer 2016).

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Adopter variables (individual level)

For individuals Rogers outlined an *innovation decision process* incorporating five stages, which were not necessarily linear, that potential adopters pass through. The stages corresponded to subjects determining the advantages and disadvantages of a particular innovation in deciding whether to adopt it (Rogers 2003).

Knowledge: The individual becomes aware of the innovation's existence and starts to understand how it works.

Persuasion: The individual develops an attitude towards an innovation.

Decision: An individual who is aware of an innovation and has formed an attitude towards it will at some point decide whether to adopt the innovation. This often involves a trial phase.

Implementation: The individual starts using the innovation. She continues learning about it and overcomes problems, further reducing the innovation's uncertainty.

Confirmation: After having implemented an innovation, an adopter will continue to collect information that either reinforces or alters their decision – leading to continued adoption or discontinuance.

Rogers incorporated the stages into a model for the innovation decision process – Figure 7.

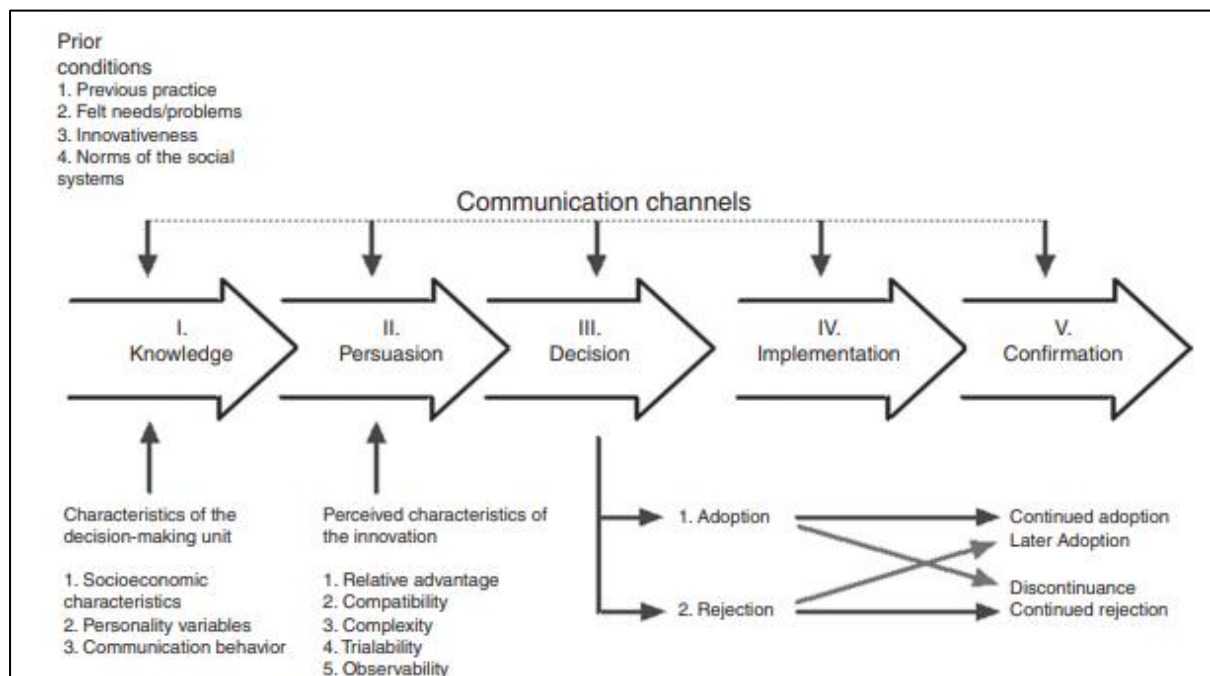


Figure 7: Adoption Innovation Decision Process, Adapted from Rogers 1983, cited in (Miranda, Farias et al. 2016).

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Rogers also proposed a now widely used model of adopter types in which he classified people as innovators (the fastest adopter group), early adopters, the early majority, the late majority and laggards (the slowest to change) (Rogers 2003). However, based on their review findings, Greenhalgh et al. argued that these classical models provide little information about how to accelerate and promote change and underplayed the active role of potential adopters in the process. Instead, they put forward the following aspects of adopters and the adoption process in their conceptual model (Figure 10, p49) (Greenhalgh, Robert et al. 2004), (Greenhalgh T 2005).

General psychological antecedents: characteristics of adopters associated with likelihood of adopting innovations – such as tolerance of ambiguity, intellect, motivation, values.

Context-specific psychological antecedents: an intended adopter who is motivated and capable to use an innovation.

Meaning: the meaning of the innovation for the adopter, which can be negotiated and reframed. Where meaning for the individual adopter matches the meaning attached by other stakeholders an innovation is more likely to be adopted.

The adoption decision: (and to what extent that is contingent, collective or authoritative in nature), and how the concerns of the adopter are addressed at various stages during the adoption and assimilation process.

Adoption by organisations (and individuals within an organisation)

Individuals are often members of organisations and will adopt innovations in such a context. According to Rogers the innovation process for organisations involved the following steps – as summarised by (Singer 2016).

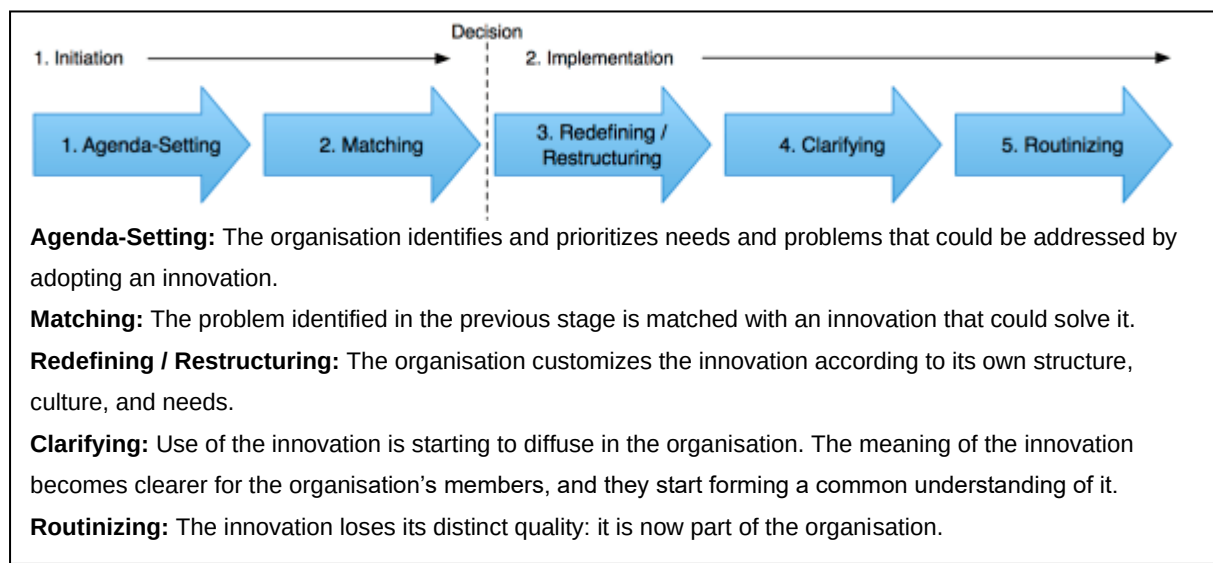


Figure 8: The innovation process for organisations according to Rogers (Singer 2016).

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A finding of the Greenhalgh et al. review was that the evidence of adoption by organisations, which they referred to as 'assimilation', was more consistent with an "*organic and often rather messy model*" than for individual adoption with the organisation moving "*back and forth between initiation, development, and implementation, variously punctuated by shocks, setbacks, and surprises*" (Greenhalgh, Robert et al. 2004) (Van de Ven, D.E. Polley et al. 1999).

Diffusion and dissemination

Greenhalgh et al. (Greenhalgh, Robert et al. 2004). consider the influences of adoption as lying on a continuum between pure diffusion (unplanned, informal, decentralised and largely horizontal) and active dissemination (planned, formal, centralised, and often vertical) – Figure 9.

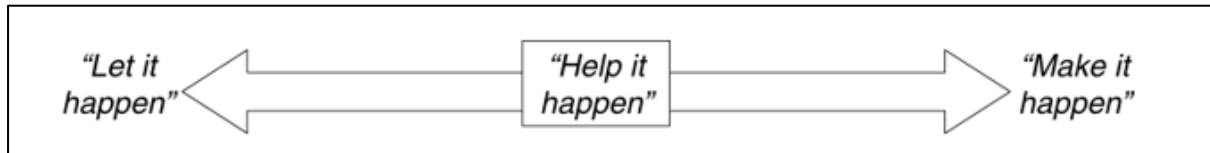


Figure 9: Diffusion (unplanned) and dissemination (planned) continuum (Greenhalgh, Robert et al. 2004).

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Building on the work of Rogers and others, Greenhalgh et al. summarised mechanisms for diffusion and dissemination, which I recap in turn:

Network structure: the structure and quality of the social networks in which individuals and organisations sit. Horizontal (i.e., peer to peer) networks – common with GPs for example – may be more effective for spreading influence and reframing of meaning, whereas vertical networks may be more effective for cascading information and authoritative decisions.

Homophily: the adoption of innovations is more likely if the potential adopters have similar backgrounds to each other, and to existing users.

Opinion leaders: Expert opinion leaders exert influence (positively or negatively) through authority and status, while peer opinion leaders influence through representativeness and credibility.

Champions: Adoption is more likely if key individuals in the social network are willing to support the innovation.

Boundary Spanners: Organisations are more likely to adopt if those with significant social ties are able and willing to link the organisation to other networks in relation to this innovation.

Formal dissemination programs: An effective program is likely to 1) take account of adopters needs and perspectives; 2) tailor strategies to sub-groups; 3) use appropriate messages and communication styles; 4) use appropriate communication channels; 5) incorporate rigorous evaluation and monitoring of goals/milestones.

The larger social and political context

System Antecedents for Innovation (Inner context)

Some structural and cultural features of organisations were also seen to influence adoption/assimilation.

Structural Determinants of Innovativeness: Greenhalgh et al. found that organisations were better able to assimilate innovations if they were large, mature and had differentiated departments or units that could focus support. Also helpful was some flexibility in resourcing, allowing resources to be directed to new projects, and decentralized decision-making structures.

Absorptive capacity for new knowledge: “An organisation that is systematically able to identify, capture, interpret, share, reframe, and recodify new knowledge; to link it with its own existing knowledge base; and to put it to appropriate use will be better able to assimilate innovations”.

Receptive Context for Change.

As well as an absorptive capacity for new knowledge, “receptive context includes strong leadership, clear strategic vision, good managerial relations, visionary staff in pivotal positions, a climate conducive to experimentation and risk taking, and effective data capture systems”.

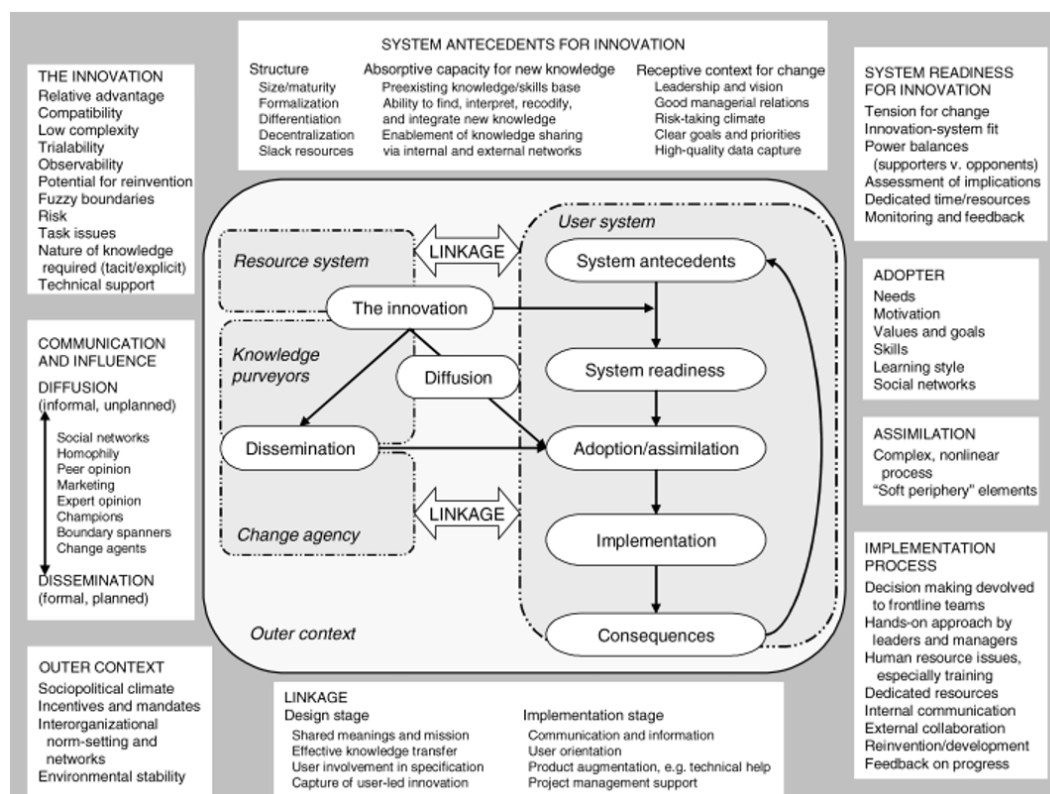


Figure 10: Conceptual Model for Considering the Determinants of Diffusion, Dissemination, and Implementation of Innovations in Health Service Delivery and Organization, (Greenhalgh, Robert et al. 2004).

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Figure 10 shows the unifying conceptual model Greenhalgh et al. derived from their synthesis of theoretical and empirical findings. They intended the model mainly as an aide for considering the different aspects of a complex situation and their many interactions (Greenhalgh, Robert et al. 2004).

System Readiness for Innovation (Inner context)

Greenhalgh et al found that while an organisation may be amenable to an innovation in general, they may not be ready or willing to assimilate it. Thus, the concept of organisation readiness was important, which included elements such as: a desire for change by staff; compatibility of the innovation with the organisation's goals and values; whether the impact of the innovation has been fully assessed and anticipated; the number of supporters for the innovation; adequate and ongoing resources and capacity to evaluate the impact of the innovation.

Interorganisational Networks and Collaboration (Outer context)

Greenhalgh et al. highlight a number of external influences on adoption and implementation. These include: *Informal interorganisational networks* including whether similar organisations have adopted the initiative. *Intentional spread strategies*: Formal networking initiatives, such as quality improvement programmes that help to build momentum and share learning. *Political directives*: Policy initiatives, especially where accompanied by financial resources.

Implementation and routinisation

In their model Greenhalgh et al. refer to implementation as “*early usage that follows adoption decisions*” ..., a definition first proposed by Meyers et al. (Meyers, Sivakumar and Nakata 1999). System readiness was key, but longer-term use and integration into routine practice was also contingent on factors such as an adaptive organisational structure that supports devolved decision making, support at top and middle management levels, the motivation, capacity and competence of individual practitioners, early and widespread involvement of staff, dedicated and ongoing funding, effective communication within organisations, timely feedback, and when an innovation is adapted to fit the local context.

It is apparent that Meyers definition of implementation differs from more recent interpretations identified earlier in this chapter. These have a broader focus, not limited to use or usage. Greenhalgh et al. acknowledged that implementation overlaps with and depends on factors relating to the adoption decision and to aspects of assimilation. More typical in recent implementation research is for adoption to be considered part of the implementation story, rather than a distinct and reducible precursor to it. This position is

exemplified by Proctor's list of implementation outcomes which includes adoption as a proposed measure (Table 4, page 42).

Normalisation Process Theory

Building on diffusion of innovations, Normalisation Process Theory (NPT) (May and Finch 2009) is a framework increasingly used as a conceptual tool to examine and explore implementation. It is concerned with understanding how interventions become 'normalised' i.e., enter routine use within the context studied. This is important from the perspective of understanding the potential effects of an intervention, and whether it can be widely implemented – required for any significant impact on health (Murray, Treweek et al. 2010). NPT addresses “*key mechanisms that promote and inhibit the implementation, embedding and integration of new health techniques, technologies and other complex interventions*” (May, Cummings et al. 2018). NPT characterises implementation in relation to the work undertaken by a range of actors across for domains. These are how people understand the innovation and its purpose (coherence); what decisions are taken to use the innovation, including advantages and disadvantages (cognitive participation); what people do to bring the innovation into everyday use (collective action); and how an innovation is reviewed, modified or abandoned (reflexive monitoring) (May and Finch 2009).

Murray et al. provide an example of NPT applied to an intervention to promote care for patients with back pain in primary care (Murray, Treweek et al. 2010). They found that many patients did not present back pain as a primary condition, and that the intervention had low coherence a focusing on one condition made little sense to GPs within the wider context of the consultation. In turn this led to low cognitive participation and collective action. NPT clarified understanding of this problem and led to changes in the design of the trial, including attaching a GP to the project who acted as a peer advisor to GP participants and reengaged their interest in using the referral template (Murray, Treweek et al. 2010).

Normalisation Process Theory features in Chapter 7, where, similarly to the back pain example above, it supports exploration of the response by GPs to an EARS tool in primary care.

i-PARIHS

The main implementation framework I use in this thesis is i-PARIHS (integrated - Promoting Action on Research Implementation in Health Services), which is an update of a previous framework (PARIHS). In a 2015 book, two of the frameworks' developers - Gill Harvey and Alison Kitson - list the three key themes that prompted the development of their initial framework (Harvey and Kitson 2015). The themes were: 1) evidence is broader than research and 'good' research is not sufficient to guarantee its uptake; 2) a recognition that context matters as factors within the inner and outer context (i.e. the immediate site of implementation and the wider organisation and policy environment) play a significant role in determining the outcomes of implementation; 3) a need to tailor implementation methods and approaches to match the particular needs of the situation.

PARIHS and i-PARIHS (which adds the prefix *integrated*) developed through multiple iterations over a 20-year period. Development has coincided with and learned from the wider 'movement' that has shifted from an epistemological position of implementation as a sequential process to one characterised by complexity and non-linear, interactive and context specific processes (Greenhalgh, Robert et al. 2004), (Glasziou and Haynes 2005), requiring a flexible and responsive approach to implementation (Bergström, Ehrenberg et al. 2020). i-PARIHS has been widely applied to support implementation studies, both as a tool for guiding implementation strategies and to support analysis (Bergström, Ehrenberg et al. 2020). PARIHS incorporated three main constructs – *evidence*, *context* and *facilitation*, which became four in i-PARIHS - *innovation*, *context*, *recipients* and *facilitation*. I provide an overview of these four constructs, touching upon the reasons for their amendment between versions.

Innovation

The original PARIHS construct was heavily focussed on the evidence for an innovation, as a key driver of implementation. They had a broad view of evidence, recognising that research evidence was only part of the knowledge base. Thus they identified clinical expertise, patient choice and local data/experience (Figure 11) as important aspects of the evidence for an innovation (Rycroft-Malone, Seers et al. 2004, Harvey and Kitson 2016) – acknowledging the overlap with models of evidence based practice. Over time, the PARIHS developers added an additional layer to these initial concepts which addressed attributes perceived as affecting the quality of the evidence; which they presented as a continuum (Table 5); conceptually akin to a hierarchical component. The PARIHS framework proposed that the more these four sub-elements of evidence aligned towards the high end of the continuum, the stronger the evidence to underpin implementation (and the easier the implementation) (Harvey and Kitson 2015 p17).

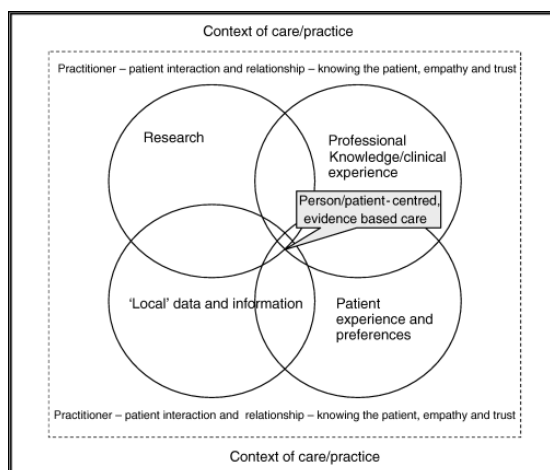


Figure 11: Four sources of evidence for patient-centred, evidence-based practice (Rycroft-Malone, Seers et al. 2004).

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Table 5: Attributes of ‘high’ (strong) evidence.

Source: (Harvey and Kitson 2015 p17) reprinted with permission from the publisher.

<i>Dimension of evidence</i>	<i>Attributes at the high end of the continuum</i>
Research	• Well-conceived, designed and executed research • Seen as one part of a decision • Valued as evidence • Lack of certainty acknowledged • Social construction acknowledged • Judged as relevant • Importance weighted • Conclusions drawn
Clinical experience	• Clinical experience and expertise reflected upon and tested by individuals and groups • Consensus within similar groups • Valued as evidence • Seen as one part of the decision • Judged as relevant • Importance weighted • Conclusions drawn
Patient experience	• Valued as evidence • Multiple biographies used • Partnerships with healthcare professionals • Seen as one part of a decision • Judged as relevant • Importance weighted • Conclusions drawn
Local experience	• Valued as evidence • Collected and analysed systematically and rigorously • Evaluated and reflected upon • Conclusions drawn

In time, in the revised i-PARIHS the developers extended the evidence construct and re-coined it as ‘innovation’. Based on their own empirical testing of the PARIHS framework (Rycroft-Malone, Seers et al. 2013), testing by others (summarised in a critical synthesis by Helfrich et al. (Helfrich, Damschroder et al. 2010), and on developments in implementation

research, they saw the broader term as a better fit with the ‘real-world’ picture where (rightly or wrongly) evidence was often not a principal driver of implementation. They also acknowledged a shift in understanding of the role of evidence in implementation, from evidence-based practice as researcher led knowledge transfer, to a non-linear relationship where researchers and users have key roles, and where colloquial or tacit information sources are also important (Harvey and Kitson 2015). Harvey and Kitson noted that in their experience (of applying PARIHS), even rigorous and robust research evidence is rarely enough to guarantee innovation uptake: and evidence is subject to negotiation, contestation and adaptation (Harvey and Kitson 2015), p51. Their revisions acknowledged Diffusion of Innovation theory (after Rogers and Greenhalgh et al) whereby *‘the process of aligning explicit external evidence’* with local priorities and practice is an important way of enhancing the compatibility of a proposed change (Harvey and Kitson 2016), and the *‘characteristic of the knowledge [or innovation] creates a set of conditions that make them more or less likely to be recognised and applied’* (Harvey and Kitson 2015: p35). A further observation was that quality improvement initiatives and other inductive processes were often part of the implementation process, and these would often generate context specific evidence from practice (Harvey and Kitson 2015), p41), (Harvey and Kitson 2016). The revised i-PARIHS framework incorporated the wider interpretation of evidence (knowledge sources) and added further characteristics of the innovation perceived to influence implementation; building once more on the wider implementation research (including the innovation attributes of diffusion of innovation summarised in Box 3, page 45).

Table 6: i-PARIHS Characteristics of innovation, recipients & context (Harvey and Kitson 2016)

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Innovation	Recipients	Context
Underlying knowledge sources Clarity Degree of fit with existing practice and values (compatibility or contestability) Usability Relative advantage Trialability Observable results	Motivation Values and beliefs Goals Skills and knowledge Time, resources, support Local opinion leaders Collaboration and teamwork Existing networks Power and authority Presence of boundaries	Local level: Formal and informal leadership support Culture Past experience of innovation and change Mechanisms for embedding change Evaluation and feedback processes Learning environment Organisational level: Organisational priorities Senior leadership and management support Culture Structure and systems History of innovation and change Absorptive capacity Learning networks External health system level: Policy drivers and priorities Incentives and mandates Regulatory frameworks Environmental (in)stability Inter-organisational networks & relationships

Recipients

In response once more to empirical testing, the PARIHS developers acknowledged that their original framework had failed to adequately account for the role of stakeholders including the intended targets for or users of an innovation. In adding a 'recipients' construct i-PARIHS thereby placed a greater emphasis on the importance of groups and individuals and their interactions in the process of implementation. Harvey and Kitson defined recipients as "*the people who are affected by and influence implementation at both the individual and collective level*" – thus it included practitioners, patients, commissioners, and managers (Harvey and Kitson 2016). In this construct emphasis was placed on the importance of how the innovation fits with recipients' practice, of peer views, networks and the role of credible and trusted teachers and leaders – acknowledging (Rogers 1995, 2003). Building on the wider implementation science, i-PARIHS identified key characteristics of adopters (Table 6), including their needs, motivations, beliefs, values and goals, learning style and social network – i.e., *whether the recipients want to implement the innovation*, and time, resources, knowledge, skills and support – i.e., *whether they can implement the innovation* (Harvey and Kitson 2015) pp34, 53-55 – themes of motivation and capacity and capability that correlate with antecedents in diffusion of innovation theory (Rogers 2003) (Greenhalgh, Robert et al. 2004).

Context

The context is the environment or setting in which the proposed change is to be implemented (Kitson, Harvey and McCormack 1998). While recognition of the influence of context was integral to the inception of PARIHS, the framework did not distinguish between local context and the wider organisational context (Harvey and Kitson 2016). Addressing this, the revised i-PARIHS placed a greater emphasis on the different layers of local (or project) context (micro), wider organisation (meso), and the wider health system (macro) – reflecting the growing importance of their delineation in implementation research field (e.g. in the Consolidated Framework for Implementation Research (Damschroder, Aron et al. 2009)).

Inner Context – local (micro)

The immediate work environment of the recipients of the innovation. In the case of EARS, this would (typically) relate to a primary care environment such as a general practice. Key influences would include formal and informal leadership support, culture, experience of innovation and change, learning, evaluation and feedback, and change management processes. A culture that supports innovation might encourage implementation, incorporate reflective learning and feedback, value stakeholder input, and have structures and processes to embed changes in practice (Harvey and Kitson 2015: p59).

Inner Context – organisational (meso)

The next level is the wider organisational context, which in primary care would correspond to an overarching health organisation such as a health board or clinical commissioning group (CCG). Key at this level is how well the implementation project is aligned with organisational priorities, and therefore how easily the innovation can draw upon senior level support and appropriate human resources (leaders and facilitators), time or financial backing. As with the micro level, the organisation culture, previous experience with innovation and change are also important at this level (Harvey and Kitson 2015: p59).

Outer context – health system (macro)

This level brings in the wider political, economic and cultural influences associated with the health system in which the innovation is being introduced. In the UK this level corresponds to national policy (government and NHS) and broad trends in health. The wider context in which EARS emerged is the focus of the next chapter (Chapter 3). At this level, policy drivers, regulations, mandates and incentives from the wider health system can be influential (Harvey and Kitson 2015: pp62-64). Inter-organisational networks to help promote and spread learning can also influence implementation.

Facilitation

The underlying philosophy of i-PARIHS is that implementing research into healthcare practice is complex, unpredictable and non-linear which therefore requires a flexible and responsive approach to implementation (Hunter, Kim et al. 2020). This is where the facilitation construct comes in, as the active element of implementation (Harvey and Kitson 2016). In i-PARIHS, the facilitation process assesses and responds to characteristics of the innovation and the recipients (as individuals and in teams) within their contextual setting. It is often associated with individuals or teams who are responsible for working with stakeholders and for implementing the innovation into the setting. Broadly, facilitation is about enabling implementation using experiential learning to support the process (Harvey and Kitson 2016). Facilitators may be internal or external to the organisation where the innovation is implemented. Harvey and Kitson describe facilitation as the driving force for successful implementation (2015, p105), and an enabler for the successful embedding, sustaining and spread of the innovation across, within and between individuals, teams, and organisations. Facilitation achieves this by focussing on relationships, individual and group learning and managing the myriad of contextual factors that make each implementation journey unique. i-PARIHS identified a continuum ranging between task focused facilitation and holistic facilitation. Task focused relates to achieving specific, and often measurable goals (e.g., the implementation of a clinical guideline). In contrast, holistic facilitation is concerned with releasing the potential of individuals so they could achieve the task. In later work, the

developers distinguished between ‘passive’ and ‘active’ facilitation, with the latter characterised by a ‘hands on’, and more resource intensive approach (Harvey, Llewellyn et al. 2018).

Implementation success

The i-PARIHS framework includes a definition of successful implementation as follows:

- Achievement of agreed implementation/project goals
- The uptake and embedding of the innovation in practice
- Individuals, teams and stakeholders are engaged, motivated and ‘own’ the innovation
- Variation related to context is minimised across implementation settings.

The success or otherwise of implementation depends upon the ability of the facilitator / facilitation process to enable recipients within their context to adopt and apply the innovation by tailoring their intervention appropriately (Harvey and Kitson 2016). Ideally facilitation is underpinned by an innovation backed by robust evidence, (that practitioners agree with), and provided in a context that is receptive (Rycroft-Malone, Seers et al. 2013).

Use of i-PARIHS in this thesis

I apply i-PARIHS as part of my analysis of implementation of EARS in UK primary care, notably in the commissioner interviews of Chapter 7. Use is based on the following rationale:

- Its development reflects and responds to the wider literature on implementation science, evidence-based medicine and knowledge translation, and has responded to empirical use and critique over time – including a critical synthesis (Helfrich, Damschroder et al. 2010).
- It has been widely used as a framework to better understand the complexity of implementation in practice; to help both explain and predict why the implementation of an innovation into practice is or is not successful (Harvey and Kitson 2016). This includes practical application in research studies prospectively as a means of supporting implementation, and as here, retrospectively.
- *i-PARIHS* has a focus on the role of evidence, recognising that this includes a diverse range of sources which are often contested, *and subject to re/negotiation*.
- I found that the framework and its nomenclature had face validity, particularly in terms of its interrelated domains of innovation, context, recipients, and facilitation. Working with the NHS in research, evaluation and quality improvement roles since 2003, these domains were consistent with my experience and understanding of implementation.
- In this thesis I was keen to link with a range of stakeholders, and i-PARIHS has been identified as one of the most appropriate frameworks to support analysis of implementation across different levels of health systems (Tabak, Khoong et al. 2012).

Summary

In this section I have introduced implementation research and discussed its value and role in evidence generation. I have illustrated that implementation research can help to unpick the complex and interrelated factors that help or hinder the uptake of innovations in health care. Implementation frameworks, with strong theoretical bases, have been developed to support implementation and evaluation, helping to further our empirical understanding of innovation in real world settings where understanding the context is crucial.

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Chapter 3: Demographic, Epidemiological and Policy Context

Introduction

In this section I set out the demographic, epidemiological and technological context for the introduction of EARS into policy and practice in the UK. This section will thereby illuminate the multifaceted origins of EARS driven by the desire to address major population health challenges, and the potential of new technologies to support a new personalised and preventative approach to primary care. I will also highlight some of the important terms that shape the debate around EARS. Taking a largely historical perspective I explore the key drivers of the EARS innovation as captured in the policy documents and rationale of the time. I am obliged to start this overview however with consideration of emergency admissions – it is what EARS tools predict, and an outcome that many EARS based initiatives often hoped to address.

Emergency Admissions

An emergency or unplanned admission is one where a patient is admitted to hospital urgently and unexpectedly. Most emergency admissions follow Accident and Emergency departments (A&E) visits, but they can also result from referral by primary or community-based clinicians. Although a core and necessary component of healthcare provision, emergency admissions are frequently viewed as a negative outcome. Governments and health providers are motivated to minimise these occurrences in recognition of the impacts that they have on patients and on services. From a patient perspective, emergency admissions are often unsettling and disruptive (The King's Fund 2012). Patients, particularly older patients or those with compromised immune systems, can suffer functional decline and increased dependency, as they rapidly lose the strength needed to maintain an independent life after leaving hospital (Zisberg, Shadmi et al. 2015). They are also exposed to risk of infections (Boev and Kiss 2017) exacerbated in recent times by the emergence of Covid-19 (Barranco, Vallega Bernucci Du Tremoul and Ventura 2021). In addition, many patients admitted to hospital would prefer to be treated close to home – or to avoid needing to seek urgent treatment in the first place (The Health Foundation 2018).

From a provider perspective, emergency admissions disrupt planned and elective care, and represent the most expensive component of service provision (The Health Foundation 2018). Unfortunately, emergency admissions have been rising unabated for many years. Despite an increasing focus on emergency admissions and its causes, figures from the

Health Foundation and National Audit Office demonstrate a 42% growth in emergency admissions in the 12 years up to 2018 – from 4.3 million in 2006/07, to 5.3 million in 2012/2013 and 6.0 million in 2017/18 (National Audit Office 2013, The Health Foundation 2018).

Why have emergency admissions been rising?

Rises are in part explained by demographic trends such as increases in the older population 65+. However, estimates suggest that demographic factors only explain around half of the rises in admissions (The Health Foundation 2018). The other main driver is likely to be survival rates driven by improvements in care. A retrospective cohort study of nearly 10 million English patients with an index emergency admission estimated that improvements in hospital survival rates between 2000 and 2009 explained 37.3 percent of the increase in unplanned admissions observed over that period (Laudicella, Martin et al. 2018) – see Figure 12. While such improvements in survival represent a major health success – they also bring an increased likelihood of chronic conditions and multimorbidity (multiple chronic conditions) (Abegunde, Mathers et al. 2007, World Health Organization 2011).

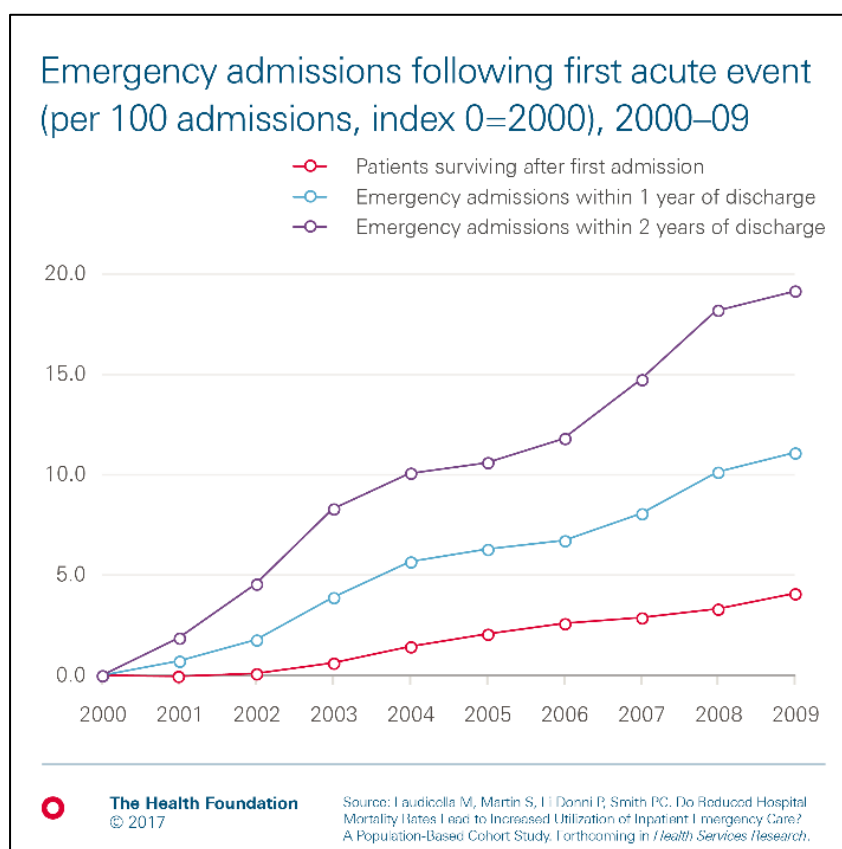


Figure 12: Emergency admissions following index event in England 2000-2009 (source: Health Foundation 2017, from (Laudicella, Martin et al. 2018))

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Chronic conditions and multimorbidity

Around half of emergency admissions can be attributed to just five per cent of the population – typically older people with multimorbidity (Department of Health 2005, Department of Health 2013) (Cassell, Edwards et al. 2018), a cohort that is growing in size in most developed countries (Navickas, Petric et al. 2016). In the UK, national statistics estimate the over 65 population as 10,464,019 in 2020, compared to 7,587,127 in 1991 (Welsh Government 2022) – a rise of 32%. NHS England projects that multimorbidity affects over three million people in England alone, including two thirds of those aged over 65 (NHS Health Education England 2022). It is strongly linked to inequalities in health, with those in the most deprived areas having double the rate of multimorbidity in middle age than those living in the most affluent areas (NHS England 2016).

Care for people with multimorbidity represents a huge challenge across the whole NHS. In primary care an estimated 53% to 80% of GP consultations relate to multimorbidity (Cassell, Edwards et al. 2018) (Mercer S 2016), 79% of prescriptions and 56% of hospital admissions (Cassell, Edwards et al. 2018). While the numbers are considerable, care for multimorbid patients is also challenging because different conditions and their treatments interact in complex ways, yet care systems are often designed around single conditions – rather than the person as a whole (NHS England 2016). In an influential review entitled *Guidelines for people not diseases*, Hughes et al. (2013) illustrated that following NICE guidelines for someone with five common long-term conditions (previous myocardial infarction, Type 2 diabetes, osteoarthritis, chronic obstructive pulmonary disease, and depression) would necessitate at least 10 prescriptions, 9 lifestyle modifications, 8-10 primary care appointments, and 8-30 psychosocial intervention appointments (Hughes, McMurdo and Guthrie 2013).

Multimorbidity can thus contribute to poorly coordinated and fragmented care, that fails to address the patient's needs and values, leads to additional, and often unnecessary, interactions across healthcare systems, and poorer outcomes (May, Montori and Mair 2009, Stott and Young 2017, Salisbury, Man et al. 2018, NHS Health Education England 2022). Furthermore, care for those with multimorbidity is often reactive and triggered by actual problems, rather than proactive, structured, and planned (Frei, Chmiel et al. 2010).

Integrated care

The barriers to providing appropriate care for patients with long term conditions and multimorbidity (repeated in

Box 4), have been described as a failure to provide integrated care (NHS England 2013).

Integrated care can be defined by its aim of “*achieving improved patient care through better coordination of services provided*” (Nuffield Trust 2011). Integration meanwhile “*is the*

combined set of methods, processes and models that seek to bring about this improved coordination of care” (Nuffield Trust 2011).

- **Single condition services:** services dealing with single conditions only and adopting single condition guidelines (with attendant dangers of polypharmacy and excluding a holistic approach to service users).
- **Lack of care coordination:** people being unaware of whom to approach when they have a problem, and nobody having a generalist’s ‘bird’s eye’ view of the total care and support needs of an individual.
- **Emotional and psychological support:** in particular, a lack of attention to the mental health and wellbeing of people with ‘physical’ health problems (as well as failure to deal with the physical health of people with mental disorder as their primary long-term condition).
- **Fragmented care:** the healthcare system remaining within its own economy, and not being considered in a whole system approach with social care or other services important to people with long term conditions (e.g., transport, employment, benefits, housing). Failure to support people with ‘more than medicine’ offers as provided by, for example, third and voluntary sectors.
- **Lack of informational continuity:** care records which can’t be accessed between settings, or to which patients themselves don’t have access.
- **Reactive services, not predictive services:** failure to identify vulnerable people who might then be given extra help to avoid hospital admission or deterioration/complications of their condition(s).
- **Lack of care planning consultation:** services which treat people as passive recipients of care rather than encouraging self-care and recognising the person as the expert on how his/her condition affects their life

Box 4: Barriers to care for those with long term conditions: (NHS England 2013)

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How patients in turn experience integrated/coordinated care is captured in the allied concept of continuity of care, for which Haggerty and colleagues differentiate three types (Haggerty, Reid et al. 2003). *Informational continuity* relates to the use of information on past events and circumstances to tailor care; *management continuity* relates to the consistent and coherent approach to care management that is responsive to patient’s needs, and *relational continuity* refers to the ongoing therapeutic relationship between a patient and care provider/s (Haggerty, Reid et al. 2003). Coordination of care has been shown to reduce emergency admissions (Huntley, Lasserson et al. 2014), but is heavily influenced by, and requires adaptation to, the context in which it is delivered (Duan-Porter, Ullman et al. 2020). Primary care has been identified as the key starting point for integrated and coordinated given that the majority of patient/clinician health encounters occur there (Freund, Wensing et al. 2010, Department of Health 2013), with upwards of 25 million monthly consultations in England alone in 2022 (NHS Digital 2022). The problems patients face may not be known to care providers, who may suspect the presence of some problems, but may only act on demand (Frei, Chmiel et al. 2010).

A preferred model, advocated in integrated care approaches, is for greater emphasis on working in a proactive way to set and prioritise goals together with the patient and to empower the patient to reach these goals (Frei, Chmiel et al. 2010).

Are Emergency Admissions Avoidable?

While most emergency admissions are unavoidable, there is recognition that a subset of cases may be preventable with earlier treatment, preventative care or improved integration. This subset of cases is known variably as potentially avoidable hospitalisations (PAH) (Pappas, Hadden et al. 1997) or more commonly as ambulatory care sensitive conditions or ACSCs (Purdy, Griffin et al. 2009). ACSCs have emerged as a key focus of attention in emergency admission reduction debates. Analysis of emergency admissions for ACSCs is often used as a marker of primary care effectiveness (Bindman, Grumbach et al. 1995), (Laditka, Laditka and Mastanduno 2003), consistent with the definition of ACSCs as “conditions for which hospital admission could be prevented by interventions in primary care” (Billings, Zeitel et al. 1993). Most ACSCs related to chronic conditions, where primary care treatment can identify or help prevent problems developing or flaring up e.g., for asthma, diabetes or COPD. Other ACSCs are for acute conditions such as infections, where effective care stops the condition deteriorating; and conditions preventable by vaccination, such as influenza (Sanderson and Dixon 2000), (The Health Foundation 2018). ACSC conditions are strongly linked to inequalities of health, (Laditka, Laditka and Mastanduno 2003) (Pappas, Hadden et al. 1997).

Estimates for the proportion of ACSC admissions, and therefore how many admissions could theoretically be avoided, vary between 10 and 20% (The Health Foundation 2018) (The Health Foundation and Nuffield Trust 2013). These estimates depend in part on codes used in the respective analysis. Calling for greater alignment and consistency of disease coding, Purdy et al. found that the NHS used only 19 of 36 ACSC's used elsewhere (Purdy, Griffin et al. 2009).

A 2017 analysis of data from 8,120 English general practices found variation of 55% between high and low utilisation practices in terms of ACSC admission rates (Busby, Purdy and Hollingworth 2017). Deprivation, multi-morbidity and the quality of primary care are key factors driving variation (NHS England 2014, O'Cathain, Knowles et al. 2014). Furthermore, ACSC emergency admissions in England have increased at a higher rate than other admissions over recent years (Santos, Rice and Gravelle 2020, NHS Digital 2021).

Triple Fail Events

Patients experiencing emergency admissions for potentially avoidable causes has been described as a triple fail event, raising the spectre of suboptimal health outcomes, significant health costs and poor patient experience (Lewis, Kirkham et al. 2013). The triple fail is therefore a conceptual reversal of the predecessor idea of the triple aim - a framework for healthcare improvement developed by Don Berwick and the Institute for Healthcare Improvement (Berwick, Nolan and Whittington 2008). The triple aim proposed the simultaneous pursuit of three dimensions of performance: improving the health of populations, enhancing the patient experience of care, and reducing the per capita cost of health care (Berwick, Nolan and Whittington 2008). Patients with chronic conditions and especially multimorbidity are more likely to experience emergency hospital admissions for potentially avoidable causes resulting in a 'triple fail event' (Lewis, Kirkham et al. 2013).

In this chapter thus far, I have outlined the challenges to healthcare from rising emergency admissions and multimorbidity, driven both by demographic change and perversely, by improvements to treatment and therefore survival rates. With rising demand, patient complexity and costs, a major policy response was needed.

Policy and strategic drivers

In this next section I provide an overview of the policy and strategy response to the linked population, disease and health system challenges. I present the major policy milestones (Government/NHS strategies and white papers) between 2000 and 2016 (outlined in Figure 13). These dates precede the first UK EARS tools and trace the story up to the inclusion of EARS in NICE guidance for the care of patients with multimorbidity. Although the demographic and epidemiological challenges are common to the UK and indeed most developed countries, for clarity of scope, the policy literature that I draw upon is largely focussed on the UK/English setting.

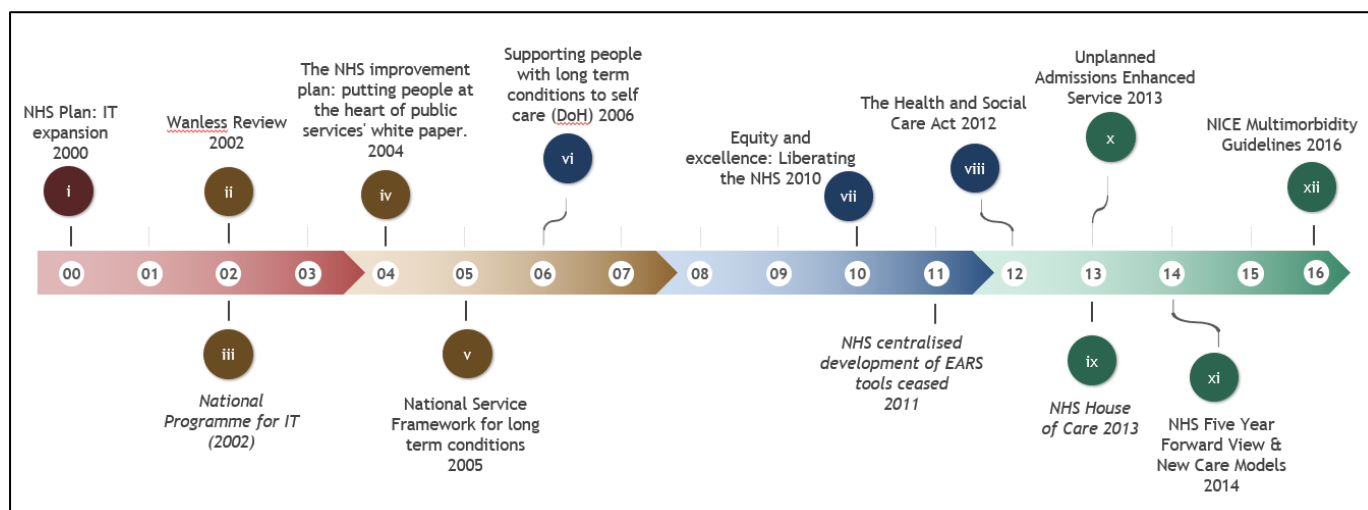


Figure 13: Timeline of key policy milestones for EARS (2000 to 2016)

[Figure created by Mark Kingston in Microsoft Visio, 2023]

2000 NHS Plan [i in Figure 13]

The NHS plan (Department of Health 2000) was one of the first strategic documents to emphasise the challenges from chronic conditions. It was also a key milestone in a policy shift towards choice and competition in the NHS in England, encouraging use of the private sector where this could add value to services. The plan proposed that improvements to information technology (IT) would facilitate major improvements in service delivery, as part of the modernisation of the NHS. The NHS plan was informed by the 1992 NHS Information Management and Technology (IM&T) strategy, the first nationwide NHS IT strategy, which had delivered the NHS number, a unique patient identifier suitable for use as a linking field to join datasets, and had introduced five information principles, which went on to form part of subsequent NHS strategies:

1. Information should be person-based;
2. IT systems should be integrated;
3. Information should be derived from existing operational systems;
4. Information should be secure and confidential; and
5. Information should be shared across the NHS. (Brennan S 2005)

2002 The Wanless Review [ii]

The landmark *Securing our Future Health: Taking a Long Term View* (2002) report was commissioned by then Chancellor of the Exchequer Gordon Brown (Wanless 2002). Led by Sir Derek Wanless, the Wanless review was tasked with a 'long-term assessment of the technological, demographic and medical trends over the next two decades that will affect the health service' (The Health Foundation 2022). The resulting vision responded to the identified challenges of rising costs, an ageing population, prolonged hospitalisations and

poor integration of health and social care (Wanless 2002). Wanless sought to modernise healthcare by improving workforce planning, integrated care, social care funding, and increasing investment in IT to support healthcare delivery and management and to 'ensure systems across the UK are fully compatible with each other' (Wanless 2002) (The Health Foundation 2022). The ambition was to bring the NHS into the information age: an age which financial institutions, airlines, supermarkets, and most manufacturing industries had already entered (Ambinder 2005). Supported by IT and access to better information, Wanless recommended a shift in focus from the acute sector, to make better use of community-based care facilities, with patients placed at the '*heart of the health service of the future...involved fully in decisions – not just about treatment, but also about the prevention and management of illness*' (Wanless 2002). Wanless cautioned, in respect of previous endeavours including a 1992 government IT strategy, that any expenditure increase should be with "*clear and well-developed views about the benefits which [the Government and Health Service] want to achieve and how they will be delivered*" (Wanless, 2002, p.102). The Wanless review was influential, and these points about the rising burden of illness and multimorbidity, pressures on secondary care, interoperability, integrated care, and patient centredness are important in the developing case for EARS. Wanless' recommendations for action were committed to by the then government, with increasing expenditure (and taxation) to bring the UK in line with average health spending in the rest of the EU (The Health Foundation 2022).

2002 National Programme for IT (Npfit) [iii]

The Wanless review paved the way for the next UK Government health IT strategy, the National Programme for IT (Npfit). This flagship campaign, announced by prime minister Tony Blair launched with a budget of £6.2 billion. It set out to overhaul NHS systems and through a top-down national approach, introduce standardised and integrated electronic patient records across primary and secondary care, virtual choose and book services, and computerised referral and prescription systems (Panorama Consulting Group 2021). Unfortunately, recent history is punctuated with high profile failures in digital health innovations in the NHS and the highest profile of these was the Npfit. By 2011, massively overspent and unsuccessful, it was decommissioned. Key reasons behind its demise included: implementation issues related to poor planning and change management, inadequate stakeholder engagement and training, underestimating the scale of the project, and resistance to the centralised and standardised approach that conflicted with desires for tailoring at the local level (Justinia 2017) (Panorama Consulting Group 2021) (Robertson, Cresswell et al. 2010) (Williams 2005). At the heart of the issues was a significant disconnect with end users. Ambitious IT projects of this scale are already vulnerable to risks,

and without understanding user needs, these liabilities are amplified. As NPfIT began, feedback began coming in from key figures within the health system, including doctors and general practitioners. Early on, they expressed concern that the system didn't meet accessibility or use requirements. They were also unclear on the actual outputs it would deliver (Panorama Consulting Group 2021).

The end result was that the NPfIT was decommissioned and it was proposed that NHS IT would no longer operate as a centralised national programme but that, in line with broader reforms in England, decision making and responsibility for IT would be localised (Department of Health 2010). The experience of the NPfIT emphasised the need to better understand how innovations can be introduced effectively into healthcare (Greenhalgh, 2010).

2004 The NHS improvement plan: putting people at the heart of public services' white paper [iv]

Responding to the challenges outlined by Wanless, the 2004 white paper majored on the desire for proactive and preventative healthcare that would prevent emergency admissions and support people to retain independence (Department of Health 2004).

The plan encouraged a new spirit of innovation, centred on improving the personal experience of patients as individuals (Department of Health 2004).

The plan envisioned reduced waiting times for secondary care and improved integration and communication between social care and health services, offering a better, less fragmented service to users (Department of Health 2004), (The Health Foundation 2004). Approaches (and funding) to realise these changes were outlined, and included a commitment to delivery of personal electronic health care records that could be accessed across providers, an increased community based workforce, including the introduction of community matrons (experienced nurses able to support and plan care for those with long term conditions or complex needs), increased support for public health, offering patient's choice over treatment locations, and practice based commissioning (PBC). PBC was designed to give general practitioners, nurses and other primary care professionals the power to decide how NHS money is spent in their local area (although the appetite for embracing such changes was reported as limited (The King's Fund 2008)).

2004 Department of Health emergency admission risk stratification tools

To meet national goals for reductions in emergency bed days and effective administration of practice-based commissioning, National Health Service (NHS) organisations have highlighted the need for tools to assess patient needs across the continuum of care. (Wennberg D, Siegel M et al. 2006).

In response to the challenge set out above, the first UK risk stratification model (Patients at Risk of Re-hospitalisation) was commissioned nationally, by the Department of Health,

through a consortium of the King's Fund, New York University and Health Dialog (Wennberg D, Siegel M et al. 2006). The same team would go on to produce a follow up tool, known as the Combined Predictive Model, which I explore further later in the chapter.

2004 (General Medical Services Contracts) Regulations (NHS 2004)

The 2004 general practice contract placed an increased emphasis on quality of their management of chronic disease. The contract awarded points, worth set amounts of money, for the establishment of processes like registers, call and recall systems, to review and monitor patients with a range of chronic diseases (e.g., diabetes, heart disease). However, these targets were largely based on single conditions, and failed to address the complex needs of those with multi-morbidity – prompting respected commentators to call for adoption of a generic model for managing chronic diseases (Lewis and Dixon 2004).

2005 Supporting People with Long Term Conditions. An NHS and Social Care Model to support local innovation and integration (DoH) [v]

The wait for a model was short for 2005 saw the introduction of a bespoke model of care for long term conditions (Figure 14), which aimed to support a structured and systematic approach to improving care (Department of Health 2005). The model set out the familiar problem statement of rising long-term conditions, poor patient outcomes, reactive care, and the high use of secondary care by a small proportion of the population – many of which would be preventable with improved primary care (Department of Health 2005). In response, the care model included a series of principals and components that paved the way for the introduction of EARS tools into UK primary and community care. These included proactive, preventative, and coordinated care, underpinned by IT and decision support tools – addressing patient needs before a crisis, even if they were relatively stable at the time. The model was based on a stratified approach with patients' needs and potential solutions varying by level (Box 5). The document proposed using community matrons to support those with highest risk and complexity – i.e., Level 3 patients, through 'case management'.

Level 3: Case management – Identify the most vulnerable people, those with highly complex multiple long term conditions, and use a case management approach, to anticipate, co-ordinate and join up health and social care.

Level 2: Disease-specific care management – This involves providing people who have a complex single need or multiple conditions with responsive, specialist services using multi-disciplinary teams and disease-specific protocols and pathways, such as the National Service Frameworks and Quality and Outcomes Framework.

Level 1: Supported self-care – collaboratively help individuals and their carers to develop the knowledge, skills and confidence to care for themselves and their condition effectively.

Box 5: Stratified care levels in The NHS and Social Care Long Term Conditions Model (Caldwell and Mays 2012).

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While definitions of case management vary, Hutt et al. (2004) described it as '*the process of planning, co-ordinating and reviewing the care of an individual*' cited in (Ross, Curry and N. 2011). Case management often covers a range of activities – but it is recognised that these can vary widely between programmes (Ross, Curry and N. 2011). By 2011 the Kings Fund reported that the community matrons had been the chief mechanism to deliver case management in the NHS. Evidence for case management is mixed. A 2013 review found good evidence that many common aspects of case management are effective, including continuity of care with a GP, structured discharge planning and advanced care planning (cited in (Lewis 2015)). However, in a systematic review Stokes et al. (2015) concluded that there is little evidence that case management is effective in reducing secondary care use or costs, but does show a positive impact on patient satisfaction (Stokes, Panagioti et al. 2015). Of the 36 studies included, only four used routine data risk prediction tools to identify patients for intervention, with most relying on referral criteria or identification by clinicians unaided by a risk model. The results of the sub-group of four remaining studies using routine data generated risk models to predict emergency admission were favourable, although none were from the UK (Stokes, Panagioti et al. 2015).

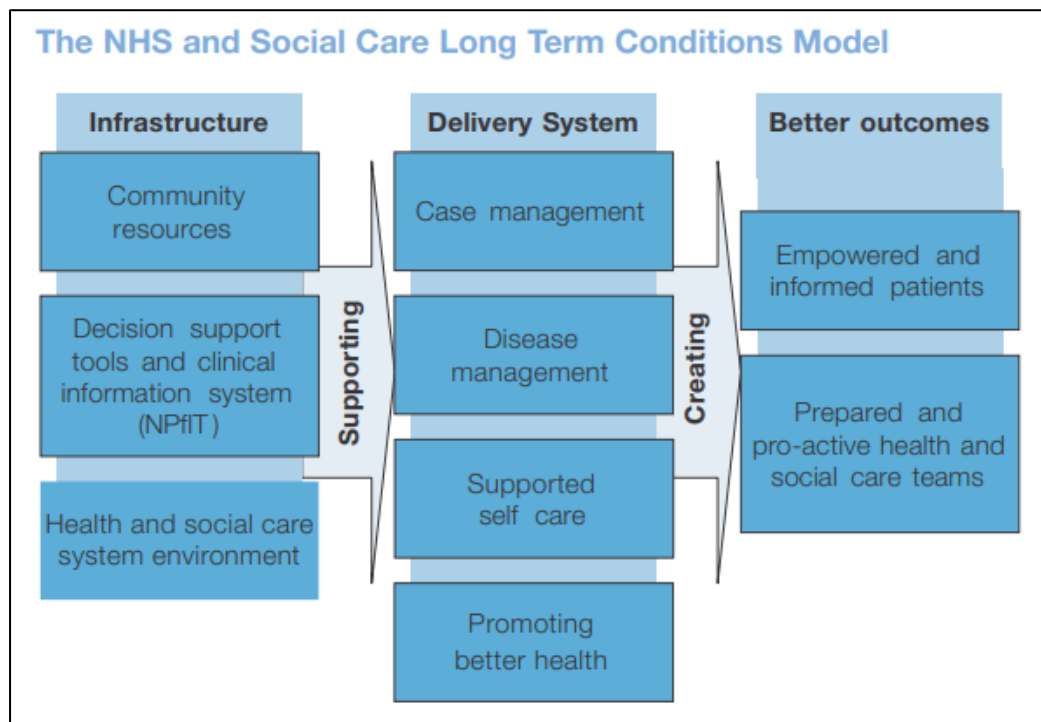


Figure 14: The NHS and Social Care Long Term Conditions Model (Department of Health 2005)
 Image used under the terms of the Open Government Licence v3.0
nationalarchives.gov.uk/doc/open-government-licence/version/

The NHS model built heavily, and acknowledged, forerunner models of care from the USA – the Wagner Chronic Conditions Model (Wagner, Austin et al. 2001) – Figure 15 (Bodenheimer, Wagner and Grumbach 2002), and the Kaiser Permanente Medical Care Programme (from here on Kaiser). Implementation of these models in the USA was linked to lower secondary care utilisation and improved or equivalent quality of care, for similar expenditure as the UK (Ham, York et al. 2003) (Rothman and Wagner 2003). Kaiser achieved better performance at roughly the same cost as the NHS because of integration throughout the system, efficient management of hospital use, the benefits of competition, and greater investment in information technology. (Feachem, Dixon et al. 2002). Both US models had promoted primary care as the starting point for improvements to care for those with chronic conditions and multimorbidity, based on its defining features of ‘continuity, coordination, and comprehensiveness’ (Rothman and Wagner 2003).

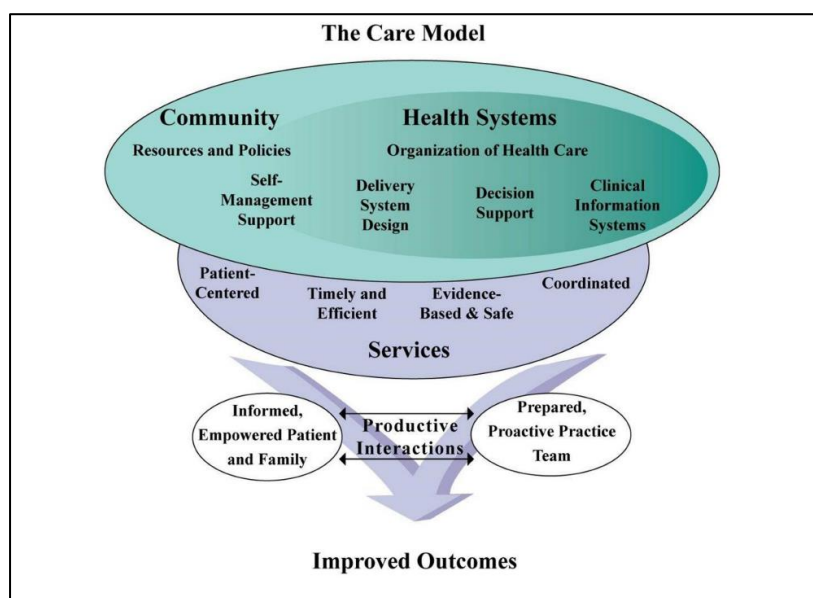


Figure 15: Wagner Chronic Care Model

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The Wagner chronic care model's most important elements are community approach, support of self-management, coordination of care, development and application of protocols and guidelines (Wagner, Austin et al. 2001).

The Kaiser focus on the stratified approach, was also incorporated into the Wagner model which emphasised six interrelated components of self-management support, clinical information systems, delivery system redesign, decision support, health care organisation, and community resources. Applying these components in an integrated model 'can produce system reform in which informed, activated patients interact with prepared, proactive practice teams' (Bodenheimer, Wagner and Grumbach 2002).

These models, and their underlying evidence illustrating the potential for improvements in primary care management of chronic conditions and multimorbidity had been included in a compendium of information and evidence for chronic disease management, which acknowledged that limited evidence came from implementation in the UK (Department of Health 2004). Other commentators also cautioned that comparisons among health systems are difficult because of the complexity of the systems and their contextual specificity (Feachem, Dixon et al. 2002). The compendium had included examples of the successful application of model components (but not all six together) (Bodenheimer, Wagner and Grumbach 2002), but with numerous implementation challenges (Rundall, Shortell et al. 2002, Casalino, Gillies et al. 2003). Summarising 41 interviews with senior leaders within US medical groups (which cover primary and secondary care) , Rundall et al. reported the main barriers to implementing chronic care management processes to be: the lack of financial or staff resources, lack of adequate clinical information systems, doctors being too busy, lack of

financial incentives to improve care, and resistance to change. In contrast, facilitators were organisational culture, good clinical information systems, supportive clinical or managerial leadership, and fit with local strategy (Rundall, Shortell et al. 2002, Casalino, Gillies et al. 2003).

The NHS and Social Care Long Term Conditions Model was the first government directive to champion risk stratification as a means of identifying patients at risk who may benefit from proactive management. This approach was listed as one of three primary drivers for the model, alongside integrated locality teams and systematised support for patients to manage themselves. Delivery of these approaches and the model overall would (it was hoped) help meet a government Public Service Agreement target which called for a personalised care plan for vulnerable people most at risk (of poor health outcomes) and targeted a reduction of emergency bed days of 5% by March 2008 through improved primary and community-based care (Department of Health 2005).

The immediate focus should be the introduction of case management for the most vulnerable people with complex long-term conditions. Significant numbers of hospital admissions relate to long term conditions and can be avoided (Department of Health 2005).

The care plans for complex patients were to have a named care coordinator and be available across health services and multidisciplinary team members.

The document acknowledged the role of software solutions in supporting this case finding (Department of Health 2005), a likely reference to an exploratory programme of work commissioned by the Department of Health that was examining the potential of emergency admission risk stratification tools (The King's Fund 2006).

National Service Framework for LTCs (Department of Health 2005) **[v]**

Tackling the long-term conditions and multimorbidity challenge, head on, NHS England introduced a National Service Framework for LTCs (Department of Health 2005), initially focused on those with neurological conditions. The framework and guide reinforced the commitment to integrated care planning, founded on multi-disciplinary team working (including cross-referring) and coordinated care. While there was a delivery role for the estimated 3000 community matrons, the documents outlined that there was overlap with other emerging roles in primary and community care, such as care coordinators or case managers. The Framework was unusual and noteworthy in having sections outlining the evidence base for each recommended care practice, with evidence distinguished by category (primary, secondary, review based) and grade (a-c reflecting number, quality and applicability), as well as a separate measure capturing 'expert opinion' (Department of Health 2005).

Evidence-based markers of good practice for QR1

		Evidence grade
1	There is timely integrated assessment involving all relevant agencies leading to individual care plans ^{9,12,17,50,51} which: - cover current and anticipated needs (including health, social, emotional and cultural needs); - are held by the person and regularly evaluated and reviewed with them by the clinical team. Review is based on clinical need, including self-assessment (see QR2); and - ensure that staff have access to all relevant records and background information about the person's condition, test results and previous consultations.	RA Expert
2	Arrangements are in place to ensure that: - all people with long-term neurological conditions have a named point of contact for advice and information. - people with complex needs who require skilled input from a number of professionals have a named individual (eg a care co-ordinator, case manager or community matron) who is responsible for co-ordinating the input from all relevant agencies and producing a care plan^{37-39,40(G20)}.	Expert
3	The care assessment and planning process ensures that appropriate services are available to provide support for life transitions and to enable people with long-term neurological conditions to receive continuity of care (eg when they transfer to adult health or social care services or across geographical service boundaries ⁵¹⁻⁵⁵ , or following a change in circumstances such as the death of a carer).	RC Expert
4	Local arrangements for providing information ensure that: - people receive timely, quality-assured, culturally appropriate information in a range of formats^{40,41,45,46,48,51,56} on: - all relevant aspects of service provision; - the condition and how best to manage it^{43,44,56,57}; - wider social inclusion issues (eg employment and transport⁵⁸). - health and social care professionals, people with long-term neurological conditions and carers receive appropriate training on effective ways to provide and use information. Assessment of information needs is part of review and any interaction with health and social services.	RC Expert
5	People with long-term neurological conditions and their carers can access education and self management programmes, tailored to their individual needs ^{51,59,60} and these are available at different stages of the condition ^{33,36,42,61} .	RA Expert

Figure 16: Evidence markers - National Service Framework for LTCs (Department of Health 2005) [Image used under Open Government Licence v3.0 nationalarchives.gov.uk/doc/open-government-licence/version/]

2006 DoH, Supporting people with long term conditions to...Self Care [vi]

This follow up to the NSF, offered a best practice guide for supporting those with any LTCs to self-manage their care, in an attempt to realise the health service's 'biggest untapped resource' (Department of Health 2006). Self-care it was argued could lead to improvements to physical and mental health and wellbeing, reduced severity of symptoms, improved medicines compliance, reduced emergency care use, enhanced independence and greater confidence and a sense of control (Department of Health 2006). The document acknowledged a need to not just change service provision but also a cultural change – allowing 'patients to be partners in their care, letting them decide what support they need,

when they need it and how'. To achieve these ambitions the Department of Health wanted to see an increased focus on self-care, improved information sharing with patients, patient education (for self-care), multi-agency approaches including the community and voluntary sectors, and involvement of patients and the public in service design. The guide placed an emphasis on practitioners to facilitate self-management through needs assessments and care planning. The starting point of which should be a person's view of their "*abilities, needs and ambitions*". Person-centred care planning is one of the most important ways in which health and social care can be transformed into integrated services with the individual or their carer at the centre of the package of care (Department of Health 2006).

2007 LTC Quality, Innovation, Productivity and Prevention (QIPP)

The QIPP national workstream was led by Sir John Oldham as part of the delivery approach for the Long Terms Conditions models. QIPP was focussed on three primary drivers, validated risk stratification (*'of those at high and medium to high risk of accessing healthcare services'*), integrated care and patient self-management, with an emphasis on delivering all of these components in unison:

Where a common LTC model, based on these three primary drivers, has been effectively applied, indications are that unscheduled admissions can be reduced by 20% and length of stay by 25% (NHS England 2012).

QIPP sought to support the transformational culture change needed to support the ambitions of the model to transition from *'see, treat and discharge to identify, integrate and co-manage'*. The QIPP workstream led to the introduction and funding of a Year of Care scheme which set out to help develop and test the LTC model, initially by learning from support for those with diabetes. As part of this learning, it supported the introduction of EARS tools in sites (NHS England 2012). The workstream also negotiated incorporation of the three model drivers into the general practice contract (Department of Health 2013).

Published QIPP documents were notable for their regular promotion of the underpinning of the LTC model by 'international evidence', and for the 'widespread support from organisations such as the King's Fund and Nuffield Trust' (NHS England 2012). Yet a read through of the references cited, suggests that there remained gaps in understanding of the combination of drivers, and especially in relation to risk stratification.

2010 Equity and excellence: Liberating the NHS [vii]

The 2010 *Equity and Excellence* document set out the strategic plans of the Conservative and Liberal Democrat coalition government. It announced several changes to the structure of healthcare, including the abolition of Primary Care Trusts (PCTs) to be replaced by clinically led groups of GP practices. The aim was to shift decision making as close as possible to

individual patients, by building on the role that primary care professionals already played in coordinating patient care (The Health Foundation 2010). The plan outlined a vision of patients in charge of decisions about their care.

2011: Withdrawal of Department of Health EARS Tools

In a letter to NHS chief executives, the Department of Health confirmed that PARR and the combined model were being withdrawn in favour of an open market approach to supply of EARS tools. The letter added that the “continued uptake and usage of risk stratification tools are fundamental to the success of the LTC QIPP workstream and the delivery of good LTC management.” (Department of Health 2011).

2012: The Health and Social Care Act [ix]

2012 Liberating the NHS: No decision without me, about me

2012 NICE Guideline: [CG138] Patient experience in adult NHS services: improving the experience of care for people using adult NHS services

The Health and Social Care Act introduced some of the proposals outlined in the earlier Equity and Excellence white paper. It committed to the introduction of Clinical Commissioning Groups (CCGs), as the new primary care managerial consortia responsible for commissioning local NHS services – supported by regional Commissioning Support Units (see Box 6). It also set out a legal basis for risk stratification in relation to information governance (NHS England 2022).

The Act further committed to patient and carers involvement in decisions about their care and treatment, and to patient choice. These commitments were entrenched in *Liberating the NHS: No decision without me, about me* (NHS 2012), which encouraged shared decision making, and gave a mandate for care plans to be agreed between patients and clinicians.

a key element of patients being truly involved in decisions about their care and treatment is the ability of a patient to have a care plan. A written record of the care-planning discussion between a patient and clinician (NHS 2012).

The NHS documents noted that delivery of shared decision making would require a change in the patient/clinician relationship – combining clinical expertise with patient experience and understanding of their condition and preferences (NHS 2012). The commitment to shared decision making was also made in NICE clinical guideline [CG138] which sought to embed shared decision making into practice. The guidelines advocated the use of personalised risk communication, supported by patient decision aids (tools to help patients appraise options),

where suitable; and encouraged organisations to facilitate staff understanding of risk communication (e.g., understanding and presentation).

Clinical Commissioning Groups (CCGs)

CCGs were introduced as clinically-led statutory NHS bodies responsible for the planning and commissioning of health care services for their local area. Each general practice was a member of the CCG in their area, and they were clinician led (Peters, Adam et al. 2013). There were 225 CCGs on their initiation in April 2013, although a series of mergers reduced this over time, with 195 in April 2018, and 106 CCGs by April 2021. They covered populations of between 68,000 and almost a million initially, but these figures rose over time following mergers (to a high of 2.1 million) (Stetler, Legro et al. 2006)

CCG responsibilities included assessing local needs, deciding priorities and strategies, and buying and supporting clinical services on behalf of the population. They are responsible for the health of their entire population and measured by how much they improve outcomes. As of July 2022, the functions of CCGs have been subsumed into Integrated Care Systems (ICSs).

Commissioning support units (CSUs)

CSUs provided support and services for CCGs such as IT and business intelligence, finance, HR, data management, or contracting (Skivington, Matthews et al. 2021). They were introduced in April 2013, with 25 CSUs. CCGs could buy services from CSUs or carry them out in-house, whichever they felt to be most efficient and appropriate. One of the anticipated responsibilities for CSUs was in support of EARS.

Box 6: Descriptions of Clinical Commissioning Groups, CCGs, and Commissioning Support Units, CSUs

[Created by Mark Kingston in Microsoft Word 2023]

2013 Transforming urgent and emergency care services in England: Urgent and Emergency Care Review (NHS England 2013)

The 2013 review highlighted that despite the warnings of Wanless and others over the previous dozen years urgent and emergency care services were unsustainable. There was ever rising demand for hospital care driven not only by population change and the prevalence of disease, but also by the success of programmes to reduce bed days and A&E waiting times, making a visit to hospital more appealing than alternatives (NHS England 2013). The report outlined an action plan based on improvements to five aspects of the health and care system: These were self-care; the 111 telephone advice service; access to primary and community staff; hospital emergency centres and networking of urgent and emergency care services. It was self-care however, that the report majored on – described as “*by far the most responsive way of meeting people’s urgent but non-life threatening care needs*” (NHS England 2013).

To achieve this, we will need to provide better and more easily accessible information about self-treatment options so that people who prefer to can avoid the need to see a healthcare professional. We will also need to accelerate the development of comprehensive and standardised care planning, so that important information about a patient's conditions, their values and future wishes are known to relevant healthcare professionals. This way, patients will be better supported to deal with that condition before it deteriorates, or if additional help is required. (NHS England 2013)

2013 House of Care – a framework for long term condition care [x]

Following directly from the QIPP work on The Year of Care, The House of Care was created to further encourage high quality holistic care for those with long term conditions or multimorbidity, framing the problem that patients experienced as the failure to overcome the barriers to integrated care (see Box 4, page 28) (NHS England 2013). The house of care framework, as presented in Figure 17, advanced the previous LTC model, with greater emphasis on integrated and coordinated care built around the person, rather than around care systems.

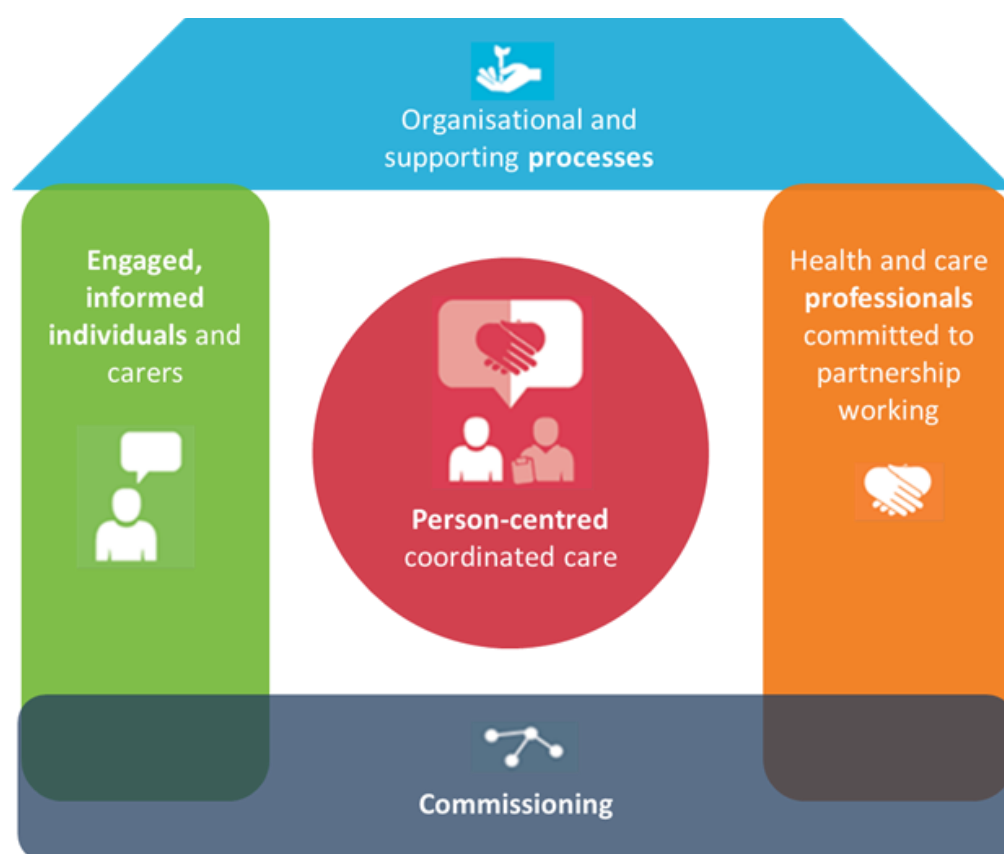


Figure 17: NHS England House of Care (2013)

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NHS England described the 'house' metaphor in relation to key components that all needed to be present to achieve the goal of person-centred coordinated care (NHS England 2013):

Foundations built on commissioning with an emphasis on quality improvement and not just contracting. A **roof** built with the best organisational and clinical processes, including best practice, evidence, NICE guidelines and quality standards. **Pillars** representing ‘empowered patients and carers’ – delivered through shared decision making and self-management, supported by care coordination; and **health and care professionals** working in partnership – listening, supporting, and collaborating to deliver continuity of care. The House of Care model continued the promotion of risk stratification – in this case to support identification of appropriate patients to receive a customised House of Care approach to support their needs (NHS England 2013).

2013-2015 Unplanned Admissions Enhanced Service [x]

Elements of the house of care and previous chronic care model were apparent in the ambitions of the 2013/2014 Unplanned Admissions Directed Enhanced Service for general practice – as negotiated via the QIPP workstream. This was a non-statutory element of that year’s General Medical Services (GMS) contract, similar to work undertaken for the Quality and Outcomes Framework (Box 7). The contract provided a financial lever for general practices to undertake ‘proactive case finding and patient review for vulnerable people’. The funding was extensive, with £162 million allocated annually, corresponding to £2.87 per patient and £20,340 per practice. Through ‘more personalised care’, the initiative aimed to improve the quality and co-ordination of care for high risk patients to improve their health and wellbeing and reduce hospital admissions and ED attendances (NHS England 2015). It funded practices to create a register of patients at high risk of avoidable unplanned admissions, for proactive case management. Risk stratification was the recommended means to identify patients for the register – which had to incorporate a minimum of two percent of the practice population. However, alternative approaches to patient identification were permitted (i.e., clinician identification) but likely to introduce additional practice workload, biases and be less accurate. The care provision for the identified high-risk cohort included enhanced access (e.g., same day telephone access), a named GP for care coordination, development of a care plan and regular review with patient/carer input, and efforts to improve discharge arrangements (NHS England 2015). The Enhanced Service ran for three years, until the 2015/2016 contract, when the funding was incorporated into core funding. Similar incentive schemes were introduced in Wales, Scotland and Northern Ireland (Scottish Government 2013) (Northern Ireland Health and Social Care Board 2013, Welsh Assembly Government 2013). The introduction of the Enhanced Services provided an additional driver for the use of EARS tools by an estimated 10,128 UK general practices, with 7,841 in England (2016 data (NHS Digital 2016)). A freedom of information request (for this thesis) confirms that participation in the scheme was popular with 92.8% of English practices submitting returns in 2015/2016 (NHS Digital 2019).

The Quality and Outcomes Framework (QOF)

QOF is a voluntary reward and incentive programme. It rewards GP practices, in England for the quality of care they provide to their patients and helps standardise improvements in the delivery of primary care. It relies on the recording of appropriate clinical data in patient records which is then used to determine financial reconciliation. Marked improvements in record keeping and delivery of clinical targets have been consistently demonstrated following the introduction of QOF; including in studies of smoking (Taggar, Coleman et al. 2012), asthma and hypertension, (Steel, Maisey et al. 2007) and coronary heart disease (McGovern, Boroujerdi et al. 2008) suggesting that incentivised targets can influence clinical behaviour.

Box 7: Quality and Outcomes Framework

[Created by Mark Kingston in Microsoft Word 2023]

2014 NHS Five Year Forward View / 2014 Introduction of NHS New Care Models [xi]

The forward view set out a vision for health services based on improved integration of care across and within sectors, better prevention, and more self-care. The report acknowledged that not enough had been done to heed the Wanless warnings over the rising burden of avoidable illness (Care Quality Commission 2014). The forward plan had £8 billion in funding to support increased access to care, building and workforce including GP recruitment, and efforts to encourage integration of health and social care and pooled efforts. It included funding for 50 vanguard sites to design, test and deliver a variety of scalable and replicable new care models for the whole country, with the expectation that success would be replicated elsewhere (The King's Fund 2016).

2016 NICE Multimorbidity Guideline [NG56]

Further encouragement to use EARS for patient care was incorporated into a new NICE guideline, that encouraged the use of validated tools to “*identify adults with multimorbidity who are at risk of adverse events such as unplanned hospital admission or admission to care homes*” (NICE 2016) – with a view to providing appropriate care that takes account of their conditions, needs and views – through shared decision making and other patient centred approaches. The guidance noted that patient selection may be an EARS tool or frailty tool such as the electronic frailty index (eFI) (Clegg, Bates et al. 2016).

Technological developments

Alongside (and reflected in) the demographic and policy context, are important technological developments that also provide part of the EARS back story and merit a brief overview here.

Electronic Health Records

An EHR contains the results or records of clinical and administrative encounters between a health service provider and a patient that occur during episodes of care (Ambinder 2005). As an electronic database EHRs act as both a repository and searchable resource for patient level information. They aim to improve the accuracy of the information, support clinical decision-making, and improve the accessibility of information for continuity of care, by providing accurate details of medications, diagnoses, and legible notes (Williams and Boren 2008). EHR data is routine, backed by a range of technical, political, and quality factors, including but not limited to:

- the inadequacies of paper records (Ambinder 2005)
- the availability of computers, communication technologies, and the internet (Evans 2016)
- reimbursement incentives that pay for using EHRs and for providing quality care (Taggar, Coleman et al. 2012)
- health research and epidemiology – often using linked datasets (Lyons, Jones et al. 2009)
- emergence of screening or risk tools integrated into computer systems (Usher-Smith, Silarova et al. 2017).

However, the use of EHR has raised concerns over privacy and security – and these remain crucial obstacles for their acceptance (Evans 2016) for standard care and in new applications such as EARS. Patients, and services continue to demand assurance that these records are securely protected (Ruland, Brynhi et al. 2008), and compliant with information governance standards (Gaunt and Roger-France 1996).

Section summary

In this section, I have highlighted that demand led by population rises, ageing and changes in the profile of disease have continued to put UK health services under pressure. The policy response has sought to promote care approaches that address some of the existing deficiencies and improve care – with the hope of achieving systemic improvements. I have shown that risk stratification was seen as an integral component of many of the proposed solutions. In the next section, I offer a closer inspection.

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Chapter 4: Introduction to clinical risk tools and EARS

Risk stratification has an important role in ensuring that patients who can receive appropriate care within the community setting receive their care there, leading to a reduction in avoidable hospitalisations and the frequency of unnecessary hospital admission and emergency department attendances. (NSW Government: The Agency for Clinical Innovation (ACI) 2018)

Introduction

Having established the context in which EARS tools were advocated, it is timely to look more closely at the tools themselves, and their disease specific predecessors. In this section, therefore I provide an overview of clinical risk tools, and then look more closely at EARS specific tools, their origins, design, and function. I reflect on how they generate risk scores; discuss their performance (accuracy in calculating risk of emergency admission); and consider how they look and fit with clinical systems, aided by closer examination of indicative risk tools. I conclude the section with consideration of some of the reported challenges of introducing risk stratification in practice.

Risk tools

Origins in disease specific risks

In the previous section I outlined some of the key demographic, policy and technological drivers behind the emergence of EARS as a healthcare innovation. As I have demonstrated, the concept of risk is familiar and a routine consideration in healthcare, albeit one that is not always discussed explicitly.

Risk tools (sometimes known as prognostic tools) emerged as part of the wider shift from treatment to prevention of disease for those at risk, and in response to greater understanding of the importance of risk factors in determining future health (Mahmood, Levy et al. 2014).

Risk factors being variables that correlate either positively or negatively with an outcome (Offord and Kraemer 2000). Some risk factors such as date of birth or ethnicity are *fixed* and not subject to change, while *causal* risk factors are those that are potentially modifiable and affect the outcome predicted e.g., smoking status as a risk factor for lung disease. The distinction is important for interventions must focus on *causal* risk factors if clinically important improvements are to be made (Offord and Kraemer 2000). The importance of risk factors was identified following influential cohort studies such as the Framingham Heart

Study (1948 to present) (Mahmood, Levy et al. 2014) (Kannel, Dawber et al. 1961). The risk factor concept paved the way for the development of clinical risk scores as a means of identifying those at risk, to support the targeting of preventative interventions (Mahmood, Levy et al. 2014). Following Framingham, a number of multivariate regression models were devised to calculate coronary heart disease risk, using risk factors such as age, total cholesterol, weight, ECG abnormality, haemoglobin, smoking status, and blood pressure – see for example Truett, Cornfield and Kannel (Truett, Cornfield and Kannel 1967). There followed the first and perhaps best known of all clinical risk scores – the Framingham Risk Score (from here on Framingham), first published in 1998 by Wilson and colleagues (Wilson, D'Agostino et al. 1998). Framingham provided a 10-year risk of cardiovascular disease, and was widely, and swiftly adopted in international clinical guidelines (Bitton and Gaziano 2010), including QoF and NICE guidelines in the UK (Liew, Blacklock et al. 2013). Other risk scores quickly followed, as IT innovations, particularly electronic record keeping, helped support their incorporation into clinical workflows (Wu and Orlando 2015). Using routine clinical and demographic data prominent innovations include:

- QRisk2 (Hippisley-Cox, Coupland et al. 2008) and Predict CVD (Bannink, Wells et al. 2006) which determine ten-year cardiovascular risk. QRisk2 is recommended by NICE, (as an updated replacement for Framingham) for use in cardiovascular disease: risk assessment and reduction since 2014 (Clinical guideline [CG181]), (NICE 2023), and is integrated into EMIS - the predominant UK general practice clinical computer system (Hippisley-Cox, Coupland et al. 2008).
- The FRAX tool for ten-year fracture risk assessment (Kanis, Johnell et al. 2008) and similar QFracture tool both for use in a primary care population (Hippisley-Cox and Coupland 2012).
- Cancer risk tools such as the Harvard Risk Tool (Colditz, Atwood et al. 2000) which uses data on risk factors, such as age, sex, family history of cancer, medical history, and lifestyle factors to estimate an individual's risk of developing cancer within ten years.

Use of clinical risk tools – what does the research say?

Through an MRC funded programme looking at clinical prediction risk models the PROGRESS study team provided an overview of the research in papers in the BMJ and PLOS Medicine (Hemingway, Croft et al. 2013) (Moons, de Groot et al. 2014) (Hingorani, Windt et al. 2013) (Steyerberg, Moons et al. 2013), building on previous work by members of the same team (Royston, Moons et al. 2009).

Their summary conclusions and recommendations from across the wider clinical prediction risk model field are also relevant here. They emphasised three important stages in

prognostic model research: model development, external validation and impact on clinical practice (Steyerberg, Moons et al. 2013). However, in a systematic review, building on three former reviews, they identified very few publications regarding clinical impact or usefulness – with most weighted towards development, and to a lesser extent validation – see Figure 18.

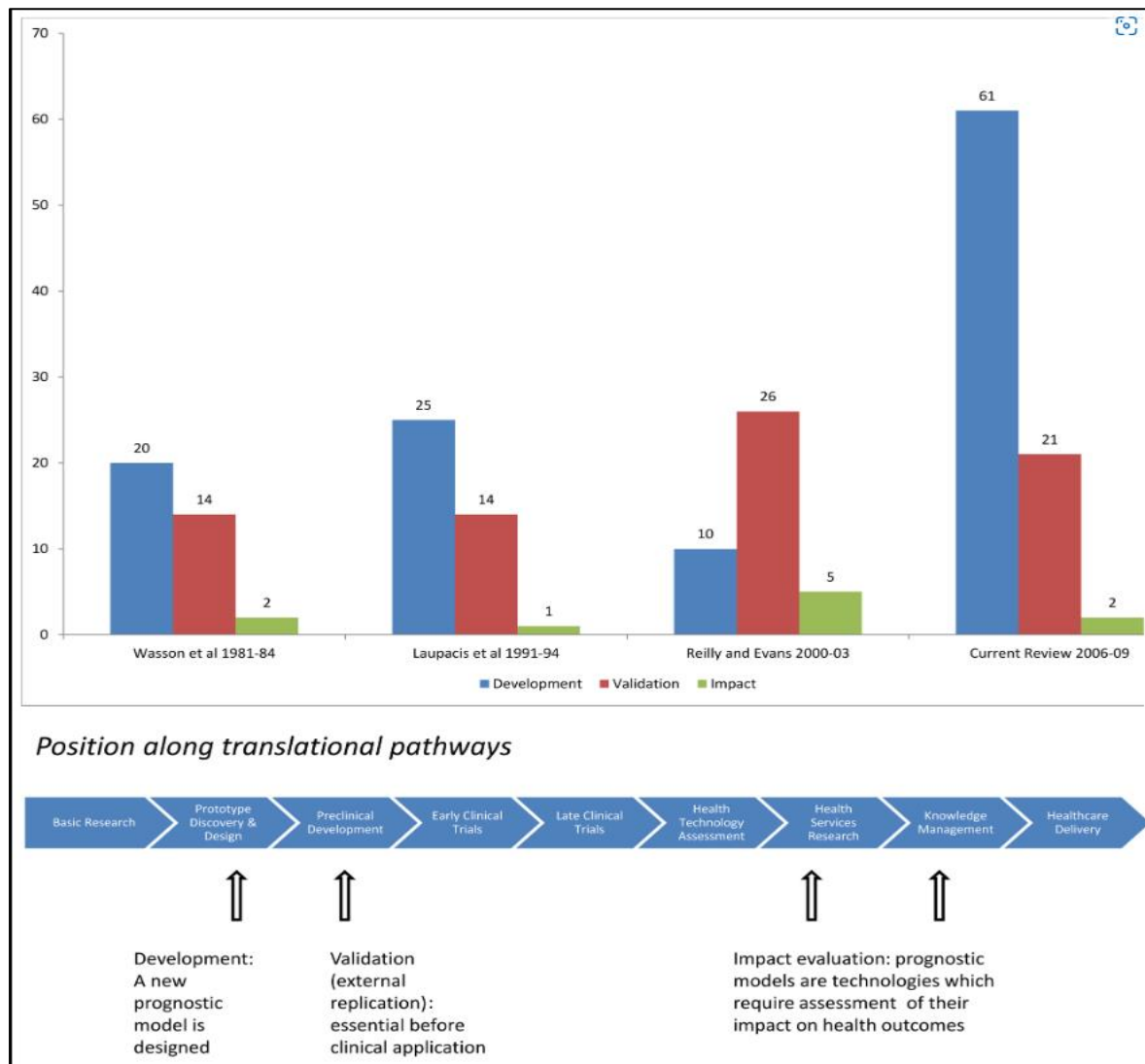


Figure 18. Distribution of published articles describing risk model development, validation, and impact assessment in four reviews (Royston, Moons et al. 2009).

Pathway adapted from Chart 7.1 in the Cooksey report (Cooksey 2006) [used under the terms of the Open Government Licence v3.0 nationalarchives.gov.uk/doc/open-government-licence/version/

A closer look at the websites of the example risk tools identified earlier backs up this finding. For example, the FRAX website (<https://www.sheffield.ac.uk/FRAX/reference.aspx>) offers 50 references – journal articles, conference proceedings, reports and guidelines describing model development and validation but a title and abstract search of these indicates that none discuss implementation, adoption or effectiveness. Similarly, all ten articles (five in the BMJ) on the QRISK2 website (<https://www.qrisk.org/2017/index.php>) relate to tool development, validation and modelling.

The PROGRESS team also reported a concern that many prognostic models were used without clear evidence of impact, while other well developed and validated models were not used at all (Royston, Moons et al. 2009). They were highly critical of the research field to date (i.e. up to 2013), and called for a fundamental shift in practice, policy and research to generate evidence based use of prognostic models: building on opportunities from developments in electronic data collection to use models to assist (not replace) clinicians with their prediction of patient outcomes and to enhance informed decision making *with* the patient (Steyerberg, Moons et al. 2013), (Royston, Moons et al. 2009). Key areas to focus attention on, they argued, were translational research and clinical impact studies, training of users, and the involvement of patients, who were largely excluded from the research field despite questions of prognosis being “*amongst the most important to patients*” (Steyerberg, Moons et al. 2013).

Qualitative data from studies in the UK indicates that general practice clinicians are familiar with such disease specific risk assessment tools, and have used them to varying degrees, helping to provide a conceptual reference point for EARS (Porter, Kingston et al. 2016), (Freund, Wensing et al. 2012) (Usher-Smith, Silarova et al. 2017). A number of studies of the barriers and facilitators to the introduction of risk tools have been undertaken, chiefly using qualitative methods. An interview and focus group study of 68 GPs in Germany, found that risk tools were accepted, but barriers to use included: a lack of clinical recommendations to support risk modification: lack of services to refer at risk patients to, doubts over the capacity and role of GPs to support primary prevention work, doubts about patient’s willingness to engage in risk discussion, and where this work would fit into practice. To support use, there were suggestions for improved computer visualisations which could be shared with patients, training, integration of lifestyle recommendations, and incentives (Müller-Riemenschneider, Holmberg et al. 2010). A recent qualitative study in the UK (Akanuwe, Black et al. 2021) considered a cancer risk tool (QCancer) in interviews with general practice practitioners and notably patients/service users. Findings illustrated that there was support for the tool’s potential role in supporting decision making, modifying health behaviours and improving speed of referral. Barriers included concern over how tool use would fit with practice, especially in regard to additional consultation time to support personalised care; the need for clinician training in use of the tool; evidence of effectiveness and the need to integrate the tool into general practice (Akanuwe, Black et al. 2021). Such barriers are familiar from the summary of literature around implementation of digital health technology, earlier in this chapter. If tools are to be adopted in the longer term, then strategies to address such barriers are needed.

Risk Communication

One of the potential applications of clinical risk tool data is through risk communication, whereby there is a discussion between patients and clinicians about the risk in question:

In shared decision making, the communication process by which patients and clinicians work together to make optimal healthcare decisions is increasingly important... As part of this, effective communication between healthcare professionals and patients is an important aspect of patient-centred care and shared decision making. Appropriate communication of both health-related risks and benefits are essential to help patients make the best-informed health-related decisions that are concordant with their personal values, experiences, and preferences. (Beaudart, Hilgsmann et al. 2022)

As the quotation above iterates, the discussion of risks and their mitigation between clinicians and patients is a foundation of patient centred care principles (Kanis, Johnell et al. 2008). Risk communication is also a recommendation of NICE guidelines [(NICE 2021, NICE 2023), and consistent with ethical principles around understanding and appreciation of risk information (Anderson and Iltis 2008). It is the duty of the clinician to present the risks in a meaningful and useful way that the patient can understand (Sewell and Rimmer 2022). Risk communication is an important area, because theories of behavioural change emphasise the association between risk perception (belief about the likelihood of personal harm from a “risk”) and health related behaviour (Weinstein and Klein 1995, Ahmed, Naik et al. 2012). Better communication practices lead to better adherence to care – and can be improved through training. In a 2009 meta-analysis of 21 studies Zolneirek and Dimatteo found a 12% higher risk of poor adherence when physicians had not received a training intervention (Zolnerek and Dimatteo 2009).

It has been recognised that meeting the goals of risk communication – sharing information, changing beliefs, and changing behaviour is not straightforward (Naik, Ahmed and Edwards 2012) (Han, Joeekes et al. 2014). One key challenge relates to health literacy which the WHO define as ‘the personal characteristics and social resources needed for individuals and communities to access, understand, appraise and use information and services to make decisions about health’ (World Health Organization 2015). An observational study of health literacy with 5,795 English participants, published in the British Journal of General Practice, found that a significant proportion of the population did not have the skills to fully understand and use health materials they sampled, with 43% below a competency threshold for text information, and 61% below a text and numeracy threshold (Rowlands, Protheroe et al. 2015). The importance of the words and numbers used, their framing and presentation has been repeatedly demonstrated in disease specific and more general risk communication research. This includes systematic and scoping reviews, (Zipkin, Umscheid et al. 2014),

(Ancker, Senathirajah et al. 2006) (Anderson and Iltis 2008), (Paling 2003); a Cochrane review of screening risk communication, (Edwards, Naik et al. 2013); a cancer risk review (Stellamanns, Ruetters et al. 2017); risk communication in research reviews (Coyle and Gillies 2020) (Anderson and Iltis 2008); a scoping review of fracture risk communication (Beaudart, Hiligsmann et al. 2022); and a further systematic review of cardiovascular risk communication (Waldron, van der Weijden et al. 2011). Building on these publications, the main literature recommendations for risk communication have been brought together by Schrager (Schrager 2018) and previously by Fagerlin et al. (Fagerlin, Zikmund-Fisher and Ubel 2011) which I summarise in turn here, initially with Schrager:

1. Remind the patient that all options confer some risk
2. Use absolute risk rather than relative risk to reduce bias
3. Be careful about the way you present numbers
4. Use visual aids
5. Use plain language

Summary of recommendations for risk communication to patients

1. Use plain language to make written and verbal materials more understandable.
2. Present data using absolute risks.
3. Present information in pictographs if you are going to include graphs.
4. Present data using frequencies.
5. Use an incremental risk format to highlight how treatment changes risks from preexisting baseline levels.
6. Be aware that the order in which risks and benefits are presented can affect risk perceptions.
7. Consider using summary tables that include all of the risks and benefits for each treatment option.
8. Recognize that comparative risk information (eg, what the average person's risk is) is persuasive and not just informative.
9. Consider presenting only the information that is most critical to the patients' decision making, even at the expense of completeness.
10. Repeatedly draw patients' attention to the time interval over which a risk occurs.

Box 8: Summary of recommendations for risk communication to patients: Source: (Fagerlin, Zikmund-Fisher and Ubel 2011).

Emergence of emergency admission risk tools in primary care

The highly skewed distribution of healthcare, with a small number of people (often with chronic or complex presentations) accounting for a large amount of total resources (Panattoni, Vaithianathan et al. 2011), (Oliver-Baxter, Bywood and Erny-Albrecht 2015), has important implications for how preventive services are targeted, how budgets are set, and how health services are regulated and evaluated. A literature review by The Kings Fund outlined two key reasons to identify this high risk, high-cost cohort. The first is to use this

information to calculate insurance premiums or resource allocations to cover expected future costs. This process, known as ‘risk adjustment’ has been employed in the US and in other capitated systems – see for example Hughes et al. 2004 (Hughes, Averill et al. 2004) or Pope et al. 2004 (Pope, Kautter et al. 2004) – and sometimes uses future costs rather than emergency admissions as the prediction of interest. The second reason for identifying this group is for ‘case finding’ – the process of identifying people who may benefit from early intervention to prevent a negative outcome or event – i.e., emergency admission. This is the approach that has primarily been applied in the UK, for the demographic, epidemiological and policy reasons outlined in the previous section, and reflected in the quotation below.

If it were possible to predict these admissions and offer preventative care to stop them from occurring, not only would we be improving the health status of these high-risk patients, but we might also make overall savings from the NHS from reductions in unplanned admissions. (Nuffield Trust 2011)

Identifying at risk patients – alternative approaches to EARS

Intervening with those at risk of admission relies on targeting those genuinely at risk. Initial approaches to patient selection for interventions targeting high-risk patients included ‘threshold modelling’ (or criteria-based referral) and identification by clinicians unaided by a risk model (Lewis, Curry and Bardsley 2011). Threshold modelling was used in nine UK Evercare pilots of advanced nurse led case management, with patients eligible if over 65 and with two or more emergency admissions in the previous 12 months (Gravelle, Dusheiko et al. 2007). The intervention failed to realise its aims – to reduce emergency admissions or bed days but provided additional contacts, monitoring and treatment options that were highly valued by patients and their carers (Gravelle, Dusheiko et al. 2007) (Sargent, Pickard et al. 2007). However, evaluations revealed that the eligibility criteria was inconsistently implemented and recorded. Records suggested that many did not meet the criteria (Sargent, Pickard et al. 2007), and the appropriateness of the threshold model was widely questioned: it systematically excluded younger people and those without a recent emergency admission (Donnan, Dorward et al. 2008), and was susceptible to regression to the mean (Roland, Dusheiko et al. 2005). Regression to the mean is a ubiquitous phenomenon in repeated data (Barnett, van der Pols and Dobson 2005), and describes the scenario where observations made at the extreme will tend towards the population average in follow up – i.e. be less extreme (Lewis, Curry and Bardsley 2011). Using routine data for 224,000 English patients, Roland et al, found that for patients 65+ with two emergency admissions in the previous year (i.e. the Evercare criteria), the emergency admission rate was 75% less the following year without any intervention (Roland, Dusheiko et al. 2005).

While the Evercare pilots were just one example of the application of threshold modelling, they illustrate the limitations of the approach to correctly identify those at risk of future events, and the need for evaluations to incorporate appropriate control groups to determine

implementation effectiveness and account for regression to the mean (Roland, Dusheiko et al. 2005), (Lewis, Curry and Bardsley 2011) (Barnett, van der Pols and Dobson 2005).

'The reasons why Evercare appears to have a modest impact on admissions could be because the method of selecting patients for case management may not accurately identify those at highest risk, or because the type of case management used is not effective. We should learn from these pilots, and try different forms in future. These interim results for Evercare show there is still a lot to learn and evidence about which type of programme is the most effective is still limited.' (The King's Fund 2005)

Another approach to identifying patients is clinician-based estimation, whereby clinicians familiar with a patient group seek to identify those at high risk. This approach is largely discredited due to illustrations of poor predictive accuracy and the practical challenge of scaling up to a large population. One oft cited study, including in many EARS related NHS England documents, was undertaken by Allaudeen et al. (Allaudeen, Schnipper et al. 2011). They found that San Francisco hospital clinicians' ability to predict readmissions of 165 patients within 30 days was no better than chance. Caution should be expressed about generalising from this study in relation to EARS in UK primary care given its limited size, US secondary care setting, and focus on hospital staff. A more recent primary care study by Dorr et al. (Dorr, Ross et al. 2021), compared risk stratification groupings (high/medium/low) generated by practice staff (using clinical records, local algorithms and clinical judgement) with those generated by a risk stratification model used for risk adjustment (the Hierarchical Condition Categories or HCC). The study examined the records of 3,381 patients with outcome data from six primary care practices in Oregon, USA. The authors found that the HCC model performed best (in terms of sensitivity and positive predictive values), although the most effective predictions combined the use of the HCC tool alongside 'clinician adjudication' (Dorr, Ross et al. 2021).

EARS models and tools

Given the limitations of threshold modelling and clinician identification (unaided by a risk tool), more sophisticated approaches to patient identification have been employed. The earliest approaches used self-reported data collected via questionnaire or interview, with data entered on a website, application or even on to paper. These tools were thus administered on an individual basis, enabling the inclusion of additional factors not routinely incorporated in clinical records, but that may be predictive, such as living arrangements, access to care or self-assessment of health. The latter is one of six items on the Emergency Admission Risk Likelihood Index (EARLI) risk questionnaire (Lyon, Lancaster et al. 2007). But due to cost, capacity and practicality the self-reported approach restricts potential for widescale population wide use, and for the longitudinal approaches with repeated measures.

Self-completed tools also introduce methodological issues associated with response rates, recall issues and respondent burden (Freund, Wensing et al. 2012), (Wallace, Stuart et al. 2014).

Routine data-based risk stratification has subsequently been the favoured approach to risk calculation across larger populations. Technically, this approach has become feasible due to the routine collection of computerised and retrievable individual level patient data, allowing analysis of patient histories over time.

With the advent of new data sources, such as patient-reported outcomes, and tools, such as the electronic health record (EHR), which make these data more accessible, the process of stratifying a patient panel at the point of care in real time is possible (Dorr, Ross et al. 2021)

Risk stratification can be defined as a systematic estimate of the probability of one or more people succumbing to a disease or experiencing an event (typically negative – such as an emergency admission or death). It is often further and (sometimes primarily) defined by its purpose, as in this example from the American Academy of Family Physicians (AAFP).

Risk stratification is “the process of assigning a health risk status to a patient, and using the patient’s risk status to direct and improve care,” (American Academy of Family Physicians 2020)

This definition emphasises a personalised approach to care – in contrast with the same organisation’s description of risk adjustment as an ‘*actuarial tool to predict health care costs*’ (American Academy of Family Physicians 2020).

Risk stratification is dependent on underlying risk models that consolidate a range of clinically significant data parameters (such as age, diagnoses, previous admissions and disease status) and calculate a risk level, score or indicator. Risk models therefore provide information about the relationship between these parameters and the predicted outcome (ASSEHS Study Team 2016).

This calculation is often automated, with outputs provided to end users either within the same platform or via a separate tool. While risk models can be used on an individual basis, risk stratification normally involves the simultaneous application of the model across a wider population group.

Risk model performance

The performance of emergency admission risk models is assessed using established indicators of predictive models. As summarised by Kansagara et al.(Kansagara, Englander et al. 2011), the Nuffield Trust (Nuffield Trust 2011) and NHS England (NHS Confederation 2018) they include:

Positive predictive value or PPV: how likely people predicted at a certain risk threshold (e.g., at high risk) are to experience an emergency admission in the timeframe specified. A lower PPV means that many of the patients will not go on to have an admission, and any preventative intervention may be wasted. By way of example if 300 of 1,000 patients predicted to have an admission went on to have one, the PPV would be 30%. PPV is higher for those at the highest risk of admission and is usually reported for a particular subset – e.g., the 10%, 5%, or 2% at highest risk.

Sensitivity: the proportion of all the people having an emergency admission that the model is able to identify.

Specificity: the proportion of those who are correctly predicted to not experience an emergency admission.

C-statistic – or the ‘area under the curve’ or AUC, this is the area under the receiver operating characteristics (ROC) curve, which displays the trade-off between sensitivity and specificity for a predictive model. The c-statistic reflects the proportion of times a PRM correctly discriminates between high and low risk individuals. A c-statistic of 0.5 indicates that the model performs no better than chance. Models above 0.7 are generally deemed acceptable, and those above 0.8 as good. The c-statistic is useful because it allows comparisons of different models based on a single number. However, commissioners may be particularly interested in certain portions (e.g. those at high risk) – if the PPV for this subset of patients is high, this counteracts a lower c-statistic (Oliver-Baxter, Bywood and Erny-Albrecht 2015).

		Status of person according to “gold standard”		
		Has the condition	Does not have the condition	
Result from screening test	Positive	a True positive	b False positive	Row entries for determining positive predictive value
	Negative	c False negative	d True negative	Row entries for determining negative predictive value
		Column entries for determining sensitivity	Column entries for determining specificity	

Figure 19: Model sensitivity, specificity and PPV.

Source: (Trevethan 2017) – used under a CC BY license.

A 2014 systematic review of the technical performance of primary care emergency admission risk prediction tools identified 27 tools, 18 using routine or primary data, and nine using self-report data (Wallace, Stuart et al. 2014). The authors reported that most models (18 of 27) predicted emergency hospital admission at 12-month follow-up. Other outcomes predicted included any type of hospitalisation, bed days, emergency department visits and deaths – or combinations thereof (Wallace, Stuart et al. 2014).

A limitation in determining the accuracy of models was that articles reporting their performance did not all provide appropriate detail for comparison. Wallace et al. used the c statistic as the primary measure of predictive accuracy, with those achieving a score of >0.8 deemed the most accurate. They found that models developed using routine clinical data performed better than those using self-report data (c statistics 0.63–0.83 vs. 0.61–0.74, respectively). The six best performing tools all included variables for prior health care utilization, multimorbidity or polypharmacy, and named medical diagnoses or prescribed medications. Only three predicted ambulatory care sensitive admissions.

As Wallace et al. report, the availability of candidate variables for risk modelling is defined by the data available. The authors note that many of the self-report risk models captured non-medical factors as predictor variables. These included activities of daily living, mobility, or falls history, self-rated health, availability of social or care support and living arrangements. Wallace et al. propose that efforts to test the value of adding variables such as these are important. Doing so however is not straightforward; many are not routinely captured, and where they are, this may not apply across the whole population of interest. Nonetheless, the desire to improve risk modelling through the inclusion of non-medical or social measures is

commonly expressed (Nuffield Trust 2011), (Haas, Takahashi et al. 2013), (Kingston 2010), (Oliver-Baxter, Bywood and Erny-Albrecht 2015).

One US study of qualitative interviews with patients identified by a risk prediction model as high risk found that the majority had poor self-rated health, precarious housing status, lived alone, and reported high levels of social isolation. (Raven, Billings et al. 2009) cited in Wallace (Wallace E 2016).

Further details including a summary table of the specific variables used for published EARS models have been published in a report for the Australian Primary Health Care Research and Information Service (PHCRIS) (Oliver-Baxter, Bywood and Erny-Albrecht 2015) – building on the Wallace et al. systematic review.

Risk model creation?

The success of population health management depends, in part, on accurately identifying patients at high risk for poor health outcomes as well as preventable and costly health events (Heath 2016)

Methods for creating risk models have received considerable research interest, and standardised approaches have been developed to build upon the emergence of access to datasets of routinely collected longitudinal health records -see for example Moons et al. (Moons, Royston et al. 2009) and Altman et al. (Altman, Vergouwe et al. 2009). Naturally, the performance of risk models is an important consideration, and is assessed in a standard two staged approach of development of the risk model, followed by validation. The first stage involves analysis of the data to compare and then select the candidate variables having the highest power in predicting the outcome of interest. Candidate variables are those that deemed available and of suitable data quality. The combination of variables that perform best are employed in the model, with their performance judged – as stage two – either within the same dataset (internal validation) or preferably in a separate dataset (external validation) – as the similarities in data can result in overestimates of performance with the former (Moons, de Groot et al. 2014).

At the development stage, risk stratification models are configured in terms of the outcome they predict and timeframe of interest. The outcome/s of a risk tool can be categorical (e.g., low, medium, high risk), or quantitative such as the probability of an event occurring or a number representing future expenditure or days in hospital.

To demonstrate the development and validation process in practice, I summarise the development and validation steps followed for three EARS tools created between 2005 and 2018.

Combined Model – Department of Health 2005

The Combined Model was developed as a case finding tool for the NHS in England, by a consortium of the King's Fund, New York University and Health Dialog. As reported by Wennberg et al, the model was based on routine data for 560,000 patients from two Primary Care Trusts and sought to identify emergency admission risk for the following 12 months (Wennberg D, Siegel M et al. 2006). The development team used three years of hospital data including inpatient, outpatient, and accident and emergency (A&E) attendance data, combined (hence the name) with general practice data including lab, diagnosis, and encounter information. The sample was split into equal groups – 50% for a development sample, and 50% for validation – before logistic regression was used to mine for predictor variables using two years of data from the development sample. Potential variables (n=850) were assessed independently for their relationship with emergency admission before being included in a multivariate model. The model was then validated by applying the variable beta weights resulting from the logistic regression analyses to the validation sample. This stage confirmed that 586 out of the top 1000 patients predicted by the model had an emergency admission in the year following prediction, with a PPV of 74% for the highest risk 250 patients in the model. The model was made available to the NHS in England for localisation, requiring access to appropriate local data and development of a risk tool to access the risk stratified outputs. However, it has been reported that uptake of the Combined Model was restricted by practical and information governance problems accessing computerised patient level information from GP practices (Nuffield Trust 2011).

The Welsh Predictive Risk Stratification Model (PRISM) 2008

The Welsh EARS model, known as PRISM, was developed in response to the chronic conditions management policies in Wales (Welsh Assembly Government 2007). It was commissioned by NHS Wales, with development led by Informing Healthcare (now part of Digital Health and Care Wales) with the support of Health Dialog. Development involved 300,000 anonymised linked GP and hospital patient records, with 1,200 candidate variables explored across two initial years of data. The 37 variables (Table 7) with the highest power in predicting the outcome of emergency hospital admission within 12 months formed the model (Informing Healthcare 2010). These variables were sourced from inpatient, outpatient, GP and deprivation data.

Table 7: Variables included in PRISM risk algorithm (Informing Healthcare 2010).

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PRISM Variables	
GP Systems (22)	Inpatient (8)
Neurotic personality and other non-psychotic disorders	Inpatient admission (IA) with diagnosis of Cerebral Palsy and other paralytic syndromes
Poisoning	IA with diagnosis symptoms and signs involving the circulatory and respiratory systems
Sprains/strains of joints/muscles	IA with diagnosis symptoms and signs involving the digestive system and abdomen
Mental and behavioural disorders	IA with diagnosis abnormal findings on examination of urine, without diagnosis
GI disorders	IA with alcohol related diagnosis
Cephalosporins & Cephamycins	Emergency admissions in last 12 months
Corticosteroid Clinical Use	Non-emergency admission
Loop Diuretics	Inpatient day & night cases
Macrolides	Demographics (3)
Narcotic Analgesics	Age
Other Antidepressant Drugs	Age Squared
Penicillinase Res Penicillins	Gender
Sulphonamides & Trimethoprim	Outpatient (3)
Ulcer-Healing Drugs	OP visit following emergency admission
Vitamin B Group	OP visit with referral from GP
Polypharmacy	OP visit with outcome "Another appointment given"
Polypharmacy squared term	Welsh Index of Multiple Deprivation (1)
Smoking status	Deprivation score for super output area of residence
Total number of chronic conditions	
CHF	
COPD	
Epilepsy	

The risk model (algorithm) divides the patient population into four distinct tiers; according to their increasing risk (and potential service need). The tool also stratifies patients into four risk levels according to the relative risk within the practice as a whole. So for example, using the default stratification, the 0.5% of patients with the highest practice risk will appear at Level 4; those in the top 0.5 -5% in Level 3 (high risk); those between 5 and 20% in Level 2 (medium risk) and the remainder in Level 1 (low risk).

The model was validated and subsequently amended using the third year's data (i.e. analysis of who went on to have an admission) (Informing Healthcare 2010). Following the creation of the predictive data model Health Solutions Wales (then part of the Welsh NHS IT infrastructure) was tasked with building an effective system (tool) to utilise the model, potentially for use across Wales. This involved creating a database capable of handling data feeds from primary and secondary care, along with a web-based tool to allow GP practices to view the results of the predictive analysis (Informing Healthcare 2010). I will return to look at the PRISM interface later in this chapter when considering EARS tools from an end user perspective.

Machine Learning Model – 2018 (Rahimian, Salimi-Khorshidi et al. 2018)

More recently, an EARS model was developed and reported by Rahimian et al. , using a machine learning approach with records for 4.6 million patients from 389 practices in

England between 1985 to 2015. This increase in sample size is indicative of the expanding availability of routine data for research in the years since the Combined Model and PRISM were derived. In this case the authors used the Clinical Practice Research Datalink (CPRD) <https://cprd.com/>, a repository of pseudo-anonymised patient data from 674 general practices in the UK, covering approximately 7% of the current UK population (Herrett, Gallagher et al. 2015). Rahimian et al. split their sample 80/20 in terms of derivation and validation cohorts. In developing their machine learning approach, they tested three models: a logistic regression model based on a pre-existing EARS model using 43 variables - QAdmissions (Hippisley-Cox and Coupland 2013); and two machine learning strategies. They used various combinations of variables with the addition of marital status, prior general practice visits, 11 additional morbidities and temporal information (e.g., time since first diagnosis). They also looked at different risk prediction windows of 12, 24, 36, 48, and 60 months. In terms of performance, they found their best performing model was a two-year prediction and incorporated the new variables. This model showed a 10.8% higher AUC (0.848 compared to 0.740) compared to the baseline QAdmissions model – with most of the improvement attributed to the temporal information.

The study is commendable for incorporating a comparison with a pre-existing EARS model, and for learning from the performance of that model in the derivation of improved models. The application of machine learning also shows promise.

One note of caution over each of the three models cited, and one that is common across this field, is that their development is reported by the developers themselves, rather than by independent analysts. Other commentators have noted that owners of some commercial tools may be reluctant to share model performance e.g. Heath 2016 (Heath 2016). The Nuffield Trust have long argued for standardised comparisons of risk tool performance using a reference dataset (Nuffield Trust 2011) but to date this has not materialised.

User perspectives

How tools look

Having addressed how models are developed and validated, I next provide a brief overview of how they appear (as tools) to end users with the aid of three examples from England, Scotland, and Wales. Although important in the notion of usability, a known factor in technology adoption, just how tools look and operate, has had little attention in NHS guidance documents or indeed in research.

QAdmissions

The first example is from England, with the aforementioned QAdmissions risk model/tool (Hippisley-Cox and Coupland 2013) which predicts risk of emergency admission within 12 or 24 months. The model was developed in response to the Unplanned Admissions Enhanced Service – as confirmed by the developers (Hippisley-Cox and Coupland 2013). The aim was for the tool to be used and hosted by general practices for practice wide risk calculation, stratification, and appropriate intervention across the risk spectrum. The approach required linkage to the general practice clinical data, but not to external datasets such as hospital records – which the authors note requires additional technical, ethical and information governance solutions (Hippisley-Cox and Coupland 2013). To access the results, the QAdmissions website states that risk tool software can be implemented into any GP system supplier (e.g., EMIS), CCG, or CSU by licensing a software development kit. The authors also released a web tool for clinical use at an individual level through direct data entry into the QAdmissions website at <https://qadmissions.org/index.php> (see Figure 20).

53 year old white man from the South West, ex-smoker, drinks 7-9 units/day, has type 2 diabetes, body mass index of 39.1 kg/m² currently prescribed antidepressants, with last haemoglobin of under 11g/dl and an abnormal liver function test, has a 29% risk of having an emergency admission within the next two years as shown in the screen shot below (www.qadmissions.org). This level of risk would put him in the top 10% of patients at risk of emergency admission. The same man without anaemia or abnormal LFTs would have a risk of 14%.

The screenshot shows the QAdmissions risk calculator interface. The header includes the ClinRisk logo and a welcome message. Navigation tabs include Reset, Information, Publications, About, Copyright, Contact Us, Algorithm, and Software. The main section is titled 'Calculate risk over 2 years' and 'The results'. The 'About the person' section contains fields for Age (53), Sex (Male), Ethnicity (White or not stated), and UK postcode. The 'Necessary information' section includes dropdowns for Strategic health authority (South West), Smoking status (ex-smoker), Alcohol status (7-9 units per day), and Emergency admissions in the last year (none). It also has checkboxes for various medical conditions like Heart attack, Atrial fibrillation, Congestive cardiac failure, Chronic renal disease, Venous thrombo-embolism, Cancer, Asthma or COPD, Falls, Epilepsy, Manic depression or schizophrenia, Malabsorption, coeliac disease, and Chronic liver/pancreatic disease. The 'Blood tests' section has checkboxes for Abnormal LFTs (checked), Anaemia (checked), and Platelets > 480. The 'Drugs' section has checkboxes for taking anticoagulants, antidepressants (checked), antipsychotics, and anti-inflammatory painkillers. The 'The results' section displays a 29% risk of having an emergency hospital admission within the next two years, accompanied by a 10x10 grid of colored circles representing the risk level. Below the grid, it states that the person's score has been calculated using estimated data and that their body mass index is 39.06 kg/m².

Figure 20: QAdmissions EARS risk data entry webpage – screenshot (Hippisley-Cox and Coupland 2013)

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Scottish Patients at Risk of Readmission and Admission (SPARRA)

The second example is from Scotland, with the SPARRA EARS model – a tool developed within the Scottish NHS in response to government policies aimed at reducing hospital admissions and improving preventative primary care (NHS NSS 2012). The SPARRA model is notably different from the QAdmissions model. The main difference being that it is run centrally, rather than hosted at individual general practices, and it does not include a general practice data feed. Instead, the SPARRA model uses nationally compiled administrative datasets of secondary care and community pharmacy data. It determines one year emergency admission risk for 85% of the Scottish population. SPARRA also determines three cohorts for potential follow up in primary care - Frail Elderly, Long Term Conditions, and Younger Emergency Department (Public Health Scotland 2019). The SPARRA model is refreshed monthly and outputs are made available to participating practices as a spreadsheet incorporating a ranked, stratified list of patients in each cohort (see extract in Figure 21). Each updated spreadsheet was initially emailed to practices but more recently is accessible via a reporting platform – with users required to register for access to the system. Some non-identifiable SPARRA data is also available to approved Scottish health board staff, to support service planning. In addition, and again in a more recent development, the model can also be accessed as a webtool –Figure 22. As of 2019 Public Health Scotland noted that a new version (version 4) of SPARRA is in development (Public Health Scotland 2019) – but as of 2023 had yet to be released (<https://publichealthscotland.scot/our-areas-of-work/social-and-community-care/scottish-patients-at-risk-of-readmission-and-admission-sparra/overview/>).

SPARRA Patient List

Risk Year Start Date	GP Practice Code (Current)	CHI Number	First Forename	Surname	SPARRA Risk Score	SPARRA Risk Score (Previous)	Sex	DOB	Age	Polypharmacy
01/02/2019					60	63				19
01/02/2019					60	60				7
01/02/2019					60	74				12
01/02/2019					60	62				9
01/02/2019					60	56				18
01/02/2019					59	55				16
01/02/2019					59	59				17
01/02/2019					59	59				9
01/02/2019					59	59				17
01/02/2019					58	58				6
01/02/2019					58	47				14
01/02/2019					56	56				6

Figure 21: SPARRA EARS risk output – extract of practice user view (ISD Scotland 2019)

[Figure used under the terms of the Open Government Licence v3.0
nationalarchives.gov.uk/doc/open-government-licence/version/]

Figure 22: SPARRA EARS risk data entry webpage (frail elderly cohort) – screenshot (Public Health Scotland 2019)

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nationalarchives.gov.uk/doc/open-government-licence/version/]

Predictive Risk Stratification Model (PRISM)

Moving from Scotland to Wales, the third example risk tool (PRISM) is a further example of a centrally developed tool. PRISM was partially integrated into the clinical systems of general practices, available as a separate module or application to the main patient records. It required user registration, including approval via a practice information governance lead (guardian), and then a login via username and password to access (see Figure 23).

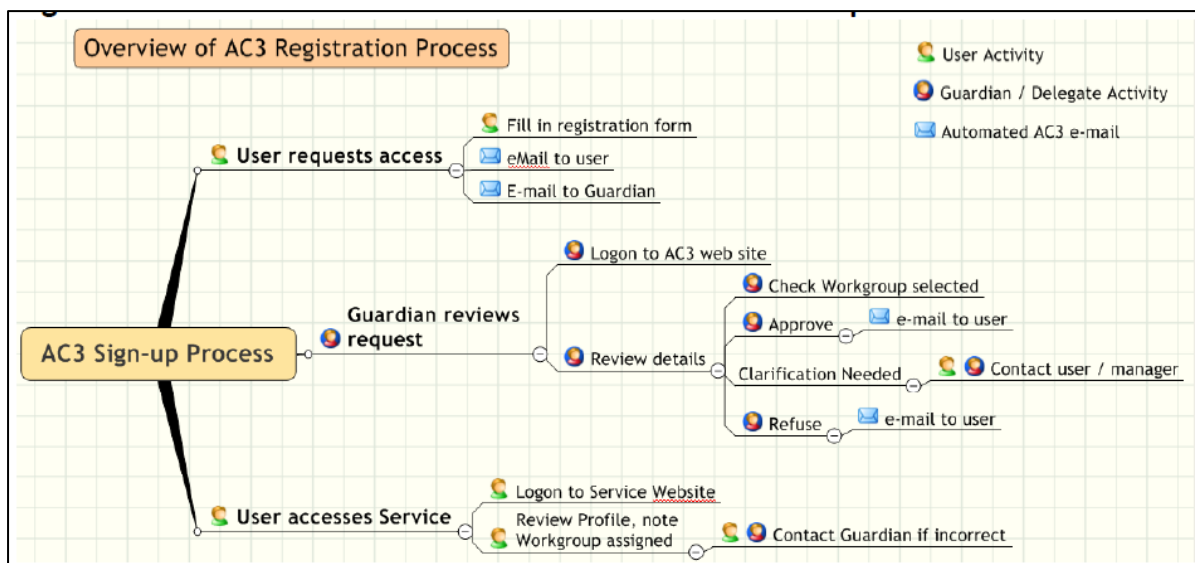


Figure 23 Prism Account User Control (AC3) Process. Source: (Kingston 2010)

[Figure used under the terms of the Open Government Licence v3.0
nationalarchives.gov.uk/doc/open-government-licence/version/]

From a user perspective PRISM offered the following functions and views, with data also updated once a month:

- Main data screen incorporating a cone shaped graphic with hyperlinks to the stratified patient lists in each of four risk groups – from very high to low risk (Figure 24).
- A patient search option, and search filters using the model variables (Table 7, p102)

- Access to a risk threshold adjustment option to fine tune the stratified lists (Figure 26).
- A summary of patients in each risk level, incorporating risk change indicator arrows, and hyperlinks to access the patient level risk information.
- A page dedicated to each patient with a breakdown of risk variables (Figure 27).

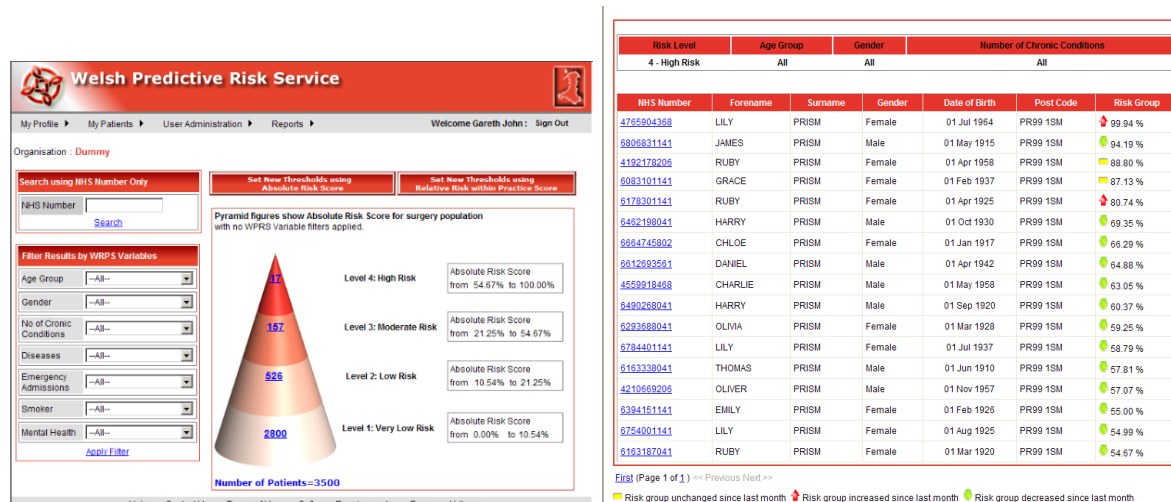


Figure 24 (left): PRISM screenshot - main data screen – risk levels cone (dummy data)

Figure 25 (right): PRISM screenshot – stratified list of patients (dummy data)

Source: Kingston (2010) [Images used under the terms of the Open Government Licence v3.0 nationalarchives.gov.uk/doc/open-government-licence/version/]

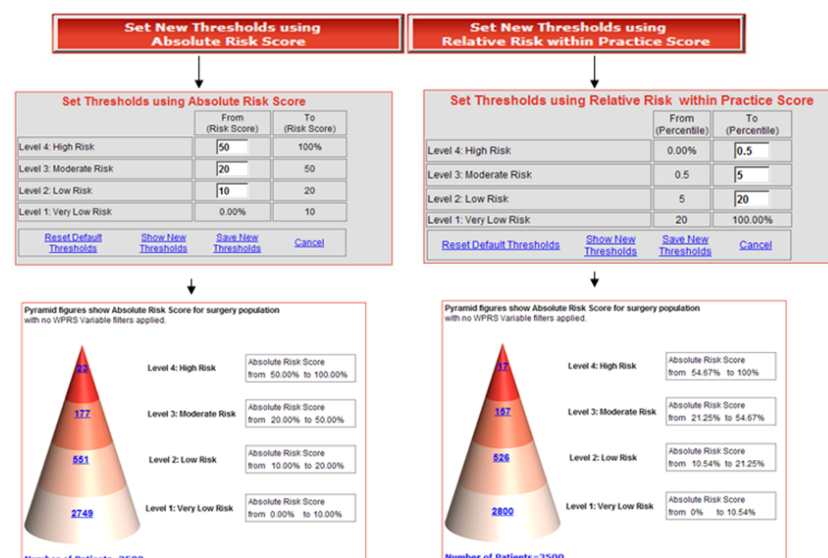


Figure 26: PRISM screenshot - Threshold adjustment

Source: Kingston (2010) [Images used under the terms of the Open Government Licence v3.0 nationalarchives.gov.uk/doc/open-government-licence/version/]



Welsh Predictive Risk Service



My Profile ▶ My Patients ▶ Welcome Mr. Trainer : Sign Out

←

Nhs Number	Name	Date Of Birth	Gender	Post Code	Predictive Risk Score
4755904260	PRISM, LILY	01 Jul 1964	Female	PR99 1SM	99.94

Demographic Variables in Risk History

GP Variables in Risk History

Risk Variable	Value
Neurotic, personality and other nonpsychotic disorders	Yes
Poisoning	No
Sprains and strains of joints and adjacent muscles	No
Mental and behavioural disorders	No
GI disorders	Yes
Corticosteroid Clinical Use	Yes
Loop Diuretics	Yes
Narcotic Analgesics	Yes
Other Antidepressant Drugs	Yes
Penicillinase Res Penicillins	2
Sulphonamides & Trimethoprim	No
Ulcer-Healing Drugs	Yes
Vitamin D Group	No
Polypharmacy	18
Patient has stated that they are a current smoker	No
Number of chronic conditions (PRISM model)	1

Hospital Admission Variables in Risk History

Outpatient Variables in Risk History

Chronic Conditions in Risk History

Figure 27: PRISM screenshot – patient variable summary (dummy data)

Source: Kingston (2010) [Images used under the terms of the Open Government Licence v3.0 nationalarchives.gov.uk/doc/open-government-licence/version/]

Comparison of the three example EARS tools illustrates that not all risk tools alike. They are marked by quite different registration, access arrangements, and user interfaces that vary, in these examples, between a spreadsheet (SPARRA), separate web platform (PRISM) and an integrated module integrated with general practice clinical IT systems (QAdmissions).

Although we do not have an example screenshot of the QAdmissions general practice interface, we can observe that the SPARRA and PRISM interfaces vary in presentation and in the simplicity or complexity of the data they present. It is noteworthy that some tools such as the Adjusted Clinical Groups tool (<https://www.hopkinsacg.org/>) offer the potential for additional risk presentations over and above EARS – such as predicted future costs or readmissions; adding further information to support care decisions, but also further complexity. Simpler tools may be more practicable and usable (Royston, Moons et al. 2009), but further exploration and formal usability testing is needed.

The underlying models vary also, with data sources of general practice data alone (QAdmissions), linked general practice, secondary care and deprivation data (PRISM), and secondary care and pharmacy data (SPARRA) – with each approach requiring specific technical and information governance solutions.

These example EARS tools and their accompanying resources have primarily been designed and developed for clinician use in primary care settings for case finding. None include a patient facing element that would lend itself to discussion within a patient clinician encounter. Although the QAdmissions and SPARRA online web tools could in theory also be

accessed by patients interested in their own risk score, the accompanying guidance is firmly aimed at clinicians.

Choosing a risk tool

The Department of Health's decision to not fund a national update of EARS models, in line with the government policy of promoting choice and plurality meant that commissioners would potentially have a much more active role in decisions over the supply of risk prediction for the areas they served.

“Previously, there were standard, proven cost-free models that were backed by the Department of Health. Now, however commissioners will begin navigating through what many become a highly competitive free market with all the advantages and pitfalls that that entails”. (Nuffield Trust 2011)

Conscious of the significant challenge, the Nuffield Trust produced a guide for commissioners in selecting or developing an EARS (Nuffield Trust 2011), with a similar focus also addressed by the Australian PHCRIS team (Oliver-Baxter, Bywood and Erny-Albrecht 2015) and the EU funded Activation of Stratification Strategies and Results of the interventions on frail patients of Healthcare Services (ASSEHS) project team (ASSEHS Study Team 2016). Across these reports, there are considerations relating to the model, particularly its technical composition and accuracy; to the tool, particularly its user friendliness; and to overarching aspects such as licenses, costs, information governance and alignment with planned use. I summarise the key factors identified across these sources in Table 8.

Table 8: Factors to consider when commissioning an EARS tool.

Created by Mark Kingston in Microsoft Word, 2023

Model related	Tool related	Other
License/costs for use	License/costs for use	Costs e.g. of obtaining the data, incentivising use.
Model localisation	Tool availability	Training of users/facilitators
Outcome to be predicted (e.g., unplanned admission in next 12 months).	User-friendliness	Alignment with appropriate follow-up intervention/s (and assumed cost effectiveness of any intervention – and ability to measure).
Predictive accuracy (internal and externally validated)	Data sources and presentation (format and quantity)	Implementation
Availability of the data on which the model is run. Some national datasets may be of higher quality, cleaned and prepared for linkage (Nuffield Trust 2011)	Information governance	Ethical use – i.e. not using the tools to disadvantage certain groups
Data linkage mechanisms		
Information governance		
Recalibration – i.e. updates		

Logic model for EARS in UK policy

MRC guidelines on evaluating complex interventions encourage the use of programme theory to describe how an intervention is expected to lead to its intended effects, and under what conditions (Skivington, Matthews et al. 2021). Programme theory seeks to identify and consider a) the key parts of an intervention and how they interact b) the mechanisms of the intervention – the causal links between intervention components and outcomes and c) the features of the context that are expected to influence those mechanisms, and how those mechanisms might influence the context (Pawson, Tilley and Tilley 1997), (Skivington, Matthews et al. 2021). The purpose of programme theory is to help inform our understanding of the intervention and its implementation. Programme theory is often presented using a logic model, a simplified graphical representation of how an intervention is understood to work to translate the inputs (resources), through implementation and receipt into outputs and impacts, within a particular context (Funnell and Rogers 2011), (W.K. Kellogg Foundation 2004). Building on the previous thesis sections I hereby present a logic model for the use of EARS within the general practice Unplanned Admissions Enhanced Service in England - (Figure 28). Note this is not a logic model emanating from the progenitors, but my interpretation of the intervention programme theory or logic – based on the policy and guidance documents that accompanied and preceded the service.

The logic model is situated within the epidemiological and demographic context I have previously outlined, building on the literature from chapters 3 (Demographic, Epidemiological and Policy Context) and 4 (introduction to risk tools and EARS).

Resources available to implement the Enhanced Service included financial support to participating GP practices, the accompanying guidance and the workforce associated with delivering the intervention. These are shown on the model as inputs. Anticipated outputs required by the ES included: identification of patients vulnerable to emergency admission, creation of a case management register; improved and coordinated hospital discharge and care; improved communication between providers and patients; and additional scrutiny and review of emergency admission and ED attendances for practice patients. In the logic model, the theory was that these changes in primary care would lead to changes in delivery and use of services including ED attendance and hospital admissions, more efficient use of resources and better coordinated care. Healthcare professionals will take more proactive approaches to identify and manage patients at high risk of emergency admissions, with improved communication among staff and with patients. In turn, patients will experience improved knowledge, skills and confidence towards self-management and improved quality of life. Building on the literature and theory presented thus far, I identify factors which may affect how the ES is implemented in practices. These moderating factors include evidence,

attitudes, beliefs and behaviours of GPs and patients and the feasibility, perceived or actual, of caring for the identified multimorbid patients. Service factors, such as GP resources, availability of services and characteristics of GP practices, may also have an effect. I will return to the logic model (Figure 37, page 249) later in this thesis to support interpretation of findings, considering for example the relative importance of the moderating factors.

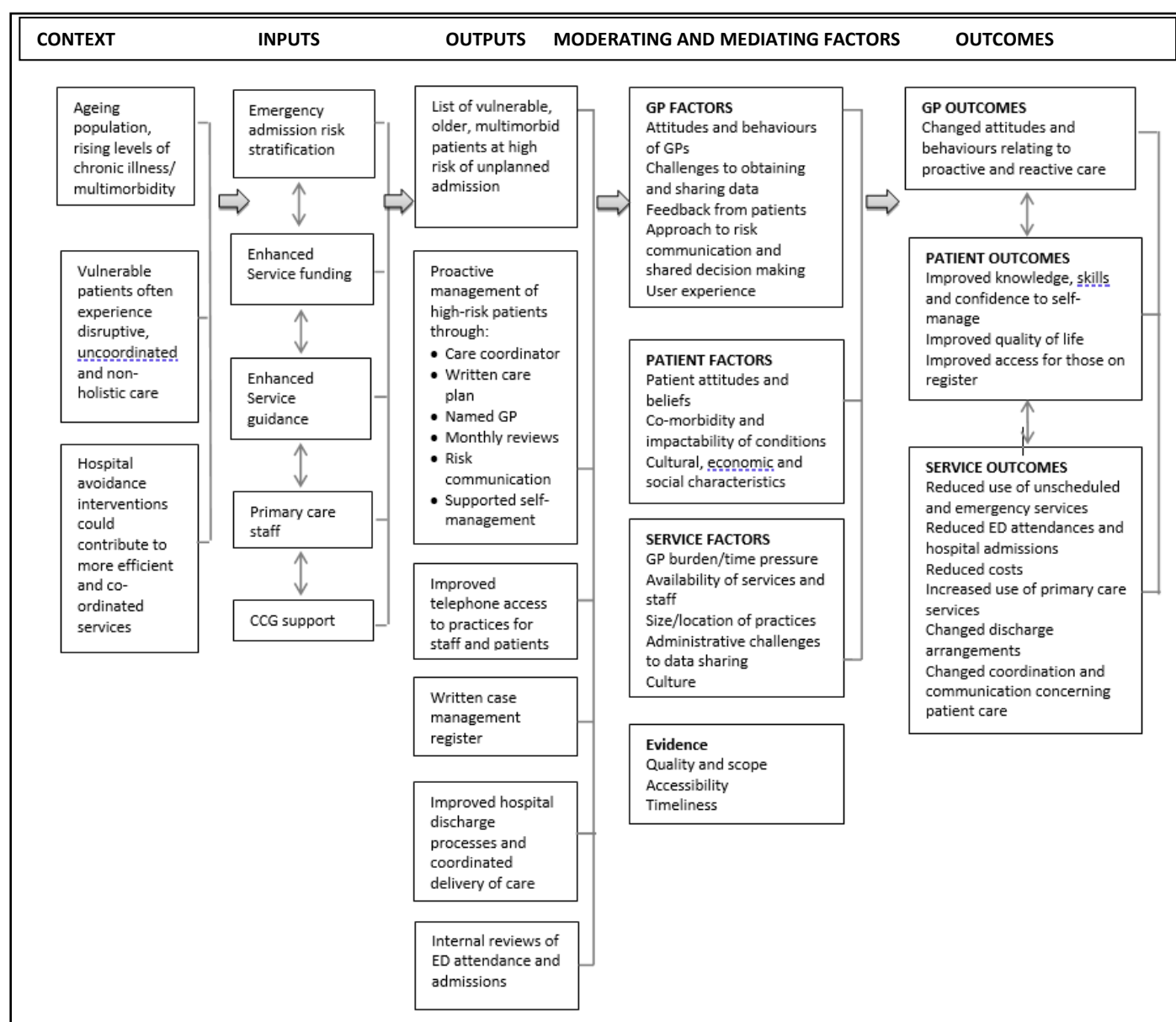


Figure 28: Logic model for the use of EARS (within Unplanned Admissions Enhanced Service)
[Created by Mark Kingston in Microsoft Word, 2021]

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Chapter 5: Systematic review of the costs, effects and implementation of emergency admission risk prediction models in primary care

Introduction

In this systematic review we aim to examine the effects, costs and implementation of using risk prediction models in primary care to identify patients with chronic conditions at risk of future emergency admissions. To our knowledge, no review has been undertaken into the effectiveness of risk prediction models. Given international interest and policy focus on these tools, this review is needed to identify and review published studies, strengthen the evidence base and inform best practice in managing patients at risk of emergency admission.

The effectiveness of emergency admission risk prediction tools is poorly understood. This review will therefore identify and synthesise evidence, covering: clinical and cost effectiveness; how tools have been used for patients with, or at risk of, chronic conditions; and barriers to, and facilitators of, their use.

Methods

I registered this systematic review with PROSPERO – the International Prospective Register Of Systematic Reviews on 14 April 2015 (reference: CRD42015016874). The methods (and published protocol (Kingston, Evans et al. 2016) conform with the Preferred Reporting Items for Systematic review and Meta-Analysis for Protocols (PRISMA-P) guidelines (Moher, Shamseer et al. 2015) and the findings conform with the related PRISMA guidelines (Moher, Liberati et al. 2009).

Research question

What are the effects, costs and facilitators of, and barriers to, implementing emergency admission risk prediction models in primary care for patients with, or at risk of, chronic conditions?

Eligibility criteria

In addressing the research question, I sought peer-reviewed studies published since 2005, with no language restrictions, that met the criteria in Table 9.

Table 9: Eligibility criteria

Population	Patients registered with general practices, or consulting primary or community care practitioners.
Intervention	Models in primary care using routine data to predict risk of hospital admission for patients with, or at risk of, chronic conditions. <i>Exclusion:</i> Models that rely on patient-reported data.
Comparators	External (e.g., trial) or internal (e.g. cohort). None for qualitative studies.
Outcomes	Clinical or cost effectiveness, views of patients or health professionals on emergency admission risk prediction models, or implementation of model.
Study Design	Studies that report empirical data. <i>Exclusion:</i> Commentaries or editorials.

Search strategy

I carried out a comprehensive electronic search in ASSIA (via ProQuest), CINAHL (via EBSCO), the Cochrane Library (Cochrane Central Register of Controlled Trials and Economic Evaluations), HMC (via Ovid), ISI Web of Science, MEDLINE (via EBSCO) and Scopus. We developed and piloted a search strategy with the support of a specialist librarian in an iterative process using published clinical prediction and prognostic search filters (Ingui and Rogers 2001, Geersing, Bouwmeester et al. 2012). Box 9 lists the resulting MEDLINE search strategy. I adjusted the MEDLINE search strategy for our other data sources.

S1	predict* OR clinical* OR outcome* OR risk*
S2	(Predict* AND (Outcome* OR Risk* OR Model*) OR ((History OR Variable* OR Criteria OR Scor* OR Characteristic* OR Finding* OR Factor*) AND (Predict* OR Model* OR Decision* OR Identif* OR Prognos*)) OR (Decision* AND (Model* OR Clinical* OR (MH "Logistic Models")))) OR (Prognostic AND (History OR Variable* OR Criteria OR Scor* OR Characteristic* OR Finding* OR Factor* OR Model*)) OR ((TI predict*) OR validat* OR rule*)
S3	(MH "ROC Curve") OR ("Stratification" OR "Discrimination" OR "Discriminate" OR "c-statistic" OR "c statistic" OR "Area under the curve" OR "AUC" OR "Calibration" OR "Indices" OR "Algorithm" OR "Multivariable")
S4	(MH "Predictive Value of Tests") OR TI PREDICT* OR AB PREDICT*
S5	AB (SCOR* OR OBSERV*) OR TI (SCOR* OR OBSERV*) OR MH Observer Variation
S6	(S1 - S5/OR)
S7	"primary care" OR "primary health*" OR GP OR general practi* OR PCT* OR "health authorit*" OR community OR CCG* OR "family practi*" OR NHS OR "case management" OR "managed care" OR "integrated care" OR (MH "General Practitioners") OR (MH "Physicians, Family") OR (MH "Physicians, Primary Care") OR (MH "Primary Health Care") OR (MH "Primary Care Nursing") OR (MH "Community Health Services") OR (MH "Community Health Centers") OR (MH "Community Health Nursing") OR (MH "Primary Prevention") OR (MH "Disease Management+") OR "disease management"
S8	(rehospitali?ation* OR hospitali?ation* OR readmission* OR re-admission* OR admission*) OR "emergency referral*" OR (MH "Emergencies") OR (MH "Emergency Service, Hospital/TD/SN") OR (MH "Emergency Treatment+/TD/UT") OR (MH "Emergency Medicine") OR (MH "Emergency Medical Services+") OR (MH "Length of Stay/EC/SN/TD") OR overnight stay
S9	(S6 AND S7 AND S8)
S10	"chronic condition*" OR "chronic* ill*" OR "chronic disease*" OR "chronic care" OR ("LONG TERM" N1 (condition* OR ill* OR disease*)) OR (chronic N2 (condition* OR ill* OR disease*)) OR multimorbidity OR comorbidity OR multi-morbidity OR co-morbidity OR (MH "Chronic Disease+")
S11	(S9 AND S10)

Box 9: Search strategy for MEDLINE (via EBSCO)

I selected 2005 as the earliest publication date, to precede relevant policy initiatives that prompted risk model development using routine data (Department of Health 2004, Department of Health 2005, Kocher and Adashi 2011, Welsh Assembly Government March 2007), and to ensure relevance to contemporary primary and community care. The end date was June 2015. I also:

- hand searched the indexes of three journals known to have published in this field - BMC Family Practice, the British Journal of General Practice, and the International Journal of Integrated Care, to check for relevant articles not indexed in the electronic databases;
- used ISI Web of Science and Scopus to search the references and citations of included articles;
- undertook a secondary search using the names (or other identifiers) of risk models used in included articles; and consulted experts in emergency admission risk prediction (the PRISMATIC trial management group).

Study selection

We used EndNote reference software (version x7, 2014) to collate search results and remove duplicates. These steps were undertaken by MRK, supported by the subject librarian. A colleague (BAE) and I independently determined initial eligibility of identified studies by screening titles, abstracts and keywords, using an include, maybe or exclude framework. Any 'maybe' was resolved by secondary screening or discussion. Another colleague (HH) and I then assessed full texts against the inclusion and exclusion criteria. Disagreements were resolved through discussion. We recorded reasons for excluding full text articles, and summarised the study selection process in a PRISMA flow diagram (Moher, Liberati et al. 2009).

Data extraction

I developed a data extraction form that reflects the review aims and conforms with guidance from the NHS Centre for Reviews and Dissemination (Centre for Reviews and dissemination 2009). I piloted this form on a sample of studies. A colleague and I extracted data independently and in duplicate from all eligible studies, resolving differences through discussion with a third reviewer. Our primary outcome for data extraction was the number of emergency hospital admissions, given the risk models are typically advocated for use within emergency admission avoidance interventions. We also extracted data, where available, on:

- Details of the risk model used and of validation of the model;
- Use of non-emergency healthcare resources, implementation costs, reported facilitators and barriers, and clinicians' and patients' views, notably satisfaction;

- Study characteristics (setting, objectives, design and methods);
- Study population, notably selection criteria;
- Nature and purpose of risk prediction model; and
- Implementation of risk prediction model – who used it and how.

Quality assessment

Two reviewers (MRK and HH) independently assessed general study quality as strong, moderate, or weak, resolving any differences through discussion with a third reviewer (BAE). To account for a range of study designs we used two bias assessment tools. Thomas et al's 2004 tool – suitable for quantitative elements which assesses study design, sample selection, identification and analysis of confounders, blinding of outcome assessors and participants, validity and reliability of data collection methods, and nature and extent of withdrawals (Thomas, Ciliska et al. 2004). We also used the framework produced by Walsh and Downe to appraise the qualitative studies according to their scope and purpose, design, sampling, analysis, interpretation, reflexivity, ethical dimensions and relevance (Walsh and Downe 2006).

Data synthesis

I tabulated the characteristics of included studies, including narrative summaries of risk prediction models, how they were implemented and their effects. If feasible, I planned to analyse outcomes relating to clinical and cost effectiveness by meta-regression, and to assess study heterogeneity by two statistics – Q based on the chi-squared test and I², which assesses how much variance is attributable to heterogeneity (Higgins 2011). I used narrative synthesis to review qualitative data on model implementation, patients' and clinicians' views, and cost and clinical data too heterogeneous for meta-analysis through the four-step framework developed by (Popay, Roberts et al. 2006).

- Developing a theory of how the intervention works, why and for whom;
- Generating a preliminary synthesis of findings of included studies;
- Exploring relationships in the data; and
- Assessing the robustness of the synthesis.

Results

Search Results

The initial electronic database search identified 10,244 papers, with a further 11 identified through other sources. Following the removal of duplicates, 6,621 papers were screened by title and abstract, with 215 reviewed in full text format. 13 papers, from 11 studies met all

criteria and underwent full data extraction. See Figure 29. Systematic Review Search Results Flow Diagram.

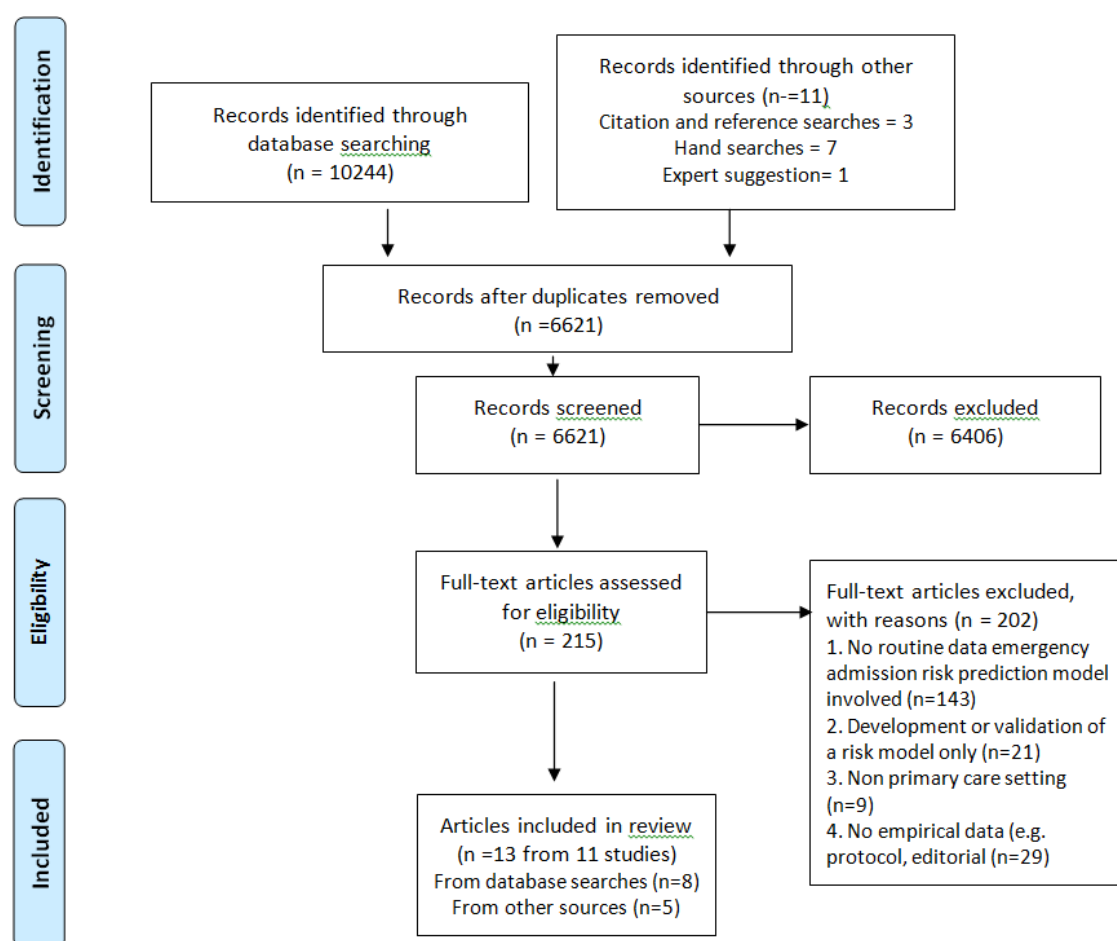


Figure 29. Systematic Review Search Results Flow Diagram

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Quality Assessment

An overview of the results of the quality assessment can be found in Table 14 and Table 15. Most studies were deemed of low quality.

Settings

Of the 11 studies, eight were European, consisting of four studies (and five papers) from England (Abell, Hughes et al. 2010, Hall, Kulendran et al. 2011, McEvoy, Escott and Bee 2011, Reilly, Abell et al. 2011, Roland, Lewis et al. 2012), two (related studies) in Germany (Freund, Mahler et al. 2011, Freund, Wensing et al. 2012), one in Scotland (Baker, Leak et al. 2012) and one in Spain (Arce, De Ormijana et al. 2014). Three studies were undertaken in North America, one in Canada (Dhalla, O'Brien et al. 2014) and two in the US (three

papers), (Levine, Steinman et al. 2012, Takahashi, Pecina et al. 2012, Upatising, Hanson et al. 2013). A summary of included studies is provided in Table 11.

All studies related to interventions in primary and community care, including one study that randomised patients to community-based care on discharge from hospital (Dhalla, O'Brien et al. 2014).

All papers were published from 2010 onwards with reported data collection or coverage between 2005 and 2014.

Study Designs

The included studies featured three RCTs, (Levine, Steinman et al. 2012, Takahashi, Pecina et al. 2012, Dhalla, O'Brien et al. 2014) three cohort studies (Reilly, Abell et al. 2011, Baker, Leak et al. 2012, Roland, Lewis et al. 2012), one cross sectional study (McEvoy, Escott and Bee 2011) and one further observational study (Freund, Mahler et al. 2011). Three wholly qualitative studies were included (Hall, Kulendran et al. 2011, Freund, Wensing et al. 2012, Arce, De Ormijana et al. 2014) with qualitative methods also featuring in two others (Abell, Hughes et al. 2010, McEvoy, Escott and Bee 2011).

Risk tools identified

Most studies reported the use of a single tool predicting emergency admissions to hospital. Three studies reported findings relating to the use of multiple risk tools, as applied in different Primary Care Trust (PCT) areas (Abell, Hughes et al. 2010, Reilly, Abell et al. 2011, Roland, Lewis et al. 2012), although none provided a disaggregation of results by area or tool used. The Patients at Risk of Re-hospitalisation (PARR) tool was used in four studies (Abell, Hughes et al. 2010, Hall, Kulendran et al. 2011, Roland and Abel 2012) (Roland, Lewis et al. 2012). PARR uses data on prior hospitalisations to predict risk of re-hospitalisation, and hence calculates risk only for those patients with a previous admission. The Combined Predictive Model was reported in three studies (Abell, Hughes et al. 2010, Reilly, Abell et al. 2011, Roland, Lewis et al. 2012), with single references to: the Elder Risk Assessment (ERA) (Takahashi, Pecina et al. 2012), Case Smart Suite Germany (Freund, Mahler et al. 2011), LACE (Dhalla, O'Brien et al. 2014), Nairn Case Finder (Baker, Leak et al. 2012), High Impact User Manager (Abell, Hughes et al. 2010), and Adjusted Clinical Groups (ACGs) (Arce, De Ormijana et al. 2014). An unnamed tool developed by SCAN Health Plan was used for the Levine et al. study (Levine, Steinman et al. 2012).

All except two tools were reported as predicting the likelihood of an emergency hospital admission (or readmission in the case of the PARR tool) within 12 months. The LACE tool predicts risk within 30 days (Dhalla, O'Brien et al. 2014) and the ERA tool (Upatising,

Hanson et al. 2013) predicts risk within 24 months. The time span for the ACG tool used in Arce et al.'s qualitative study (Arce, De Ormijana et al. 2014) was not provided. Only one paper explicitly addressed risk tool technical performance - (Baker, Leak et al. 2012) reporting an area under the ROC curve of 0.794 for the Nairn Case Finder. A number of papers did include a reference to resources where details of the development and validation of the respective risk tools could be found (Abell, Hughes et al. 2010, Hall, Kulendran et al. 2011, McEvoy, Escott and Bee 2011, Reilly, Abell et al. 2011, Takahashi, Pecina et al. 2012, Upatising, Hanson et al. 2013, Arce, De Ormijana et al. 2014, Dhalla, O'Brien et al. 2014). No technical performance details or references were included in three papers (Freund, Mahler et al. 2011, Levine, Steinman et al. 2012, Roland, Lewis et al. 2012).

Risk tools users

Identification of who used the risk tools was included in all bar three studies (McEvoy, Escott and Bee 2011, Reilly, Abell et al. 2011, Levine, Steinman et al. 2012). See Table 12.

Interventions

Eight of the studies focused on case (or care) management of patients at high risk of emergency admission to hospital (Abell, Hughes et al. 2010, Freund, Mahler et al. 2011, Hall, Kulendran et al. 2011, McEvoy, Escott and Bee 2011, Reilly, Abell et al. 2011, Baker, Leak et al. 2012, Levine, Steinman et al. 2012, Dhalla, O'Brien et al. 2014). Two studies featured the use of telemedicine (Freund, Mahler et al. 2011, Takahashi, Pecina et al. 2012) as part of an overall package of care.

A range of primary care and community staff delivered, or were proposed to deliver, the interventions. This included the use of community matrons (Abell, Hughes et al. 2010, Hall, Kulendran et al. 2011, McEvoy, Escott and Bee 2011, Reilly, Abell et al. 2011) - senior nurses with a care coordination function (Hall, Kulendran et al. 2011), who were introduced following Department of Health funding in support of the care of patients with long term conditions (Department of Health 2009). The intended use of multi-disciplinary teams was noted in five studies (Hall, Kulendran et al. 2011, Baker, Leak et al. 2012, Levine, Steinman et al. 2012, Roland, Lewis et al. 2012, Takahashi, Pecina et al. 2012, Dhalla, O'Brien et al. 2014) and virtual wards featured in three (Hall, Kulendran et al. 2011, Roland, Lewis et al. 2012, Dhalla, O'Brien et al. 2014). The virtual ward model is based on the use of predictive models to identify those at risk of emergency admission, and the provision of a period of intensive, multidisciplinary case management at home using the processes and staff associated with hospital wards (Lewis, Georgiou et al. 2013). One study related to gathering evidence to inform the development of an intervention (Freund, Mahler et al. 2011).

Case selection

Although the use of risk tools featured in each study, the consistency in which the tools were used for case selection varied. In four studies, patients received the intervention only if deemed at high risk by a risk tool (Baker, Leak et al. 2012, Levine, Steinman et al. 2012, Takahashi, Pecina et al. 2012, Upatising, Hanson et al. 2013) while the same number of studies reported that clinician referrals, without the use of a risk tool, were also accepted (Abell, Hughes et al. 2010, Freund, Mahler et al. 2011, Hall, Kulendran et al. 2011, Roland, Lewis et al. 2012). One study did not clarify the case selection approach (McEvoy, Escott and Bee 2011).

Main quantitative results

Four papers (three studies) reported patient outcomes with comparison groups, (Levine, Steinman et al. 2012, Takahashi, Pecina et al. 2012, Upatising, Hanson et al. 2013, Dhalla, O'Brien et al. 2014) - see Table 13. Evidence of effects were limited. Levine et al's (Levine, Steinman et al. 2012) trial showed significant reductions in risk of admission to hospital, and in length of stay for patients in the intervention arm (home care delivered by a multi-disciplinary team). The same study also reported a significant improvement in patient satisfaction as measured by the Home Care Satisfaction Measure (Geron, Smith et al. 2000). While there was also a cost saving in the intervention arm, the authors report that this did not remain following adjustment for demographics and health conditions (Levine, Steinman et al. 2012).

Main qualitative results

Organisational issues, staff attitudes towards risk prediction models, together with staff skills and access to computer equipment affected use within primary and community care (see

Table 10).

Table 10: Barriers and facilitators to using risk prediction models

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Barriers	Facilitators
Not an organisational priority (McEvoy, Escott and Bee 2011)	Supportive organisational processes for risk tools (Arce, De Ormijana et al. 2014)
Difficult to fit use of model into predominant reactive ways of working (Hall, Kulendran et al. 2011, Arce, De Ormijana et al. 2014)	Individual and organisational support for a population management approach to primary care delivery (Arce, De Ormijana et al. 2014)
Low interest in using risk prediction models and new ways of working (Hall, Kulendran et al. 2011, McEvoy, Escott and Bee 2011)	Training for staff (Hall, Kulendran et al. 2011, Arce, De Ormijana et al. 2014)
Priority placed on personal and clinical knowledge over risk model information (Freund, Wensing et al. 2012)	Interest in new approaches to primary care delivery (Hall, Kulendran et al. 2011)
Questions over accuracy and timeliness of risk model data (Freund, Wensing et al. 2012, Arce, De Ormijana et al. 2014)	Confidence and skills in IT (Hall, Kulendran et al. 2011)
Inadequate access to IT equipment (Hall, Kulendran et al. 2011)	

Primary and community care context

Political, organisational, and cultural issues were reported to affect how risk prediction models were introduced and used. Lack of organisational leadership and guidance meant staff took individual decisions about whether and how to use the model (McEvoy, Escott and Bee 2011). GPs and nurses were more likely to accept and use risk prediction models if they were involved in developing the implementation process, could see how it fitted into their practice and had confidence in the organisation promoting its use (Arce, De Ormijana et al. 2014). According to GPs, the structure of general practice and the dependencies of patients forced them into delivering reactive care. Against a backdrop of multiple new initiatives, they said limited time and heavy workload prevented them working differently (Arce, De Ormijana et al. 2014).

Staff attitudes

Existing knowledge of risk prediction processes and an understanding of its principles were reported to affect willingness to use risk prediction models in included studies. Support for new ways of working was also required (Hall, Kulendran et al. 2011, McEvoy, Escott and Bee 2011, Freund, Wensing et al. 2012, Arce, De Ormijana et al. 2014). GPs and nurses who perceived risk prediction as a population health management approach were more likely to use a risk model to identify patients at higher risk, especially those they did not already know, in order to prevent patients becoming ill or more ill (Arce, De Ormijana et al. 2014). Hall et al. (Hall, Kulendran et al. 2011) reported that community matrons also welcomed a system which could identify patients before they presented to hospital and those high users of services who were not known to their GP. However, the community matrons said effective multidisciplinary working was necessary in order to deliver selected care to high-risk patients

and this depended on a common understanding and outlook between staff from different disciplines.

Healthcare staff recognised that risk prediction tools could successfully identify high risk patients (Hall, Kulendran et al. 2011, Arce, De Ormijana et al. 2014). But concerns about the reliability of tools limited their use. Data could be out of date, inaccurate or perceived not to provide new information. (Hall, Kulendran et al. 2011, Arce, De Ormijana et al. 2014) Confidence in risk prediction data was affected by which data were included in the algorithm. Those tools with the widest data sources (ideally health and social data from a whole population) were reported to be most popular because they were perceived to be most equitable and highlighted the most appropriate patients for treatment (Arce, De Ormijana et al. 2014). However, staff who lacked confidence in the model data or who prioritised clinical experience and knowledge were less likely to use risk models (Freund, Wensing et al. 2012). Studies reported that staff used risk prediction alongside other information sources to get the fullest picture of a patient's needs (Abell, Hughes et al. 2010, Hall, Kulendran et al. 2011, McEvoy, Escott and Bee 2011, Arce, De Ormijana et al. 2014).

IT skills and access to equipment

Limited access to the risk prediction model was a common issue for staff who worked in the community. Hall et al. (Hall, Kulendran et al. 2011) reported that community matrons wanted access to a patient's data on a computer system and to understand the systems they were using, in order to make best use of risk prediction data. McEvoy et al. (McEvoy, Escott and Bee 2011) reported that staff in one site could use systems of colleagues in social services, community services and secondary care but many staff were denied access to all data in another site. Although McEvoy et al. and Abell et al. (Abell, Hughes et al. 2010) did not describe how case managers accessed risk prediction data, both reported that collaborative working was difficult for staff and delayed use of the risk prediction tool until pragmatic solutions were agreed to meet information governance requirements. Lack of IT skills also inhibited staff from using risk prediction models (Hall, Kulendran et al. 2011, Arce, De Ormijana et al. 2014) .

Table 11: Characteristics of included studies
(Table created in Microsoft Word by Mark Kingston, 2023).

Authors/year	Country	Aim	Design and Methods	Description of Interventions incorporating risk prediction tools to identify patients	Data collection/coverage
Abell et al. 2010 (Abell, Hughes et al. 2010)	Manchester, England	To explore processes that influence patient selection for case management and to explore the factors within the service that promote a differential service.	Three-stage process and outcome evaluation across 10 PCTs: 1) Postal questionnaire-managers with lead responsibility for case management in PCTs (n=10); 2) Follow up interviews with managers (n= 8); 3) Tracking of case managed patients from 10 PCTs through hospital utilisation data (n= 2728)	Case management through a range of primary care staff (e.g. community matrons, district nurses, community nurses) across 10 PCTs.	2007-2008
Arce et al. 2014 (Arce, De Ormijana et al. 2014)	Basque area, Spain	To explore implementation of risk tool.	Qualitative. 3 focus groups with users (12 GPs and 11 nurses)	Secondary prevention activities by primary care practice staff for patients with hypercholesterolaemia, high blood pressure, or type 2 diabetes, not suffering heart failure, or ischaemic heart disease.	December 2011
Baker et al. 2012 (Baker, Leak et al. 2012)	Nairn, Scotland	To describe results of intervention aimed at reducing unplanned hospitalisations of older patients who are frail.	Observational. Analysis of routine data. Before/after comparison	Case management featuring care plans for older patients who are frail. Supported by case manager (1.2 WTE), care workers (2 WTE), physiotherapist (1 WTE) and OT (0.5 WTE).	April 2007 to November 2008
Dhalla et al. 2014 (Dhalla, O'Brien et al. 2014)	Toronto, Canada	To explore whether a virtual ward could improve health outcomes and reduce readmissions after hospital discharge in a high-risk population.	Parallel group randomized trial with patients randomized at hospital discharge in a 1:1 ratio to either the virtual ward model of care or usual care	Virtual ward, admitted on day of discharge from hospital, with care coordinator (similar to case manager), p/t pharmacist, p/t nurse or nurse practitioner, f/t physician, clerical assistant. Regular MDT discussion, Care plans, liaison with primary care physician, home visit by coordinator. Further follow up in home, in hospital clinic, or elsewhere e.g. Family physicians office. Average discussion 6.3 times in MDT team meetings, 2.8 home visits.	June 29 2010- June 2 2014
Freund et al. 2011 (Freund, Mahler et al. 2011)	South West Germany	To compare patient selection for care management interventions by physicians and by predictive modelling.	Observational study comparing patients selected by predictive model with those selected by physicians.	Study relates to intervention development. The planned intervention comprises needs assessments, self-management support and regular telephone-based follow up by specially trained health care assistants who work alongside primary care physicians.	Insurance data- medical and pharmacy claims from Jan 2007 to Dec 2008.
Freund et al. 2012 (Freund, Wensing et al. 2012)	South West Germany	To explore how physicians select patients for care management and how risk prediction may complement their case finding.	Qualitative - 12 interviews with physicians from 10 primary care practices	As above.	Not reported
Hall et al. 2011 (Hall, Kulendran et al. 2011)	London, England	To evaluate how community matrons select their case load.	Qualitative Service evaluation. Interviews with 7 Community matrons and 2 GPs.	Case management via community matrons. Virtual ward in some areas explored.	Not reported
Levine et al. 2012 (Levine, Steinman et al. 2012)	3 Los Angeles County regions, USA	To assess the efficacy of a home care program designed to improve access to medical care for older adults with multiple chronic conditions at risk of hospitalization.	RCT in which participants were assigned to the home care intervention (Choices for Healthy Aging [CHA] program) or usual care. Routine data, costs and telephone patient satisfaction questionnaires.	Home care intervention program – early identification and treatment of exacerbation of the illness; patient-specific health education; self-management or caregiver management of the disease; advance care planning and other psychosocial issues. Care delivered via interdisciplinary team, with core team members consisting of physician, nurse practitioner, nurse care manager, and a social worker.	Jan to July 2008

McEvoy, Escott & Bee 2011 (McEvoy, Escott and Bee 2011)	Northern England	The evaluation aimed (i) to assess the quality of the organisational infrastructure; (ii) to obtain a better understanding of the key influences shaping service development; and (iii) to identify potential changes in practice that may help improve service quality.	Formative evaluation Self-completion questionnaire and semi-structured interview	Case management for high intensity service users via three community matrons who acted as both advanced clinical practitioners and case managers, six case managers and an administrator.	Feb 2007 and Aug 2008
Reilly et al. 2011 (Reilly, Abell et al. 2011)	Manchester, England	Evaluate the implementation and impact of case management for long term conditions in 10 PCTs.	Cross sectional postal survey, interviews and retrospective cohort analysis	Case management through a range of primary care staff (e.g. community matrons, district nurses, community nurses) s across 10 PCTs.	July 2007 interviews; 1 July 2005-1 Oct 2006 cohort analysis
Roland et al. 2012 (Roland, Lewis et al. 2012)	England	Evaluation of English integrated care pilots.	Questionnaire to staff and patients. Analysis of secondary care utilisation using HES data on 3646 patients and 17,311 matched controls.	Virtual wards, with nurse led case management. Plus focus on delivery system redesign and improved clinical information systems (two key elements of Wagner's Chronic Care Model).	Staff questionnaires Summer 2010. Spring 2011. Patient questionnaires- Autumn 2009 and Autumn 2010.
Takahashi et al. 2012 (Takahashi, Pecina et al. 2012)	Rochester, Minnesota, USA	To determine the difference in hospitalisations and emergency room visits in older adults using telemonitoring versus standard care.	Randomised controlled trial	Usual care included various types of face-to-face visits, phone services, and home health care available to all primary care patients. Home health care includes provision of home health nursing and/or physical and occupational therapist visits. The telemonitoring intervention included usual medical care and telemonitoring case management. Using telemonitoring the participant's blood pressure, pulse, oxygen saturation, blood glucose level, and weight were measured as per an individualized protocol, based on their medical condition.	Nov 2009 to July 2012
Upatising et al. 2013 (Upatising, Hanson et al. 2013)	Rochester, Minnesota, USA	To evaluate the effectiveness of home telemonitoring in reducing the decline of worsening frailty states in older adults aged 60 years and over with comorbid health problems.	Trial- secondary analysis	As above.	Nov 2009 to July 2012

Table 12: Summary of risk models

[Table created in Microsoft Word by Mark Kingston, 2023]

Authors/year	Risk prediction model	Outcome and time span of risk model	Validation	Population risk model applied to	Users of risk model	Case selection method
Abell et al. 2010 (Abell, Hughes et al. 2010)	PARR 1 and II; Combined Predictive Model	PARR - likelihood of re-hospitalisation within the next 12 months. Combined Model - risk of emergency admission within the next 12 months.	Not discussed but reference supplied for PARR tool development and validation paper (Billings et al.2006) (Billings, Dixon et al. 2006)	Unspecified number of patients across 10 PCTs providing case management services.	Case managers including community matrons	Risk models (10/10 PCTs); referrals from professionals (10/10); criteria (threshold) 9/10; assessment framework (4), disease registry (3), other (3)
Arce et al. 2014 (Arce, De Ormijana et al. 2014)	Adjusted Clinical Groups (ACG)	Risk score for health costs, risk score for risk of admission to hospital. Time span not reported.	Not discussed. Link to ACG website provided.	2.2 million people in Basque Health Service area.	GPs and primary care nurses	Risk score and presence of diabetes, high blood pressure or hypercholesterolaemia
Baker et al. 2012 (Baker, Leak et al. 2012)	Nairn case finder	Risk of admission to hospital within next 12 months.	Reports area under the ROC curve of 0.794. Refers to appendix for further information.	General practice with 10 860 patients	Practice staff	From each monthly list, the 1% of patients with the highest risk of admission were defined as the advanced care plan cohort, along with all care home patients
Dhalla et al. 2014 (Dhalla, O'Brien et al. 2014)	LACE	Predict the risk of death or non-elective readmission within 30 days after discharge.	Not discussed but reference provided to development and validation paper (van Walraven et al.2010) (van Walraven, Dhalla et al. 2010)	30,143 patients discharged from four Toronto hospitals	A research coordinator assessed patient eligibility at each hospital	Risk model only
Freund et al. 2011 (Freund, Mahler et al. 2011)	Case Smart Suite Germany	Likelihood of hospitalisation within the next 12 months.	No details provided	6,026 beneficiaries of a statutory health insurance program in Germany	Primary Care Physicians	Mix (study explored case selection by physician and by risk model)
Freund et al. 2012 (Freund, Wensing et al. 2012)	Case Smart Suite Germany	Likelihood of hospitalisation within the next 12 months.	No details provided	6,026 beneficiaries of a statutory health insurance program in Germany	Primary Care Physicians	Mix (study explored case selection by physician and by risk model)
Hall et al. 2011 (Hall, Kulendran et al. 2011)	PARR	PARR - likelihood of re-hospitalisation within the next 12 months.	Not discussed but reference supplied for PARR tool development and validation paper (Billings et al.2006) (Billings, Dixon et al. 2006)	No details provided	Community matrons (data supplied on email by PCT)	Mix (PARR) referrals and identification by community matrons
Levine et al. 2012 (Levine, Steinman et al. 2012)	Unnamed tool developed by SCAN Health Plan	At risk of hospitalisation. Time span not provided.	No details provided	1,362 patients eligible from 3 Los Angeles County regions	Not specified.	Risk model only (intervention and control)
McEvoy, Escott & Bee 2011 (McEvoy, Escott and Bee 2011)	PARR	Risk of readmission within 12 months.	Not discussed but reference to development and validation paper provided.(Billings et al.2006) (Billings, Dixon et al. 2006)	High risk patients in Northern England	Not specified (likely to be community matrons/GPs)	Not specified though all had All had PARR score of over forty, indicating that there was a high risk they would require emergency readmission to hospital

Reilly et al. 2011 (Reilly, Abell et al. 2011)	PARR Combined Predictive Model, High Impact User Manager (Dr Foster).	PARR and High Impact User Manager Risk of readmission within 12 months. CPM - risk of emergency admission with 12 months.	Not discussed but reference supplied for PARR tool development and validation paper (Billings et al.2006) (Billings, Dixon et al. 2006)	Unspecified number of patients across 10 PCTs providing case management services.	Case managers including community matrons	Risk model and clinician referral. (referrals in all 10 sites)
Roland et al. 2012 (Roland, Lewis et al. 2012)	PARR Combined Predictive Model.	PARR - risk of readmission within 12 months. CPM - risk of emergency admission with 12 months.	No details provided.	Six integrated care pilot sites in England.	Varies across 6 sites – but includes GPs and case managers.	Mix of risk profiling tools, medical history and clinical judgement to identify older people at risk
Takahashi et al. 2012 (Takahashi, Pecina et al. 2012)	ERA	Risk of admission to hospital within 2 years.	Reference provided to development of ERA tool (Crane et al.2010) (Crane, Tung et al. 2010)	Residents of four Mayo Clinic sites in Minnesota.	Not specified.	Risk model (and aged over 60)
Upatising et al. 2013 (Upatising, Hanson et al. 2013)	ERA	Risk of admission to hospital within 2 years.	As above	Residents of four Mayo Clinic sites in Minnesota.	Not specified.	Risk model (and aged over 60)

Table 13: Costs and effects of interventions including risk prediction models compared to control

[Table created in Microsoft Word by Mark Kingston, 2023]

Readmission or death							
Author	Length of follow-up	Intervention (n)		Control (n)		RR (95% CI)	P-value
		Yes	No	Yes	No		
Dhalla et al. 2014	30 day	235	721	203	756	1.16 (0.98 to 1.37)	0.08
	90 day	364	594	355	602	1.02 (0.91 to 1.15)	0.68
	6 months	481	477	473	483	1.10 (0.93 to 1.11)	0.75
	1 year	601	355	600	354	1.00 (0.93 to 1.07)	0.99
Readmission/ Hospitalisation							
Author	Length of follow-up	Intervention (n)		Control (n)		RR (95% CI)	P-value
		Yes	No	Yes	No		
Dhalla et al. 2014	30 day	204	754	182	779	1.12 (0.94 to 1.34)	0.20
	90 day	313	615	313	625	1.01 (0.89 to 1.15)	0.87
	6 months	421	487	417	500	0.95 (0.87 to 1.05)	0.33
	1 year	524	373	535	368	0.97 (0.91 to 1.07)	0.99
Takahashi et al.2012	1 year	53	49	45	58	1.19 (0.89 to 1.59)	0.24
Levine et al. 2012 (Levine, Steinman et al. 2012)	1 year	40	116	52	88	0.69 (0.49 to 0.97)	0.03
Death							
Author	Length of follow-up	Intervention (n)		Control (n)		RR (95% CI)	P-value
		Yes	No	Yes	No		
Dhalla et al.2014	30 day	47	908	40	918	1.18 (0.78 to 1.78)	0.43
	90 day	100	854	112	845	0.90 (0.69 to 1.16)	0.40
	6 months	165	791	166	789	0.99 (0.82 to 1.20)	0.90
	1 year	251	698	244	703	1.03 (0.88 to 1.19)	0.73
Takahashi et al.2012 (Takahashi, Pecina et al. 2012)	1 year	15	87	4	99	3.79 (1.30 to 11.02)	0.015
Nursing home admission							
Author	Length of follow-up	Intervention (n)		Control (n)		RR (95% CI)	P-value
		Yes	No	Yes	No		
Dhalla et al.2014	30 day	7	861	5	847	1.37 (0.44 to 4.31)	0.59
	90 day	12	818	18	800	0.66 (0.32 to 1.36)	0.26
	6 months	22	769	24	739	0.88 (0.50 to 1.56)	0.67
	1 year	31	704	30	681	1.00 (0.61 to 1.63)	>0.99
ED visits							
Author	Length of follow-up	Intervention (n)		Control (n)		RR (95% CI)	P-value
		Yes	No	Yes	No		
Dhalla et al.2014	30 day	284	675	270	691	1.05 (0.91 to 1.21)	0.46

	90 day	430	504	433	506	1.00 (0.90 to 1.10)	0.97
	6 months	548	368	562	361	0.98 (0.91 to 1.06)	0.64
	1 year	641	267	657	258	1.03 (0.88 to 1.19)	0.73
Takahashi et al. 2012 (Takahashi, Pecina et al. 2012)	1 year	36	66	29	74	1.25 (0.84 to 1.88)	0.27
Levine et al. 2012 (Levine, Steinman et al. 2012)	1 year	26	130	30	110	0.78 (0.48 to 0.97)	0.30
Hospitalisation or ED visits							
Author	Length of follow-up	Intervention (n)		Control (n)		RR (95% CI)	P-value
		Yes	No	Yes	No		
Takahashi et al. 2012 (Takahashi, Pecina et al. 2012)	1 year	65	37	59	44	1.11 (0.89 to 1.39)	0.35
Transition between frailty and death							
Author	Type of transition	Intervention (n)		Control (n)		RR (95% CI)	P-value
		Same or better	Worse or death	Same or better	Worse or death		
Upatising et al. 2013 (Upatising, Hanson et al. 2013)	Baseline to 6 months	57	19	73	17	1.32 (0.74 to 2.36)	0.34
	6 to 12 months	63	5	79	1	5.88 (0.70 to 49.13)	0.10
Satisfaction							
Author	Time	Intervention (mean(SD))		Control (mean(SD))			P-value
Levine et al. 2012 (Levine, Steinman et al. 2012)	Baseline	68.08 (20.3)		71.68 (20.7)			0.14
	6 months	80.05 (19.0)		74.37 (21.4)			0.03
Physician Office visits							
Author	Length of follow-up	Intervention (mean(SD))		Control (mean(SD))			P-value
Levine et al. 2012 (Levine, Steinman et al. 2012)	1 year	6.87 (4.38)		7.09 (4.21)			0.65
Total costs (\$)							
Author	Length of follow-up	Intervention (mean(SD))		Control (mean(SD))			P-value
Levine et al. 2012 (Levine, Steinman et al. 2012)	1 year	7328.86 (12,735.88)		9374 (16,683.98)			0.01

Table 14: Quality assessment of quantitative papers

[Table created in Microsoft Word by Mark Kingston, 2023]

Authors	Selection Bias	Design	Confounders	Blinding	Data collection methods	Withdrawals and dropouts	Overall quality rating
Baker et al. (2012)	Weak	Moderate	Weak	Weak	Strong	Moderate	Weak
Dhalla et al.(2014)	Strong	Strong	Moderate	Weak	Strong	Strong	Strong
Freund et al. (2011)	Weak	Weak	Weak	Weak	Weak	Moderate	Weak
Levine et al. (2012)	Weak	Strong	Moderate	Moderate	Moderate	Moderate	Moderate
Reilly et al. (2011)	Moderate	Moderate	Weak	Weak	Moderate	Weak	Weak
Roland et al. (2012)	Moderate	Moderate	Strong	Weak	Moderate	Weak	Weak
Takahashi et al. (2012) (Takahashi, Pecina et	Weak	Strong	Moderate	Weak	Moderate	Moderate	Weak
Upatising et al. (2013) (Upatising, Hanson et	Weak	Strong	Moderate	Weak	Moderate	Moderate	Weak

Table 15: Quality assessment of qualitative papers

[Table created in Microsoft Word by Mark Kingston, 2023]

Author	Scope and purpose	Design	Sampling strategy	Analysis	Interpretation	Reflexivity	Ethical dimensions	Relevance and transferability	Overall quality rating
Abell et al. (2010) (Abell,	B	B	A	B	C	C	A	B	B
Arce et al. (2014) (Arce, De	B	B	B	C	C	C	B	B	C
Freund et al. (2012)	B	B	A	B	B	C	B	B	B
Hall et al. (2011) (Hall, Kulendran	B	B	A	B	B	C	A	A	B
McEvoy et al. (2010)	B	B	A	B	C	C	B	B	B

Key to quality rating: A, no or few flaws. The study credibility, transferability, dependability, and confirmability is high; B, some flaws, unlikely to affect the credibility, transferability, dependability, and/or confirmability of the study; C, some flaws which may affect the credibility, transferability, dependability, and/or confirmability of the study; D, significant flaws which are very likely to affect the credibility, transferability, dependability, and/or confirmability of the study.

Discussion

This is the first review of studies into costs, effects and implementation of emergency admission risk prediction tools. Our review highlights the shortage of high-quality evidence in this area. Given the small number of studies and the variability between them, our review did not provide strong evidence for or against the use of emergency admission risk prediction models. A search for unpublished articles was beyond the scope of this review, although we consider it unlikely that our findings would have been greatly affected.

The studies included demonstrate heterogeneity in interventions. It is important to note that emergency admission predictive risk tools form part of an intervention, which varies according to the nature of the target population and delivery, although most featured case management based on identified high risk patients. Case selection approaches varied, with some interventions including patients referred by healthcare professionals rather than identified by risk tool – but not differentiating outcomes in relation to the different recruitment approaches. In some cases, the use of mixed methods of case selection, illustrated a lack of intervention fidelity. In the published studies it is not possible to separate out effects of the predictive risk tool from those of the associated intervention. Overall, there was little indication of clinical or cost effectiveness following the introduction of risk prediction models in the included studies.

A handful of studies included staff feedback on the use of risk prediction tools. This data indicated that while there was support for the use of the tools, there were concerns over the accuracy of models and access to data. The review revealed a deficit of evidence regarding patient perspectives.

There was poor quality of reporting in relation to the technical performance of the tools. This review supports the need for further studies that address important gaps in our understanding of the implementation and effectiveness of emergency admission risk prediction tools.

Strengths and limitations

The strength of this review is its extensive, unbiased search of multiple databases, journals, references, and citations, combined with consulting experts. The review is broad to ensure a thorough understanding of evidence relating to the impact of emergency admission risk models from a range of study designs. Limitations are that the review did not include grey literature (as I intentionally focusing on peer-reviewed literature), and that study heterogeneity may present challenges for data synthesis.

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Chapter 6: Emergency Admission Risk Stratification in UK primary care: national survey of access and use

Introduction

Emergency admission risk stratification (EARS) tools have been widely promoted to help identify vulnerable people who may benefit from intervention in primary or community care (Nuffield Trust 2011, NHS England 2015). With emergency admissions rising, costly, and associated with poor patient outcomes (National Audit Office 2013) (Steventon A 2018), it was hoped that EARS could support efforts to positively impact on patient experience, health and associated costs (the so-called triple aim) (Nuffield Trust 2011).

The tools use clinical data such as diagnoses, medication and medical histories alongside demographic data to calculate risk of emergency hospital admission, typically within 12 months (Paton 2014, Wallace, Stuart et al. 2014). They also stratify a population, e.g. the patients of a general practice, and estimate comparative risks. Interest in EARS tools has accelerated over recent years as reports have emerged that up to a fifth of emergency admissions could be prevented through early intervention in primary care (The Health Foundation and Nuffield Trust 2013) while improvements in data availability, quality and linkage have improved the feasibility of generating risk scores from routine data. Thus, health services have been attracted to such tools that can help identify individuals for risk-appropriate preventative interventions.

Although these factors have stimulated enthusiasm for EARS, the literature identifies four stages that are essential to embed such clinical prediction rules in practice: *rule development*; *validation* in an external population; *impact* and effectiveness studies; and *implementation* in clinical practice (Toll, Janssen et al. 2008, Adams and Leveson 2012, Moons, Kengne et al. 2012).

Much of the EARS literature focuses on the first two stages, with systematic reviews focusing on model derivation, technical characteristics and performance (Kansagara, Englander et al. 2011, Wallace, Stuart et al. 2014, O'Caoimh, Cornally et al. 2015).

There is less literature addressing effectiveness, implementation, and impact. Of the studies that use EARS to select patients for community interventions (typically case management or virtual wards), none reported reductions in admissions, cost savings or significant patient benefit (Roland, Lewis et al. 2012, Lewis, Georghiou et al. 2013, Stokes, Kristensen et al. 2016, Snooks, Bailey-Jones et al. 2018).

Although there is no strong evidence supporting the clinical or cost effectiveness of interventions incorporating EARS tools, there has been concerted political and practical investment in EARS across the developed world (Freund, Wensing et al. 2012, Oliver-Baxter, Bywood and Erny-Albrecht 2015, ASSEHS Study Team 2016). This is evident in the UK, where state funding supported the development of risk models: PARR (Patients at Risk of Readmission) and the Combined Model in England, SPARRA (Scottish Patients at Risk of Readmission and Admission) in Scotland and PRISM (Predictive Risk Stratification Model) in Wales. In addition, each nation implemented general practice frameworks funding primary care ‘case management’ of patients at high risk of admission (Table 16).

Table 16: UK general practice contracts encouraging use of EARS tools

[Table created in Microsoft Word by Mark Kingston, 2023]

Nation and framework	Financial years applicable	Practice requirements	Participation (2014-15 unless stated)	Average funding (2014-15 unless stated)
England Avoiding unplanned admissions: proactive case finding and patient review for vulnerable people; Enhanced Service (NHS England 2014)	2014-15 2015-16 2016-17	Identify those at high risk of avoidable unplanned admissions; establish case management register ($\geq 2\%$); & proactively manage these patients.	>95% of ~8000 practices in England (source: NHS England)	£20,000 per practice; total £162m a year.
Scotland Scottish Quality and Outcomes Framework: Guidance for NHS Boards and GP practices (Scottish Government 2013)	2014-15	List those 5% at predicted risk of emergency admission or unscheduled care; identify 15% who would most benefit from Anticipatory Care Plan including polypharmacy review; multi-disciplinary team review needs of ACP cohort.	>95% of ~800 practices in Scotland (source: NHS Scotland)	£11,000 per practice; total £9m a year.
Wales Quality and Outcomes Framework for the GMS contract: Quality and Productivity Domain (Welsh Assembly Government 2013)	2013-14	Identify $\geq 0.5\%$ at predicted risk of unscheduled admission who would benefit from review & active management; multi-disciplinary team review care of identified patients.	>80% of ~450 practices in Wales (2013-2014) (Source: NHS Wales)	£7,000 per practice.(2013-14)
Northern Ireland Risk Stratification and Proactive Management Enhanced Service (Northern Ireland Health and Social Care Board 2013)	2014-15	Identify those at high risk of hospital admission or deterioration. Work with patients & carers to agree goals for proactive management. With support from health & social care, create integrated plan to support patients & carers to manage condition; identify deterioration; & know how to access care & support.	89% of ~350 practices in NI (Source: NI HSCB)	£6,000 per practice; total £2m a year.

EARS tools make the identification of high-risk patients easier, quicker, and more reliable (Allaudeen, Schnipper et al. 2011, Lewis 2015, NHS England 2015). However, their use within GP contracts is not mandatory, but is dependent on local decisions by commissioning groups – guided to a lesser or greater degree by national directives. In 2011 NHS England decided to open the market for the supply of EARS tools, so as to promote commercial

investment and choice (Department of Health 2011) and encourage Clinical Commissioning Groups to coordinate local EARS requirements. Thus, demand for EARS tools was driven at many levels of the UK NHS, despite lack of evidence for effectiveness. But little is known about how these drivers affected EARS implementation at macro (nation), meso (commissioning group or health board) and micro (practice) levels; whether tool use has been limited to the GP contract case management activity summarised in Table 16; or what factors explain variation? This study aimed to describe EARS tool implementation and use across the four UK nations by estimating how many general practices had access to tools; assessing which tools had been implemented; summarising the uses of tools in practice; and exploring factors perceived by commissioners to influence that use.

Methods

Design

Cross-sectional online survey of NHS organisations with responsibility for primary care commissioning in the UK. This work accords with the CHEcklist for Reporting Results of Internet Electronic Surveys (CHERRIES) (Eysenbach 2004). See Appendix 4.

Participants and recruitment

I approached all 235 NHS commissioning organisations in operation at the time: 209 Clinical Commissioning Groups (CCGs) in England; 14 Health Boards in Scotland; 7 Health Boards in Wales; and 5 Local Commissioning Groups (LCGs) in Northern Ireland. I knew of no distribution lists for those responsible for the commissioning and use of EARS tools; with such knowledge dispersed differently within and between targeted organisations. I therefore undertook web searches and telephone enquiries to identify appropriate contacts, identifying 264 across the 235 organisations. I also obtained an email list from Binleys' Database of NHS Commissioning Organisations including: CCG accountable officers; GP board members; leads for commissioning acute unplanned or non-elective care, long-term conditions, primary care quality, information services and data protection. Thus I identified a total of 1,298 contacts.

I emailed all contacts and followed with up to four reminders. I personalised all emails and included a participant information sheet as attachment or embedded hyperlink. I varied the content of each reminder email to increase impact, following the advice of Dillman et al. (Dillman 2014). In all correspondence we emphasised the importance of gaining responses from organisations with or without EARS tools available in their area. I used the SurveyMonkey platform to distribute emails and manage survey responses (SurveyMonkey Inc.), and optimised the survey for desktops, tablets and smartphones (Dillman 2014). To

increase the representativeness and power of the responding sample (Kelley, Clark et al. 2003), I continued the survey period until 70% of organisations had responded, so the survey was live from November 2015 to May 2016. I used an implied consent model which infers willingness to participate from survey completion (Smith 1999). No incentives were offered.

Survey Instrument

As I identified no existing instrument about EARS, I developed a questionnaire to address our objectives. I piloted early versions with experts in EARS or survey methods, and then with volunteers from 12 commissioning organisations from across the UK. This helped me to address issues related to ambiguity and usability by modifying wording, number and order of questions. I tested the revised version through cognitive interviews with three of the volunteers. Cognitive interviews reduce non-response and non-completion (Drennan 2003) by testing respondents' understanding of questions and tasks (Collins 2003). I incorporated 'think-aloud' interviewing, asking participants to say what they were thinking as they completed questions, and 'verbal probing' using questions exploring participants thoughts on issues such as comprehension of words, ambiguity and recall (Willis 2005, Pugh and Porter 2011). The cognitive interviews enabled us to improve question instructions and response options. The cognitive interview guide and a summary of changes following interviews is provided in Appendices 1 and 2.

I sought to minimise missing data by using adaptive questions and skip logic. So, those organisations with no EARS tools had fewer questions, survey progression was dependent on valid responses (including 'don't know' or not applicable' where appropriate). These features meant a lower denominator for some questions, as indicated in results text and tables. Overall, there were 16 questions included in the questionnaire, spread over five online pages.

Finally, I tested technical aspects of the web-based survey management including mail merging and data extraction. The final questionnaire (see Appendix 3) included closed questions and open-ended text questions and addressed: respondents' characteristics; EARS tool availability; local use of EARS; and the role of specified factors in influencing use of EARS (using a six-point Likert scale from 1 'not important' to 6 'very important'). I derived these factors from a systematic review and the PRISMATIC trial which evaluated the implementation of an EARS tool in Wales (Hutchings, Evans et al. 2013, Kingston, Evans et al. 2016, Porter, Kingston et al. 2016).

Analysis

Responses were included if over 50% complete. If I received multiple responses from the same organisation, I used the most complete or, failing that, a response from a contact I had identified, rather than from Binleys' list. I used SPSS version 22 to estimate unweighted descriptive statistics and cross-tabulate responses by nation, size of organisation, and whether respondent was clinical or not. To analyse the question about the proportion of practices with access to an EARS tool, I used the midpoint of the range offered, namely 17% for "1-33%", 50% for "34-66%", and 83% for "67-99%", alongside 0% and 100%. I used Nvivo (version 11) to manage textual replies and group them thematically. I selected comments for this paper to illustrate themes.

Ethical approval

Given the staff (rather than patient) sample and the study type and design, the survey did not require formal NHS ethical approval. I did however seek independent peer review from the Abertawe Bro Morgannwg University Health Board (ABM UHB) Joint Scientific Review Committee. I also gained NHS Research & Development permission from ABM UHB (IRAS reference 168535). Confirmation letters are supplied in Appendix 17.

Results

Profile of Responses

I received responses relating to 171 (72.77%) of the 235 organisations approached (Table 17). Six respondents replied for multiple organisations, including one from Northern Ireland who represented the five Local Commissioning Groups through a national agreement. The total number of participants was therefore 161. I excluded 61 duplicate responses from 43 organisations, of which 44 (72%) were incomplete. Participating organisations supported a mean 42.9 practices each and a mean population of 292,000. The 64 non-participating organisations supported a mean 43.5 practices each and a mean population of 277,000. Most responses came from employees of the health board or commissioning group in question (140 organisations (82%)).

Completion rates by question ranged from 88% to 100%. The median survey completion time was 9.2 minutes. Free text comments were provided by 129 respondents (75.43%), with responses to the questions on the role of the CCG in determining local EARS tool use (75 responses, 1,116 words), additional factors influencing EARS uptake (22 responses, 561 words); and descriptions of services introduced or amended following EARS implementation (57 responses, 1,259 words).

Table 17: Characteristics of responses received

[Table created by Mark Kingston in Microsoft Word 2021]

Nation	n	%
England (CCGs)	152/209	73
Scotland (NHS Boards)	7/14	50
Wales (Health Boards)	7/7	100
Northern Ireland (LCGs)	5/5	100
Size of catchment population	n	%
Small (22k to 202k)	53/171	31
Medium (203k to 302k)	55/171	32
Large (303k to 1,142k)	63/171	37
CCG deprivation quartiles (England only)	n	%
Quartile 1 - lowest deprivation	40/152	26
Quartile 2	34/152	22
Quartile 3	37/152	24
Quartile 4 – highest deprivation	41/152	27
Type of respondent	n	%
General Practitioner	49/171	29
Other clinician	17/171	10
Non-clinician	105/171	61
Employing organisation (multiple responses)	n	%
Commissioning organisation (CCG, Health Board or LCG)	140/171	82
General practice	35/171	20
Commissioning Support Unit (England only)	7/171	4
Other	5/171	3

Access to EARS tools across the UK

Table 18 presents the availability of EARS tools across the UK. Of the 171 responding organisations, 148 (87%) reported availability to at least one practice in their area. Each of the participating Scotland and Northern Ireland areas had access, in contrast to Wales where less than half had practices with EARS. 106 (62%) areas reported that all their practices had access to EARS tools; 23 (13%) reported that at least two thirds had access; and 19 (11%) had up to two thirds with access. Based on the mid points of the range, I estimate that almost three quarters (73.2%) of practices in the sample areas had access to EARS tools. Estimates vary by nation: Northern Ireland (100%), Scotland (91%), England (76%) and Wales (14%).

Table 18: Reported EARS tool availability by nation

[Table created by Mark Kingston in Microsoft Word 2021]

Reported estimate of % of practices with EARS availability in commissioning area	Nation				Total (n, %)
	England CCGs (n, %)	Scotland NHS Boards (n, %)	Wales Health Boards (n, %)	Northern Ireland LCGs (n, %)	
None (0%)	19 (12.5)	-	4 (57.1)	-	23/171 (13.5)
1-33%	9 (5.9%)	-	2 (28.6)	-	11/171 (6.4)
34-66%	5 (3.3%)	2 (28.6)	1 (14.3)	-	8/171 (4.6)
67-99%	22 (14.5%)	1 (14.3)	-	-	23/171 (13.5)
All (100%)	97 (63.8%)	4 (57.1)	-	5 (100)	106/171 (61.9)
Any access	133/152 (87.5)	7/7 (100)	3/7 (42.8)	5/5 (100)	148/171 (86.5)

The survey identified 39 EARS tools in use across the UK, 19 of which were included in our response options, with others (each reported by 3 areas or less) identified in text comments. 37 of the tools were found in England where the commonest tools were those supplied by the main primary care IT system providers – EMIS, TPP and Vision (see Table 19), and it was not uncommon to find multiple tools available within the CCG, (mean 1.83 tools per CCG reporting EARS access). In text comments it was apparent that some tools had been developed locally, often with the support of one of the NHS Commissioning Support Units providing business intelligence support at area levels.

In the other nations only one tool was reported in each area (mean 1.00 n=15), typically, but not exclusively, the national NHS products (SPARRA in Scotland, PRISM in Wales and a similar tool in Northern Ireland).

Table 19: Organisations reporting access (for at least one general practice) to specific EARS tools in their area (n=171)

[Table created by Mark Kingston in Microsoft Word 2021]

Supplier	Underlying Risk Model	Sources of data informing risk model algorithm: Primary care (P) / Secondary care (S)	Nation				Total	%
			EN	Sc	Wales	NI		
EMIS Web - Risk Stratification	QAdmissions	P	58	1	0	0	59	34.5
TPP System One	TPP	P	35	0	0	0	35	20.5
Bespoke local tool	Varies	-	30	0	0	0	30	17.5
Sollis - Clarity Patients	ACG	P&S	22	0	0	0	22	12.8
Vision	QAdmissions	P	15	0	0	0	15	5.8
North of England CSU	Combined/RAIDR	P&S	12	0	0	0	12	7.0
Vision – Basic tool	Vision	P	10	0	0	0	10	5.9
Capita	ACG	P&S	7	0	0	0	7	4.1
Dr Foster	Dr Foster	-	6	0	0	0	6	3.5
Eclipse	Eclipse	-	5	0	0	0	5	2.9
ISD Scotland - SPARRA	SPARRA	P&S	0	5	0	0	5	2.9
Health Intelligence	Combined	P&S	5	0	0	0	5	2.9
NI HSCB – Risk Stratification	NI model	P&S	0	0	0	5	5	2.9
NHS Wales - PRISM	PRISM	P&S	2	0	2	0	4	2.4
Other	Varies	Varies	16	1	1	0	18	10.5

Factors encouraging and inhibiting access and use of EARS tools

Table 20 shows that practice managers (mean score 4.84), clinical leadership (mean score 4.77), and the role of NHS commissioners (CCG/health board/LCG) (mean score 4.63) were seen as most important in the perception of respondents as encouraging access and use. Research evidence (mean score 3.59), case studies of benefits from other areas (mean score 3.44) and other NHS agencies (mean score 3.25) scored lowest. Free text included three comments on the importance of the Unplanned Admissions Enhanced Service in England. Other factors in the text comments included;

“Ease of use and regular reminders about updated data” [LCG A, Scotland];

“Additional engagement with practices through use in social care” [CCG A, North of England];

“Funding from the Welsh Government to support a pilot, and the need to work closely with the local authority and third sector” [HB A, Wales];

“[The] CCG has only recently started to develop specific LES agreements which specify use of RAIDR to assist in increasing dementia diagnosis” [CCG B, South of England].

The factors perceived as most important in inhibiting access to and use of EARS tools (Table 21) related to capacity – workload of GP staff (mean score 4.91) and workload of other health and social care staff (mean score 4.08). Slightly less important was information governance (mean score 3.90). For the 18 responses from organisations that had not implemented EARS tools, information governance and workload of GP staff (mean scores of 4.28) scored highest. The biggest difference between non-implementers and implementers was that cost scored higher for the former (mean score of 3.89 compared to 2.86). Text comments on other factors inhibiting general practice uptake highlighted some perceptions of a lack of value or confidence in tool inputs and outputs, and commissioning challenges.

“For many practices the tool did not identify many patients who were not on their horizons already” [CCG C, South of England];

“Biggest issue has been lack of reliability of the tool” [CCG D, North of England];

“The CCG has struggled to commission an appropriate EARS (tool); some of this has been related to contradictory offers from different providers including local Commissioning Support Unit”. [CCG E, Midlands and East of England];

Table 20: Factors encouraging access and use of EARS tools by general practices (areas with access)

[Table created by Mark Kingston in Microsoft Word 2021]

Factor	Importance: mean (SD) (Scale 1-6)				
	England (n=127)	Northern Ireland (n=5)	Scotland (n=7)	Wales (n=3)	Total (n=142)
Engagement of practice managers	4.85 (1.23)	6.00 (0.00)	3.71 (1.60)	5.00 (1.00)	4.84 (1.26)
Clinical leadership	4.74 (1.27)	6.00 (0.00)	4.57 (1.72)	4.67 (0.58)	4.77 (1.27)
Role of CCG/health board/LCG	4.67 (1.13)	6.00 (0.00)	3.14 (1.34)	4.33 (2.08)	4.63 (1.21)
Financial incentives	4.28 (1.50)	6.00 (0.00)	3.57 (1.51)	2.00 (1.00)	4.25 (1.54)
Local or national priorities or policy	4.10 (1.42)	5.00 (0.00)	3.14 (1.35)	3.67 (1.15)	4.07 (1.41)
Local service provision aligned with EARS use	4.14 (1.44)	5.00 (0.00)	3.14 (1.21)	1.00 (0.00)	4.05 (1.52)
Role of GP clusters or networks	3.81 (1.59)	5.00 (0.00)	3.57 (1.40)	3.67 (2.52)	3.84 (1.58)
Research evidence	3.59 (1.49)	5.00 (0.00)	3.57 (1.71)	1.33 (0.58)	3.59 (1.51)
Case studies of benefits from other areas	3.35 (1.40)	4.00 (0.00)	3.71 (1.49)	2.00 (1.73)	3.36 (1.40)
Role of other NHS agencies	3.24 (1.50)	4.00 (0.00)	2.86 (1.46)	3.33 (1.15)	3.25 (1.47)

Table 21: Factors inhibiting access and use of EARS tools by general practices (areas with and without access)

[Table created by Mark Kingston in Microsoft Word 2021]

	With access to EARS tools in area					Without access			Total (n=160)
Factor	England (n=127)	Northern Ireland (n=5)	Scotland (n=7)	Wales (n=3)	Sub- total (n=142)	England (n=14)	Wales (n=4)	Sub- total (n=18)	
	Importance: mean (SD) (Scale 1-6)								
Lack of research evidence	2.86 (1.46)	4.00 (0.00)	3.00 (1.15)	3.67 (2.51)	2.93 (1.43)	3.50 (1.45)	3.25 (0.95)	3.44 (1.38)	2.99 (1.43)
Lack of training/expertise in using EARS tools	3.58 (1.58)	3.00 (0.00)	4.29 (1.80)	1.33 (0.58)	3.55 (1.55)	4.36 (1.50)	1.50 (1.00)	3.72 (1.84)	3.57 (1.58)
Cost of introducing EARS tools	2.85 (1.56)	3.00 (0.00)	3.00 (1.15)	2.67 (2.89)	2.86 (1.46)	4.57 (1.34)	1.50 (1.00)	3.89 (1.81)	2.98 (1.53)
Information governance issues	3.84 (1.64)	5.00 (0.00)	2.86 (1.36)	4.67 (0.58)	3.85 (1.58)	4.50 (1.56)	3.50 (1.91)	4.28 (1.64)	3.90 (1.59)
Issues with software or hardware	3.48 (1.63)	4.00 (0.00)	4.14 (1.87)	3.33 (0.58)	3.53 (1.56)	3.86 (1.74)	1.25 (0.50)	3.28 (1.90)	3.50 (1.60)
Resistance from clinical leaders	3.08 (1.54)	2.00 (0.00)	3.29 (1.11)	4.33 (2.08)	3.07 (1.51)	2.92 (1.54)	4.00 (1.82)	3.17 (1.61)	3.08 (1.52)
Lack of interest from practice staff	3.89 (1.55)	4.00 (0.00)	3.71 (1.70)	3.00 (1.00)	3.87 (1.47)	3.71 (1.73)	3.25 (2.06)	3.61 (1.75)	3.84 (1.50)
Lack of alignment with service priorities or policy	2.81 (1.36)	3.00 (0.00)	3.42 (1.40)	1.00 (0.00)	2.81 (1.33)	3.07 (1.49)	2.00 (1.41)	2.83 (1.50)	2.81 (1.35)
Workload of GP practice staff	5.02 (1.31)	6.00 (0.00)	4.57 (1.81)	4.33 (2.08)	5.02 (1.22)	4.71 (1.44)	2.75 (1.71)	4.28 (1.67)	4.94 (1.29)
Workload of other care staff	4.12 (1.55)	5.00 (0.00)	4.00 (1.63)	3.33 (1.15)	4.13 (1.48)	4.28 (1.54)	1.75 (1.50)	3.72 (1.84)	4.08 (1.52)
EARS tool not integrated with clinical systems	3.81 (1.66)	5.00 (0.00)	4.14 (1.77)	2.67 (1.15)	3.84 (1.61)	4.42 (1.50)	1.50 (0.58)	3.78 (1.83)	3.83 (1.64)

* responses from organisations without EARS availability who answered 0 for every category were treated as missing data (n=3)

Use of EARS tools at practice and at wider levels

The majority of areas with access to EARS tools reported their use by general practitioners or other professionals to identify individual patients at risk (Table 22). Many areas were using the tools to support service planning or development at the level of commissioners or of 'practice cluster or networks'; but less than 10% of commissioners reported using EARS for service evaluation.

Table 22: How EARS tools are used

[Table created by Mark Kingston in Microsoft Word 2021]

Use in area	England (133)		NI, Scotland, Wales (15)		Total (148)	
	N	%	N	%	N	%
To identify patients for follow up or review (case finding) by GP practice staff	113	85.0	12	80.0	125	84.5
To identify patients for follow up or review (case finding) by non GP staff	69	51.9	4	26.7	73	49.3
To inform service planning or development work at CCG/Health Board/LCG level	64	48.1	7	46.7	71	48.0
To inform service planning or development by groups of practices (e.g. practice clusters or networks)	40	30.1	9	60.0	49	33.1
In relation to service evaluations	26	19.5	5	33.3	31	20.9

Almost 40% (58 of 148) of commissioners reported that the introduction of EARS tools had resulted in the 'introduction of new services' or the 'redesign of existing services' in their area. A further 31 areas (21%) were 'planning changes'.

Text comments (n=57) from those that had introduced or redesigned services revealed a diverse range of service innovations following the implementation of EARS tools. A common theme, reflected in many comments, was that EARS-related initiatives operated mainly at multi-practice level (e.g. locality) rather than at individual practice level. These initiatives had refined several staff roles (e.g. care coordinators, community geriatrician, community matrons, and support workers) and launched several services (e.g. frailty teams, integrated care teams, locality teams, hospital at home, and telecare). Many of the comments (n=14) acknowledged the input of multi-disciplinary teams (MDTs) in initiatives.

Development of extended MDT programme (GP/community/Social Care/Mental Health & Health Trainers). Helps identify patients for presentation. [CCG G, Midlands and East of England]

Case coordinators (band 5 non-clinical) employed by community provider to create list and coordinate MDT [CCG H, South of England]

We are implementing a Frailty Pathway, this has included the commissioning of a Community Geriatrician, GPs with an extended role, re-modelling our Community

Teams and bringing them together to form integrated Neighbourhood Teams [CCG I, Midlands & East of England]

Principally risk tools have been well used through the national [GP Contract work]. However the local Integrated Care programme has also mandated and incentivised use of the risk tool. Based on the clinical profile of high risk patients, additional locally enhanced services are also being developed such as in the areas of frailty and palliative care. [CCG J, London]

Discussion

Summary of findings

The survey shows widespread implementation of EARS tools across the United Kingdom. Extrapolated to include non-responding areas, 73.2% uptake equates to 7,414 of the UK's 10,128 general practices having access to an EARP tool. However, the tools were by no means universal, with areas not having implemented them apparent – particularly in Wales. I identified variation in implementation at all levels – nation, commissioning group and practice. This variation extended to the choice of EARS tools: in England there was a wide range of tools and suppliers, both commercial and non-commercial; much less so elsewhere. Many of these tools were bespoke, developed locally or regionally. This reflects NHS England's stated aim of decentralising tool development and creating a market for EARS tools. (NHS England 2015) In contrast, where tools had been implemented in Scotland, Wales and Northern Ireland, they had been developed and promoted within each country. In England, Scotland, and Northern Ireland the majority of areas implementing EARS tools reported changing or introducing services in response, using the tools to support initiatives that were wider than specified in the corresponding general practice contracts. Though exemplified by integrated care initiatives across practices, our results highlight clear differences in interventions and approaches across commissioners. I identified human factors as drivers of EARS implementation, with practice managers, clinical leaders, and NHS commissioners in key roles. But the main barriers to implementing EARS tools in general practice were concerns about workload and information governance. I also found that costs were a more important concern for areas that had not implemented EARS tools, compared to those that had. For both implementers and non-implementers research evidence, or the lack of, was a relatively low scoring factor.

Strengths and limitations

This is the first study to examine implementation of EARS across the UK. The main strength of the study lies in the comprehensive coverage – 171 (73%) of the 235 NHS commissioners

across four nations. Surveying these organisations is challenging amid variations in configuration and staffing. The response rate of 73% is higher than previous published CCG surveys – 27% (Williams, Harlock et al. 2017), 43% (Simmons 2014), and 52% (Dunne, Wormald et al. 2017). I achieved this by identifying and contacting multiple potential respondents at each commissioning group, by encouraging organisations to select the most appropriate respondents and by rigorous follow up and reminders to non-responders. Nevertheless, I acknowledge that non-respondents could differ from respondents, which I have considered throughout interpretation of results.

A limitation is that the survey period overlapped two financial years. Although I am not aware of any political or operational changes that may affect responses between years, I recognise that this cannot be ruled out. Comparing the results of early responders (Nov/Dec 2015) with late responders (April/May 2016) did not identify any significant variations. A further potential limitation is the variation in respondent profile, a mix of clinical and non-clinical staff. However, I believe this reflects the profile and involvement of both staff types in the commissioning process.

Finally, as with all self-completion questionnaires, there may be variability in respondents' interpretation of questions. I mitigated for this through our extensive survey instrument development and testing.

Comparison with existing literature

Most of the literature on EARS has focused on model development and validation. Three recent systematic reviews show wide variation in the predictive accuracy of models (Kansagara, Englander et al. 2011, Wallace, Stuart et al. 2014, O'Caoimh, Cornally et al. 2015). Three of the models reported appear in these reviews (Combined Model, ACG, PRISM) and underpin many of the tools encountered. I undertook supplementary searches on other implemented tools identified in our survey but found little published data on their performance. An exception is QAdmissions, developed at the University of Nottingham, which reports reasonable comparative performance (Hippisley-Cox and Coupland 2013). Although most build on the development work of the national initiatives such as the Combined Model and PRISM, emergent tools may not have been accompanied by the same levels of scrutiny. Wallace's review of 27 EARS tools found that the best performers used routine data from both primary and secondary care (Wallace, Stuart et al. 2014). But many of the tools I identified, especially those supplied by clinical IT system providers, use primary care data only. Although this reduces their predictive performance, the compensating advantage is that these tools are easier to incorporate into the existing clinical system, thus avoiding the need for a separate platform, and helping to overcome challenges of integration, inter-operability and information governance; all barriers confirmed in our survey

findings and elsewhere (Lewis 2015, ASSEHS Study Team 2016, Porter, Kingston et al. 2016).

Despite these barriers, most areas reported that EARS tools had been introduced. In England I estimated 87% of practices had access to EARS tools but understand that more (around 95%) took part in the Unplanned Admissions Enhanced Service. It follows that several practices used alternatives to EARS tools to stratify their patients, despite evidence that both of the usual alternatives – clinical judgement and criteria-based selection – have poor predictive validity (Allaudeen, Schnipper et al. 2011), (Roland and Abel 2012).

The survey indicated that fewer than a fifth of Welsh practices had a tool available, reflecting a Welsh Government decision to delay rolling out EARS pending the results of a randomised trial (PRISMATIC) in 32 practices within one health board (Snooks, Bailey-Jones et al. 2018). The findings supported the cautious approach given that the intervention outlined in Table 16 (p138) of general practice led case management for high risk patients was shown to be ineffective and resulted in increased costs, emergency admissions and bed days (Snooks, Bailey-Jones et al. 2018, Snooks, Bailey-Jones et al. 2018). Further studies published after the widespread roll out of EARS, including a systematic review of case management for at risk individuals and an observational study of MDT case management for risk stratified patients, both found increased costs and health service use (Stokes, Panagioti et al. 2015, Stokes, Kristensen et al. 2016). It is far from uncommon for health innovations to be introduced at scale and great cost without an understanding of their costs and effects. Notable examples include the introduction of NHS Direct (Munro, Nicholl et al. 2000) and the LUCAS mechanical chest compression device (Gates, Smith et al. 2012).

Implications for research and practice

In confirming the widespread implementation of EARS across the UK, these findings have emphasised a huge investment of time, energy, and financial resource. At the time of the major nationwide roll outs associated with the GP contracts there was no research evidence supporting the EARS based case management approach. EARS implementation was based on assumptions that it would reduce costs and improve care, but this was not a reasonable foundation for the level of investment that followed. Nor was due consideration given to the potential for unintended consequences – despite warnings to that effect (Roland and Abel 2012). In addition, opportunities were likely missed to build in prospective evaluation during implementation of EARS.

Perhaps surprisingly, stratification for risk of emergency admission, and increasingly, of frailty, remains an international healthcare priority with use recommended in NICE clinical guidance on multimorbidity (Kernick, Chew-Graham and O'Flynn 2017); the NHS 10 year plan year (England); and current English general practice contract (NHS England 2018), and

major programmes elsewhere e.g. Australia (NSW Government: The Agency for Clinical Innovation (ACI) 2018), Catalonia (Duenas-Espin, Vela et al. 2016), Furthermore EARS is the most common ‘intervention’ across the 50 NHS integrated care ‘Vanguard’ sites (National Audit Office 2018). With continued interest and investment, we must continue to raise the question of evaluation– in line with the health service edict to base innovation on rigorous evidence (Nuffield Trust 2011, Lewis 2015, NHS England 2015).

This survey revealed that less than a fifth of sites were contributing to evaluations. Given that various local, non-GP contract EARS initiatives were reported, a wide range of multi-faceted interventions may have been implemented without evaluation or evidence of effectiveness. It has been shown that evidence of effectiveness is a crucial factor in sustaining use of health innovations (Kitson, Harvey and McCormack 1998), and clinical prediction rules in particular in particular (Toll, Janssen et al. 2008, Adams and Leveson 2012, Moons, Kengne et al. 2012). Therefore, if the widespread use identified in this survey is to be sustained, new supporting evidence may well be needed.

Conclusion

This survey has confirmed that British primary care responded to policy and contractual initiatives by widespread implementation of EARS tools. This may have been deemed a success, arming general practice with infrastructure and data to support improved patient care. But recent evidence suggests that the use of EARS is costly and ineffective, with lost opportunities from alternative expenditure and activity. The benefit of such investment is questionable given the evidence of clinical and cost effectiveness of preventative interventions based on EARS. Going forward, policy makers must consider the current evidence base in decisions on the future use of emergency admission and similar risk stratification tools.

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Chapter 7: Commissioner interviews

Introduction

Health services across the developed world have introduced data-driven risk tools which calculate and stratify emergency admission risk for a given population. Their use has been encouraged in primary care, to support clinicians in identifying (or case finding) individuals who may benefit from additional clinical intervention; part of a shift from disease specific to more holistic and integrated care, with the hope that community case management of identified patients can help to reduce risk and prevent admissions. Support for the use of risk stratification tools has been enshrined in UK health service policies including long term conditions models, integrated care initiatives and more recently in NICE multimorbidity guidelines (NHS England 2015) (NICE 2016). Perhaps the most widespread, or at least consistent application of EARS tools was to support general practice contractual work, such as the NHS England 'Avoiding unplanned admissions: proactive case finding and patient review for vulnerable people' enhanced service. This scheme committed £480 million over three years (2014-2017) and encouraged general practices to use risk tools to identify and proactively 'case manage' patients at higher risk of emergency admission (NHS England 2015). The aim was to improve the quality and co-ordination of care and reduce emergency admissions and ED attendances (NHS England 2015). Similar schemes operated in other parts of the UK.

Despite positive validation of the predictive accuracy of many EARS tools, particularly at higher levels of risk (Wallace, Stuart et al. 2014), and the commitment of significant public funding to the enhanced service, there was little evidence to support the effectiveness of either the risk tools or the proposed follow up (case management). Nonetheless, a freedom of information request (from this author) confirmed that 92.8% of practices participated in the English Enhanced Service in 2015/2016 (NHS Digital 2019), and a 2016 survey of 171 UK commissioning organisations estimated that 89% of UK practices had access to an EARS tool (Kingston, Griffiths et al. 2020).

Although individual general practices operate autonomously and make their own judgments on participation in non-statutory initiatives such as the Enhanced Services, decisions over procurement and supply of EARS tools fell within the remit of NHS organisations operating at a wider planning and delivery level. This was a role fulfilled by Clinical Commissioning Groups (CCGs) in England, and health boards in Northern Ireland, Scotland and Wales. The survey identified 39 different digital EARS tools in use, produced by a range of NHS and commercial suppliers (Kingston, Griffiths et al. 2020). Most were in England in line with an NHS England decision to open EARS supply to the market, and to base decisions on 'local

priorities, circumstances and systems' (Department of Health 2011). This approach provided geographic autonomy with CCGs empowered to make decisions over implementation – whether to introduce EARS at all, which tool to use, and how best to integrate and ensure congruence with local systems, structures and clinical practice. However, the NHS is littered with high profile failures in digital technology implementation (Justinia 2017). They are notoriously challenging to implement (Cresswell, Bates and Sheikh 2013), and there is poor understanding of strategies to help digital tools 'cross the chasm from clinical validation to integration' into routine practice (Marwaha, Landman et al. 2022).

There is a need therefore to better understand health technology commissioning decisions and the implementation processes and influences. It is in this context that this follow up study was undertaken, building on and complementing the previous survey, using a qualitative approach and revisiting a sample of those respondents. The aim was to explore commissioner views, and help understand the rationale for commissioning EARS tools, and to describe implementation approaches and experiences, including barriers and facilitators.

Methods

Study design and theoretical framework

I undertook an empirical qualitative interview study with representatives from Clinical Commissioning Groups in England, and health boards in Wales and Scotland.

Analysis was guided by the theoretical implementation framework of i-PARIHS which is used here as a conceptual lens (Harvey, Llewellyn et al. 2018). Implementation frameworks provide a supportive underpinning that can help explain implementation processes, barriers and facilitators and explain outcomes (Bergström, Ehrenberg et al. 2020) (Harvey and Kitson 2016). i-PARIHS is one of a number of implementation frameworks – others of note include Diffusion of Innovations (Rogers 2003, Greenhalgh, Robert et al. 2004), Normalisation Process Theory (May and Finch 2009), and the Consolidated Framework for Implementation Research (Damschroder, Aron et al. 2009). i-PARIHS has developed, through a number of iterations, over a 20-year period. Its development has coincided with, and learned from, a wider 'movement' that has seen a shift from an epistemological position of implementation as a sequential process to one characterised by complexity and non-linear, interactive and context specific processes (Greenhalgh, Robert et al. 2004), (Glasziou and Haynes 2005). The i-PARIHS framework has been widely applied to support implementation studies, both as a tool for guiding implementation strategies, and (as used in this chapter) to support analysis (Bergström, Ehrenberg et al. 2020). I-PARIHS features four main constructs with successful implementation of evidence, or an innovation determined by *facilitation, innovation, recipients and context* (Box 10).

Innovation relates to the characteristics of the innovation, and the set of conditions that make it more or less likely to be recognised and applied within the setting. These conditions are underlying knowledge sources, clarity, degree of fit with existing practice and values (compatibility or contestability), usability, relative advantage, trialability and observable results.

Recipients relates to the people involved in implementation, and those who are affected by and influence implementation at the individual and collective level.

Context focuses on the micro level – the immediate setting for implementation (here general practices), the meso level – the broader organisation to which that setting relates (e.g. CCG/health board), and the macro or outer context level - the wider health system in which the organisations sit and the policies, regulatory frameworks and political environment that govern the way the health system functions.

Facilitation is the process that activates implementation of the innovation with intended recipients in their contextual settings.

Box 10: i-PARIHS core constructs (adapted from (Harvey and Kitson 2016), (Hegarty, Murphy et al. 2019).

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Study Setting

Participants were invited from NHS organisations across the UK with responsibility for local EARS tool commissioning and implementation decisions: CCGs in England, NHS Boards in Scotland, and Health Boards in Wales.

Participants and recruitment

Participants were identified through a previous survey quantifying the penetration of EARS tools in UK primary care (Kingston, Griffiths et al. 2020). The survey included a request for volunteers for a further qualitative study, with 67 of 171 (39%) expressing interest and providing contact details. Using this list, I employed quota based purposive sampling to recruit participants with differing attributes that reflect the range (e.g., from across UK nations and regions, with and without EARS tools available in their areas, and clinicians and non-clinicians). I aimed to recruit a minimum of 15 participants, an a priori target size large enough to allow a 'new and richly textured understanding' of the phenomenon under study, but small enough to enable a 'deep, case-oriented analysis' (Sandelowski 1995).

Each invitee was emailed a participant information sheet (Appendix 5) outlining the study, and what involvement would entail. Email and telephone reminders were employed to follow up and to book interview appointments.

Semi-structured interviews

Telephone interviews were conducted using a semi-structured topic guide (summary in Box 11, for full guide see Appendix 7). This covered availability and use of EARS and frailty tools; associated interventions; barriers and facilitators to uptake; the influence of general practice

contracts; and views on the impact of tools and research priorities. The topic guide was based on the background literature and informed by the EARS survey.

Modifications were made following pilot interviews with four representatives. As subsequent changes were minor, and to structure rather than content, these interviews were included in the final analysis. Telephone interviews took place between October 2016 and January 2017. I undertook the majority of interviews, with two female colleagues (both qualified qualitative researchers) helping with the remaining interviews. Informed consent was confirmed verbally at the start of each interview. The consent document is supplied as Appendix 6. Interviews were digitally recorded and transcribed verbatim aside from one case where a participant requested that only notes be taken. Interviews lasted between 17 and 52 minutes (mean 32 minutes). Field notes were taken in a few cases.

1. How many general practices have access to a) EARS, b) frailty tool?
2. What were the main reasons these particular tools were provided in your area?
3. How are the EARS/frailty tools currently used in general practice in your area?
 - a) Please describe the intervention that the EARS/frailty tool is used within, including who uses the tools, which groups of patients are targeted, and what services are provided to identified patients?
4. Has your CCG/HB/LCG developed local guidance for how the risk tools are used? In what format?
5. Looking back at the survey response for your area, the main things that positively influenced the uptake of risk tools were [list]...could you tell me a little bit more about how each of these factors helped?
6. Looking back at the survey response for your area, the main things that hindered the uptake of risk tools were [list]...could you tell me a little bit more about these factors?
7. How have QOF or Enhanced Services influenced how the risk tools have been used?
8. Are you aware if GPs or others have communicated with patients about their risk?
9. What do you consider the evidence gaps? What should be the research priorities?
10. What impact do you believe the introduction of risk tools into your area has had?
11. What levels of enthusiasm have you observed regarding the use of EA/frailty risk tools?
12. What are your expectations for the future use of EA/frailty risk tools?

Box 11: Interview topic guide for interviews with commissioners

[Created by Mark Kingston in Microsoft Word 2021]

Analysis and reporting

I led the analysis process guided by but not limited to the i-PARIHs framework. A clinical GP colleague (CH) supported coding and analysis, with further input from the supervisory team. CH and I undertook an initial review of transcripts to flag significant sentences and support idea generation. Subsequently we clustered meaning into themes and patterns to support distillation of participant experiences and views. Following further refinement, piloting and discussion, a coding framework of 48 higher-level and 81 lower-level codes was agreed.

Data was organised and coded within the qualitative analysis software Nvivo (version 12). I present findings in relation to the rationale for EARS introduction and describe how EARS tools were used. Then, framed by i-PARIHS I consider the core constructs of context, innovation, facilitation, and recipients.

To support this work I followed the consolidated criteria for reporting qualitative research (COREQ) guidance (Tong, Sainsbury and Craig 2007), with a COREQ checklist supplied in Appendix 8.

Results

Profile of Respondents

As shown in Table 23 below, a nominal target of 15 participants was exceeded, with 20 taking part. No participants were recruited from Northern Ireland, despite repeated contacts, and there were fewer medium sized organisations included than targeted (five). Table 23 indicates that most areas introduced new care process or modified existing processes in association with the introduction of EARS.

Table 24 indicates the regions where participants were based, their job title and clinical background, and allocates each a unique ID number used in presenting results including quotations.

Table 23: Interviewee profile by category (minimum target in brackets)

[Table created by Mark Kingston in Microsoft Word 2021]

<i>Criteria</i>	<i>Sampling Targets- Completed (Target)</i>			
<i>Nation</i>	<i>England 15 (10)</i>	<i>Wales 3 (2)</i>	<i>Scotland 2 (2)</i>	<i>N. Ireland 0 (1)</i>
<i>Organisation population coverage</i>	Small 7 (5)	Medium 3 (5)	Large 10 (5)	NA
<i>Processes of care amended based on use of risk tool</i>	Yes - new care processes introduced 9 (5)	Revisions to existing care processes 9 (5)	No changes 4 (5)	NA
<i>Clinician</i>	Yes 9 (7)	No 11 (7)	NA	NA

Table 24: Respondent profile

[Table created by Mark Kingston in Microsoft Word 2021]

Code	Region	Job Title	Clinical/ Non-clinical
1	West Yorkshire	Executive GP, Vice-Clinical Chair in the CCG, Urgent Care Lead.	Clinical
2	Midlands & East	Governing Body Member, Clinical Lead for Primary Care Integration Neighbourhoods	Clinical
3	Midlands & East	Senior Commissioning Manager	Unknown
4	North Yorkshire and The Humber	Business Intelligence Manager	Non-clinical
5	South	Information Analyst Principal and Service Lead	Non-clinical
6	North	Business Intelligence Manager	Non-clinical
7	Midlands and East	Primary Care Relations Lead	Non-clinical
8	West Yorkshire	Primary Care Project Manager	Non-clinical
9	North	Programme Director for Urgent Care and Collaborative Commissioning	Non-clinical
10	North	Not supplied	Non-clinical
11	North	Public Health Principal	Non-clinical
12	South	Head of Primary Care	Non-clinical
13	London	Commissioning Manager	Clinical
14	South	Deputy Medical Director/Deputy Chief Medical Officer	Clinical
15	South	Associate Director for Information	Non-clinical
16	Scotland	Speciality Doctor	Clinical
17	Scotland	Director of Primary Care	Clinical
18	Wales	General Practitioner, Cluster Lead	Clinical
19	Wales	Primary Care Clinical Director	Clinical
20	Wales	Assistant Area Director	Non-clinical

Rationale and evidence for introducing EARS

At the CCG/health board level the introduction of EARS was heavily influenced by the policy direction around emergency admission reduction and preventative primary care; with EARS seen as a mechanism to support this shift towards new care models founded on targeted, proactive care. Interviewees cited many of the policy terms (as outlined in Chapter 3) in their rationale for EARS introduction – Sites 3 and 15 for instance, were interested in ‘integrated care’, Sites 14 and 10 focussed on admissions in older adults.

So, we were moving strategically towards a population health approach like many CCGs are, modelled on sort of other healthcare systems, such as Spain. And, obviously, there's a lot of focus on the highest risk, or the most frail patients. And, nationally, there's a DES for the two per cent, and lots of other sort of work on care homes and MDT, for that cohort. But, there's an understanding we need to really shift our proactive or preventative care model lower down this pyramid of needs. (Site 19)

There was a big policy push saying: If you have good predictive scoring, you'll be able to identify the patients who are at risk of emergency admissions, and you'll be able to do something better, and you'll be able to reduce emergency admissions and, therefore, it's a – you know, it's a win/win. (Site 17)

While most interviewees identified a general policy shift, some specific policies and programmes were recalled as influential, including the House of Care and the QIPP long terms conditions programme:

We implemented [EARS tool] about three and a half years ago...as part of our work from ...the Department of Health Long Term Conditions QIPP Programme, that talked

about doing three things, which were: to use risk stratification to identify your population at risk, having integrated multidisciplinary teams to proactively manage people at risk, and then have systematic self-care. (Site 13)

Most interviewees described their organisation's rationale in terms of a fit with policy and service aspects, rather than patient outcomes. Patient centred elements of the policy context, including terminology such as shared decision making or self-management were notably absent from the reported rationale.

Decisions to implement EARS had been made at different times over the decade – reflecting a gradual introduction of tools over time, rather than a milestone influenced approach. The decision to implement was sometimes aligned with specific funding schemes, including local general practice contract add-ons:

The main one was to identify their patients at risk of admission. There used to be some funding called £5 a head, targeted at the over-75s. So, we commissioned an enhanced service – a local enhanced service, called Tailored Care for the Vulnerable Adults, and what we did within that specification was said that a) they needed to submit their information to RAIDR at that time and b) they needed to do advanced care plans for a percentage of those on their high-risk register. (Site 14)

In all but one case, sites had commissioned or supplied their EARS tool prior to the introduction of the national general practice contracts. The exception illustrates that the national enhanced service added a further rationale for any sites yet to implement EARS and added bottom-up demand to the top-down policy direction.

There was an initiative [Enhanced Service] with NHS England who under time constraints were asking practices to risk stratify their patients. At the time there wasn't really a tool, so we worked quite closely with our CSU to use RAIDR [EARS tool]. (Site 8)

SPARRA was also supported through the GMS contract in Scotland, as a good tool to highlight patients who would benefit from an anticipatory care plan. (Site 7)

Evidence base – prior to implementation

Explicit references to research or other forms of evidence in the decision to introduce EARS were rare, with little indication that they represented a significant driver for implementation. A few interviewees acknowledged that they implemented EARS despite gaps in knowledge and understanding of EARS tools – particularly regarding intervention for those identified from risk stratification.

Because the evidence base is not hugely supportive, really, at the interventional end, because we know case management doesn't work, for example. So, all the various versions of supportive case management – well, it depends what the objective is. If the objective is to keep people out of hospital, to avert emergency admission, there's not a lot in the toolbox in terms of research and evidence-based, so... we're starting the conversations with specialists and with research, and it's about what the intervention will be in response to the [risk tool]. (Site 15)

If you asked someone clinical then in many cases they would say, we're not sure there is enough research evidence to say it works. What are you going to do with all of these people that you identify? (Site 4)

A rare contrasting perspective came from a Scottish site, where the interviewee recalled the influence of research from other areas in and outside of the country on their implementation:

The research evidence is based on work that has been done in a number of areas in Scotland, particularly in the north of Scotland in Nairn. Using risk predictive tools and putting together an anticipatory care plan in the right way, and developing key information – will provide information and qualitative information to significantly reduce individual's risk of hospital admission – in the region of 30 per cent. We also looked at research evidence from other areas, including Canada, Scandinavia and New Zealand. (Site 7)

Tools available

Table 25 summarises the tools participants reported in use in their area and reasons for choosing the tools. All but one reported the availability of an EARS tool, and many sites also had a separate frailty tool available – typically the eFI (electronic Frailty Index) – which was reported to be regularly used for case finding vulnerable patients, and as a proxy for admission risk.

Table 25: Tools available and rationale for choosing them - by site

[Table created by Mark Kingston in Microsoft Word 2021]

CCG / HB	Tools Available		Reported Reasons for Choosing Tool(s)
	EARS	Frailty	
1	Bespoke local tool including social care data	n/a	Tool available without charge as developed by local GP who was interested in topic
2	PRISM	n/a	Tool developed by national team and made available through research project
3	RAIDR	eFI, SystmOne	RAIDR available through CSU – regional approach to tool access. eFI used as it was integrated into IT systems – better usability
4	PRISM	n/a	Tool developed by national team - available through national 'demonstrator' programme
5	n/a	eFI, SystmOne	eFI available as integrated into IT systems
6	Adjusted Clinical Groups	n/a	No data
7	SPARRA	eFI, SystmOne Complexity Index	SPARRA most accessible, and nationally promoted, came with no charge and recognised as fit for purpose
8	RAIDR	eFI, SystmOne	RAIDR available at no extra cost through CSU
9	Adjusted Clinical Groups	n/a	One tool within a suite of tools that were implemented at a regional level – initially via Strategic Health Authority level, then CSU
10	PRISM Doctor Foster IQ Risk Stratification	n/a	Poor experience with first tool (Dr Foster). Main tool now PRISM – commissioned as deemed more accurate and easier to implement. IQ Risk Stratification limited in range of variables
11	TPP (SystmOne)	eFI, SystmOne	Individual practice pilot schemes and area-wide pilot
12	Adjusted Clinical Groups	eFI, SystmOne	Unclear
13	RAIDR	Edmonton Frail Scale (EFS) eFI	RAIDR available through CSU – regional solution to tool access
14	RAIDR	Frailty Model (local)	RAIDR available through CSU – regional solution to tool access.
15	NECS Combined Predictive Model	eFI, SystmOne	Locally developed by Commissioning Support Unit and PCT
16	IQ Risk Stratification (EMIS)	n/a	Not described
17	RISC	n/a	Locally developed because of dissatisfaction with previous tools
18	Health Analytics tool	n/a	Unclear
19	QAdmissions (EMIS Web)	eFI, SystmOne	Integrated into pre-existing IT systems and recommended by NICE (multimorbidity guidance (NICE 2016).)
20	Adjusted Clinical Groups TPP (SystmOne)	eFI, SystmOne	Locally developed because of dissatisfaction with pre-existing tools

How tools are used

Extent of current use

Across sites, 17 reported that practices used EARS tools at the time of the interviews. Two CCGs reported that, despite attempts, they had not yet put an EARS tool in place, although some practices may have had recent access through clinical systems. Three sites explicitly confirmed that use was very limited, two in Wales (Site 1, 4), who both confirmed they awaited the results of a nationally sponsored evaluation (PRISMATIC), and one in England (Site 9). However, a consistent message was that use was not consistent across practices, nor amongst staff within practices. Although many individual clinicians did not access the tools at all, they may still be involved in subsequent discussion and care of those identified.

Description of Interventions

The interviews confirmed the influence of the CCGs/health boards in shaping the use of EARS in their localities, as they responded to the policy direction.

The interviews confirmed that the main recent focus for EARS had been in support of the nationally agreed GP contractual work. Practices at each of the sites where EARS was available had used tools to support this work. But there had been or were still a range of other more localised initiatives – typically led by the CCG or health board. A snapshot of these is provided in Table 26 which forms the basis of the following narrative overview.

Table 26: Reported uses of EARS tools by site
[Created by Mark Kingston in Microsoft Word 2021]

CCG / HB	Use summary	Practice level	Cluster or wider level	Pilot/ fixed term	Risk level targeted	ES only	MDT
1	6-7 practices use locally developed tool. Those identified between 3% and 7% highest risk offered social prescribing intervention to include befriending. Staffed by charity employees (integrated to practices) with health board funding (intermediate care fund)	Yes	-	Yes	3 rd	NA	Yes
2	Tool In 40% of practices with implementation aligned with research study. Use determined by practice.	Yes	-	Yes	3 rd /4 th	Yes	-
3	Mainly frailty via TPP System One – all practices (16) have this. Used for case identification and for additional services to prevent hospitalisation. E.g., mental health support, care home visits. Created Complex Care Service (for highest risk, with consultant led service (CCG wide), and the Enhanced Primary Care for practice-based interventions.	Yes	Yes	-	3 rd /4 th	No	Yes
4	Limited use in subset of practices in national chronic conditions demonstrator pilot sites, at both neighbourhood and practice level. Typically used to identify high risk cohort for review – sometimes with discussion at MDT.	Yes	Yes	Yes	3 rd /4 th	No	Yes
5	No EARS tool but frailty tool used sparingly, mainly in Trailblazer neighbourhoods which will report back to CCG re future use.		Yes	Yes	-	No	unclear
6	No tools in place.	-	-	-	-	-	-
7	Used for patient identification at practice discretion – Non mandated. Used to support MDT, anticipatory care planning and focus on admission avoidance.	Yes	-	-	Not stated	NA	Yes
8	RAIDR and EFI. RAIDR use for identifying people for ES. Piloting EFI use with one cluster of practice (four practices) s, with a care home mdt led by consultant geriatrician. + ith the GP, a pharmacist, a community nurse, and a staff member from the care home. for identified patients. (Then review Notes, visit, care plan).	Yes	Yes	Yes	Top 2% for ES	No	Yes
9	EARS/no frailty. Little current use, some for ES. CCG developing short term programme of work around MDT working – identifying patients based on age/number of CCs. Patients can then be linked with a Public Health coordinator akin to social prescriber, plus community matrons, pharmacy links etc. Service just coming on stream. EARS tool encouraged – but not mandated.	Yes	planned	planned	Top 2% for ES	Yes – but pilot to follow	No – but planned
10	Linked to additional funding for practices to target admission reduction, and a separate MDT community care teams in neighbourhoods 4 to 5 practices)- providing proactive care and care plans re social, mental, physical health).	Yes	Yes	Yes	3 rd /4 th	No	Yes
11	CCG had introduced pilot scheme to support admission avoidance (13 practices took part). Practices used a variety of information sources to identify patients for the pilot and for the EA DES including fracture risk, frailty, clinical judgement. Although an inbuilt EARS tool was available to most practices this was Not widely used. Current use varied considerably – some doing bare minimum ‘just to get paid’ others doing follow up and changing model of care, but expected use to drop off.	Yes	No	Yes	Varied	Yes – following previous pilots	No
12	Had been a pioneer site experimenting with EARS, with three different tools commissioned locally. Subsequently favoured one tool. Current use mainly in relation to ES.	Yes	No	No	CCG focus ‘jumpers’ - rising risk	Yes	No

13	Using EARS tool over 3 years to support identification of frail patients for integrated community teams (intermediate care and crisis response and reablement services, in partnership with Local Authority) to target – initially as main criteria, subsequently as one potential criteria. Wanted to look at 0.5% to 4% ‘high to moderate risk’ group. Subsequent use driven by DES – where focus on top 2% clashed.	Yes	unclear	Unclear	Top 2% for ES – but CCG promoted 3 rd level	Unclear	unclear
14	Local Enhanced Services – building on DES etc. Now incorporating frailty. As part of this work had been identifying people for advanced care planning. - previously very ad hoc approaches to sample identification.	Yes	No	Yes	Varied	Yes – following pilots	No
15	Been using risk stratification since 2011, aligned with integrated care initiatives including QIPP. EARS supported advanced care plans (for and outside of DES) and community proactive nursing support. Now working on a pilot for targeted social care and social prescribing – in an RCT, and a separate grant supporting work about further predictive risk models to benefit health and social care.	Yes	Yes – in evaluation	Yes	3 rd /4 th (CCG encourage 3 rd)	No	No – but planned
16	No data	-	-	-	-	-	-
17	Introduction predates DES, in relation to attempts to improve patient centred care, with CCG ‘pushing’ programme of care planning; starting to make progress when DES focus took over (counter-productively in respondent’s view – as ‘jumping through hoops’). Consideration as part of a Vanguard initiative for integrated care/case management.	Yes	No	No	3 rd /4 th (CCG encourage 3 rd)	Yes	No
18	Have had a tool in place for approx. 5 to 6 years. Commissioned on area basis across four London boroughs; pre CCG. Use for DES but introduced LES to cover top 5% (Not just top 2%) and link to integrated care services, and MDTs with social care, community matron and others. Note that their BI tool, incorporating EARS also lets them flag up other elements e.g. smoking, live alone – used this info to refer to fire service for fire risk. EARS risk profiling, one of a suite of initiatives locally ~ (MDTs, risk profiling, social care)	Yes	No	Yes	3 rd /4 th (CCG incentive for 3 rd)	No	Yes
19	Introduced local service whereby practices come together in neighbourhoods to discuss profile of patients to support service redesign – but early days and No changes Yest. Highest risk patients fit within MDTs and end of life care initiatives.	Yes	Yes	Unknown	3 rd /4 th	No	Yes
20	CCG commissioned Solace to provide ACG tool, with partner CCGs in area. But use was limited due to technical issues with tool, data and the need for lengthy manual updates by practices. and use ceased. TTP frailty tool had wider use – driven by ES, but also by care coordinators in area. In future, expect to use EARS both at CCG/STP for population health and by practices.	Yes	No	No	4 th	Yes	No

Many initiatives had been introduced before the national GP contracts, others operated in parallel, and a further group were in the planning stage. Most operated at practice level, but a subset of six sites used EARS at a cluster or neighbourhood level, with practice staff joining those from other area practices, occasionally with other community staff.

But, I think, like we alluded to earlier, once the localities do start to come together and they can identify key people to do it on behalf of like the locality, then you may find [EARS] does become part of what they do. (Site 8)

Consequently, some sites wanted to bring together insights and intelligence from EARS tool users to support discussion of their neighbourhood priorities:

Each of the practices are reviewing their lists and would have met in neighbourhood teams to look at some degree of commonality across the lists. Identifying sort of themes, which would then inform some of our commissioning intentions and going forward, to say, "Well, you know, what are the key and common characteristics across all the practices' lists? What should we be doing differently to try and intervene in a different way?". (Site 19)

Many of these same sites, and eight overall confirmed that they had introduced approaches that involved discussion and follow up of patients within multi-disciplinary teams (MDT) of varying composition. Two further sites planned a similar approach.

We are working on trying to roll it out just for multidisciplinary team working. Each practice is trying to establish a list of patients that would be suitable for MDT working... we're trying to not be too prescriptive about how practices do this process. It's more important that they identify some patients and bring them to the meeting. (Site 9)

They have a list of patients in the top five per cent...and then they have to do an assessment of each of these patients and then make a decision: Does this patient need further ongoing, sort of, preventative care, or management, through the integrated care system? So, they have an MDT every month....we've been in every GP practice with the community matrons or social workers, and the various other people...surrounding the patient, and anyone can propose a patient, but it mainly comes from the GPs, as to how they're going to manage these patients. (Site 18)

In one area, a pilot involved the collaboration of practices and care homes to use tools within their locality before MDT discussion and intervention; interventions included decision making on Anticipatory Care Planning, and interventions by community-based matrons who liaise with primary care. In two areas (Sites 1 and 7), there were initiatives to recruit third sector volunteers to identify patient need and link patients to appropriate services. In Site 1, for example, Age UK were involved in assessing patients identified by practices as at high risk. Follow up would then be based on managing those patients or referring on to 'social prescribing' including a befriending scheme, to medication reviews by pharmacists, or to a frailty service. Patient intervention and / or monitoring was often adopted by non-GPs such as community matrons, practice nurses, care home staff or other community-based teams.

For example, at Site 8, practices worked directly with community nurse teams, to set up the care co-ordination models for these patients in preparation for deterioration in their clinical condition. In Site 18 care plans driven by practices and community services were drawn up for the most vulnerable adults. This patient list would be reviewed regularly and a programme was setup to prescribe social interventions in an anticipatory way. In Site 17, highest risk tier patients were managed by complex care teams. For the next tier of at risk patients, enhanced, primary care-based teams (including 'health coaches', musculoskeletal health professionals and mental health professionals) were formed to input into their care.

One CCG opted not to be prescriptive in how practices should manage their tool and patient list, thereby giving freedom to implement the tool use as they saw fit e.g., tool used to identify at risk group, then patient intervention done on an ad hoc, opportunistic basis on attendance at the surgery.

Common to many of the initiatives building on EARS was their short term or exploratory nature. Nine sites were explicitly using EARS in relation to pilots in a cohort of practices, with the implication that success may lead to further scaling up of the initiatives.

There's I think 16 Neighbourhood Teams and there were two or three chosen as Trailblazers to try and kind of get to grips with these issues. These pilots started in June and ran for three months. There is supposed to be a report coming out. (Site 5).

Well, we're just piloting it. Our practices across the city are coming together - we're testing it with...four practices within a grouping, combined that with some MDT work, so they're running the eFI to identify patients; also identifying patients within RAIDR, but then we're taking that a step further in carrying out MDTs within care homes. We'll start evaluating what that's actually telling us. So, has the eFI given us any different information to what we get from RAIDR, and is the outcome for the patient any different? So, we've got a bit of probation work to do on that. Then the idea really is: if it is proved useful, then we're gonna roll that out across the city. (Site 8)

Even in those sites where EARS had been in place the longest (e.g., Sites 13,15), there was little sense that use had become routine. The respective sites were keen to further embed them however, by exploring refinements to the tool, patient selection and models of care.

In describing interventions, interviewees rarely outlined an active patient role; or recalled the policy focus on patient centredness, shared decision making, or self-management. The following examples were therefore exceptional in their explicit acknowledgement of patient input.

All practices have got access and practices can choose how frequently they want to access [it]. The information is updated on a regular basis and it's used to support multidisciplinary working and team working and looking at anticipatory care planning. It's also used to focus our thoughts on individuals at risk of hospital admission

...helping the individual to understand their condition and their situation, so they can make informed decisions, and about improving their health literacy... look at any services that could be in place... to try to prevent unavoidable admission. (Site 7)

And we're now currently starting to work with the community nurse teams...to set up the care co-ordination models. So, it's looking at more of a self-care type of model, so rather than waiting for GPs to call in the long-term condition patients, we're putting their care plans in place, so that patients would know what to do if their issue became exacerbated. (Site 8)

Risk communication (discussion of explicit emergency admission risk in patient/clinician encounters and one of the mechanisms by which the patient centred approach can be introduced), was not a confirmed feature of any intervention – although one interviewee confirmed they had wanted to promote this approach through the use of graphical visualisations of risk over a year...“because it makes who they are, and where they are, tangible” – Site 12. Other interviewees suggested that a less explicit, more generalised approach was more prominent, along the lines of:

We've identified you as being – someone that...we need to make sure we've got a good plan in place for you, should things start going wrong. (Site 8)

I think they [GPs and] the people who are under the care of our, say, integrated teams that comprise sort of practice, community nursing and social work, they probably wouldn't say, “You're high risk.”... but would actually sort of suggest, you know: “We think you'd benefit from this kind of intervention.” (Site 13)

Patient selection

Across the range of interventions risk score or level was rarely the sole criteria used for risk selection but often the starting point. While the national GP contract schemes focussed on the highest risk cohort, it was common for CCG/Health Board led initiatives to use a broader profile and to include a focus on the next level of risk down, in the hope that greater impact could be made with those who may be less familiar or more amenable to intervention.

There's a DES for the two percent. But, an understanding we need to really shift our proactive or preventative care model lower down the pyramid of need. (Site 19)

People who are flagged as the top of the triangle, tend to die within a year or two, and I think the view of some clinicians is that the people at the top are people whose health is so poor and they're so close to the end of their lives, that the possibilities of delivering more proactive care, and reducing admissions, are quite limited. (Site 17)

Interviewees also highlighted an increasing prominence of consideration of frailty in selection processes. There were a number of reports of the dual use of emergency admission and frailty stratification, or of exploring such potential:

Has the EFI given us any different information to what we get from the [EARS tool] and is the outcome any different? (Site 8)

In most sites, the algorithmic data was combined with clinical judgement in determining inclusion in any patient facing interventions.

Barriers and facilitators

As a complex intervention, the implementation of EARS involved many component parts and personnel across the stages of adoption decision, commissioning, development, installation, and use in practice. This complexity is apparent in the factors that were reported to influence implementation (positively and negatively), presented here within the four i-PARIHS constructs of context, innovation, recipients, and facilitation.

Context

A summary of barriers and facilitators relating to the context domain is presented in Figure 30, p172.

Outer context (macro)

In terms of the outer context, the national policy agenda around chronic conditions, multimorbidity and integrated care was prominent in the decision making of CCGs and health boards around EARS implementation:

We introduced [EARS] as part of work that arose from the DofH Long Term Conditions QIPP Programme, and that talked about doing three things: to use risk stratification to identify your population at risk, having integrated multidisciplinary teams to proactively manage people at risk, and systematic self-care. So, we grabbed hold of all three to develop our local model around integrated neighbourhood teams. (Site 13)

...vanguards are going ahead and we're looking at more joining up primary, secondary care, social care. These types of tools should grow (Site 9)

The most referenced of the specific policy developments was the introduction of the case management schemes within each of the UK nations' GP contracts. This determined a specific set of tasks, financial reimbursement to general practices; and a dedicated timeframe for EARS use – prompting further exploration in those sites without a tool or where availability was limited. In most sites tools were already available having been commissioned, but over time these were increasingly supplemented by those embedded into the clinical IT systems by those suppliers. The result was that the GP contracts provided an additional stimulus for EARS use at practice.

So, financially, was an incentive to practices to demonstrate they were doing some form of risk stratification, so without that financial 'carrot' I don't think we would've got the level of use we did have. (Site 20)

Although the GP contracts was reported to have prompted an increased in use of tools, prior use varied across sites, and it was apparent that where local services or approaches had

been developed, these contrasted, and at times clashed with the specific requirements of the national enhanced services. One interviewee described the emergence of the national Enhanced Service as ‘*unhelpful*’ (Site 17) as practices focussed on that rather than a “*more ambitious*” locally developed care planning approach the CCG had introduced.

Broadly the right idea but our view was: we shouldn't be focusing on the top half a per cent who are the very high at risk population, because the evidence is that you're gonna have a better impact with people at high and moderate risk. So it meant that practices were focusing energy on what we thought were the wrong people. (Site 13)

We were starting to make some progress and then the DES came along and said, you know, “Well, actually, all you have to do is pull off your two per cent, you know, write a one side of A4 care plan, which doesn't really need to be person-centred in anyway, and then stick it in the file, and claim your 54 pence, or whatever it is, you know.” It's a disastrous approach really to trying to do anything useful in general practice to try and implement it through a national contract...because whatever's been negotiated has been hammered out between a bureaucrat and a trade unionist. (Site 17)

Because EARS implementation and use was often an ongoing process over a number of years, it was impacted by structural instability and organisation changes. This was particularly the case in England where CCG's and CSUs were subject to various mergers and reconfigurations, with knock on effects on staff and on practice systems.

Business Intelligence was just batted around like a ball. That's why we ended up with four (practice clinical) portals, so certainly, in our area. The changes in commissioner landscape were hardly helpful. And we're all gonna merge up now, aren't we, with other CCGs, I would imagine in the next couple of years. (Site 10)

We did have big issues, as I say, with the previous tool, this combined predictive model, because it – it was something that we got from a local commissioning support unit that then disappeared and so there were loads of technical issues with it, the system was frequently down, so we've lost a lot of credibility on the use of this sort of risk stratification, amongst practices. (Site 13)

Many of the interviewees acknowledged the challenge of putting in place appropriate information governance (IG) arrangements. This was particularly the case for those sites (often early adopters) with systems that required transfer of (anonymised) data from practices to suppliers or regional entities such as CSUs, or where linkage of primary and secondary care data was sought. Solutions had rarely been quick to overcome, with a considerable back and forth between the CCG/health board, suppliers and concerned practices. Overtime many sites had worked through technical solutions and reassured most practices, aided in part by the Health and Social Care Act 2012 focus on IG for primary care risk stratification. But IG challenges remained for inter-organisational working, and the same Act received criticism as a barrier to integrated working approaches reliant on data sharing (such as in MDT working), and other secondary uses of the data, such as research.

I guess we certainly find – well, it can become a barrier if you – particularly, if you're looking to get practices working together and around MDTs. “Can we talk about this

patient by name, if we've got other people in the room from a different practice, or, just other clinicians?". (Site 8).

So, the CCG can see the risk stratification, the practice can see the risk stratification data, but, according to this new data-sharing agreement (H&SC Act 2012), the data cannot be shared with social care, for example. And it cannot be shared with universities, so we can't do any evaluation or research currently – using predictive risk data. And that's also stopped our development in terms of our vision for putting together a whole suite of predictive risk tools across health and social care, including eFI. That's all stopped because NHS Digital are saying, "We can't share data with anybody." (Site 15).

In general, IG issues were a hurdle to overcome for many CCGs and health boards, with the issues especially prevalent prior to the GP contract and where use of data was proposed outside of practices or with non-practice staff (e.g., in MDT scenarios). One of the two sites that did not have a risk tool in use at time of interview (Site 5) had attempted to introduce two EARS tools, the first an in-house locally developed tool, was abandoned due to an inability to resolve IG for the data flows. The second attempt involved an integrated care joint venture across a number of providers (primary and community services and secondary care). It also encountered IG issues, but ultimately failed due to the collapse of the partnership itself.

Inner context - CCG/health board (meso level)

As we learnt in relation to rationale for introduction, most interviewees confirmed their organisations were keen to introduce EARS as a resource to support improvement that aligned with the strategy agenda around emergency admissions, multimorbidity and preventative care for vulnerable patients. It helped that many organisations had introduced staff roles (practitioner roles such as community matrons but also leadership roles), projects and structures that responded to these national priorities.

I am a GP member of the governing body, and the clinical lead for proactive care and prevention, and the Primary Care Integration Neighbourhoods which is, essentially, the piece of work that is looking at long-term conditions, frail and elderly, supporting – in the community, encouraging self-management, care planning, all that sort of stuff, and preventing hospital admissions. (Site 5)

As illustrated in Table 26 (p164), EARS use was aligned with a range of local services and initiatives, with some already in place and others developed contemporaneously or prompted by EARS introduction. These included structural changes at the multi-practice level, such as the emergence of GP clusters, neighbourhoods and localities, and other attempts to integrate care across settings and professions – such as multi-disciplinary team working. Common to all of these developments was the opportunity to incorporate novel approaches (such as EARS use) in finding new ways to address the population's health challenges.

So, that's why we did it, it was to underpin our road map towards integrated working and developing multidisciplinary teams across health and social care. (Site 16)

That's the strategy and that's the process we're trying to – you know, really engage and involve our GP practices and our neighbourhoods, which are teams of GPs, social care, community and district nursing services, the voluntary sector. And saying, "How could you work differently, together – to do something differently for this group of patients?". (Site 19)

Some interviewees reflected on their organisation's role as purveyors of innovation and quality improvement. Consequently, there were processes, staff and structures already in place to engage with practice staff and support implementation. These various ways in which EARS was aligned helped create organisational contexts that were broadly receptive to its implementation and permitted the necessary commitment of time, people and financial resources to facilitate change.

So we commissioned – we've put a lot of extra investment in general practice over the last five years, in the form of our GP specification, and the practices are incentivised to go onto the system – to understand who's admitted to hospital, and then take actions to try and prevent future admissions. (Site 10)

Despite an overall commitment to innovation, there was a degree of caution and frustration over the sheer number of initiatives that their organisations were responding to.

General practice suffers from a plethora, a jigsaw puzzle, of initiatives and so it's really hard for practitioners to see the wood from the trees...the idea of predictive scoring has just simply been lost under the tidal wave of initiatives. (Site 17)

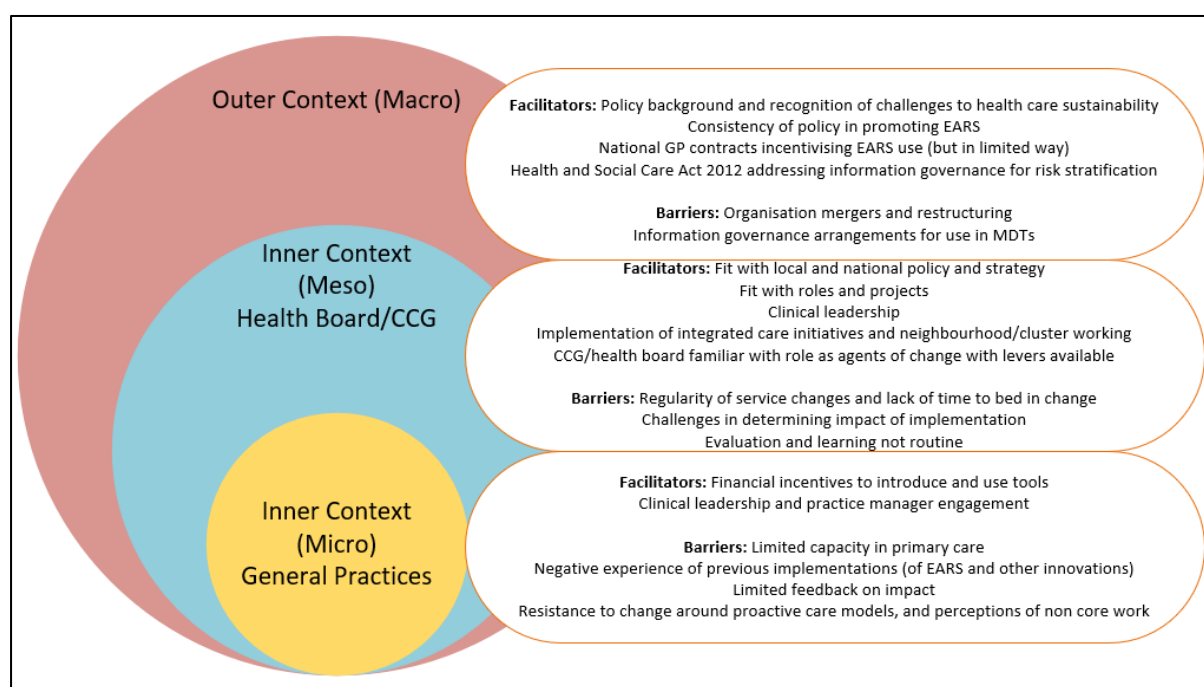


Figure 30: Contextual factors affecting implementation of EARS

[Created by Mark Kingston in Microsoft Visio 2023]

Inner context - Practice (micro level)

The organisation priorities of individual practices at times clashed with the CCG/health board, not least in the ambition to introduce innovation and change. In essence, the main point of difference was around the delivery of standard care, or as three separate interviewees (Sites 5, 8, 10) described it, doing the “day job”. Closer inspection reveals two interrelated and recurring themes that presented as barriers to the implementation of EARS in particular, and to changes in primary care more broadly. Firstly, what might be deemed ‘the busyness of the business’ of primary care, and the associated challenge of introducing changes into that environment. References to a lack of capacity in primary care to engage with new initiatives (even when people might wish to) were prominent and are typified in the comments below:

The main problem from a primary care point of view would be the time and capacity in primary care to actually do this work... Because primary care is under so much pressure, it's just not a priority. (Site 4)

And I think – well, the practices, on the whole, they're so busy doing the day job and just fire-fighting constantly, that something like this is always seen as a bit of a luxury, isn't it? (Site 8)

Secondly, there was a distinction between the perception of what was and wasn't routine care. A focus on proactive, preventative care was not always felt to be part of the core remit of general practice, in part because of the pressures of dealing with existing workloads; but there were also indications of a need to support a cultural shift from demand led or reactive care:

And to take time out to look at it [EARS and associated interventions], they don't see it as an operational arm of the practice. (Site 8)

Introducing tools like this can be a big change for people, and in particular, clinicians. It means they'll work in a very different way. (Site 6)

I'd say this is one of those improvement projects, where the attention is on the tool rather than on creating the right culture, context and climate, and making sure that people have got the skills to use it, too. I think, as in many QI projects, we've been blinded by the attraction – attractiveness of the shiny new tool. (Site 1)

One of the CCG/health board responses to the barriers around introducing change was to provide practices with financial support to encourage their use of EARS – typically for MDT or practice-based care planning. This was reported in around a quarter of sites and was deemed influential as a mechanism to promote initial use.

The practices are incentivised to go onto the system... to understand who's admitted to hospital, and then take actions to try and prevent future admissions. I don't think if we'd not had our GP specification, that we would've really got [much uptake], we would've got your usual ones (practices/GPs) who are really good at doing stuff, but you wouldn't have got the others looking at it. (Site 10)

A contextual barrier at practice level related to the consequence of failures or challenges in the implementation of previous innovations, and particularly digital health solutions. One interviewee referred to a history of NHS innovations that had been introduced and then withdrawn. They also provided an example from their former employing CCG where a regional EARS tool had been developed, after considerable development, engagement with practices, and modification.

It takes a lot of time and effort to persuade people to take on this change. And then what happened to us as commissioners, we started to make progress, we implemented the BUPA Health Dialog tool, then made significant changes, and I believe they pulled out of the market. It was commissioned across the West Midlands. So as a small CCG, we had no say in the decisions really. (Site 6)

Innovation

Clarity

A common theme was that despite the consistent policy support, there were fundamental evidence gaps, and limited guidance (evidence based or otherwise) on the best approaches to using EARS tools to support patient care.

Well, I think the evidence that they work, and they work better than rules of thumb. That would be my first thing. And then the second thing is...have we streamlined the process and have we got the – the right people working together? And then the third thing is: Have we got the right population? Are we picking out the people who are there for maximum benefit, as far upstream as possible? (Site 18)

This intervention uncertainty was recognised as a weakness when implementing EARS and primary care, where a strong evidence base and clarity of purpose were deemed valuable. This background resulted in a great deal of uncertainty and inconsistency at CCG and health board level about the role of EARS tools, and the mechanisms by which positive impacts could be achieved.

What we haven't been able to present to the providers is a coherent narrative about how we think that services can be improved. In the UK we have this idea that case finding and predictive tools, and case management, would be a good thing, and would lead to beneficial results, and we haven't been able to prove that's the case...So, in my mind, there's a whole coherent jigsaw puzzle of different initiatives that all relate to development of person-centred care, and –, actually, in practice what you get is a e-mail bulletin once a week, and it's got five or ten things saying, "please can you do this. Please could you stop doing that. Please can you make sure you report on this." And every week that comes out, and every week it's got different stuff in. I don't think we've been able to provide a coherent narrative about where predictive risk scoring falls into that. (Site 12)

Okay, it's not just screening someone, it's thinking: Well what does that mean for them? And what does it mean for a practice or a service, in terms of how it needs to respond and work with somebody over a period of time? (Site 9)

Consequently, some areas reported that they encouraged uptake of EARS tools in general practices as an additional resource but without a specific steer, mandate or incentive for use. Typically, this approach had prompted some initial exploratory use at practice level, but was not deemed likely to lead to sustained use.

A couple of years back, the practices were as able as we could get them at that stage, to be able to report wider use of risk stratification. But, because we've never quite got our heads around what and how, and making sure that that is the message that we use, it means that it isn't something that's embedded in any element. (Site 8)

Adaptability and Trialability

As noted earlier, many sites were keen to explore localised models of care that use EARS data; tailoring its use therefore to fit with local systems and processes which were initiated or adapted accordingly. Thus the EARS innovation was regularly adapted, with a variety of deployments and interventions as presented earlier.

Whether across the whole geographic area or in practice clusters, it was typical for there to be an element of trialability in the deployment of EARS, often reflected in a non-committal approach from recipients. This reflected the uncertainty about how best to use the tools discussed above; but in some cases this was deemed appropriate and in keeping with use within NHS new care models, and other similar national innovation programmes – such as Vanguard (e.g. Site 17), Pioneers (Site 3) or Chronic Condition Demonstrators (Wales) (Site 4) or more local initiatives – e.g., a Trailblazer programme at Site 2. Overall, there was a degree of acceptance that EARS tools were a relatively new or novel innovation, which had encouraged adoption decisions and use at practice level.

So, I think there was, you know, quite a strong push to say: "Come on folks, this is the future. You know, you need to do this." And I have no doubt that that was successful in actually getting people to – in practices, to use it. (Site 17)

... but that this was not necessarily a pathway to sustained use:

I'd say this is one of those improvement projects, where the attention is on the tool rather than on creating the right culture and context and climate and making sure that people have got the skills to use it, too. I think, as in many QI [quality improvement] projects, we've been blinded by the attractiveness of the shiny new tool. (Site 1)

To address the uncertainty, some sites were monitoring impact, typically to inform local decision making rather than the 'bigger picture'.

Well, we're just piloting it at the moment. So it's only four practices within a grouping, but what we've done is, we've combined that with some MDT work, so they're running the eFI to identify patients. Also identifying patients within RAIDR, but then we're taking that a step further in carrying out MDTs within care homes... during that time, we'll start evaluating - has the eFI given us any different information to what we get from RAIDR, and is the outcome for the patient any different? Then the idea really is: if it is proved useful, then we're gonna roll that out across the city. (Site 8)

A consequence of the 'trialability' approach to implementation was that many of the EARS interventions were short term, with longer term commitments of resources subject to further knowledge, experience and funding, all of which influenced the respondents expectations for longer term tool use. Often this 'evidence' was collected locally as part of a quality improvement approach centred on feedback from primary care staff and experience as users of the EARS tools. Positive feedback helped to promote use, especially when coupled with positive data, even if it were preliminary or anecdotal:

The GPs in this, you see, were sceptical, and needed a bit of persuading, because they were just saying that it would cause more work, and then they found it didn't. And there were some early evidence that, actually, the home visits were reduced and there was more telephone contact. So the shifts of work changed, and – in this cohort, compared with the control cohort. So that was small-scale figures, early on. (Site 1)

We have shown looking at the data that anticipatory care planning can be a useful intervention that reduced the risk of hospital admission by between 20 and 30 per cent. (Site 7)

Many sites described getting anecdotal feedback from users but there was little understanding of the local impact of EARS introduction, or associated initiatives, on patient care or outcomes. But this was something that was deemed important, particularly in longer term decision making.

We've got to demonstrate a return on the investment on anything now...as long as the system is demonstrated to be value for money – the potential number of avoidable admissions we can successfully avoid, compared to the cost. (Site 20)

Its' got managerial support here for the time being. Without evidence (in future) it is difficult to justify it. (Site 1)

Overall, references to data were scarce and few reported formal or externally led evaluation work. A number of challenges to undertaking evaluation and to observing results were put forward, including:

- the challenge of determining impact on outcomes such as hospital admissions or costs due to contamination from other initiatives with similar ambitions;

When we look at the American Primary Care Pioneers...one of the reasons they're really successful is they have a really strong proactive case management approach, based on data... they can demonstrate a reduction in emergency admissions as a result and yet, somehow, we can't. And I think, probably, the reason for that is that we have such an accretion of projects and initiatives and so on, in the NHS, that it's really hard to separate the signals from the noise. (Site 17)

- information governance restrictions to using risk stratification data for evaluation (i.e. for purposes other than direct care);
- limitations due to the time initiatives take "to bed in" or to be evaluated properly;

- a lack of evaluative skills within organisations to support robust decisions.

Despite these challenges there was a desire to explore outcome data – particularly emergency admissions data, and many respondents acknowledged that further evidence (research as well as local data and experiences) over time would likely define future use of the tools going forward.

We were waiting for the PRISMATIC trial to report ...[it] would have more robustness in its evaluation than ours. (Site 2)

Source of the innovation

From the interviews, I identified 13 different EARS risk tools in use, with their sources a notable point of difference. Nine sites had introduced EARS tools that had been developed on a national or regional basis, including SPARRA and PRISM in Scotland and Wales, and RAIDR in England (which originated from the North of England CSU) – see Table 25. .

These national and regional tools were typically preferred to commercial alternatives as they were perceived to address the technical requirements while offering simplification of the sourcing and procurement process as well as shared ownership and promotion across a wider network (i.e., a further contextual driver). Often these regional models were available without direct cost to the CCG, increasing their incentive for adoption. Where regional or national tools were not used, commercial systems such as the Adjusted Clinical Groups system were prominent. Reporting a desire to introduce anticipatory care planning, one site in Wales (Site 1), with no funding to support a commercial solution was supported by an NHS fellow who developed a bespoke, local tool.

Some sites reported additional complexity due to having different clinical system providers across GP practices in their area – a common occurrence. So for example, Site 19 had purchased a license to use the QAdmissions EARS tool for its EMIS system practices, but this was not available to practices on SystmOne who were using the electronic Frailty Index (eFI) as an alternative. Some other sites had managed the issue of different clinical systems by using separate clinical portals to host EARS (and other tools), although this also required interoperability obstacles to be addressed.

At least two sites had experience of tool suppliers withdrawing their products after lengthy development and implementation processes. This had influenced one site to abandon EARS tools entirely (Site 6).

It takes a lot of time and effort to persuade people to take on this change...we started to make progress, we implemented the [EARS] tool, then made significant changes, and I believe they [tool supplier] pulled out of the market. (Site 6)

And we'd made an awful lot of work, and when you make changes and persuade people that this is a good thing, and then you change it, when you bring something new along, there is a – they're even more resistant to that change. But, as a commissioner trying to make that change happen for a second time when it failed the first time, is really, really difficult. (Site 10).

In the absence of a satisfactory commercial (or regional) tool Site 10 doubled down to develop a new tool within their organisation, a very different approach to facilitating EARS access for practices. They undertook a review of the market including performance data, before deciding to use the Wales predictive model (PRISM). They then validated the risk model with their own population data (finding it performed better than the benchmark) before developing a front-end for users to access within an existing clinical informatics dashboard. The approach provided the CCG with increased confidence in the model and reinforced their organisation level commitment.

Confidence in risk tools and underlying modelling

The implementation of EARS was not a static or one-off event. Implemented tools were often subject to refinements, typically but not always improvements, as systems and technology developed, and as users fed back experiences. Many interviewees reported that at least some users in their area lacked confidence in the modelling of the tools – both before (i.e., based on principles and beliefs), and after their introduction (i.e., based on user experience). Table 27 summarises some of the issues identified in regard to the models and include: reservations over the quality of the coding and timeliness of data included in the risk model; doubts over the appropriateness of the weighting of some variables, especially secondary care data; and the impact of data lags (the time from events to their inclusion in a new risk calculation).

Although many sites were piloting specific care models building on EARS data, the same approach was rarely taken to the introduction of the EARS tools themselves, with little indication that EARS models themselves had been tested in a subset of general practices before wider implementation. Indeed, most sites had committed to a full organisation wide roll out rather than a staged approach – offering the innovation as quickly as possible to as many practices as possible. In some cases, it was only after full introduction that fundamental issues were identified, with important implications for longer term user goodwill:

When we took on the [EARS tool] we believed we were getting a fully working operational system. And, when we used it, we started doubting some of the outputs from the tool. And so there was some work done, with our CCG working with the third party supplier, to check the algorithms, and tweak those algorithms to mean that the outputs were more in line with what our primary care colleagues were expecting to see

in the list of patients. Unfortunately, confidence in the system had been knocked. So, to recover that lost prestige of the system has been a bit of a struggle. (Site 20)

Many sites had been on a similar journey, with tools refined or improved over time; but at the expense of a hardening of resistance to the tools, making it increasingly challenging for CCGs/Health boards to encourage use of new versions.

I think people who used the old version – until they see and understand the new version – will be put off by using it. (Site 9)

they found [using previous EARS system] the data was so out of date, it didn't tell them what they wanted it to, or, just wasn't available, so we've had to go back three steps with this system that includes risk stratification. There's a lot of repair work to be done - a lot of practices sort of go, "Hmmm, yeah – not mad keen on it." (Site 13)

Conversely in the Welsh sites, roll out was more cautious and limited to testing sites only.

Table 27: EARS Model and data issues reported

[Created by Mark Kingston in Microsoft Word 2023]

Aspect of model	Indicative Quotes
Variables and weighting	<i>Oh, this is Mr X, he's – why is he up here? But then he only gets up there if he's been in hospital. Because that's the way the risk tool works, so it's sort of like it's – giving them lists of patients that they already know about. (Site 18)</i> <i>We had a simple risk stratification tool that was developed within the NHS by NHS Devon, which we used up until last year for a couple of years. However, the weightings of the intervention done in primary care versus secondary care, did not seem very accurate. So what it used to do, it used to take much more notice of what happened in hospital care, and not enough notice of what was happening on consultations in primary care. (Site 20)</i> <i>GP's have decided its not useful, they can pick the patient out themselves more accurately, or more readily than a risk stratification tool. ...When someone's gone into hospital and come out there's] a flurry of activity around the patient, then two months later the risk prediction tool comes up, and this patient's move up the scale – the risk prediction tool is a couple of months behind. In a sense the profiling needs to be predicting people who haven't had a hospital admission yet. (Site 18)</i> <i>We found anomalies (in previous EARS tool) where people have had loads of outpatient activities, appeared as pretty high risk, and you knew that they weren't really. Also it picked up people who had challenging mental health conditions. (Site 13)</i>
Impactability	<i>I think the risk tool...is perceived to be a very good predictor of mortality...[but] at the top of the triangle actually are people whose health is so poor that the possibilities of delivering more proactive care, and reducing admissions, are quite limited. (Site 17)</i>
Data lags	<i>GP's have decided its not useful, they can pick the patient out themselves more accurately, or more readily than a risk stratification tool. ...When someone's gone into hospital and come out there's a flurry of activity around the patient, then two months later the risk prediction tool comes up, and this patient's move up the scale – the risk prediction tool is a couple of months behind. In a sense the profiling needs to be predicting people who haven't had a hospital admission yet. (Site 18)</i>
Data quality	<i>We know that we've had coding issues- certainly in secondary care (Site 18)</i> <i>You've got a female with a male condition, or a male with a female condition. So, coding anomalies, and it can pull up those and again, it would give the practices their list of patients that they could then go in and change that, and make amendments and things. (Site 14)</i> <i>You're relying on a system to pull the information for you and – there were, there was some feedback around, they'd run the tool, but actually, from their soft intelligence, they're missing certain patients, or this patient is no longer living in (area)for example. (Site 11)</i>
Data extraction	<i>Yeah. I suppose all clinicians getting the (EARS) data on an ongoing basis... I thought that was how to engage the practice managers, because – a (EARS tool) data purge can be quite clunky. And it's not</i>

	<i>immediately intuitive to a lot of clinicians, and it also takes some time – that would be one of the impediments to people using it. (Site 7)</i> <i>Also, we were told when we took on the system, that there would be an automated data extraction solution, so that data could be sucked out of primary care systems remotely. We were told that would be sorted within a matter of months. We kicked off a project with (supplier) to get that process set up, but then it stalled. Not due to the CCG's input, but due to (supplier) input and, at the moment, we still don't have that automated data extraction. What happens now is, as before, (the supplier) contact the practices individually, book a time with them, and then the practice manager has to log onto their system and manually do an extract...the practices found that a big nuisance...it can take up to two hours. (Site 20)</i>

Sites were at different stages of implementation of tools, and it was common for sites to have had some technical challenges along the way that affected the availability and functionality of tools. For example, a technical barrier, especially in early adopting sites, related to the need for practice staff (typically a practice manager) to have to intervene in a series of manual tasks to upload or extract data from practice systems for the risk stratification. In one site this routinely took up to two hours to complete each month. In most cases, as technology systems developed the data extraction process was automated. Similarly, there were other reported improvements over time, such as to the quality of the underlying data and coding, an important factor in user confidence. A by-product of EARS use in one site was exposure to and flagging of anomalous data within the tool – based on errors within the source (practice data) – that could then be corrected – see Table 27.

Usability

The functions that the tools offered varied in line with the type of EARS tool supplied to users (type 1 – spreadsheet shared with practice, type 2 – interactive dashboard focussed on EARS data, type 3 – broader analytics platform of which EARS only a part). Those tools that stratified for emergency admissions alone benefited from simplicity, and clarity of purpose; whereas those that offered other stratified data (e.g., future costs or prescription use) added richness of data, but at the potential expense of additional complexity.

I don't think it's clear how you do use it. I think we're given loads of information, and there is loads in there, and that's why I've tried to do these shortcut reports that give them some steer really from a proactive level. But, then, I don't think there's an awful lot after that, that then says: "And with this, here's what you do with it". So I'm writing these reports thinking: Oh, well, I should I sort by A&E attendances and what order should I put that in, and the case management report, what's the best order to put those patients in? And what would they do about it? So, patients who are on a number of medications – what do they do about it? I don't think there's an awful lot to support that, so in the end you are just left with loads of information. (Site 9)

However, while interviewees recognised the potential of richer data, particularly for wider, area-based population health analyses by CCG or practice networks, individual practice use was driven more by specific tasks and uses, and therefore ease of navigation to the

information they sought was of prime importance. Thus usability must be seen in the context of how and where users wished to use it. At the time of interviews, this was primarily to support identification of patients at high risk of hospitalisation within the practice or within MDT sessions. However, the ease of navigation was affected by a range of reported usability factors, that affected whether or not tools were used, or delayed their use:

- Access arrangements - many tools required specific arrangements to govern user access, including user registrations and passwords which some struggled to recall.
- System availability – while most tools ran without issue, slow website speeds and systems being down were occasional, but important frustrations.

For individual practices it, you know, there's a bit of effort involved. And, you know – and when they were – experiencing those technical difficulties, it just makes them a bit less likely to make the effort. (Site 13)

- System complexity – most tools were reported to be largely intuitive, or required little training, but some of the Type 3 tools with more data/options required additional exposition.
- Tool access location – most tools were separate from the main clinical systems, and not interoperable. They often required additional steps to access, and to compare with patient notes and other/routine practice data.

They found it can be cumbersome when they were trying to identify people and then look at them on the clinical systems. So that was where the time difficulties came in for practices, that they were finding it – and they were having – they were arranging a meeting, but not getting through many patients, because of – because it was quite time-intensive. (Site 3)

What we would like to do is, we would like to have the SPARRA, SPARRA information and the SPARRA risk score as something that would be updated and visible on the patient's screen when you're in a consultation mode. (Site 7)

Fit with practice

EARS was largely welcomed as a technical solution to the challenge of identifying patients for closer consideration and potential follow up or linking to local services – something that could “make their job easier or more streamlined” (Site 11) and provide “some assurance that they're actually focusing their energies on those people that need it.” (Site 13).

When they have their MDT meetings in the practices, they would use information from it and their lists, to inform the discussions on which patients needed discussing, rather than just those that they absolutely knew about, so it was highlighting patients that they weren't aware of. (Site 14)

For most interviewees there was widespread recognition that tools provided a relative advantage compared to other means of patient identification (such as clinician led selection). However, when the tool did not meet expectations of a fit with practice, the CCG/health board often played the role of mediator between practice and supplier – as in the case of one site with a Type 3 EARS tool, which sought adaptations to their tool as it had a proxy

measure (future resource use – a default in the US) rather than a specific emergency admission risk (Site 9).

The tool didn't work in the same way as it does now. It didn't have the risk of emergency admission in there, it just had risk of future resource use, so there were limitations about the lists that was bringing out. But practices very quickly were put off the tool really, with that...it brought out patients that weren't relevant really. High risk patients would be patients who were pregnant, for instance. (Site 9)

Interviewees reported a positive correlation between EARS use and local and national initiatives – but emphasised that clarity of task was important in this context. Consequently, the specific nature of the requirements of the Enhanced Services positively (and the direct link to funding) impacted clinical use of EARS.

That's when practices really started to use it, because they set up a shortcut report that they could literally just click one button and get that list off. (Site 9)

There was however an awareness of the distinction between meeting the requirements of the Enhanced Services, and of the associated funding, and meaningfully impacting patient care.

The main thing is that people keep saying, it's all very well stratifying risk, but what are you going to do with all these people you've identified. (Site 4)

(The Enhanced Service) talks about producing care plans, but that was ostensibly just the practice doing a bit of a tick list, rather than a collaborative [with the patient] care plan, and also for us, it didn't mandate the use of multidisciplinary team meetings. So, from a sort of a risk tool point of view, it got people to use their risk tool, but it kind of missed the point. (Site 13)

Although there were reservations about the value of the national Enhanced Services, and a focus on processes and record keeping, the relative clarity about initial next steps and what to do with the risk profiled data, contrasted with other more exploratory approaches where a degree of uncertainty over what to do next (after risk stratification) was common, and part of a bigger debate about supporting vulnerable patients.

Okay, it's not just screening someone, it's thinking: Well what does that mean for them? And what does it mean for a practice or a service, in terms of how it needs to respond and work with somebody over a period of time? I'd be really interested in that sort 'So what?' question. So it's when people use screening: What difference does it make in terms of what happens to an individual patient, or how commissioners might think? So, rather than, you know, just about: Do you use screening – yes, or no? It's: Okay, well what does it mean? (Site 13)

Facilitation

In terms of EARS implementation, the role of facilitator was undertaken by one or more CCG/Health Board staff supporting all aspects of the implementation, and often acting as a middleman between suppliers (NHS or commercial) and practices – both practice managers

(often in gatekeeper roles) and general practitioners (principal users). To this end, brokerage skills, drive and determination were useful attributes, especially in the light of implementation setbacks. At a small minority of sites this role was supplemented by the support of an external agent from a CSU or commercial supplier – to address specific functions around setup or initial training. In common with the diversity of interviewee roles, the principal facilitators at sites were a mix of project managers, clinical leads and business intelligence staff. Three main and interrelated facilitation tasks were identified in the implementation of EARS. The first of these tasks concerned the supply and setup of the tools, including all necessary steps around commissioning or procurement, enabling introduction of the tools to practices (addressing technical and governance arrangements), and initial training. The second facilitation task was an influencing role, encouraging practices to receive and adopt the tools into practice. The third facilitation task involved the development of new or existing services or models of care to support patients identified through the risk tools. All three tasks were dependent on regular engagement and motivational work with practice staff, and varied in line with local capacity, structures and overall commitment. The following strategies were commonplace to support delivery of these tasks.

- Involvement of clinical leaders

The model of GPs supporting GPs, nurses supporting nurses, is a very effective model that we've used for many years. But the GP leaders in the city, in terms of the CCG clinical leads of various clinical portfolios, understand the value of risk stratification and are keen. (Site 15)

We've been identifying clinical leads who work in the CCG to attend their neighbourhood or practice meetings, to try and help some of the discussions. (Site 8)

So when we set up our original sort of model, we – it was – we had a sort of professional reference group that was GPs, social work and community staff, working to develop that model and, you know, were very sold on the idea of using risk stratification to support identification of patients. (Site 13)

- Attendance at clinician meetings (e.g., protected learning time, communities of practice)
- Attendance at practice manager meetings. Practice managers were deemed particularly important as gatekeepers to other staff and in the context of technical installation/introduction of tools.

We've got to get them (practice managers) – you've got to get them knowing it, and then it'll transcend into the practice. (Site 10)

- Practice visits and online Webex sessions
- Linkage with emerging multi-practice networks (e.g., clusters/neighbourhoods)
- Alignment with national and local services and priorities, and commitment to test new care models (often attracting additional, time limited government funding)
- Financial incentives to deliver care packages
- Training (group sessions or in individual practices) and guidance documents

The extent of CCG/health board engagement with practices varied over time, and while there was a consistent emphasis on getting tools into place, subsequent engagement depended in the most part on whether services had been aligned or introduced following EARS introduction:

I would say – at one point think they were all using it, and what we probably haven't done is sort of re-visited in a way, and sort of promote it. I think if we give them a task to do on it, they'll go and do it. (Site 14)

Site 14 was not the only site to have initially concentrated on tool introduction rather than facilitating use once in place. This had prompted another interviewee to reflect on what implementation success might look like when introducing new technologies in health:

What are the success factors are in actually implementing it in a way that changes clinical practice. So, as you know, we – when we use the word implementation in the NHS, what we tend to mean is a roll out of – You know, a top-down sanctioned roll out of things, whereby all of the people who you want to do something, have been given a computer log-in and an on-line training session, and have been told in a, you know, some sort of forum or meeting, that this is a good thing, and they ought to be doing it. And that's not actually implementation is it? (Site 12)

Encouraging practice take up of risk tools was not straightforward, and there was some resistance to change partly related to the challenging context of primary care, to the failed precedents of other clinical IT tools, and to the uncertainty over effective strategies for use.

You have to do your work [laughs]. Historically, new tools like this have been introduced and then pulled out of the NHS, on numerous occasions. I would never anticipate that everybody is going to be onboard with it. And people never are, are they? It's a big change – it's a big change in the way people work, and it's – I think, sometimes, GPs can see it as something else that they have to do. (Site 6)

Approaches to overcoming this resistance included the use of evidence around the predictive validity of tools; access to performance data from validation using the local population data was reported as helpful in this regard (e.g., in Site 10). Sharing of local admissions data was another strategy employed to generate interest and discussion, although many interviewees identified a need for robust data on effectiveness or impact on practice and patients to support longer term tool usage.

Financial levers were used by sites, whereby monies were available to practices to support their use of the tool – typically for care planning and/or MDT work. Involvement in national schemes such as NHS England's Integrated Care Pioneer scheme, was one approach that helped to align EARS use with new proactive care models, armed with £5 per head of population.

Our CCG has found [pioneer status] very useful and has responded to the practices being involved, with the practices being quite proactive in developing their own enhanced plan and care schemes. So, I think they've been quite enthusiastic about it, and about being part of the pioneer status and the new models of care... we're able to

not just identify people and ask primary care to do something about it, we've got other funded services that can actually do things for people. (Site 3)

However, efforts to encourage use were sometimes undermined by implementation missteps associated with delayed or withdrawn tools, and by users' experience of technical or usability issues.

And I think it's not the principle of risk stratification, it's the experience of using a tool that just wasn't very good. So, that's why we've obviously put a lot of effort into training around why it's quite helpful, and also how it fits with other things as well. (Site 13)

Although many sites responded to user experiences (i.e., by modifying tools), only one formal user testing approach was reported, a rare example therefore of facilitation supporting a critical reflection process. This oversight group was reported in positive terms:

We put together a GP oversight group monitoring GPs about what else we should put in this tool to provide context, at the patient level, to present back to GPs and practice teams, and primary care teams – what other contextual information would be useful to go with the risk score, to it – to inform multidisciplinary team discussions say. We went through a process over a year or two developing this and ended up with the range of parameters that we currently have. So it gives the risk score, and a range of other parameters for each patient pulled from the primary care and the secondary care record. So that was a great facilitator in its uptake because we were developing it through this GP group. (Site 15)

Recipients

The feedback from interviewees indicated that most general practices were willing recipients of EARS, although this was typically on a trial basis, without a commitment to longer term use. There were exceptions however, some were seen as generally less open to innovation and change – especially where the benefits were not clear, or where the task was not perceived as a core function. For individual staff within practices, the interview data illustrates an even more pronounced variation around the willingness to explore innovations such as EARS. While many staff were happy to receive tools, with intellectual and technological curiosity common, further exploration and use was typically limited to a subset more willing or able to engage.

Some practices and clinicians are very happy to start looking for this workload. And some think, there's enough coming through the door already, so we don't wanna be running these proactive reports as such. I've haven't got the time to do that. (Site 9)

Because of increased demand in primary care, and no resource going alongside that...if we had more time on our hands, we'd have more time to do things that aren't essential to our role. (Site 2)

As one interviewee proposed, the array of staff views on EARS included “the evangelist to the cynic, and everything in between” (Site 13). However, it was regularly implied that many individual's positions were not static, but varied over time, being subject to a range of

influences, including the input of clinical leaders and peers, facilitation efforts including training, and any knowledge and experience gained from data and experience with tools.

There is a swathe of GPs that don't buy into risk prediction: some say, "Well, these are all the patients that I know anyway". And then you get other people who've really looked into it, "No, you know what, I found six new patients I didn't realise they were on the edge of something." Then you get a couple of people who are cynical about the impacts of what they can do with the patients despite believing and understanding the risk score. (Site 10)

One of the more common barriers that interviewees identified related to doubts from GPs that risk tools could identify patients at risk of admission better than themselves. Although for some this view was intransigent, there was often scope for opinion change following exposure.

The tools are good and there's absolutely – you can't argue with it really. When they work, they're excellent. I remember going to a practice who were quite reluctant and said, "We know our patients." But we demonstrated the tool and they were really onboard with it, immediately. They were able to recognise the patient they'd identified as high risk, but there was information in there that they weren't aware of. (Site 6)

While most CCG and health board facilitators principally targeted clinical staff, particularly GPs for training and engagement, a minority of users of EARS tools were in fact practice managers, particularly in scenarios where they would compile lists of patients for onward clinical consideration.

Early impressions with EARS tools were particularly important, with problems encountered at this stage having a big impact on recipients' decisions on future use. Given the regularity of initial technical and usability issues, many recipients were reportedly off by these early experiences. This was a source of frustration for facilitators, as, unsurprisingly, some potential users were reluctant to subsequently engage – even with a modified or replacement risk tool.

While financial reimbursement from national or local schemes offered further incentive for engagement (or indeed re-engagement), the availability of other resources to support identified patients, such as NHS or third sector services also motivated users.

Yes, I mean, it's – it – the basic issue is that there isn't enough money in this – the health economy locally, and so – and there just aren't enough community services, and that is the basic problem. (Site 5)

Although initial views were subject to change, as influenced by further experience and facilitation, a fundamental concern for recipients was over the value of the risk information to them as practitioners, and to patients. There was a fair degree of uncertainty in regard to patient and service outcomes following tool use. Most interviewees were cautious about expressing benefits or disbenefits of use – partly due to issues with data and evaluation

noted earlier. A small minority felt that there had been benefits (to date) to individual patients through better targeting of resources and to a general cultural shift towards technology informed holistic and anticipatory care.

I think there's been some positive impact about the way that people think about patients and sort of don't regard people as a sort of homogenous blob. (Site 9)

But this cultural shift was rarely smooth, for reasons not merely tied in to capacity and change management factors (as identified earlier), but to beliefs and values around the core general practitioner role. The use of EARS and an anticipatory care approach was not always in tune with the expectations and commitment of GPs.

In terms of overall added value, most doubted that EARS implementation had resulted in benefits at scale. In the absence of a clear understanding of impact however, it was commonly perceived that clinicians would make their own judgement calls regarding EARS use:

It's like most things, if somebody regularly uses it, sees it has positive benefits for the way that they work and for the patients and how they work with them, they will be supportive of it. (Site 13)

Enthusiasm and forward view

Interviewees reported that the rationale behind the introduction of EARS tools was broadly accepted by recipients. Yet, there were sporadic but influential reports of resistance to the focus on emergency admissions for two reasons. Firstly, because of a belief that this was an overly secondary care centric measure (i.e., a boundary issue), and secondly, because some felt it implied that GPs were referring to many patients to emergency departments – which was in turn disputed. Such positions were, however, amenable to clarification through training and other facilitation processes.

Table 28 summarises interviewees perceptions of enthusiasm levels towards EARS tools and their use in general practice – encompassing both the health board/CCG and practice staff. The table data is illustrative of how enthusiasm was affected by many of the barriers thus far reported, including workload, uncertainty about how best to use tools effectively, and consequences of implementation failures associated with withdrawn tools or poor usability. But enthusiasm was not rigid and uniform and was subject to variation over time in response to changes to the innovation, context, or facilitation activities. Planned future use of EARS tools at each site (also shown in Table 28) reflects a mixed position. Many interviewees hoped that EARS use would continue or be reinvigorated but acknowledged the importance of a range of influencing factors – including the outcomes of local data and evaluation work, integration with multi-practice initiatives and efforts to release capacity through staffing or funding. Fundamentally however, many of the original contextual drivers remain, in terms of

the ongoing population health challenges faced; and the continued efforts to address these through initiatives in primary and community care. Some felt these ambitions would continue to prompt the use of EARS.

Our plan is to develop an MCP, and ultimately in a council care system for the city. And a key part of that would be: How is the system – the out of hospital system gonna be – you know, proactively better manage these people who – particularly if you’ve got a range of long-term conditions, but if they are higher users of hospital services. (Site 8)

We started – sort of almost re-started this journey with the community care teams and proactive care. I still think it’s fairly fundamental to getting that up and running. We’ve got 12 neighbourhoods and only three are live. So, I think, certainly in the next 12 months, the tool will still be – there’ll still be a spotlight on using the tool, and it’ll still be very much pushed. (Site 10)

Table 28: Recipient enthusiasm and future use expectations

[Created by Mark Kingston in Microsoft Word 2023]

CCG / LHB	Enthusiasm for Risk Tool (perception of interviewee)	Planned Future Use
1	Initial resistance from GPs concerned about increased workload but did not materialise. Strong support (health board and practice staff) for social prescribing intervention.	Dependent on further evaluation from pilot in six practices.
2	Initial promotion and support generated initial enthusiasm but waned over time. Lack of integration into IT system reduced enthusiasm.	Concerns about the demand on practices indicate that future use dependent on pressure being taken off general practice.
3	Initial scepticism that tool would add anything on top of clinician’s judgement of at-risk patients. Enthusiasm increased as results observed during use. CCGs feel process has been beneficial and enhanced by good working relationships with practices and by practices developing care schemes.	Continued use anticipated because tools already embedded in practice and extra funding likely to be provided through integrated care pioneer.
4	Largely unchanged over time. Concerns that inadequate time and capacity in primary care to do the work required. Belief that some GPs feel they already know their patients adequately without the need for a tool.	Future intervention dependent on good evidence for the use of tools as well as patient benefit.
5	GPs unconvinced that tools used were generating appropriate lists of patients. Some enthusiastic GPs but most considered their workload too great already.	Planned evaluation of the pilot work of Trailblazing Neighbourhood Teams to determine future use of tool. Anticipation that a tool will be used by integrated community services team liaising with practices to determine individual patient mgmt.
6	Initial reluctance / resistance. But more appreciation of the tool once demonstrated. Frustration shown when tool withdrawn.	Anticipation that risk tool(s) would be used in future
7	Health board maintain enthusiasm but at practice level, lack of awareness of how tool has expanded and improved over time thought to have limited enthusiasm. However, healthcare professionals have increasing enthusiasm when shared.	Continued use anticipated, including within GP clusters to develop anticipatory care plans for patients. Plans to include social data within tool to enhance health and social care partnerships. Hope to develop a more integrated interface to improve accessibility for clinicians during consultations. Want to identify patients who <i>change</i> risk scores - becoming more vulnerable.
8	Overall enthusiasm unclear. Concerns about information governance and workload on practice staff.	Potential for another tool to be used in the future Plan to find evidence for tool use on patient outcome including comparisons between EA tool and EFI tool. High risk patient identification and proactive management with multi-care provider teams.
9	Mixed enthusiasm initially and has waned. Lack of awareness of how tool has expanded and improved over time thought to have limited enthusiasm.	Hope that use will increase as long as confidence in the tool remains high enough. Looking to expand the tool to incorporate wider data and services including for secondary and social care and for MDT work to develop
10	Enthusiasm currently growing although fears that this may wane with time.	Expectation that use will continue in the medium term but may decrease after this. Increased risk tool use anticipated if tools can incorporate mental health and social care into the stratification.
11	Mixed – Practice managers more enthusiastic than clinicians. Tools moderately well-received but lack of confidence in some	Anticipation that tool use will end unless adequately promoted and funded / incentivised.

	aspects. Overall perception that tool(s) have been beneficial but in less tangible ways than emergency admissions.	
12	Limited active engagement – due to lack of managerial support at CCG level.	Anticipation that tool use will end if funding ends.
13	Low practice enthusiasm initially due to technical difficulties with previous model used. Mixed enthusiasm across practices during use.	Hopeful that the tool use will become more widespread and provider driven.
14	Practice managers more enthusiastic than GPs.	Hope that tool use will expand and increase In line with local services.
15	Early resistance because usefulness was questioned. But since more positive	IT data collection platform to be used in order to collect data through multiple formats from large populations. This to be used to compare risk identified to outcomes.
16	Not described.	Local provision of services for dementia patients with difficult to manage behavioural symptoms.
17	Perceived to be low, in part due to saturation with other initiatives and the negative perception of national enhanced service.	Expectation that use would decrease, from low bar. Hope that appreciation for and use of tools will increase as technology improves.
18	GPs not initially enthusiastic - feeling that the tool wasn't providing information beyond what they knew themselves. CCG enthusiastic because of impression that through using the tools, non-elective admissions had decreased.	'Real time' risk analysis, rather than projected risk based on historical data Consideration about how to use the tools and subsequent interventions more proactively, than reactively. Evaluation to see if a change in risk score could be considered a measure of increased risk of hospital admission. Analysis of data to identify what impact decreased admissions have on social care.
19	Some initial concern about impact on pre-existing workload. Interest from practice staff described as varying considerably.	Consideration of how best to manage at risk groups with a neighbourhood approach. Identification of patients who have a high rate of increasing risk and frailty and how best to manage them.
20	Some practices use the tool. Others didn't see it as a priority and had low confidence in the tool because of practical issues with usability. General perception from GPs that the tool wouldn't provide information beyond what they knew themselves. Reduction of enthusiasm over time.	Plan to access a more user-friendly tool with practices able to automate their data extraction. Hope that if funding can be agreed, then the tool(s) can be re-implemented.

Discussion

In these interviews with representatives of twenty health boards and CCG, I found that the main drivers for implementation came from a national policy context, which strongly supported EARS to improve care and address system pressures – chiefly in secondary care. Charged with delivering the national policy direction in their local areas, CCGs and predecessor organisations and health boards adopted EARS as a novel, promising intervention that could be linked with the bigger picture. This meant there were opportunities and support to explore EARS use aligned to emerging:

- *principles* such as integrated care.
- *care models* for chronic conditions.
- *funding* for innovation and new ways of working; *structures* such as neighbourhood, cluster and local authority-based partnerships;
- *staff* roles at managerial and operational levels such as integrated care leads, community matrons and case managers.

There was therefore, a strongly supportive context at the macro and meso levels and this represented a significant factor in decisions to introduce and explore EARS opportunities.

However, one aspect of the policy focus on EARS – that of its potential role in supporting patient-centred care (through for example improved care coordination, shared decision making or risk communication) was largely absent from transcripts, being rarely cited as justification for EARS implementation or decisions on future use.

In terms of the reported implementation experiences, the overall picture presented was not of a uniform, structured and consistent implementation of EARS. Rather, it was fractured and episodic, as sites acquired EARS at different times, and as they worked through the various stages of decision making, commissioning, governance, introduction to practices, modifications, and occasionally, de-implementation or reintroduction. The latter two factors were apparent because of supplier or tool withdrawals, but also due to questionable implementation approaches whereby tools that did not meet expectations or requirements were introduced to practices blind, without prior oversight, testing or user input. Especially in these sites, but true in all, was that rolling out EARS was a significant undertaking, requiring considerable inputs of human and financial resources over time.

The role of individual CCGs and health boards in developing or adapting EARS tools for local use varied considerably, with national and regional influences apparent. Scottish and Welsh sites were largely hands off, with nationally led EARS tool development; but the English sites approach was heavily influenced by the role of regional CSUs, which developed tools and offered these to affiliate CCGs. I found that EARS implementation was rarely reported as a swift and technically smooth process, but there were signs that later tools such as QAdmissions, and the eFI frailty tool (which was used as a proxy for emergency admission risk) appeared easier to introduce, chiefly because they were integrated into (different) clinical systems.

I found that there was considerable autonomy at sites about how they deployed and adapted EARS tools, with local context and decision makers key in this determination. The localised approach was strongly influenced by an uncertain evidence based and the lack of a prescribed intervention to accompany roll out of the tool. At some sites EARS was initially introduced with limited guidance, merely as an additional data source for practices to explore. Over time, most sites however introduced services or processes in which risk stratified patients could be included – typically those at the higher levels of risk. More uniformity was apparent on introduction of the national Enhanced Services, an intervention that relied on EARS tools and therefore perhaps provided the most coherent evidence of a fit with practice, and consistent intervention, albeit process orientated, time limited, and financially incentivised. However, being a nationally rolled out scheme, there was no scope for local adaptation, and for some, the process orientated outcomes

represented a watered-down case management approach that clashed with pre-existing or developing approaches.

Unlike the national Enhanced Services most interventions incorporating EARS did not incorporate all general practices within the parent organisation's remit area. This reflected the widespread use of pilots and quality improvement processes. However, there was a common recognition that determining impact of EARS tools, and their associated interventions was challenging; evaluation skills, methods, funding or data were often lacking. There was little suggestion that this work had already been done. In business terms therefore, there was little understanding of the 'return on investment' in EARS tools. Nonetheless, locally produced evidence, even if not formally produced (such as anecdotal clinician opinions) was perceived as key to decisions over future use. Although further user studies are needed, this study suggests that sustaining EARS use 'on the ground' may be challenging, given clinician opinions reported here including barriers around role identity and capacity for proactive care, usability, confidence in tool outputs, and uncertainty over evidence-based interventions. Although the reporting of user experience elements was common no sites reported patient focussed evaluation work concerning EARS.

Strengths and limitations

The principal strength of this research is in complementing the previous survey to provide further, in depth understanding of the role of EARS in primary care across a geographically diverse range of organisations, decision makers and facilitators. The range accounts, to my best knowledge, for the broadest qualitative study on this topic. Inevitably, a consequence of the scope was that it was limited to individual perspectives in each site, and to volunteers, and it is likely that other stakeholders may have different views. Nonetheless, it is reasonable that the range of perspectives offers the potential for findings to be generalised. It is important to recognise that interviews were conducted at a single point, and thus represent a snapshot specific to that temporal context. A strength is associated with the use of an empirically tested implementation framework provided additional rigour, and the study findings therefore contribute to literature concerning i-PARIHS and implementation science more broadly.

Conclusion

Commissioners at the meso organisation level readily responded to the challenges set down at the macro policy level, with EARS implementation largely driven by these external drivers. This resulted in localised approaches to EARS with considerable variation between sites in terms of tools, commitment, and position on the implementation journey. However, few sites

were able to report a smooth implementation experience. The appetite for EARS beyond (or as a better alternative to) the Unplanned Admissions work was notable, linked to the continued desire to address the population and health challenges associated with emergency admissions. However, there was an apparent disconnect between innovation efforts and research and evaluation, with little sign of patient involvement. These factors may in turn increase uncertainty about the success of EARS or similar approaches and suppress stakeholder commitment.

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Chapter 8: Implementation of emergency admission risk stratification: a multi-methods study of user experience and usability

It's not the principle of risk stratification, it's the experience of using a tool that just wasn't very good. (Commissioner - Interviewee, Chapter 7)

Introduction

Despite largescale investment and implementation of emergency admission risk stratification (EARS) tools we know relatively little about the experience and views of their end users – primary and community care clinicians. Health digital technologies are challenging to implement (Cresswell, Bates and Sheikh 2013), and the role and experience of the end user is a key factor in their adoption and ultimate success or failure (Graham, Kushniruk et al. 2008). Survey data reported earlier indicates that upwards of 39 EARS tools have been introduced into UK primary care (Kingston, Griffiths et al. 2020). These risk tools can be accessed by general practice users through any of three types of user platform:

- Type 1 - a spreadsheet (e.g. original versions of the Scottish SPARRA system) (Guthrie and Kendrick 2006).
- Type 2 - website or clinical system application designed explicitly for EARS (e.g., PRISM) as described in Kingston 2010 (Kingston 2010).
- Type 3 - a population health analytics suite incorporating a range of algorithms, including but not limited to EARS (e.g., ACG) (Sollis 2022)

Based on tools identified in the survey, the predominant tools available to general practices are the Type 2 tools specifically purposed to present EARS data via a dedicated platform or application. They operate within or alongside the main clinical IT system used by general practices. While EARS types vary, so do underlying risk models, data sources and suppliers. Commissioning organisations have a major role in choosing and refining tools and their outputs. Such efforts lend themselves to differences between tools and reinforces the need for evaluators to explore points of difference with users, to inform the wider development or refinement of EARS, and similar digital health technologies.

Recent history is littered with high profile failures in digital health innovations in the NHS. Most notable of these was the UK National Programme for IT (NPfIT). Initially launched in 2002 with a budget of £6.2 billion, it set out to introduce integrated electronic patient record

systems in a top-down approach. By 2011, massively overspent and unsuccessful, it was decommissioned – with the key reasons determined as a lack of “*adequate end user engagement, the absence of phased change management approach, and underestimating the scale of the project*” (Justinia 2017). Following such high profile failures, user testing of digital health innovations is now an expectation of the UK government, as outlined in the latest NHS long-term plan (NHS England 2019). To support this ambition, NHS Digital (the English national IT and data services supplier) has initiated a ‘user unit’ (NHS Digital 2021); working to the International Standardization Organization 9241-210 standard for ‘human-centred design for interactive systems’ to promote and improve user input and user experience study (International Standardization Organization 2019). Despite large-scale government funded development and investment in EARS, and the stated commitment to user input, no formal user experience work has been reported in this field.

I set out to address this gap through a user focussed study following implementation of one risk tool as used in Wales, UK. PRISM (Predictive Risk Stratification Model) was developed by the Welsh NHS, building on forerunners such as PARR and the Combined Model (Wennberg D, Siegel M et al. 2006). The PRISM model has also been adopted into sites in England. Using the taxonomy listed above, PRISM was in the predominant Type 2 EARS category, operating as a standalone software application, accessed through the main clinical portal. Applying a formal user experience (UX) approach, I sought to understand PRISM user (general practitioners and practice managers) views following implementation. UX encompasses user perceptions and responses resulting from the use or anticipated use of a product, system, or service (International Standardization Organization 2009). The approach has emerged as a distinct and burgeoning scientific field which recognises the importance of input from those who interact with a product or service. UX focuses on understanding users, what they need, what they value, their abilities, their limitations and their behaviour (US Department of Health & Human Services [DHHS] 2014). A major facet of UX is usability, broadly defined as ‘*the appropriateness to a purpose of any particular artefact*’ (Brooke, 1996), and in information technology (IT), as the ‘*extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use*’ (International Standardization Organization 1998).

Technologies with good UX design have high usability and are pleasurable to use, whereas health technologies that do not meet the needs of users or have poor usability, create a negative user experience, discourage use of the technology, and affect its acceptability (Harte, Glynn et al. 2014), (Scholl 2014). In healthcare, UX is a ‘high stakes endeavour’, as digital health technologies can assist clinicians in providing efficient, quality care. However, these health technologies can also interrupt workflow, cause delays, and introduce errors

(Yen and Bakken 2012) (International Standardization Organization 1998) (Kushniruk, Triola et al. 2005). This in turn may result in frustrated users, decreased efficiency, increased costs and negative healthcare consequences (Stara, Harte et al. 2018) (Kaufman, Roberts et al. 2006). The pace and tradition in health care limits access to training, increasing the importance of learnability and ease of use – both functions of usability (Rogers 2005). The design of clinical systems should therefore simplify work processes (Rogers 2005).

UX is characterised by the use of multiple methods to explore different aspects of the user experience, such as attitudes and behaviour. Incorporating usability assessments can help learn about user needs, test whether a product is meeting those needs (UK Health Security Agency 2020) and through refinement, improve performance and acceptance of software (Rogers 2005, Frith 2019, Frith 2019). Usability testing may be part of the design process, in advance of release, and can be used for insight and iterative improvement after implementation.

It is important to understand how general practice staff experienced an indicative risk stratification tool in use, from a general and tool specific perspective.

Despite the prevalence of the risk tools, in many thousands of UK practices, to the best of my knowledge, no UX or usability study of EARS has previously been reported.

Aim

To explore the user experience (UX) of practice staff with the PRISM emergency admission risk stratification tool, including barriers and facilitators to use.

Setting

I undertook data collection for this study within the PRISMATIC trial, which had introduced the PRISM EARS tool to 32 general practices in South Wales. Although data was collected as part of a trial, this was pragmatic in nature, with the use of PRISM relating to genuine clinical care, rather than hypothetical use. At the time of the study, the general practices were able, but not required, to use PRISM to support contractual work targeting patients at high-risk of emergency admission (Welsh Assembly Government 2013). This work was part of the Welsh 2013/2014 Quality and Outcomes Framework, a primary care pay-for-performance scheme that rewards practices for delivering interventions in long-term conditions.

Prior to use each practice took part in a training session introducing the PRISM tool and study tasks, with training provided jointly by a GP and a university staff member. Training was aligned with a PRISM handbook, that they also received, which covered access to and use of the tool for patient identification, and a troubleshooting guide. The training materials

were developed in conjunction with a senior primary care lead in the local health board, and a GP (DBJ) on the PRISMATIC study team.

Methods

Methodological approach

I undertook a multi methods UX study, featuring user interviews, survey, and usability test. These approaches provide complementary data and have been identified as the three most widely used UX methods (Lanius, Weber and Robinson 2021). Here I used a validated usability instrument, the System Usability Scale (SUS) (Brooke 1996). In addition, I obtained PRISM user login data from NHS Wales Informatics Service who ran the PRISM ‘service’. The SUS provides a usability score, which can be benchmarked against other digital health technologies, but it does not diagnose usability problems (Sauro 2016). These are therefore explored through the interviews. The SUS is the best known and most widely applied usability measure, as confirmed in a recent methodological review (Maramba, Chatterjee and Newman 2019). It is a ten-item questionnaire administered to the end user, generating a score out of 100, with higher scores meaning the technology is more usable (i.e., user-friendly, robust, easier to learn). It is popular because it is straightforward to administer, has proven reliability, is free to use and has such prevalence that benchmark SUS scores have been published. Sauro’s 2018 analysis provided an average or benchmark score of 68, based on over 500 technological innovations (Sauro 2018). Grades (A-F), adjective descriptions (best imaginable, excellent, good, OK, poor and worst imaginable) and Net Promotor Score (indicating whether a user is likely to recommend the technology) can also be determined to aid interpretation (Bangor, Kortum and Miller 2009, Sauro 2018). By 2013 Brooke wrote in a retrospective article that the SUS had been cited in over 1,300 papers (Brooke 2013). Use has continued apace – the same 2013 article had over 3,000 Google Scholar citations as of May 2022.

Theoretical Framework

Implementing new health care technologies such as risk prediction tools can be challenging (Greenhalgh, Robert et al. 2004). Normalisation Process Theory (NPT) (May and Finch 2009) is increasingly used as a conceptual framework to examine and explore this (McEvoy, Ballini et al. 2014). NPT “*identifies, characterises and explains key mechanisms that promote and inhibit the implementation, embedding and integration of new health techniques, technologies and other complex interventions*” (May, Cummings et al. 2018). NPT fits well within a UX study given its focus on influences of adoption decisions and actions. NPT considers implementation as a process which entails sustained work by those

responsible and suggests four constructs that help us understand how innovation happens in practice: how people understand the innovation and its purpose (coherence); what decisions are taken to use it, based on perceived advantages (cognitive participation); what people do to bring the innovation into everyday use (collective action); how an innovation is reviewed, modified or abandoned (reflexive monitoring) (May and Finch 2009).

NPT was used for the qualitative analysis undertaken in PRISMATIC. Coherence, the first of these constructs, was explored in focus groups with GPs and other practice staff conducted prior to the introduction of PRISM. Findings indicated that staff welcomed the opportunity to use the tool, believing it could help them manage burgeoning workloads and increase the sustainability of general practice. They saw potential both to benefit patients and manage demand on health services but acknowledged that it was being introduced into a challenging primary care environment. Ultimately the participants looked forward to the opportunity to test the PRISM tool in their general practices (i.e. its 'trialability') (Porter, Kingston et al. 2016), (Snooks, Bailey-Jones et al. 2018).

Here I use the remaining three constructs of NPT (cognitive participation, collective action, reflexive monitoring) to shape the analysis and reporting of the practice staff's experience as users of the PRISM tool.

Participants and sampling

I approached the PRISMATIC study leads (general practitioners) at each of the 32 participating practices. All were eligible for inclusion in the survey, with half purposively sampled for interview, to achieve a blend addressing practice size (patient population), geographical spread and deprivation. Invitations were sent via email to study leads or their nominees. Participants provided written consent, having received a study information sheet outlining the research including rationale, aims and expectations (see Appendix 9).

Interviews

I undertook most interviews. Additional interviews were completed by a female qualitative researcher from Swansea University medical school (BAE). Interviews were conducted at a time when all interviewees had had access to PRISM for between 9 and 18 months. In a few practices, the practice manager contributed to these interviews. Interview questions were informed by findings from baseline qualitative work prior to PRISM implementation (Porter, Kingston et al. 2016). They explored use and usability of PRISM, including barriers to use, how it affected practice and patient care, and future use intentions (see Appendix 10). All interviews were undertaken by MRK or BAE at the participants' general practice. With

participants' consent we digitally recorded and transcribed interviews. We made field notes after most interviews.

Survey

We administered the questionnaire through email, as an email attachment, or as a paper version prior to interviews. The questionnaire (supplied in Appendix 11) comprised three sections 1) profile of the participant and their practice (job title, role, practice size); 2) the SUS, which uses a Likert scale of 'Strongly agree [4]' to 'Strongly disagree [0]' as response options for 10 usability statements; 3) PRISM use summary including login frequency and time spent using the tool.

Login data

NWIS supplied login data – specifically the number of times each registered user at participating practices had logged into the PRISM system in the period March 2013 to September 2014. Failed logins were not captured in this data.

Analysis

Interviews

I undertook secondary thematic analysis of the interviews using qualitative analysis software Nvivo (version 12). The analysis built on the previous PRISMATIC coding framework based on NPT, but with a focus on user experience. The analysis approach was guided by the processes outlined by Braun and Clarke (Braun and Clarke 2021). I revised the coding framework a priori to address the user experience elements and made further revisions in response to the interview data recorded in transcripts. The coding yielding 96 codes, with most related to the NPT domains. A colleague (RG) provided critical input into the analysis framework, and supported subsequent analysis, with transcripts reanalysed several times under the coding framework. In analysis and reporting I followed the consolidated criteria for reporting qualitative research (COREQ) guidance (Tong, Sainsbury and Craig 2007). A COREQ checklist is supplied in Appendix 12.

Survey and login data

All statistical tests were performed using SPSS (version 22, IBM, New York). I calculated overall SUS scores of perceived usability using standardised approaches (Sauro 2011), allowing comparisons with published SUS data. Each of the 10 SUS items are rated on a Likert-type scale from 0 (strongly disagree) to 4 (strongly agree), with half of the items reverse-scored. A total score is calculated by multiplying the sum of these scores by 2.5 (possible range: 0–100). I present survey data using descriptive statistics. Where relevant,

the significance level was set to 0.05, with confidence interval (CI) for SUS mean scores determined using normative data for standard deviation (σ) of 17.7 as reported by Lewis and Sauro 2022 (Lewis J & Sauro J 2022).

Reporting

I present interview data followed by questionnaire data. I selected interview quotations to be illustrative and typical of respondents' comments unless otherwise stated. Quotations are identified by respondent role (GP for general practitioner, PM for practice manager), practice unique identifier and SUS score (where available). For example: (GP05 SUS68) represents a comment from a GP at practice number 5, who's SUS score for PRISM was 68 out of 100.

Ethics

This research was conducted as part of the PRISMATIC study, with approval from the Multi-Centre Research Ethics Committee for Wales (reference 10/MRE09/25). See Appendix 17.

Results

Staff from 28 practices participated, with 16 interviewed, and 27 completing surveys.

Interviews lasted 30 to 90 minutes. A profile of participants is provided as

Table 29.

Table 29: Profile of Participants (n=30)

[Created by Mark Kingston in Microsoft Word 2023]

Practice ID	Practice size*	Role #	Age band	Gender	Survey	Interview
1	M	GP	45-54	F	Yes	No
2a	L	GP	35-44	M	Yes	Yes
2b	As above	PM	35-44	M	Yes	Yes
3	L	GP	35-44	F	Yes	Yes
4	S	GP	35-44	M	Yes	No
5	M	GP	55-64	F	Yes	Yes
6	M	GP	25-34	M	Yes	Yes
8	M	GP	45-54	M	Yes	Yes
9	M	GP	55-64	M	Yes	No
10	S	GP	45-54	M	Yes	Yes
11	S	GP	55-64	M	No	Yes
13	M	GP	35-44	F	Yes	Yes
14	S	GP	45-54	M	No	Yes
15	L	GP	45-54	M	Yes	No
16	M	GP	35-44	F	Yes	No
17	L	GP	45-54	F	Yes	Yes
18	S	GP	35-44	F	Yes	Yes
19	S	GP	35-44	F	No	Yes
21	L	GP	45-54	M	Yes	Yes
22	S	GP	25-34	M	Yes	No
23	S	GP	55-64	F	Yes	No
24a	M	GP	35-44	M	Yes	No
24b	As above	PM	55-64	F	Yes	No
25	M	GP	45-54	M	Yes	No
26	M	GP	45-54	M	Yes	No

27	M	GP	35-44	F	Yes	No
28	M	GP	35-44	M	Yes	No
30	M	GP	35-44	F	Yes	No
31	S	GP	25-54	M	Yes	Yes
32	L	GP	45-54	M	Yes	Yes

*Practice size: S=Small (<5,000 patients), M-Medium (5-10,000), L=Large (>10,000). # GP = General Practitioner, PM = Practice Manager

Cognitive participation: deciding to use PRISM

Respondents described how they made decisions about using PRISM, based on its perceived advantages. Many respondents recognised the importance and detriment of emergency admissions, which in turn influenced their motivation to engage in the process.

When you are already ill, you know, that [an emergency admission] is the worst thing. So, that, I think fires me more than anything really. (GP5 SUS 55)

A commonly expressed view was that the use of PRISM fitted well with the requirements of the GP contract enhanced service work targeting those at high-risk of hospital admission. For many staff the use of PRISM to identify a cohort of at risk patients for this work, was the main reason to use PRISM:

It was fantastic because we were able to pick out the patients that the local health board had highlighted for the QOF thing (GP11)

Okay, so during the QPI [QOF] work, we did use PRISM to help inform our meetings, to understand what happened to the 52 patients – ish, that we were looking at, used it as a base for discussions with other team members that attended meetings. (GP8, SUS 60)

Most practices had completed their annual QOF reports at the time of interview, and it was apparent that few were using PRISM outside of this work; with the two elements (of EARS and QOF) closely aligned.

I think once the QOF requirement, you know, disappeared – because it – that's the trouble with the QOF and QPI, they have these initiatives that are just for one year, and then they stop. (GP1 SUS 55)

A few GPs, who had earlier access to PRISM and longer to use the tool, reported using PRISM to support patient care in ways outside of the QOF requirements. They interrogated the PRISM data to understand the reason for a high score or to review specific patient groups such as COPD patients.

...looking at patients that've been deemed high-risk, but not necessarily the highest risk, people that we might be able to do something about. Just exploring the data and seeing if there is anything that we could do to be more proactive. (GP13 SUS 85)

Further motivation (or “pressure”) for the focus on emergency admissions and use of PRISM emanated from opinion leaders in the health board, although this was not necessarily welcomed.

It's entirely driven by clinical politicians. That's what's driven me, and by that I mean the ABMU Health Board, and I'm a little bit cynical because of... That's where I see the pressure's coming from. (GP5, SUS 55)

Collective action: what people did to bring PRISM into use

Bringing PRISM into use involved three processes: using the technology itself; sharing the information it generated with relevant clinicians or teams; and, in the light of this information, taking action for patients.

Experience of using the technology

Experience with the PRISM tool was mixed, although with some reservations, most thought it easy enough to use, once they had access:

I'm happy to use it, it's pretty straightforward, you know, it's technically not that difficult. – (GP10, SUS 72.5)

As far as design and functionality is concerned, I think it's really simple and easy to use, and I'm not the most computer literate person going (GP21, SUS 62.5)

Despite the overall positive perspective, there were a range of technical issues that hampered or precluded use. These included issues related to the reliability of the website platform, with reports of intermittent or variable speed of the website upon which PRISM was hosted:

Once I took – I blocked a day off to do a little bit of QPI stuff [laughs] and the system was shut down without warning on that day. So, that was reasonably irritating.” – (GP21 SUS 62.5)

[laughs] So – and the problem I'm afraid is that of the four times, that it froze on two occasions, so that was a bit of a problem for me. (GP5, SUS 55)

There were also reports of difficulties with the user registration and login process, which had resulted in unsuccessful attempts to access PRISM, much to the frustration of users:

GP: I put too many wrong passwords in, and I think I got locked out.

Int: Was that ever resolved?

GP: I don't think so.” (GP18, SUS 80)

[having been unable to login] We came out and went back in [to PRISM] and I think it was more successful the second time, but I'm afraid the truth is, that cannot happen. That is an anathema to general practice. You have no time to breathe, so if it's going to work, this has got to be so robust, you know, simple things like logging on. (GP5, SUS 55)

There were implications that would-be users within practices had been so deterred by access issues, that they abandoned efforts to use the tool. Thus, these potential users were never converted into actual users due to their experience of the technology implementation, rather than the risk tool itself.

Other GPs have been signed up, but have had lots of issues with access, so it's been mainly myself who's used the tool, looking at our practice population. I don't think other GPs will bother. Because your time is so limited, if you've tried something and it doesn't seem to work for you, you're not gonna waste further time, because you just don't have that time to do it. (GP 13, SUS 85)

A recurring suggestion for resolving the access and login issues were for the tools to be integrated more directly into the clinical systems, bypassing the need for an additional login process. Some interviewees also felt that integration and alignment with patient records would speed up their use (for QoF or other purposes), and enable closer scrutiny and investigation of patients identified through risk stratification.

What I wanted was to download my 53 patients...the information that would allow me to work out why they're on that list...and it really disappointed me that a lot of that I had to do manually (GP15, SUS 30)

I think if it was more integrated and more visible in the clinical system, it would be a more useful tool. It will be easier to jump backwards and forwards between patients. I guess the other thing is if you can make it more timely, then you could see the changes more effectively with the two integrated. I think you'd probably be more aware of what good you were doing, and the impact it would have. (GP8, SUS 60)

Yeah, I think what would've been nice is if it had tied in directly with our systems – because you could then look at the patients straightaway, rather than having to make a record of the patient number and then go in separately and look at them. (GP32, SUS 67.5)

These and other suggestions for PRISM modifications and improvements are summarised in Table 31.

Confidence in inputs and outputs

Interviewees were keen to reflect on the types of patients identified through the risk stratification process, particularly in relation to their knowledge of the patients, and their expectations of which were at risk. Much of this reflection concerned those at very highest risk, the perceived target of the QOF indicators. In this relatively small patient pool, many of the general practice clinicians would know most or indeed all these patients well. This may especially be true of smaller practices, or where the list was discussed by multiple staff within the practice.

One of the things that limits its usability...makes it less necessary in a small practice, is it tends to tell you things you already know. When you've got a small list of patients, you tend to have good visibility. (GP14)

There were also several references to 'surprise' or 'unexpected' patients appearing at high-risk – where the risk tool was identifying patients that the clinicians did not consider as

vulnerable to unplanned emergency admission. These cases prompted curiosity and sense-making, but occasionally scepticism about the accuracy of the information.

I think it just threw one up – one patient up that – in the top 15, that we thought shouldn't have been there...we couldn't identify any reason why she should've been in the top 15. She was young and otherwise fit and well. (GP1, SUS 55)

A further source of unexpected patients was the reported inclusion of patients on the risk stratified list who had passed away or otherwise ceased to be registered with a practice. Although these anomalies may have been caused by data input errors, they are more likely to be linked to the time lags from an index incident (e.g., death or moved away) to data input, extraction from the original data source and final consolidation in PRISM.

Int: Did you encounter any technical issues?

Well, the population with the unregistered or dead patients. (GP31, SUS 85)

Functionality

While the chief use of the tool was to produce the stratified list of patients, typically at the highest level of risk, some specific features of the tool were brought up by users. For example, a few described inputting their own risk thresholds, - altering the default settings – as done by the following GP to examine a slightly lower highest level of (absolute) risk:

...basically looking at patients that've been deemed as sort of high-risk, but not necessarily the highest risk, but, people that we might be able to do something about. (GP13, SUS 85)

Another function that was generally welcomed was the 'movement' arrows, which provided a visual cue to signify if a patient's risk has increased, decreased, or remained static since the previous month.

And we tried to focus in on specifics, in one respect, and then we also tried to focus in on those that were climbing. So, we identified anyone with an arrow that was – meaning that their risk had gone up since last time, and we tried to pin those down and do, essentially, a chronic disease review, you know, and we had sort of a full review on them. (GP6, SUS 65).

Some users also made use of the 'filter' function, whereby they could select patients within a specific cohort – e.g., those with diabetes or COPD. Filtering in this way meant that there was often overlap of those identified by PRISM with patients on existing disease specific registers who may already be seen to be actively managed and may not require additional 'work' over and above identification and logging on a register.

I design the searches that I want to know. How many people who are aged over 45, and hypertensive and obese, have had a fasting blood sugar or a lifestyle code recorded in the last 15 months? I mean, we've designed our own search, and we're

down now to 90% of our cohort are pre-diabetics that have been seen annually. (GP10, SUS 72.5)

Some interviewees felt it would be helpful for PRISM to include clarification on the reasons for risk score changes following monthly updates, i.e., what factors had changed compared to previous scoring dates.

But, I mean, for a good example would be: You know, you've got a patient, they were – we're talking like middle tier now, so let's say they were at risk of admission of say 48, or something like that. And you re-run it and they've gone up to, say, 62, and you look at this arrow and you think: Well, why – what's happened? And you go into their notes and it's not entirely obvious what it is that's happened. So, that would be really useful (GP6, SUS 65)

Sharing of information

In the main, interviewees confirmed that it was general practitioners who used PRISM for care management. Occasionally, other staff may be involved.

Whereas our chronic care nurse has still been using it because her job is more proactive than ours really. (GP2, SUS 90)

Often the lead GP or practice manager generated a list of patients within the top stratum of risk and saved this in an electronic spreadsheet or printed it. A few practices also created a flag or popup on the records of high-risk patients, which alerted staff when they accessed the record (e.g., on patients calling the practice) – serving as a potential precursor to tailoring care or making early appointments for these patients.

That flags up – that's like a warning sign that maybe we should take them a bit more seriously'. (GP6, SUS 65)

Respondents described sharing the list of individual patients' risk scores at routine practice meetings for discussion when time allowed, or dividing it among partners who worked individually, if close to the QOF deadline. Over time, new patients might be added to the list, following a new PRISM search, and some users reported using PRISM to check on risk scores for their list of managed patients.

More than half the respondents said the work of bringing PRISM into use was inhibited by the many demands on GPs' time, shortage of GPs due to illness, retirement or maternity leave. Two practices were planning to close or merge soon.

Table 30: PRISM user experience interviews – NPT summary findings (Adapted from (Snooks, Bailey-Jones et al. 2018)

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NPT component	Questions to consider within the NPT framework (based on (Murray, Treweek and Pope 2010))	Findings from interviews with GPs using PRISMATIC
Coherence (i.e., meaning and sense making by participants)	Is the intervention easy to describe?	GPs found the PRISM tool easy to understand because they recognised the principles of risk prediction
	Is it clearly distinct from other interventions?	PRISM predicted risk resulting from health and social factors in contrast to condition-specific risk tools.
	Does it have a clear purpose for all relevant participants?	GPs and managerial staff recognised the potential value of a formal, systematic process for assessing patients' general risk alongside clinical expertise
	What benefits will the intervention bring and to whom?	PRISM could complement current clinical practice and intuitive risk assessments and identify patients for case management
	Are these benefits likely to be valued by potential participants?	It could be a useful systematic contribution to case-finding and identify patients at high-risk of emergency admissions, in line with policy imperatives
	Will it fit with the overall goals and activity of the organisation?	The PRISM tool was perceived to fit within local and national priorities to implement case management, reduce unplanned health demands and encourage self-management by patients.
Cognitive participation (i.e., commitment and engagement by participants)	Are target user groups likely to think it is relevant and usable	GPs found PRISM was very relevant in helping complete QOF requirements
	Will they see the point of the intervention easily?	PRISM could add to clinical judgement, was in line with the emphasis on proactive care and generally seemed to provide accurate data
	What affects their willingness to invest time, energy and work in it?	Protected time and financial incentives encouraged GPs to use PRISM within routine practice. Competing demands on time and resources and technical problems limited their willingness to use PRISM.
Collective action (i.e., the work participants do to make the intervention function)	Will staff require extensive training before they can use it?	Training provided practical information on using PRISM. Ideas about how to use the data in patient care came from focus groups, their own aims or QOF.
	How will the intervention affect the work of user groups?	GPs felt PRISM helped them complete the tasks required by QOF. Other use was infrequent and inconsistent across GPs.
	Will it promote or impede their work?	PRISM was easy to use but technical problems limited quick and regular access.
	How will use of the intervention be divided amongst users	The lead GP in each practice was the main PRISM user and provided information for discussion at multidisciplinary meetings
	What effect will it have on responding to patients' needs?	GPs described four types of actions to respond to patient needs: 1) reviewing care; 2) promoting self-management; 3) addressing non-medical needs; 4) changing treatment and care
Reflexive Monitoring (i.e., participants reflect on or appraise the intervention)	Will it be clear what effects the intervention has had?	GPs were uncertain, but not confident of effects on emergency admissions or patient wellbeing
	Is it likely to be perceived as advantageous for patients or staff?	PRISM raised GPs awareness of high-risk patients. It was difficult to fit use of PRISM into the everyday practice
	How are users likely to perceive the intervention once it has been in use for a while?	PRISM was rarely used in practices after the completion of the QOF process
	Can users/staff contribute feedback about the intervention once it is in use?	Lack of time and treatment options for high-risk patients limited use of PRISM
	Can the intervention be adapted or improved on basis of experience?	Respondents identified technical changes to make PRISM more usable

Table 31: Summary of user improvement suggestions (interview data)

[Created by Mark Kingston in Microsoft Word 2023]

Aspect	Indicative Quotes
Integration (logins)	<i>We came out and went back in [to PRISM] and I think it was more successful the second time, but I'm afraid the truth is, that cannot happen. That is an anathema to general practice. You have no time to breathe, so if it's going to work, this has got to be so robust, you know, simple things like logging on GP 5</i>
Integration (access to risk data in clinical record)	<i>Int: So you said that you'd like to be able to access this information in the consultation? Do you think that's an appropriate, a good way of – of using this information?</i> <i>GP: Definitely. That would make you use it. Well, you could use it at every consultation.</i> <i>GP: Yeah, and we're used to it – If you have just a small box somewhere just with the percentage sort of risk score, just to sort of remind you about it, and give you something there, then you probably would see a patient – not with everyone at all – But, you'd – if you noticed that it was quite high, then you'd probably think: Oh, sort of what – why – what can we do – am I missing something? Because a lot of people – as I say, you might not know they've been in and out, and – but if you had that, and you opened up and you could say, "Oh, gosh, like – you know, what?" And also that might improve our knowledge of what else has gone on with them, because drugs may have been changed and things, and we might not always be aware. So, I think it would – [sighs] it's just more in – if it's in your face, you're gonna use it more – I'm sure you would. GP 13</i> <i>I found PRISM really interesting and I think being proactive is something that will happen at some point. I think it needs to be more seamless in – and built into something far more easily sort of done within a consultation than it has been. But, if it was, I would definitely use it as part of my consultations. (GP13)</i> <i>What I'm saying is, that to have that isolated next to that patient's name, on the call sheet, or when in front of you, when the patient is seeing you in surgery, in some way linked to the journal on the computer, so it was right in your face. (GP5)</i> <i>Yeah, I think what would've been nice is if it had tied in directly with our systems – because you could then look at the patients straightaway, rather than having to make a record of the patient number and then go in separately and look at them" (GP32)</i> <i>Difficulty when accessing details of risk, not having link to patient record (GP3)</i>
Speed of platform	<i>And then the other thing was that every time I went on there, it just took so long to load each page, it was just slow. So it was just not a very fulfilling experience from a technology point of view, in actually accessing the data.</i>
Reducing data time lags	<i>So, you know, you're not going to send CIIS (a community based crisis team) to someone who was high-risk three weeks or three months ago (GP21)</i> <i>I think the reasons for that really are that when – as I alluded to before, is that it was identifying a lot of activity that happened in three to four months previously, and a lot of the problems had been resolved one way or another. Generally, if we're looking at our – if – you know, our patients of high – at high-risk of admission are the patients that we have been seeing regularly in the last three to four weeks. (GP 15)</i>
Reporting of changes in risk score	<i>But, I mean, for a good example would be: You know, you've got a patient, they were – we're talking like middle tier now, so let's say they were at risk of admission of say 48, or something like that. And you re-run it and they've gone up to, say, 62, and you look at this arrow and you think: Well, why – what's happened? And you go into their notes and it's not entirely obvious what it is that's happened. So, you – that would be really useful (GP6)</i>
	<i>Because you look at the top tier and you go: Yeah, I know about all those. And there's nothing I can do about it anyway, because they're all either dying or so frail there's – you know, there isn't anything that's gonna do anything for them, so, I'm just gonna go: Right, there's no point. Whereas, almost to – I sometimes feel that almost to a degree, if you just – if all it gave you were, say, 50 patients that had got worse in the last month. They didn't give you all of the rest of the data, they just told you those 50 patients. (GP6)</i>
Variables	<i>I think what would be really useful is, as I've already alluded to, is capturing the primary care data, you know. Have they had an unscheduled house visit? Are they awaiting a urgent referral for something?</i>
Printing/extracting data	<i>Having to print off 1 page at a time rather than 'all' list." (GP3)</i> <i>It allows you to display 15 patients at a time on the screen. So, to get 500, I'd have had to copy and paste it from that many pages, and, sorry, but I've better things to do. (GP15)</i>

Taking Action for Patients

All respondents reported difficulty changing from a reactive to a proactive approach to care when the daily routine in general practice was so busy and GPs said they felt overworked.

Time – it is purely time. It's just – we're all saying we're bogged down with doing the day-to-day stuff without these nice extras we would like to do. (GP3, SUS 67.5)

GPs reported a range of actions to care of high-risk patients after using PRISM. These were generally small amendments to supplement existing treatment and support for individual patients, or extra reviews (some through house calls) to fine-tune existing treatment.

Yeah, indeed. And try and identify why they were at high-risk and whether, you know, what – if any follow up was arranged for them, when they were last seen, what medication reviews are due, any other sort of QOF quality things. (GP21, SUS 62.5)

Some reviews explicitly focused on how best to manage crises which might lead to emergency admission, with one GP reporting the conversation with a patient during a face-to-face consultation:

Look – you’ve been admitted on a number of occasions. Obviously, the chances of you being admitted are quite high, why don’t we do something a bit different? We will try and alter your medication to maybe control your condition a bit better. We are here during the day, so use us rather than dial 999, and we can get somebody to see you. (GP11)

Other effects on patient care were reported. In one practice the nurse talked to high-risk patients about identifying infections, weight management and spotting early warning signs. In another, emergency drug packs were made up for identified patients to use at weekends and bank holidays if they felt their health was deteriorating. Some high-risk patients were referred to outpatient clinics, nursing teams or other care agencies for non-medical needs. Some respondents said they were concerned that practice staff did not have the capacity or skills to take on more patients. All respondents reported difficulty changing from a reactive to a proactive approach to care when the daily routine in general practice was so busy and GPs said they felt overworked.

We’ve just been overwhelmed with work, you know. We’re just about flat out just seeing patients, dealing with the day-to-day demands, and so that leaves us very little time then to actually do things proactively, which is quite frustrating really. You know, in an ideal world we’d obviously be doing things more proactively to prevent people becoming unwell, but, as it is, we’re just having to, you know – just deal with the day-to-day pressures of seeing the people that want to see us. (GP17, SUS 67.5)

We can certainly see the advantages of it but being able to spend the time to do it – I don’t know. I don’t know what that answer is really. (PM2, SUS 87.5)

Another concern for many was the lack of services available for those patients identified through PRISM. There was some doubt as to what to do with the information from PRISM if there were no services in which to direct patients within an active management plan:

I can remember going back to the very, very start of hearing about PRISM and things, and I can remember it took me about two or three meetings, to really get my head around: Okay, so this is a tool we’re gonna use, but there’s nothing that we – actually then do with what we find, other than us. Does that make sense? So – no other service linked to it.” (GP13, SUS 85)

Reflexive monitoring: reviewing PRISM

Despite early optimism that PRISM could support more proactive care, GPs generally judged it unlikely that PRISM had any measurable effect on emergency admissions and ED attendances. There was a widespread feeling that admissions initiated by GPs were already low and were not easily reduced further. They did not believe additional contact with patients identified as being at high-risk could change this, though they were very aware of media coverage about emergency use of services and said they were concerned to use resources appropriately and carefully.

There are odd occasions where you were able to proactively help somebody or put a plan in place to stop them being admitted to hospital. I think it's a fallacy to think that you could reduce emergency admissions from primary care because the primary care admissions are so small...one case a week, if that. (GP2, SUS 90)

A minority of respondents could identify instances where an emergency admission may have been avoided and two GPs who targeted patients with frequent ED attendance reported that those patients' use of 999 services had fallen. In contrast, one GP suggested PRISM reviewing may have been associated with increased hospital admissions, as need was identified.

We did bring in a certain number of people and do care plans with them and then we ended up admitting them because we'd seen them and they looked unwell. (GP31, SUS 85)

Reflecting on the effect of PRISM, the majority of respondents described how it changed their awareness of high-risk patients, especially when unexpected patients appeared in the top stratum.

We've probably had more talks together, as a group, as to how we have contacted the ambulance service and A & E... And we've talked about these patients more I think. (GP18, SUS 80)

GPs said the combination of PRISM and the QOF incentive increased their contact with some patients in this group, explaining that they did this to reassure themselves that these patients' care was optimum.

It [a high-risk score] does have an effect of making you sit up and think 'heck, what's he doing up? (GP5, SUS 55)

Most believed that increased GP patient interaction was beneficial, regardless of any treatment delivered, because patients appeared to appreciate the extra attention and, where delivered, tailored self-management advice.

Int: What difference would you say that PRISM has made to the way that you work?

GP: So, more awareness of the benefits of getting people to engage with the chronic disease clinics, and more awareness of being proactive with managing people's

ongoing conditions in the consultation. Those are the main two ways I think...Rather than just dealing with what I have to do, it's good to actually go beyond that and do the best I can for the patient.

GPs did not generally tell patients about PRISM or share the risk score. One reported view was that doing so may cause alarm. Some respondents felt the QOF focus on highest-risk patients was misplaced. They believed these few patients was already well known to the practice, but that medium-risk patients had the most to gain from close attention and proactive care, if resources were available.

Those in the middle bracket were the kind of patients that you were possibly able to help more than those...in the higher echelons that were already having all the input that was available. But it was the ones in the next cohort down which might have been more useful because you can actually put in things that will stop them from going up the pyramid. (GP2, SUS 90)

The way that we were required to do to the QOF data meant that we had to use the – the highest risk group, so, I don't think we got the best out of it that we could've done, because that top risk group we knew all the names. – (GP3, SUS 67.5)

Respondents reflected that the QOF payments encouraged short term use of PRISM, in the absence of extra resources to support changing practice in the long term. The network of community health and social services needed to support proactive care were generally not available for the high-risk patients they reviewed.

Others felt they would like to continue to use, but outside of the QOF influence, would struggle to invest time....

In a perfect world...I would like to use it frequently, but we don't work in a perfect world, and the NHS is the NHS and, really, time pressures, and work pressures mean that we don't have the time to proactively go out there and look out for work, because we've got too much [laughs]. (GP9, SUS 67.5)

We discussed those patients at various meetings, we made plans about how to minimise admissions, access Out of Hours, Casualty, but it's not in this year's QOF. We're far too busy to carry on with something I didn't really see derive any particular benefit for anybody, because we were aware of those patients, and it's been many years now that there's been an emphasis not to admit. (GP10, SUS 72.5)

Interviewees reported wide ranging enthusiasm for PRISM, before during and after its introduction. Interest in PRISM varied across practices, and within practice staffing teams.

Okay. Well, as the lead for the study I've been aware of it, but I've – I'm afraid that I - frankly notice that nobody else is, [laughs] and it's been a difficult concept to transfer to the practice. So, there's been a little bit of resistance. (GP5, SUS 55)

Well, I think – I mean, obviously, if all the other GPs [in practice] had been enthusiastic about perhaps doing a bit more with it, then we could've done a bit more with it. We could've, you know, had a list to our clinical meeting every week, or something like that. But, as everyone else was sort of not interested, you know, I feel – I can't sort of force, you know – force them to be interested as it were. (GP17, SUS 67.5)

Few linked their current use of PRISM, or their future expectations to evaluation directly, with the following notable exception.

I think all GPs are trying to reduce emergency admissions, but I can't say that we actually – actively, going to see the patients who we think might be admitted, because we haven't got the time to do that. The time to do that would require funding to divert other resources into doing that. So, yes, I've no objection on a weekly basis reviewing, for an hour, the patients, that PRISM say may well be the highest likely to be admitted, provided some trial has shown that if you pay a GP an hour an week, that X amount of money, for X amount of patients, that you've actually reduced admissions by 7%, which net – which is a trebling return of your original investment. Somebody has to work it out on terms like that, and if the professors and the experts say that, then who am I to argue with them. (GP10, SUS 72.5)

SUS Score

The overall mean SUS score for PRISM was 65.8 (n=27, 95% CI [59.13, 72.47]), below the published SUS benchmark average of 68. Using published rating scales, this score corresponds to either a D grade, 'marginal' acceptability, or between 'ok' and 'good' on the adjective rating scale – Figure 31. A further interpretation aid for the SUS score is to consider Net Promotor Score (NPS) to which the SUS is well correlated (Sauro 2018). The NPS equates to the question “how likely is that you recommend this to a colleague?”. In this study, the SUS score for PRISM equates to the margin of 'passive'/'detractor' suggesting that, on average, users would be unlikely to recommend PRISM to others. However, the range of per participant SUS scores was large, from 27.5 to 90 (see Table 32), and some higher scorers would be expected to be net promoters. Despite the range, the recorded standard deviation (SD) of 17.67 was closely aligned with the SUS benchmark SD of 17.7 reported by Lewis & Sauro 2022 (Lewis J & Sauro J 2022).

Table 32: Summary of PRISM user SUS scores by sub-group (n=27)

[Created by Mark Kingston in Microsoft Word 2023]

Variables	Mean	Min	Max	SD
Age band				
Lower (25-44) (n=13)	69.38	27.50	90.00	18.35
Upper (45-64) (n=14)	62.85	30.00	90.00	17.14
Gender				
Male (n=16)	66.41	30.00	90.00	16.45
Female (n=11)	65.00	27.50	90.00	20.12
Mean	65.80			17.67

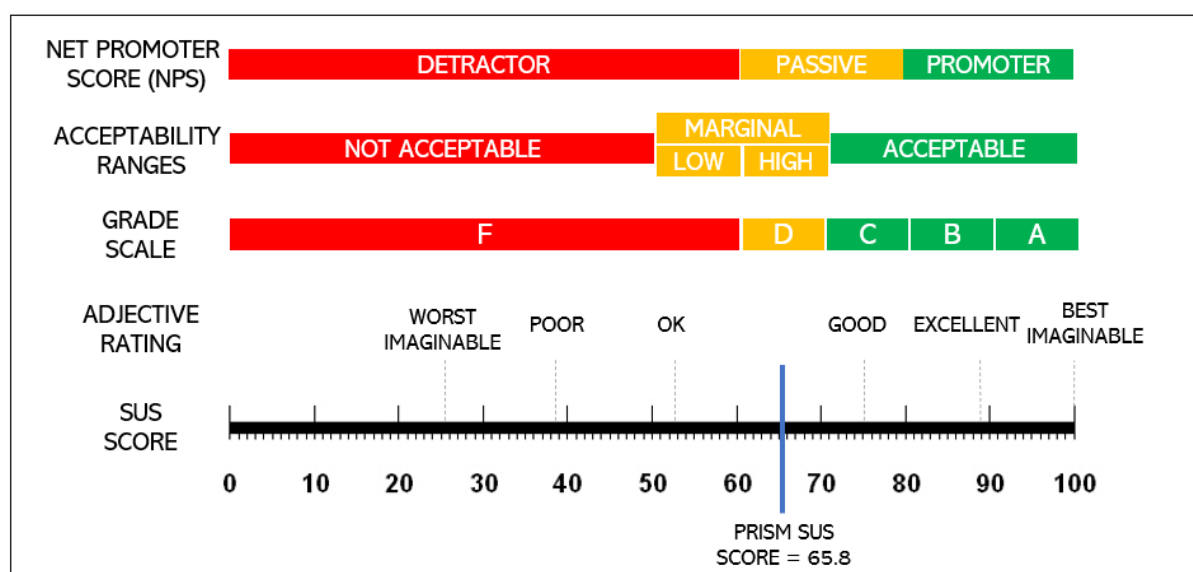


Figure 31: PRISM SUS score, grade, acceptability, adjective rating and NPS (n=27).
Adapted from (Bangor, Kortum and Miller 2009) (Sauro 2018) with permission from the authors

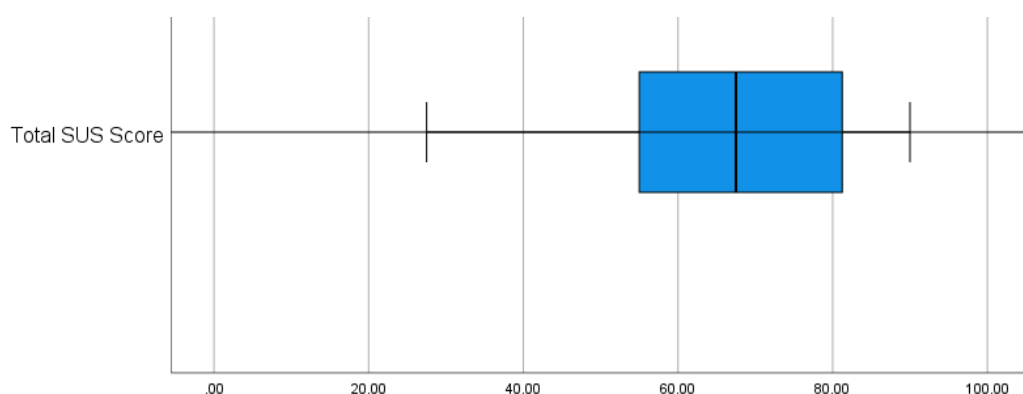


Figure 32: PRISM User SUS Score Box and Whisker Plot (n=27)
[Created by Mark Kingston in SPSS 2023]

The SUS results can also be considered at individual item level providing results relative to the other items, to the overall score, and to published benchmarks based on 500+ studies (Lewis J & Sauro J 2018). As presented in Table 33 the SUS score for individual items ranged from 50 to 75.93, with the lowest scoring items (1 and 5) relating to integration and desire to use the system frequently. The highest scoring items (2 and 6) were assessments of complexity and consistency. Compared to item benchmark scores that correspond to overall SUS scores of 68 (average), and 80 (excellent) the PRISM SUS scores are worse (than both) in six categories (1, 3, 4, 5, 9, 10), comparable to average in one (7 – relating to learnability) and slightly above the average in two (2 – complexity and 8 – cumbersome) – see Table 34.

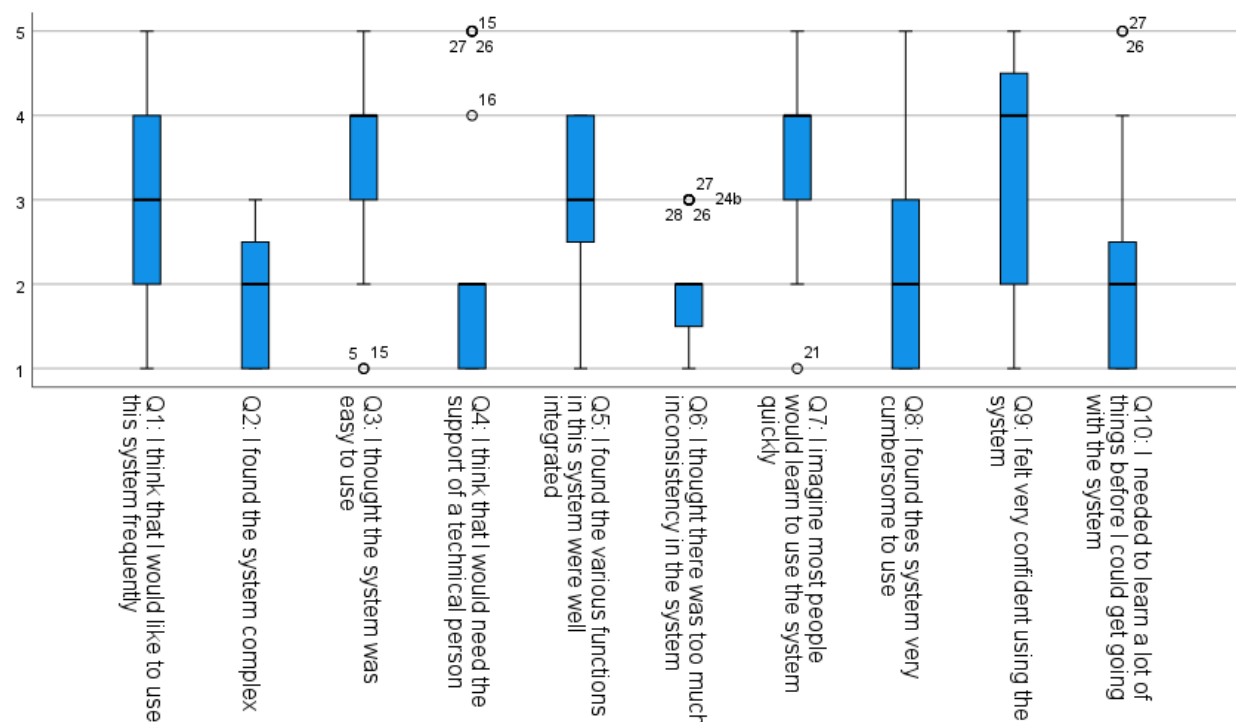
Table 33: PRISM User SUS Individual item descriptives (n=27)

[Created by Mark Kingston in Microsoft Word 2023]

Item	SUS Score (max 100)	Min	Max	Median	Mean	SD
1. I think that I would like to use this system frequently	51.85	1	5	3	3.07	1.0
2. I found the system unnecessarily complex*	75.93	1	3	2	1.96	0.8
3. I thought the system was easy to use	64.81	1	5	4	3.59	1.1
4. I think that I would need the support of a technical person to be able to use this system*	71.30	1	5	2	2.15	1.4
5. I found the various functions in this system were well integrated	50.00	1	4	3	3.00	1.1
6. I thought there was too much inconsistency in this system*	75.93	1	3	2	1.96	0.7
7. I would imagine that most people would learn to use this system very quickly	67.59	1	5	4	3.70	0.9
8. I found the system very cumbersome to use*	70.37	1	5	2	2.19	1.2
9. I felt very confident using the system	59.26	1	5	4	3.37	1.4
10. I needed to learn a lot of things before I could get going with this system*	71.30	1	5	2	2.15	1.2

For all items 1 = strongly disagree, 2 = disagree, 3 = neither disagree nor agree, 4 = agree, 5 = strongly agree.

* For negatively worded items a lower mean is desirable. Higher overall SUS score is desirable for all items.

**Figure 33: Box and whisker plots of SUS individual items for PRISM users (n=27).**

Note items 2, 4, 6, 8, 10 are negatively phrased (lower median desirable)

[Figure created by Mark Kingston in SPSS 2023]

Table 34: SUS Individual item descriptives for PRISM compared to published benchmarks – after Lewis and Sauro 2018. (Lewis J & Sauro J 2018)

[Table created by Mark Kingston in Microsoft Word 2023]

Item	PRISM SUS		Comparison of PRISM item score with item benchmarks	Benchmark target for average SUS score =68			Benchmark target for excellent SUS score =80		
	Mean	SD		Lower	Mean	Upper	Lower	Mean	Upper
1. I think that I would like to use this system frequently	3.07	1.0	worse than both	3.3	≥ 3.39	3.47	3.69	≥ 3.80	3.9
2. I found the system unnecessarily complex*	1.96	0.8	better than average	2.42	≤ 2.44	2.48	1.81	≤ 1.85	1.89
3. I thought the system was easy to use	3.59	1.1	worse than both	3.64	≥ 3.67	3.71	4.21	≥ 4.24	4.28
4. I think that I would need the support of a technical person to be able to use this system*	2.15	1.4	worse than both	1.8	≤ 1.85	1.9	1.45	≤ 1.51	1.57
5. I found the various functions in this system were well integrated	3.00	1.1	worse than both	3.51	≥ 3.55	3.58	3.92	≥ 3.96	4.01
6. I thought there was too much inconsistency in this system*	1.96	0.7	better than average	2.16	≤ 2.20	2.23	1.73	≤ 1.77	1.82
7. I would imagine that most people would learn to use this system very quickly	3.70	0.9	= average	3.68	≥ 3.71	3.74	4.15	≥ 4.19	4.23
8. I found the system very cumbersome to use*	2.19	1.2	better than average	2.21	≤ 2.25	2.28	1.61	≤ 1.66	1.7
9. I felt very confident using the system	3.37	1.4	worse than both	3.68	≥ 3.72	3.75	4.21	≥ 4.25	4.29
10. I needed to learn a lot of things before I could get going with this system*	2.15	1.2	worse than both	2.05	≤ 2.09	2.14	1.59	≤ 1.64	1.71

For all items 1 = strongly disagree, 2 = disagree, 3 = neither disagree nor agree, 4 = agree, 5 = strongly agree.

* For negatively worded items a lower mean score is desirable.

PRISM Logins

Figure 34 illustrates the number of PRISM user logins at the participating practices over an eighteen-month period. Logins rise at the start of the period, as new practices and users receive PRISM in line with the staggered introduction, but tail off fairly dramatically in the April, following the end of the QPI targets within QOF.

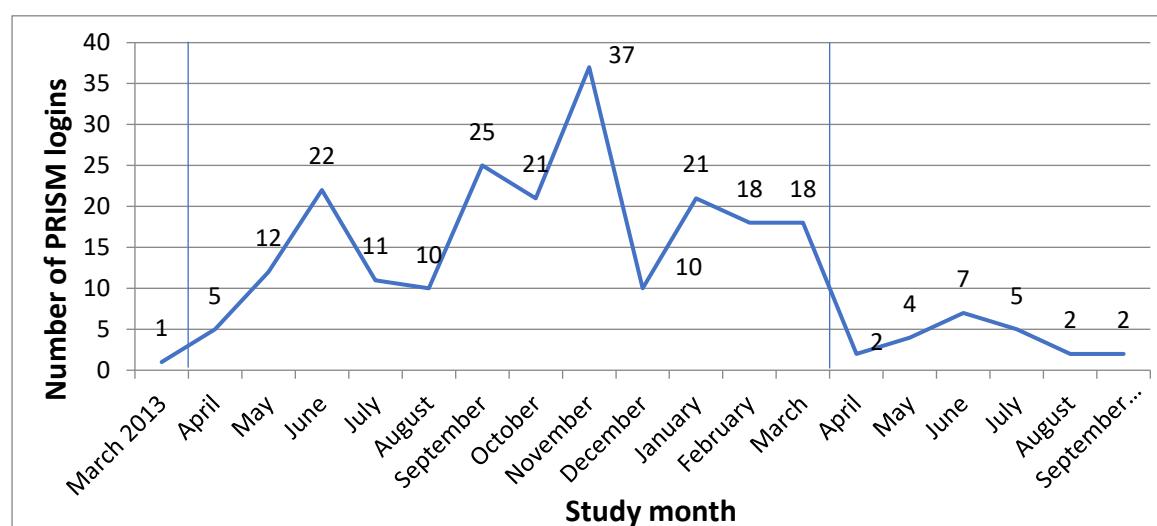


Figure 34: Successful PRISM logins by month (data supplied by NHS Wales)

[Graph created in Microsoft Excel by Mark Kingston, 2021]

Within the user questionnaire, participants were asked to estimate the number of times they had logged into PRISM in the preceding 18 months – Table 35. Two thirds of respondents indicated that they had logged on less than 3 times, if at all.

Participants also indicated how often they used PRISM. Over half indicated no set pattern. Those who estimated more frequent or regular use (monthly) provided a higher SUS score than those who used it less frequently.

Participants were also asked to estimate the length of time they spent on each given use of PRISM. One third of respondents indicated that there was no set pattern of use. These respondents provided a mean SUS score of 60.6, lower than the overall mean of 65.8. Those who reporting using the tool for longest provided the highest SUS scores.

Table 35: Estimated PRISM logins within previous 18 months

[Table created by Mark Kingston in Microsoft Word 2023]

Estimated number of logins within 18 months	SUS score	SD
1-3 times (n=13)	66.3	13.6
4-10 times (n=6)	78.1	7.7
11+ times (n=3)	66.3	35.5
Never (n=5)	58.0	21.8
Estimated time spent reviewing PRISM data		
No pattern (n=9)	60.6	13.7
Up to 30 Mins (n=4)	72.5	21.3
Up to 1 Hour (n=5)	70.9	21.3
1+ Hour (n=5)	83.1	21.3
Not used (n=3)	58.3	15.9
Tried but failed to login to PRISM (n=1)	27.5	-

We also asked respondents to identify any issues that had affected their use of PRISM, as summarised in Figure 35. The most common reported factors related to appropriate resources and capacity to meet any identified and potentially unmet needs – within and outside of the practice, and usability factors around website speed and the log in process.

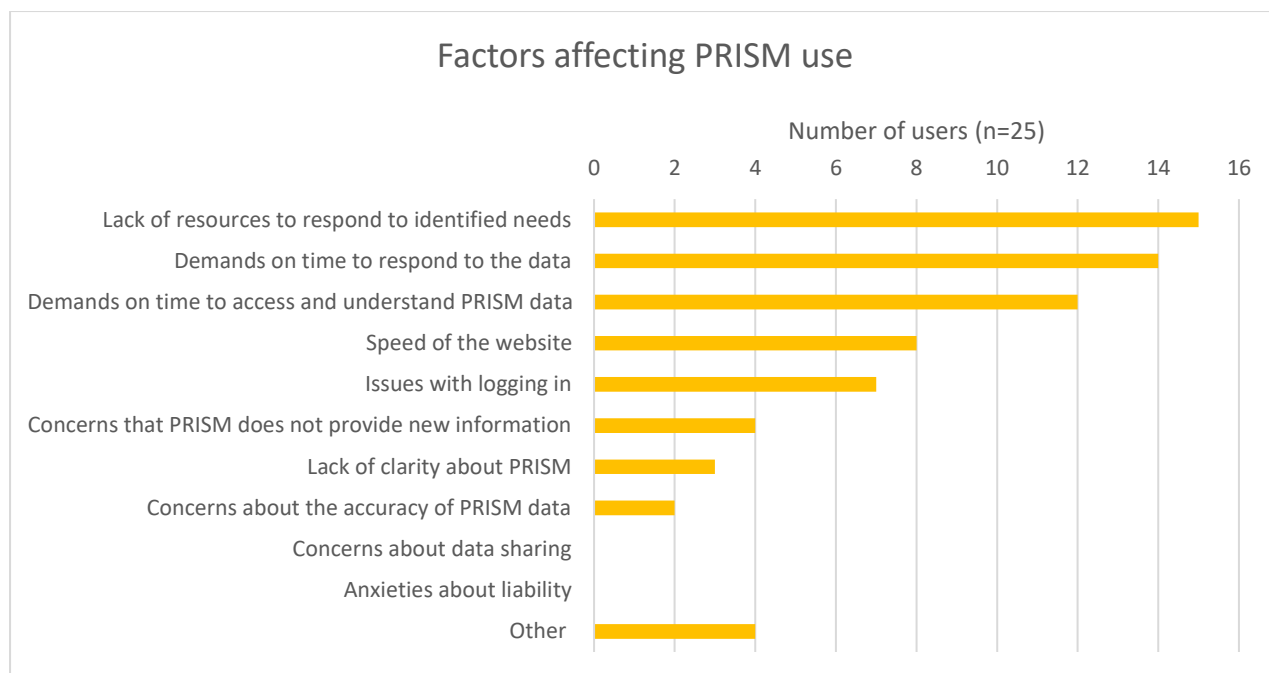


Figure 35: Has anything affected your use of PRISM in the past 18 months?
 [Chart created by Mark Kingston in Microsoft Excel 2023]

Discussion

Summary of findings

This is the first study of the user experience of primary care staff with an EARS tool that calculates and stratifies patient's risk of emergency admission to hospital. I found that introduction alongside an incentive scheme to identify and manage patients at risk of admission meant that the two elements were inextricably linked. Thus, PRISM use fitted with clinical practice, at least in the short term, making the process of patient identification easier for QOF. This was the major driver for use and all interviewees reported using the tool for this purpose. As a result, it was anomalous for PRISM users to use the tool for reasons other than QOF, and most interviewee expectations were that PRISM use would not be sustained following the end of the financial year, when the QOF incentive was to end. Some indicated resistance to 'additional' preventative work, particularly in the context of high demand for 'traditional' care. This appeared to be borne out in subsequent usage (login) data confirming a dramatic drop off in PRISM use once the financial year passed.

PRISM was applied to a small number of patients with highest-risk of emergency admissions for a short period because that was a contractual requirement. The focus on highest risk patients was not always deemed best – there may be more opportunities for improving care at lower risk levels, and some had explored this. Despite considering that they knew their

high-risk patients well and they would not benefit greatly from more resources, GPs said their awareness of these individuals was heightened by knowing the PRISM scores. Data from PRISM was used to meet the requirements of QOF, based around identifying and then adding patients to a risk register, confirming regular reviews and ensuring a care plan was in place. In many cases, patients identified were already well known to the practice, and on existing disease specific registers. It was often implied that for many patients there was no determinable change in care. Where changes were desired, these were limited by the main barriers to use, which were time and capacity within the practice and a lack of community-based services to refer to – which users often felt may be better placed to intervene. Although the extent to which this was based on the routinely reported shortage of time and resources within the practice is difficult to unpick. Overall, users doubted that the use of PRISM, aligned with the QOF requirements, had prompted significant improvements in care, although some individuals may have benefitted from the increased attention. It is likely therefore that the financial motivations for the practices of meeting QOF requirements, were greater than the anticipated patient benefit – or impact on admissions.

There was no evidence that risk scores were used in patient/clinician encounters, although some GPs wished to do so and wanted the risk information to be available within patient records.

Views on the PRISM tool itself and its intrinsic elements, suggested it was straightforward to use and to learn, but technical obstacles such as password issues and slow website speeds were common. Some potential users abandoned planned use after encountering such technical problems reminding us of the importance of usability in potential adoption. An overall SUS usability score of 65.8 was obtained for PRISM – reflecting the value of the tool in producing patient lists for QOF, relative ease of use, but also the technological barriers. Overall, users remained accepting of PRISM and the principles of EARS (confirming previous findings prior to use (Porter, Kingston et al. 2016), but reported significant challenges to optimal use for patient benefit. The chapter confirms the importance of both intrinsic factors relating to the tool functions and performance, and extrinsic factors such as contextual and user characteristics. Together these factors determine the user experience and play a significant role in the decision-making process of individual users.

Comparisons with literature

I have learnt through the interviews, that technical barriers to using PRISM affected use, yet all of the practices did, ultimately, use PRISM for QOF related work,. Without the direct relevance to clinical work (and the financial reimbursement) that the practices wanted to carry out, less effort would have been made to overcome barriers. Both these elements, the 'degree of fit' with clinical practice and financial incentives are recognised influences over

technology adoption (Rogers 2003, Greenhalgh, Robert et al. 2004, Roumani, Nwankpa and Roumani 2014).

The SUS score for PRISM obtained In this study was 65.8. In a systematic review by Bangor, Kortum and Miller (2008) (Bangor, Kortum and Miller 2008) a mean SUS score of 68 was obtained for web-based products similar to PRISM. The authors write that products of less than 70 are *“candidates for increased scrutiny and continued improvement and should be judged to be marginal at best”* (Bangor, Kortum and Miller 2008). However, even where usability is higher, this is no guarantee of adoption. A study by Kaipio et al, found that despite SUS scores of 90+, the health assessment applications they tested were seldom being used (Kaipio et al, 2015; Scott et al, 2017). This is a reminder that usability tests alone, do not determine technology adoption (Brooke 2013). No significant difference was found in overall SUS scores based on age band or gender – in line with previous literature which suggests that these demographics have no significant effect on SUS score (Sonderegger, Schmutz, Sauer, 2016; Bangor, Kortum, Miller, 2008).

Both the results of SUS scores and the analysis of interviews highlight the importance of the interaction of existing clinical systems. The lowest SUS score for individual items was provided for item 5: *“I found the various functions in this system were well integrated”*, with a sum of score of 54 (*mean=2.0*). Interview data suggests that integration of PRISM to external clinical systems is both a major barrier to its usability and a potential avenue for its improvement. This is supported by similar studies (Viitanen et al, 2011) and by the NHS’s commitment to improved system interoperability (Hufnagel 2009, NHS England 2022).

The study participants consistently cited the challenging pressures of primary care work, and this is consistent with other studies and data, including GP surveys illustrating falling morale and increased expectations of leaving practice (Dale, Potter et al. 2015) (Owen, Hopkins et al. 2019), and in rising primary care demand and failures to meet government targets for increases in GPs (Triggle 2021). These challenges are known to influence primary care clinicians participation in preventative work (Rubio-Valera, Pons-Vigués et al. 2014), as well as in technology adoption (Roumani, Nwankpa and Roumani 2014). This places extra importance on health technology like risk prediction tools to be as efficient, learnable, and user-friendly as possible.

Strengths and limitations

A major strength of this research lies in it being the first multi methods UX study of an EARS tool. Although there may be many other EARS risk tools, most perform similar functions, for the same staff in the same setting. Thus. the relevance of the findings extends beyond PRISM, not least in confirming the importance of the user interface and tool usability in the overall user experience.

Combining the SUS and qualitative interviews has allowed us to understand user experience, and to understand the factors influencing the score. A limitation is that I was unable to link individual use statistics with the usability score – this is relevant as extended use of technologies can improve their usability rating (Kortum and Johnson 2013). This was also a relatively large study, involving 30 GPs and Practice Managers with a wide range of experiences across 28 diverse practices in rural, urban, prosperous, and deprived communities. Furthermore, the response rate was excellent, with 94% of the PRISMATIC practices represented, and thus have a high degree of confidence that views are representative of those participating in the study. However, data is typically from one individual per practice and the views of other users (in these or other practices) may vary. These practices and staff volunteered to take part in the PRISMATIC trial, committing themselves to using the PRISM tool for a fixed time and receiving a small payment to acknowledge the additional demands on time of practice staff associated with participation in the study. Their views therefore may not be typical of practices which did not take part. I was not able to seek participant feedback on the findings, but this would provide a valuable sense-check opportunity in similar future work.

Despite the relative size of the study, the SUS score would have benefitted from a larger sample size to improve precision. Nonetheless I have, for the very first time, produced a benchmark usability score for an EARS tool, using the widely used standard SUS. This benchmark offers the potential to support the development and comparison of risk prediction tools in future.

Conclusions

To the best of my knowledge this was the first UX study of an EARS tool. I found that the experience of users of an EARS tool (PRISM) was heavily influenced by its usability, its purpose and the environment in which it was used. The usability of PRISM was slightly below published benchmarks for other health technologies. It was praised for being straightforward to use and to generate patient lists to support a contractual incentive (QOF) to identify, review and plan care for those at high-risk of emergency admission. It helped raise awareness of and alter care for a small group of patients. Use was typically short term and driven by external factors, notably QOF, rather than embedded in new ways of working. There was evidence of some resistance to the preventative working model of care proposed. Other technical barriers to use included issues with accessing the tool, speed, and data lags. Suggestions for improvements to the tool focussed on integration with the clinical system and with individual patient records and clarity over risk score changes. Further barriers related to staff and service capacity and the challenges of delivering routine care - which PRISM use was not associated with.

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Chapter 9: Patient perspectives on the role and value of emergency admission risk information

Introduction

The use of emergency admission risk stratification (EARS) tools to identify and proactively care for patients at risk of hospitalisation is a notable policy recommendation over the past decade (NHS England 2015) (NHS England Operational Research and Evaluation Unit 2017). As a result, at least nine in ten UK general practices have had access to an EARS tool (Kingston, Griffiths et al. 2020). Despite the scale and cost of implementation patient and public views on emergency admission risk stratification (EARS) are unknown.

EARS tools use clinical and demographic data to calculate and stratify risk of emergency admission for all patients within a given population, such as the registered patients of a general practice. Clinicians can use the tools alone or with other data and clinical insights to identify patients for risk-appropriate preventative care. Although in theory patients can be targeted across the risk spectrum, in practice most initiatives have focussed on those at high or indeed highest risk where the population size is smaller (NHS England Operational Research and Evaluation Unit 2017). EARS use is encouraged within interventions aligned with integrated care and other approaches that emphasise holistic patient centred care. The most notable driver of EARS use has been the recommended use in support of general practice contracts across the UK, including the English Unplanned Admissions Directed Enhanced Service (DES) which ran for three years from 2013 with annual funding of over £160 million (NHS England 2014). For this scheme, practices were advised to use EARS tools to create a proactive case management register of two percent of the practice population, ensuring each patient had a named GP, regular review, and a care plan – to be developed collaboratively with patients or their carer (NHS England 2014). The ambition was to “improve the quality and coordination of care given to improve their health and wellbeing”, and reduce “risk of avoidable emergency hospital admissions or A&E attendance” (NHS England 2014). Similar schemes operated in the other UK nations.

Despite the policy and contractual commitments, stakeholder research has revealed several challenges with implementation of EARS tools, including: trust issues with data; a lack of GP time to adopt proactive care practices; a lack of community services to link with or refer patients to; and technical issues with tool performance, score accessibility, reliability and usability (Müller-Riemenschneider, Holmberg et al. 2010, (Kingston 2010, Arce, De Ormijana

et al. 2014, Porter, Kingston et al. 2016, Wagner, Hall et al. 2019). All these issues may affect the potential effectiveness of EARS tools in practice – which to date is unproven. These challenges have been identified through engagement with a range of key stakeholders, including general practitioners, allied health professionals, commissioners, providers, and managers (Müller-Riemenschneider, Holmberg et al. 2010, Freund, Wensing et al. 2012) (Ross, Sachdeva et al. 2017) (Evans, Dale et al. 2021) (Stokes, Riste and Cheraghi-Sohi 2018). But one critical stakeholder group, that of patients, has been largely excluded from the research agenda to date. The deficit of patient views, consistent across the international research landscape, is problematic for several reasons. Most strikingly, it is fundamentally at odds with the routine alignment of EARS with principles of patient centredness, patient engagement and shared decision making. Take for example, the proposed collaborative role of patients in care planning, informed by risk stratification, for the aforementioned Unplanned Admissions Enhanced Service (NHS England 2015). Secondly, if we reflect on a typical healthcare definition of stakeholders as “those with a vested interest in medical decisions or evidence upon which the clinical decision is based upon” (Horev and Babad 2005) – then the absence of patients – arguably the most important stakeholder of all, is perverse.

This significant stakeholder gap has been previously identified, albeit not acted upon. Müller-Riemenschneider et al. (2010) called for research into perspectives of “the target population for primary prevention risk scoring” in their study of GP views (Müller-Riemenschneider, Holmberg et al. 2010). Similarly, obtaining patient views was one of three research recommendations from the PRISMATIC study:

Acceptability of predictive risk stratification and communication of scores to patients and practitioners is an important topic to explore (Snooks, Bailey-Jones et al. 2018).

This latter quotation outlines a further justification for conducting this study on patient views, as it acknowledges the potential value of patient/practitioner discussion of emergency admission risk. There is a growing body of evidence supporting risk communication and the premise that the exchange of information and opinion about risk leads to better understanding and better decisions about clinical management (Hargraves and Montori 2014). Risk communication has been described as an essential prerequisite for shared decision making (Edwards and Elwyn 2001), which in turn can increase patients' ability to manage their health and improve outcomes, including a reduction in admissions (Hargraves and Montori 2014).

An early finding of the PRISMATIC trial was that some GPs discussed EARS data with patients but lacked guidance on appropriate and effective communication strategies

(Kingston, Porter et al. 2014). Other EARS users have reported that integration of EARS scores with patient clinical records would support risk communication (Chapter 8). There is, however, little suggestion that risk communication has happened widely – neither in the PRISMATIC study nor in EARS implementation elsewhere. Opportunities may therefore be lost to involve patients in their care decisions, and to fully realise their potential as a resource in self-management of their health and wellbeing.

But how do patients feel about their emergency admission risk scores? How might they react? Do they ultimately want to know them? These are all important questions relating to EARS risk communication and add to the compelling argument for closer scrutiny that this chapter seeks in part to address. The aim of this work was to explore patient views about acceptability, benefits, challenges, and risks of communicating information on emergency admission risk, derived from EARS, during patient and GP encounters.

Method

Design and setting

I employed a qualitative study design, and conducted a focus group with a group of public/patient individuals to explore their views. I am an experienced focus group researcher, having facilitated approximately thirty previous groups. The group was held in a hotel in South Wales in November 2018. To provide additional rigour to analysis and results, I followed the Consolidated criteria for reporting qualitative research (COREQ) guidance (Tong, Sainsbury and Craig 2007). A COREQ checklist is supplied – Appendix 13.

I chose to conduct a focus group (rather than individual interviews) because they provide a forum that supports participants to share experiences and opinions, to react and respond to others within the group; potentially offering views or comments that might not surface during individual interviews (Tausch and Menold 2016), (Morse 1994), (Stewart and Shamdasani 2014). These dynamics also make focus groups well suited to exploratory work and idea generation, and to exploring beliefs about health and disease (Morgan 1996, Bowling 2002).

Participants and sampling

The focus group participants were sampled opportunistically on a theoretical sampling basis – where the aim was not to achieve a representative sample but to choose cases that could contribute to theory generation (Jupp 2006). The participants were all members of an existing patient and public involvement group (SUPER –Service Users for Primary and Emergency care Research) (Evans, Gallanders et al. 2020). SUPER brings together representatives from across Wales and is not linked to any particular care facility or service.

This was appropriate in the context of exploring the issues from a general rather than local or service specific perspective.

To facilitate involvement, the focus group was convened following a scheduled meeting of the SUPER group members, and in the same location. All meeting participants (n=22) were invited through email and provided with an information sheet outlining the study background and aims (Appendix 14), and a consent form (Appendix 15). Eligible participants were those with one or more chronic conditions or recent experience of an emergency admission to hospital (for themselves or a family member). This criterion was used to ensure a degree of familiarity with the emergency admission concept, and to support discussions around management of chronic conditions and admission risk. Of 22 members invited, the aim was to include six to ten to achieve a judicious balance between information discussion and manageability (Leung and Savithiri 2009), (Tausch and Menold 2016).

Participation was voluntary and written consent was obtained immediately prior to the group. As per good practice (National Institute for Health Research 2012, Evans, Gallanders et al. 2020) an honorarium was provided to cover participants' time and costs of attending the SUPER meeting of which the focus group formed a part.

Data collection

The group discussion, which I facilitated, lasted 56 minutes. I knew two of the members through previous research links with the SUPER group. No non-participants were present. I developed and used a semi structured topic guide (Box 12) as a stimulus but ensured opportunities for participants to help shape discussions. Through a brief PowerPoint presentation (Appendix 16) at the start of the focus group, I summarised the nature and background of EARS tools; theories of how they could support patient care (based on NHS documentation) and outlined an indicative risk tool (the Welsh predictive risk model – PRISM).

The focus group was digitally recorded and transcribed verbatim by an external transcription company. Comments were anonymised within the transcription, with individuals identified by self-identified gender and number only e.g., M3.

- What knowledge did you have of other types of predictive risk tools?
- Are you aware of your GP practice having an emergency admission risk tool?
- What do you see as advantages/disadvantages of identifying people at high risk of hospitalisation?
- What are your concerns?
- Do you think GPs have a role in primary prevention?
- Who do you think should have access to your emergency admission risk score?
- Would you want to know your emergency admission risk score?

Box 12: Focus group semi-structured topic guide

Analysis

I used an inductive approach and analysed the focus group thematically using printouts and Nvivo (version 12) software. Thematic analysis is a systematic and transparent method that generates themes from the explicit and implicit ideas in the original accounts of participants (Braun and Clarke 2021). I followed the six stages of analysis as described by Braun and Clarke, which include familiarisation with the data, coding, generating themes and interpretation (Braun and Clarke 2021).

I led the analysis with a colleague (AP) independently supporting key stages of coding, generating themes and interpretation, thus encouraging a critical stance to test and confirm findings (Marshall and Rossman 2014), (Miles and Huberman 1994).

The following sections highlight the key themes. Quotations are used for illustration, to reinforce themes and to maintain an authenticity of patient voice.

Ethics

Ethical approval was not required. There was no intervention, randomisation, or expectation of generalising from these findings. This position was confirmed by use of the HRA decision tools (available at <https://www.hra-decisiontools.org.uk/>). This focus group study was however carried out in accordance with ethical principles, including informed consent, to protect the rights, safety, and wellbeing of the participants.

Results

Nine participants took part in the focus group, coming together from different parts of Wales and England – see Table 36. The group demographics were consistent with the wider SUPER group profile (Evans, Gallanders et al. 2020), being well balanced in terms of gender and with an average age of 59.

Table 36: Profile of focus group participants
[Table created by Mark Kingston in Microsoft Excel 2023]

ID	Gender	Age band	Residence
1	F	60-69	South-East Wales
2	M	70-79	South-East Wales
3	M	60-69	South-East Wales
4	M	70-79	North Wales
5	F	50-59	South-West Wales
6	F	60-69	South-East Wales
7	F	60-69	West Midlands
8	M	50-59	North Wales
9	F	30-39	South-West Wales

Following analysis, I identified five main themes: namely that participants...:

- a) ...supported EARS use for patient care
- b) ...were open to use of EARS by different staff
- c) ...wanted EARS use to be aligned with a broad perspective of health and wellbeing
- d) ...saw risk communication as integral to EARS use
- e) ...had reservations over data quality and security

a) Participants supported EARS use for patient care

Participants recognised potential value in the use of EARS in primary care, where EARS information was shared with patients and used to stimulate discussion or action. When asked, all participants would like to know their own risk score; not merely out of curiosity but potentially as a stimulus to positive behaviour change and risk modification. The group debated who might be best placed to benefit from risk scores. A repeated concern was that it may not be practical or effective to target those at the very highest risk. Partly it was argued, this was because those at lower risk may have more modifiable risk factors. One participant described the focus on the top of the pyramid [as used in much of the GP contracts] as 'simplistic', as in the (highest) risk level may be *'a lot of elderly, frail people with comorbidities'* (M2) - which preventative work may struggle to realise benefits for. Members of the group proposed an approach that focussed on those at lower risk – to prevent downstream issues and ameliorate risk. The following passage further illustrates this emphasis on engaging with patients who could benefit most from application of EARS score:

- M3: *If I knew that [my risk score] in advance, can I do a lifestyle change in that three to five years so I don't end up in that high risk.*
- F6: *Yeah, how mobile are you between the categories. If you're at a fairly high risk, are you likely to be able to move down?*
- M2: *The GP could do more in actually telling people in advance [of reaching top risk level] rather than just pulling in the top cohort. If you're in the top cohort, you're a bit late to do changes.*
- F5: *Because changing your lifestyle takes time, doesn't it?*
- M3: *But if you're in one of the other cohorts, there is a chance that you might be able to do something about it.*

The extract is also noteworthy because it emphasises two further observations consistent across the transcript. Firstly, that participants consistently valued risk scores as new information that could potentially support *patient self-management* of health. Secondly, the language used was indicative of a positioning of the patient as owner of their health and as

the active actor in modifying relevant lifestyle behaviours. As per the extract however, realising this role would rely on patients being told of their risk.

Age was a recurring concern for participants, particularly in relation to the appropriateness of different patient identification strategies. Context was important here, in that participants expressed awareness of the challenging environment that EARS tools had been introduced into (in terms of primary care demand, capacity and resources). Some therefore saw factors such as age as a potential determinant (over and above risk score) for which patients might be selected for intervention.

I was just going to say that I don't know if it's just the ageing population that tends to be in the peak of that pyramid, but certainly if young children were in there, as a parent, I would certainly want to know if my child is at high risk of something. (F9)

Further down [risk stratified list], you might have your sort of forty, fifty year old, who's got an unhealthy lifestyle, is at high risk of something coronary happening sometime in the future, and perhaps they might be – you know, if you're short of resources and you can't see everyone, they might be worth targeting more than the older people who, because of their age, are going to have lots of these things. (M4)

However, this targeting of younger patients as a kind of healthcare rationing also prompted a concern over potential discrimination:

I was thinking about my own treatment by GPs, and my parents', there is a lot of age discrimination within the NHS. So, to my mind, one of the reasons why some older people may end up in emergency departments is because GPs and others don't make interventions earlier with them that they might do with somebody who was forty or thirty. (F5)

b) Participants were open to use of EARS by different staff

There was further debate about the most appropriate clinician who might use the risk information. This included discussion of the potential fit of EARS use within annual reviews undertaken by practice nurses (e.g., for asthma patients or those over a certain age).

Although there was support for this approach, some participants reported that the provision of such reviews was variable. Another participant (F5) wondered if a 'care navigator' position might be best suited – someone who knows patients and the services that they might have access to. There was awareness however that asking GPs to use the risk tools and follow up with patients may be challenging in the context of high demand for their services, and their cost:

...because GPs are under so much pressure, they're not using this information in a proactive manner, in the sense of how often are they running the reports, and x percentage of their patients, we need to invite them in. Who's ever been invited in by their GP? Generally, it does not happen. It's patient driven as opposed to GP driven. (M3)

And do you need a sophisticated GP, expensive GP to look at – you know, practice nurses all have degrees these days. They can interpret information and help you analyse the information. It doesn't have to be the GP. (F1)

c) Participants felt EARS use should be aligned with a broad perspective of health and wellbeing

A recurring theme from the group was that EARS risk tool use should align with a broad perspective of patient's health and wellbeing, in line with the general and non-disease-specific risk (of emergency admission) that the tools identify. The group expressed concern that the risk models 'seem very focused on medical factors' (Mp15) and were keen for non-medical factors to be part of the consideration in understanding individual patient risk. Factors such as 'mental illness', 'housing conditions', 'loneliness', and 'alcohol' were cited (M5 and M15). Although the group recognised that these may not be routinely captured in many current risk models there was a hope that practitioners would use their additional understanding of patients, to combine risk data with their own clinical and social insight for a more nuanced determination of which patients to follow up with.

A GP and staff might well take those into account, even if they're not in the [EARS] system. (M8)

But whilst the health centre is primarily promoted as being the medical place that you go to, the predictability tool there has got huge benefits but the answers to the issues that it comes up with will not always be medical. (M3)

However, as one participant reflected, a broad model of risk may present a challenge in determining the most appropriate, or any, risk mitigation:

What are you at risk off? Because if they're frail and they're at risk of falling, is there something that can be done by the GP practice to prevent that from happening. Whereas if they're a smoker and they're at risk of having an asthma attack because they smoke and they have asthma, then that's something that perhaps they can tackle more effectively. (F6)

The importance of non-medical factors to the patient group was not limited to patient selection but applied equally to potential risk mitigation. To illustrate this view, one participant drew on an analogy from a service for regular 999 callers which had illustrated that "a lot of these people, the services they need are not in emergency departments" (M4). In relation to community-based intervention there were suggestions that EARS use would fit well where there was a focus on 'wellbeing' (M2) or 'social prescribing' (F5). But this approach was not deemed typical in current primary care:

If we actually moved to a broader concept of wellbeing centres, which actually start to de-medicalise some aspects of people's lives – because currently, the expectation is most people going to their GPs, they're going to walk out with a prescription, and the reality is they perhaps don't need a prescription, they need something else...the

patient's expectation will always be of a medical intervention. GPs don't get paid to de-medicalise patients. (M4)

d) Participants saw risk communication as integral to EARS use

Most participants reported no direct experience of risk tools and no EARS tool was reported to be in use, to their knowledge, in the patients' general practices at the time of the focus group. They were however familiar with the concept of risk and recognised that GPs regularly made decisions or recommendations based on a balance of risk and benefits, albeit that this was not always enunciated:

I have many GP consultations about all sorts of things, and I think that he's always got risk in the back of his mind, but he doesn't ever say it (F1)

There was also a view that GPs were less likely, and less willing to discuss risk with patients than some other professionals, perhaps due to the complexity of risk discussions.

I find – my personal experience of GPs is, when I ask them about risk levels, they prescribe a drug for me for a condition. They're extremely reluctant to talk about risk. They won't really talk about it. Hospital surgeons, for example, will give me figures without asking. So, my personal experience is GPs don't like talking about risk levels. It's a very difficult area anyway, and you can't necessarily give a straight answer (M8).

Two participants did confirm experience of clinical risk tools or scores in primary care. The examples provided were both disease specific – one for colon cancer and another for heart disease. In discussing the former, there was a view that cancer risk was a regular consideration for clinicians and would likely lead to predetermined pathways of care.

It's all laid out by the NICE recommendations, and if you fit certain criteria then you're straight off on the urgent cancer pathway. (F5)

From the recipient of the heart disease risk, there was a sense of frustration with the response to their assessment – which resulted in a prescription – but not further discussion or information:

Well, actually, in the next three to five years, you could have a heart attack," and, you know, you could actually die from one heart attack, bang, you know. What would have been very useful, I think, is sharing with them some information to actually look – when you've gone away from the surgery, to make sure you can consider what the kind of options would be, as opposed to it being, "Well, there's the conversation, here's your prescription. Thank you very much, off you go." (M4)

The examples prompted further reflection on the use of risk scores, and other participants also expressed concern over meaningful discussion of the next steps for care following a risk assessment. Participants were keen that risk scores should not be used bluntly, nor the scope of care limited to a drug or strictly medical intervention. They wanted patients to be involved in the decision making about their care.

...a bit like [participant M4], you know, the response to that was, "Oh, you need to go on statins," as opposed to, "Well, actually, are there any lifestyle changes that you can do, you know, weight loss or other factors?" There was an immediate medical response to a statistic, as opposed to, "Well, actually, are there any other interventions?" (M3)

I don't want somebody to do a risk assessment and then bully, force, whatever me into pursuing a certain course of action. I mean if I don't want to take statins or not have a flu jab. (M8)

When asked (at the end of the discussion) if they would want to know their own risk score, the group were unanimous that they would – although this was tempered a little with one view that *"unless something's going to be done with it, I don't think there is much point"* (F1). In terms of intervening, the participants emphasised the patient role in any follow-on care management – with patients able to decide to respond (or not) to the information and or advice shared with them.

F6: It's great to have somebody do something about it, if they're going to give me that and say – that means I'll do something about it.

M3: Or I won't do something about it [all laugh].

F6: But it's a decision not to then, isn't it?

F7: Yeah, I would suggest it empowers you to do something about your lifestyle to a certain extent.

In relation to the potential communication approaches to sharing EARS risk with patients, one participant noted that the PRISM risk tool (of which screenshots were shared) was intended for GPs to access, and by implication, may not be appropriate to share with patients.

Some of the terminologies are not exactly how you would like your GP to regard mental health problems...So, that's one other factor, if you're going to say to people, "Would you like to see your record?" you know. (F5)

e) Participants had reservations over data quality and security

Several participants had reservations over the use of routine data, chiefly regarding accuracy, access and security. In respect of the first of these, participants understood that accuracy was an important attribute of the risk models, but felt that issues may emerge given the scale and complexity of the data, and the absence of patient scrutiny.

... in all the millions of records, there must be errors, and it's making sure errors don't cause problems. (M8)

And if you can't check it, you can't challenge what's there about you. I mean, I'm thinking, I've got an electronic patient record, and I haven't got any of this [in the electronic record]. (F6)

None of the group were previously aware of the use of risk stratification tools in primary care, and they were surprised (with audible gasps on the recording) about the scale and scope of EARS tool roll out and the costs of the unplanned admissions enhanced service in England. This prompted discussion over ownership, patient engagement, and the use of data without patient awareness.

M3: I think it's my data and I should know what's being done with it, and that is my first principle.

M8: I think there's a scandal that there isn't more known about this publicly, because this is the first I've heard about it...

M3: It's like it's secret almost.

There was also recognition within the group that there are many aspects of data that patients would not routinely be aware of, rightly or wrongly.

I think that the GP contracts contain all sorts of information that we'd be interested in, but we don't look at them, see them, aren't aware of (M6)

The concern for wider awareness was also acknowledged in relation to data flows, given expectations that some private companies may be involved in supporting risk stratification (e.g., as suppliers of risk tools).

It's within the NHS, but they subcontract to a private company, and that's fine...But we need to know what's happening. (F5)

While there were no expressed concerns with GP practice staff having access to the risk score and data, there were reservations about the potential use of the same data by other groups:

Well, the only [concern] I have is the ability potentially for various pharmaceutical companies, med tech companies, commercial organisations to have access to this data. And although it might be anonymised or whatever, it is still a potential problem. (M2)

Discussion

Summary

This study identified and articulated a range of patient/public views on EARS. In doing so it provides a rare insight from a stakeholder group that has largely been excluded from debates around EARS use. The peculiarity of that exclusion has been reinforced by the passion and enthusiasm with which the participants engaged with this topic.

The participants were cautiously positive about EARS and its potential role in primary care, although there were some reservations. Strikingly, all wanted to know their own risk score. They saw emergency admission risk information as a useful, general overview of patient health, providing an additional and personalised perspective on their health. Through risk stratification and discussion of risk at an individual level, the group saw potential for subsequent risk mitigation activity, with patients playing a major role. This perspective seemed to be founded on two key principles. Firstly, that patients were made aware of their risk score, facilitating patient involvement in decisions on next steps. Secondly that the generalised, non-condition specific risk of admission may need a general (or holistic) response, not limited to medical and drug interventions but considerate of social or lifestyle factors too.

There were few specific concerns over the principles of risk stratification for emergency admissions, but data safeguarding was important. It may well be that the use of EARS tools is acceptable to most patients – but further exploration is needed.

Some of the respondents reported that their own GPs had used non-EARS risk scores/tools in relation to their own care. They had concerns that the information was applied bluntly, as a *fait accompli*, and lacked meaningful patient/clinician dialogue. This served as a warning for the use of EARS, which participants saw as a more nuanced measure, requiring more reflection/discussion (and therefore more time) prior to care decisions. However, the patients were cognisant of pressures in primary care and recognised that risk communication and shared decision making may not be straightforward or quick – but was important in the aim of involving the patient in decisions about their own care. They felt that GPs may struggle to implement models of care based on proactive identification of patients. Such proactive care was not a familiar element of their experiences of primary care – hence the rhetorical question of ‘*Who’s ever been invited in by their GP?*’. In this context, there was a general sense that other professionals may be better placed to work with those identified through risk stratification.

Participants noted some limitations of the variables included in EARS models, particularly regarding the absence of non-clinical factors that pertain to health such as around social determinants of health. It was therefore deemed preferable if clinician users could bring additional patient insight to any decisions about patient selection for intervention (from the wider clinical record or their own knowledge of the patient). Participants felt the question of who would benefit most from intervention was important – and linked potential answers with interventions addressing social and lifestyle aspects and patient self-management.

Strengths and limitations

The primary strength of this study is its scope; in providing patient insights into a research field dominated by the experience and views of managers, clinicians, commissioners, and other stakeholders. The study complements these perspectives and the surrounding evidence and understanding around EARS.

The chief limitation of the study is its scale, with one focus group and nine participants. Although some methodologists propose two focus groups as a minimum for any study e.g., Leung and Savithiri 2009 (Leung and Savithiri 2009), this was an exploratory study conducted to provide a better understanding and identify issues of importance, rather than conclusive results (Jupp 2006, Swedberg 2020).

A potential limitation of the sampling frame was that participants were all members of a pre-existing group (SUPER) that unites public members to discuss aspects of primary and emergency care research (Evans, Gallanders et al. 2020). They were therefore likely to be more health literate and research aware than a general patient population. However, they were also varied, in terms of age, gender, clinical history, and all met the inclusion criteria of experience of chronic conditions and/or emergency admissions. They also lived in different general practice areas with diverse health and wellbeing experiences, and thus brought multiple perspectives of care to the discussion. Furthermore, some participants knew each other, and this supported a lively discussion. The group did not feature people who belonged to general practices using EARS at the time, an important cohort for inclusion in further patient focussed study.

Comparison with literature

While this study covers new groups in providing patient insights into EARS use in primary care, it is apparent that some of these views resonate with those of stakeholders reported elsewhere. This was true of the comments that point to the use of a more nuanced approach to identifying patients than use of a risk tool alone i.e., supplementing the data with the knowledge and insight of clinicians. For example, in a qualitative study of GPs working in a German case management initiative incorporating EARS (Freund et al. 2012); the clinicians reported 'care sensitivity' - patient's willingness and ability to participate - as a key determinant of selection for the intervention (Freund, Wensing et al. 2012). Similarly, a study of managers and clinicians in an integrated care multi-disciplinary team (MDT) innovation from Stokes et al. (Stokes, Riste and Cheraghi-Sohi 2018), found movement away from a 'formal data-driven approach' to a more 'fluid, active process of selection via iteration and consensus' – to target those patients with *unmet and actionable* needs, rather than simply

quota filling'. The authors advocate involvement in the MDT of those with the capability to address these needs (yet strangely they did not include patients in this thinking). The same study also provided clinician views on the most appropriate patients to target. Their findings resonate strongly with the patient feedback here – in advocating a focus on patients of moderately high (rather than highest) risk and with social rather than medical complexities (Stokes, Riste and Cheraghi-Sohi 2018). The findings also overlap with a further qualitative study of primary care clinicians and service users regarding cancer risk assessment tools. In this study participants had concerns about the tool fitting with everyday practice, and the need for training. Whereas some practitioners were sceptical, the service users were (in findings that are particularly resonant) more encouraged by the potential of the tool to support decision making, self-management and personalised care (Akanuwe, Black et al. 2021).

I found that some participants had reservations over data quality, privacy and security, all of which are common reservations expressed about the application of 'big data' in healthcare (Ancker, Silver et al. 2013), (Goytia, Kastenbaum et al. 2018). Although clinician use of the data was not deemed problematic, caution over potential influence of commercial interests was expressed, and has also been identified elsewhere (Goytia, Kastenbaum et al. 2018). Although this small study only touched upon the subject, it is likely that the use of personal data for EARS overlaps with wider debates about public trust in science and healthcare, and about the use of personal health data without explicit consent (Kalkman, van Delden et al. 2022).

Patients consistently linked the effectiveness of EARS to risk communication, and the involvement of both clinicians *and* patients in decisions about care (i.e., shared decision making). The patient support for risk communications aligns with the policy emphasis on inclusion of patients as active partners in healthcare decisions – as articulated by former UK Secretary of State for Health, Andrew Lansley, in the phrase '*nothing about me, without me*', (cited in (Coulter A 2011)). Risk communication also has a relatively strong evidence underpinning, linked to increases in patients ability to manage their health and improve outcomes, greater adherence to treatment and improved satisfaction with the process of care (O'Connor, Bennett et al. 2009, Naik, Ahmed and Edwards 2012), (Zolnierek and Dimatteo 2009).

...providing evidence-based risk and benefit information to patients and ensuring adequate understanding and accurate perception of such information by patients, forms the cornerstone of informed decision making. (Naik, Ahmed and Edwards 2012)

Despite the unambiguity of the patient interest in EARS, and an important ethical component (do they have a right to know their risk score?), to the best of my knowledge no research into EARS risk communication has been undertaken – and there is little suggestion that it has been common in initiatives to date.

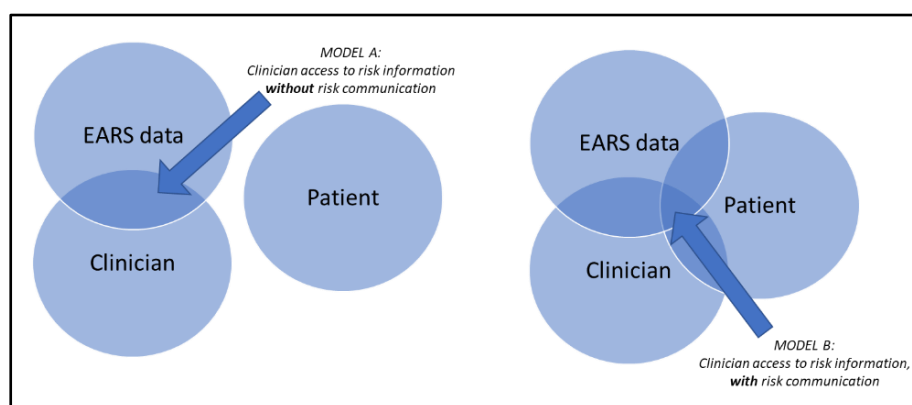


Figure 36: Venn diagram of EARS use within patient/clinician encounters – with and without risk communication

[Image created by Mark Kingston in Microsoft Visio 2023]

However, risk communication is not straightforward, and has been described as challenging to understand and communicate (Naik, Ahmed and Edwards 2012) (Han, Joeques et al. 2014). One key challenge relates to health literacy or *‘the personal characteristics and social resources needed for individuals and communities to access, understand, appraise and use information and services to make decisions about health’*, is key to improving peoples’ (World Health Organisation 2015) (Dodson, Good and Osborne 2015).

This desire for shared decision making contrasts with the traditional positioning of doctors as decision makers, acting as the patient’s agent in determining action (Coulter A 2011). It is widely accepted that the mass cultural shift to shared decision making has yet to happen.

...only a minority of patients facing major medical decisions are fully informed about the key facts that might influence their treatment choices and attempts to elicit their informed preferences are relatively rare (Coulter 2010; Fagerlin et al.2010; Zikmund-Fisher et al.2010).

In my role as focus group facilitator, I was initially taken aback by the unanimous view of participants, that they would all want to know their own risk scores. On reflection perhaps this was more likely given the participants’ SUPER group role and interest in primary and emergency care. It is also consistent with evidence that *“most patients want more health information than they are usually given”*, and that *“many people express disappointment about the lack of opportunities to participate in decisions about their care”*. (Coulter A 2011).

Issues of equity in patient selection were apparent in the discussions, with members of the group raising potential ethical dimensions to selection such as scenarios where older patients might be excluded from follow up. Meeting the challenges of scarce resources and rising demand does require decisions about the most appropriate allocation of health resources and is a central tenet of health economics. This is equally true of risk stratification, and there is merit in views that interventions should be offered to those who are the strongest responders and are the most likely to benefit from the intervention, especially if its availability is publicly funded (Fleck 2012) (Shadmi and Freund 2013). However, EARS patient selection can be complicated by its generic measure and not being tied to a specific disease (and criteria for selection), and it may also be difficult to draw a line between strong, moderate and marginal responders (Shadmi and Freund 2013), (ASSEHS Study Team 2016). These ambiguities could lead to inequitable selection as biases in selection may differentially affect patients from disadvantaged population groups (Shadmi and Freund 2013), (ASSEHS Study Team 2016).

Implications for research and practice

While small scale, this exploratory research has reinforced the importance of involving patients and public members in debates about the use of EARS. Further patient focussed study is critical to our understanding and needs to address the broad principles as well as focussed work on EARS application in specific contexts, and within individual patient/clinician interactions. At the broad level, further work on the acceptability of risk stratification is needed, to see if the enthusiasm for discussing risk scores shown by the participants is a more widely held view.

It was apparent that at least some of the participants ascribed ownership of risk scores to patients – rather than clinicians. Is the desire to discuss individual emergency admission risk stratified score with clinicians, as seen here, a common view? A lesser finding of the PRISMATIC study was that clinicians lacked guidance on using and communicating EARS scores (Snooks, Bailey-Jones et al. 2018). The patient feedback reported here furthers the argument for closer inspection of risk communication, and the potential of EARS to support shared decision making and patient self-management of their care. In the context of nearly 20 years of data driven EARS tools, the development of EARS communication guidance (with both clinical users and patients as active participants) is long overdue. There is a relatively strong intellectual field around disease specific risk communication both in terms of approach and efficacy; exploring EARS guidance could support intervention efficacy and have relevance to approaches for other holistic or multi-morbid risks such as frailty (Clegg A 2018) or Covid-19 (Gutierrez, Volkovs et al. 2021, Hippisley-Cox, Coupland et al. 2021).

Conclusion

This qualitative study adds patient perspectives to our evolving understanding of EARS in primary care. Nine patient representatives found EARS broadly acceptable and were optimistic about the potential for EARS risk communication to promote shared decision making and stimulate positive patient behaviours. They saw challenges in introducing EARS and proactive care to overstretched care practitioners and settings. The findings reinforce the importance of understanding patient views. I participants in this focus group study were active and engaged, many patients want similar involvement in decisions about their care. To improve our understanding of the potential role of EARS and similar risk stratified approaches in healthcare, further patient input is both needed and overdue.

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Chapter 10: Discussion

Introduction

In this chapter I summarise the findings from the research and discuss their implications. I begin with an overview of the key findings from the previous chapters, relating these directly to the aims and objectives (repeated below) of the study overall. I then reflect on the strengths and limitations of the study, the implications for policy and practice and add suggestions for future research. I end with the overall conclusions of this thesis.

Summary of Main Findings by Objective

Objective 1: What was the policy rationale for EARS implementation in the UK?

I found that, over a fifteen-year period, EARS was inextricably and consistently linked to a policy focus on population health challenges associated with multimorbidity and rising demand for healthcare, particularly emergency admissions – the costliest part of care provision. These challenges, of capacity, cost and quality were widely (and correctly) projected to worsen in a range of UK government and NHS policy documents, notably the Wanless Review (Wanless 2002). I illustrated that the broad policy ambition was to address a triple aim of reduced hospitalisation, improved patient care, and reduced health service costs, not by doing more of the same, but through new approaches and innovations that focussed on personalised, integrated and targeted care for high-risk individuals. This rejection of the status quo was operationalised in a range of priorities and principles and in reorganisations and new services, care models and staff roles. These were typically focussed on improvements in primary (and community) care, as a means of preventing downstream problems. Notably these changes included the emergence of chronic condition management models, paragons of care for those with multimorbidity, complete with an emphasis on stratified, integrated care, with case management for those at highest risk of poor health and high cost.

EARS was seen as a technological innovation capable of identifying high risk patients who could then be efficiently targeted for preventative care. However, primary care was also experiencing demand and resource issues which policy efforts to increase capacity were unable to address. Furthermore, there was no clear logic or understanding of the mechanisms by which targeting care at a small number of patients at highest risk could support the scale of the policy ambitions. Despite disappointing results (in the UK and internationally) of initiatives to reduce admissions (with or without EARS), the policy ambitions remained as rises in admissions and multimorbidity were realised. In response

policy makers continued to promote EARS, notably culminating in widescale promotion of use within emergency admission enhanced services in the UK general practice contracts.

Objective 2: To review the evidence for EARS prior to implementation

EARS tools had initially been developed with paper based or manual data entry, with limited potential for efficient, widescale or population level risk stratification. Advances in routinely collected health data helped lay the foundation for new EARS tools that used this administration data to autogenerate risk predictions. Government and NHS commissioned tools were developed (following well established principles of clinical risk tool development) which were deemed to meet accuracy requirements, especially for those at highest risk. In addition, there was some evidence that EARS tools predicted EAs better than alternative approaches of threshold modelling or clinician prediction, evidence that was consistently used in justification of their use in targeting of patients.

However, while development and validation of risk tools were two important parts of the evidence around EARS, a third part – evidence relating to their clinical use (effectiveness and implementation evidence) was limited. The systematic review (Chapter 5) assessed the scientific evidence up to 2015, to understand the research position prior to the widescale implementation of EARS, notably in the enhanced services of 2013/2014 onwards.

From over 10,000 articles considered, 13 papers, from 11 studies met all criteria and underwent full data extraction. The included studies were heterogeneous in terms of methods (quantitative and qualitative or mixed). A notable finding was that EARS tool use was aligned with specific interventions as an EARS+ intervention model, rather than merely additional information for clinicians to use in decision making. Case management was the main approach, often as part of new professional roles (community matrons, care coordinators) or as part of efforts to integrate existing roles (MDTs).

Case selection approaches varied, with some interventions including patients referred by healthcare professionals rather than identified by risk tool – but not differentiating outcomes in relation to the different recruitment approaches. In some cases, the use of mixed methods of case selection, illustrated a lack of intervention fidelity. In the published studies it is not possible to separate out effects of the predictive risk tool from those of the associated intervention. Overall, there was little indication of clinical or cost effectiveness following the introduction of risk prediction models in the included studies, nor of improvements in patient outcomes. A potential limitation was that for studies collecting outcome data, most follow up periods were short. A further limitation of much of the review evidence (and of other evidence from grey literature), was that process and implementation outcomes were poorly reported and insufficient to support study replication. Qualitative data did however provide

clinician and other professionals' insights, which were suggestive of important barriers and facilitators to address before effectiveness would be likely. This data indicated that while there was support from many staff involved (especially those amenable to new ways of working), there were concerns over the accuracy of models, access to data, EARS tool usability and practical applications of risk scores. Organisational support was deemed an important influence on use. The review identified no studies incorporating patient perspectives.

Overall, given the small number of studies and the variability between them, the review did not provide strong evidence for or against the use of emergency admission risk prediction models. It would therefore be hard to argue for the promotion of EARS as evidence based on the results of this review.

Objective 3: To describe the uptake of EARS in the UK

In Chapter 6 I reported findings of an online survey of 235 organisations responsible for primary care services across the four UK nations. I aimed to describe access to EARS tools and their use; and identify influencing factors. The survey achieved an excellent response rate of 72.8%, with 171 organisations taking part. Results indicated that 148 of the organisations (86.5%) had risk tools available to practices in their respective areas. Based on these figures, I estimated that over 7,000 (73.2%) UK practices had access to one or more tools. A striking finding was of 39 different tools in use with an average of two EARS tools in English CCGs, compared to one in Scottish, Welsh and Northern Irish sites. The numbers reflected the contrasting national approaches of a competition friendly multi-supplier market of NHS and commercial tools in England, and nationally led tools in the other nations.

Promotion by NHS commissioners, involvement of clinical leaders, and engagement of practice managers were identified as the most important factors in encouraging use of EARS tools by general practices. Conversely high workloads of general practice and community staff and information governance were important barriers. Tools were most frequently used to identify individual patients within practices, but there were suggestions of use at a wider organisation level as an information source for service planning. Nearly 40% of areas using EARS tools reported that they had introduced or realigned services as a result.

result, but relatively few areas reported use of tools for service evaluation.

These findings confirmed that despite the evidence base a major programme of implementation had taken place, resulting in high spread or penetration across most of the UK. The survey timing is important as it followed the introduction of enhanced services two and a half years earlier, and CCGs that had not already introduced EARS tools, had had

time to address this gap, and thereby respond to the policy agenda and related requests from practices.

Objective 4: To explore commissioner views and experiences of EARS

I found that the main drivers for implementation came from the national policy context, which strongly supported EARS as a means to improve care and address system pressures (Chapter 7). Most CCGs and health boards embraced these ambitions and readily responded to the top-down policy directive by facilitating the introduction of EARS in their areas. In terms of adoption decisions, there was little sense that clinically led (bottom up) demand was a major factor - although the unplanned admission Enhanced Services stimulated practice level demand for the few sites that did not already have tools in place. At CCG/health board level I found that there was a strong supportive context for the introduction of EARS, especially in a testing 'see how it goes' capacity. Nonetheless, implementation was often challenging and resource intensive, with supplier and tool withdrawals notable setbacks for several sites.

I found that there was considerable autonomy at sites in how they deployed and adapted EARS tools, with local context and decision makers key in this determination. The localised approach was strongly influenced by an uncertain evidence based and the lack of a prescribed intervention to accompany roll out of the tool – although that position shifted on arrival of the Enhanced Services. I found a widespread use of pilots and smaller scale testing of interventions – albeit most sites included all practices in their initial roll out of tools. Many sites reported challenges in determining the impact of EARS tools, although many wanted this understanding (from local or national sources) to inform future decisions on use. Participants felt that sustaining EARS use may be challenging, given barriers around role identity and capacity for proactive care, usability, confidence in tool outputs, and uncertainty over evidence-based interventions.

Objective 5: To explore views and experiences of EARS tool users

In Chapter 8, I explored the user experience of PRISM tool recipients in general practices in South Wales. Introduction coincided with an enhanced service (QOF) which rewarded practices for processes associated with identifying and managing patients at risk of admission. Staff, mainly general practitioners, from 28 practices participated in the study, with 16 interviewed using a semi-structured guide, and 27 self-completing a questionnaire that incorporated the System Usability Scale, a validated usability instrument.

I found that PRISM use was often limited to those in practices who were interested in the tool and its technology, but all practices had put forward users, principally driven by the

alignment with QOF. Such was the overlap that most interviewees did not expect to use the tool beyond the QOF period, and this seemed to bear true as NHS Wales data showed a drop off in logins at the end of the financial year.

Barriers to use included technical and usability factors around website speeds, login issues, lack of integration with clinical systems; resource factors around time, capacity to use, and services to refer into; and uncertainty over the value of the intervention. Some potential users abandoned planned use after encountering such technical problems reminding us of the importance of usability in potential adoption.

PRISM was applied to a small number of patients at highest-risk of emergency admissions for a short period in line with the contractual requirements. It was often implied that for many patients there was no determinable change in care. Where changes were desired, these were limited by the barriers to use. Overall, users doubted that the use of PRISM, aligned with the QOF requirements, had prompted significant improvements in care, although some individuals may have benefitted from the increased attention. There was no evidence of risk scores being used in patient/clinician encounters, although some GPs wished to do so and wanted the risk information to be integrated in patient records.

Views on PRISM usability indicated that technical issues aside, it was straightforward to use and learn. An overall SUS score of 65.8 was obtained – reflecting the task-orientated value of the tool in producing patient lists for QOF, relative ease of use, but also the technological barriers. Overall, users were largely accepting of PRISM and the principles of EARS but reported significant challenges to optimal use for patient benefit.

Objective 6: To explore patient views of EARS

In response to the gap in understanding around patient views on EARS, I reported on a focus group with members of a patient representative group in which the acceptability and use of EARS was discussed (Chapter 9). Although, the concept of EARS was new to these participants, all saw a role for EARS and expressed a desire to know their own scores as a prompt for reflections (ideally in partnership with a clinician) on holistic health and future care – including self-management. Experiences with clinical led use of other risk scores (e.g., for cardiovascular risk) were not all positive, and there was a concern that EARS scores, where used (by GPs or others), should incorporate meaningful patient involvement. They recognised that EARS discussions would need to be appropriate and tailored to individuals and would take additional consultation time. They felt that risk communication was an important area for exploration. The group members were aware of pressures in primary care however and doubted that EARS could fit into current practice without additional resources.

In general, participants accepted the use of EARS tools and were attracted to the idea of personalised risk scores which could provide a snapshot of their general health.

Logic Model

Here I revisit the original logic model (Figure 28, page 111) proposed in the introduction chapter, that reflected my understanding of the policy background that encouraged EARS use within the UK GP contracts. I reflect on how the model might be reconsidered in lieu of these PhD findings. I suggest changes and highlight areas of greater understanding or uncertainty. To aid exposition, I present a modified logic model with supporting annotations and comments that reflect key learning points informed by the research reported herein. The blue rectangles represent additions to the original logic model. The clear rectangles represent amended boxes.

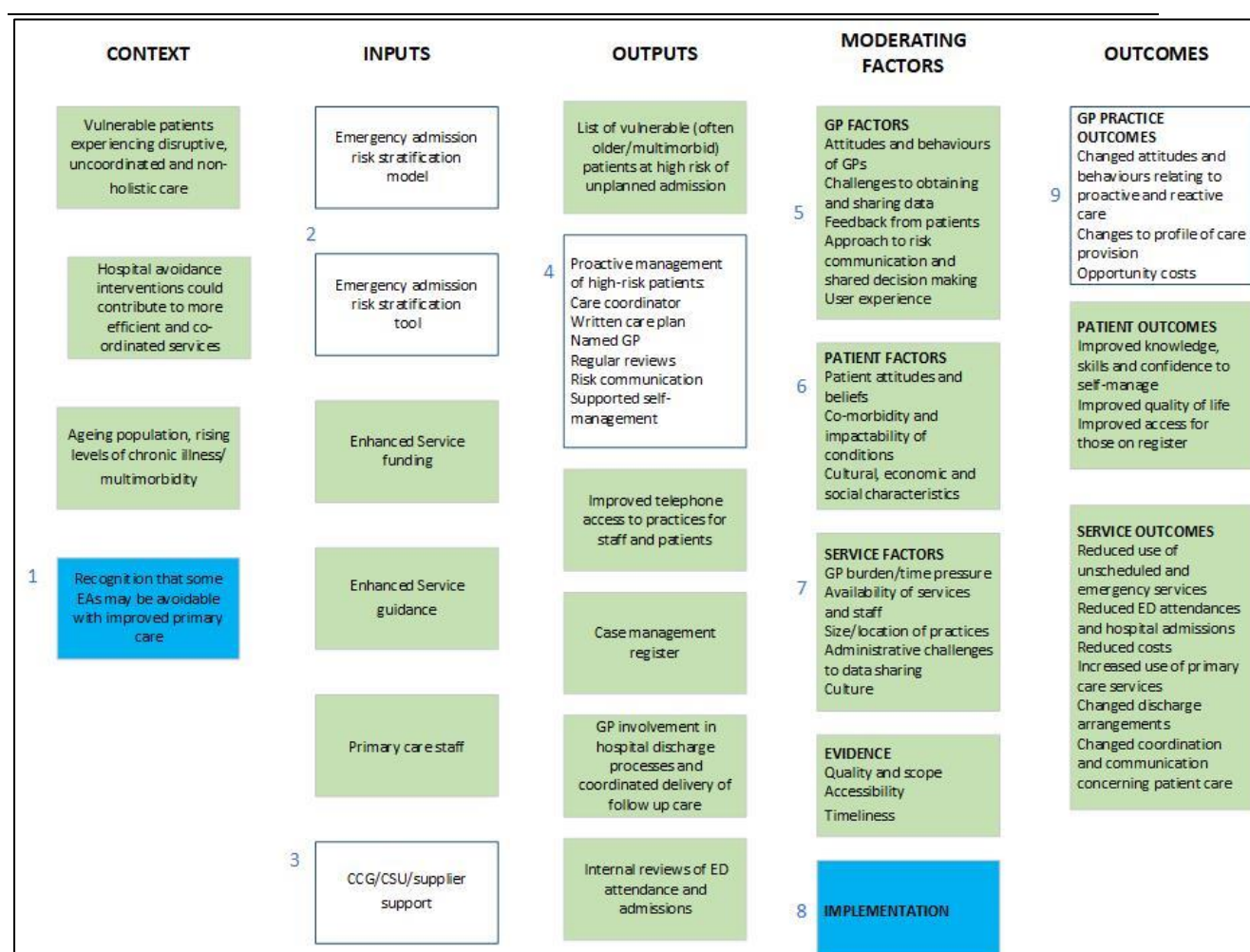


Figure 37: Revised logic model for EARS use in relation to Unplanned Admissions Enhanced Service

[Image created by Mark Kingston in Microsoft Visio, 2023]

Context

Broadly the contextual factors outlined from the policy background literature were consistent with the 'on the ground' empirical data findings. The factors presented heavily featured in the rationale for EARS introduction expressed in commissioner and practitioner interviews, and there was widespread recognition that changes and innovations were needed, and that the status quo was not an option.

One aspect that was not explicit in the original logic model was the specific emphasis on primary and community care as the setting for the 'hospital avoidance interventions' associated with EARS. I found in the thesis that the locus of EARS use was very much primary care, with very little overlap with secondary care in implementation or evaluation. On reflection, this also tallies with the common view (identified in Chapter 3) that some EAs, such as for ACSCs, may be avoidable with improved primary care (1).

Inputs

The importance of funding initiatives to promote initial use, as a platform for potential adoption were apparent. While the logic model was developed with the Unscheduled Admissions Enhanced Services in mind, the commissioner interview data demonstrated that local funding initiatives were also important drivers of take up.

The contract guidance related to the Enhanced Services was influential. Meeting the requirements was more often expressed as an administrative need, than a patient need. This likely reflects uncertainty in the value of the tasks as well as the business imperatives associated with the payment structure.

There were few reports of guidance (i.e., an input) on how to discuss emergency admission risk with patients.

One clear learning point from this thesis was that supplying emergency admission risk scores or levels depends on the underlying algorithmic model and the user facing tool. The feedback of commissioners and of PRISM users was testament to the importance of both in the overall user experience, and of the likelihood of adoption. In the revised logic model, I have expanded 'Emergency admission risk stratification' to two boxes and separated 'model' and 'tool' (2). The extent to which an EARS tool is both integrated and interoperable with clinical systems are also relevant in this domain.

A further amendment highlights the role of CSUs and EARS tool suppliers in tool development and design, as emerged from the commissioner interviews (3).

An up-to-date logic model for EARS use in England might recognise the changing infrastructure with CCGs and CSUs now defunct. A revision might also recognise the emergence of NICE guidance that encourages EARS use in the care of multimorbid patients

(NICE 2023), and reconfigured GP contracts, that removed the specific funding for EARS but incorporated a focus on vulnerable high-risk populations into the core contract (with a greater emphasis on frailty and multimorbidity) (NHS England 2018).

Outputs

Of the outputs of the original logic model, the risk stratified lists, and written case management activities were commonly reported in relation to EARS use in both commissioner interviews across England, and the user focussed work in Wales. In terms of the national GP contract, there was clear commitment to the tasks aligned thereto, especially those which could be done independently of the patient. What emerged from my research, reinforcing findings elsewhere, was that it was the proactive and patient facing aspects that were challenging to deliver. Thus, for example, the ambition of the English and Welsh contracts was that EARS would support patient and clinician led discussions of risk and of holistic health and care needs (not disease-specific). Note that these elements were not mandated however, nor related to payments. However, this direct patient facing activity was infrequently reported. It is questionable that 'risk communication', and 'supported self-management' (4) were fundamental aspects of the intervention that was delivered. Any future EARS intervention or service intending to influence patient behaviour through patient and clinician discussion may need to put in place protocols that better ensure, rather than hope, this happens.

Moderating Factors

This thesis majors on the factors that may influence how EARS tools are used (if at all). It reinforces the relative importance of the GP, patient, and service factors (5,6,7), and the complexities around evidence that were raised in Chapter 2: Part 1 (evidence and real-world settings). However, the original model would be enhanced with the addition of an 'implementation' box (8), that reflects my evidence that implementation success is an important and sometimes overlooked component.

While I have previously flagged the imbalance of understanding of staff vs patient views of EARS, it is strongly apparent when looking over the moderating factors in the logic model. In the staff interviews I undertook, there was very little positive reinforcement of use based on patient feedback. Nor however, was there much negative feedback. This reflects a lack of understanding of patient experience. Given the enthusiasm of the patient representatives in the focus group (Chapter 9), there may be missed opportunities to harness the patient perspective as evidence that supports (moderates) EARS use. This, however, remains an area of uncertainty pending further investigation.

Outcomes

Perhaps the only certainty regarding the logic model outcomes (at patient, practice, and wider levels) is that they are shrouded in uncertainty. Given the scale of investment this remains at best surprising. It is disappointing that few high-quality prospective evaluations were undertaken in line with the GP contracts and the overall EARS push across the UK. One additional element that I have added is 'opportunity costs' under GP practice outcomes – reflecting that efforts spent on EARS activities replace time and resources on other tasks (9).

Strengths and limitations

The strengths and limitations of each research package are discussed in the corresponding chapters. Here therefore I summarise the strengths and limitations as they relate to the overall scope and methodological approach.

The topic area explored in this thesis addresses important questions concerning EARS and implementation success and failure, building on and complementing the PRISMATIC study, and other related literature. A strength therefore is that this work contains learning and reflective points for researchers, policy makers and clinicians alike regarding EARS.

Like any study or set of studies, this thesis reports data from particular timepoints, and in specific contexts. As with most part time PhDs, data were collected over a number of years, providing 'snapshots' that reflect a context of the time, rather than the context of today. For example, the survey, follow up commissioner interviews, and user experience study were undertaken at a time when the national unplanned admissions Enhanced Services were active – an influential factor in the overall EARS 'story'. While this can be seen as a limitation, it is in keeping with the use of implementation research approaches where context plays an important role. This thesis emphasises that position further by unveiling some of those contextual factors that influenced implementation, of which future implementers can be aware.

As set out in the introduction, the thesis origins are linked to professional and academic role engagement with NHS staff and patients. Such influences are thought to contribute to better research questions and to research impact (Simpson, Jones, Barlow & Cox, 2014).

Alignment with the PRISMATIC study provided benefits in terms of access to engage with a relevant sample of EARS tool users, with whom I had already built a rapport, and who may have been reluctant to participate outside of that trial context.

A strength of this thesis is its inclusion of multiple stakeholders across a range of geographical, structural and role boundaries, enabling an analytical focus that encompasses a broad range of perspectives and settings in contributing understanding. Achieving these

multi-stakeholder perspectives was crucial to the delivery of the thesis objectives. Nonetheless, I acknowledge that the omission of macro level policy makers is notable, in relation to the rationale for EARS introduction. Inclusion of this stakeholder group, within government or NHS bodies, may have provided insight into the 'big picture' of EARS related decision making, and the role of evidence in these decisions. However, this is a notoriously difficult group to identify appropriately and to access (Tricco, Zarin et al. 2018), and the time passed since some decisions over EARS were made may have increased the recruitment challenge and potential for recall biases (Althubaiti 2016). In recognising this limitation, my own rationale was that the manifestation of policy makers decisions should by their very nature, be captured in the policy and service documentation that followed – which I summarise in the background and context section.

I included patient views in this thesis, not just because the patient voice has been marginalised in EARS research, but because they are arguably the most important of all stakeholders. Indeed if we acknowledge stakeholders as those *“that have a direct interest in the process and outcomes of a project, research or policy endeavour”* (Deverka, Lavalley et al. 2012), then it is hard to reason otherwise. In any discussion of EARS, it is beholden on us all to be reminded that each risk score corresponds to an individual with a unique set of circumstances, needs, views, and values. While the inclusion of patients supports comparison with the views of those who plan and deliver patient care, a potential criticism is that there were far fewer patients included in this study than professionals. This is an observation which I return to later in this chapter when considering implications for research. A strength of the study design was the multi-method approach that utilised findings from early stages, including the systematic review and survey, to inform and enhance the design and understanding of subsequent stages. The intention was to use complementary study designs that addressed different but related aspects of the overall picture (Tariq and Woodman 2013). So for example, this approach paired quantification of EARS implementation through the organisation survey, with the opportunity to capture a more nuanced understanding of issues raised through follow up interviews (Creswell and Clark 2017) (Tariq and Woodman 2013). Similarly, a multi-method approach supported exploration of both attitudinal and behavioural dimensions of the user experience in Chapter 8. One further strength was the application of implementation science frameworks, notably i-PARIHS, which I used to support analysis and reflection. While use post-hoc is a potential limitation, the framework provided a valuable and evidence based conceptual lens grounded in implementation science.

The work presented leans heavily on qualitative methods. To enhance rigour and quality, qualitative analysis should be a discursive process with multiple coders developing ideas

and revising the coding framework (Braun and Clarke 2021). This approach was taken throughout, although further opportunities to share and reflect on coding, analysis and preliminary findings would have been worthwhile.

Implications for Policy, Practice and Research

Finding ways to make the delivery of healthcare more sustainable is an ongoing challenge for policy makers in the UK and internationally. Strategies to reduce emergency admissions and improve the triple aim have long been sought but remain intangible. In examining the evidence and implementation of EARS, a policy friendly means of targeting care, this thesis has reinforced the difficulties in addressing such challenges and added to a growing picture of uncertainty over the value of EARS tools. It also serves as a reminder that policy makers can make better use of evidence in decision making, even if that evidence contrasts with expectations and hopes. It was indicative that the largest EARS related initiative – the unplanned admissions Enhanced Services – had no prior testing or pilot introduction prior to national roll out, and subsequently had no prospective evaluation either (one was planned but this never materialised (NHS England 2014)). Thus, the key policy implication of this thesis is that interventions should have, and often need, a better evidence base than was available to support the EARS implementation in the UK. This in turn highlights the need for more attention on evidence *based* or *informed* policy and supporting decision makers at macro and meso levels of the health system with the culture, skills, tools and relationships to address research evidence in their decisions. This is especially important in the context of the sustainability challenges that UK health services face in the allocation of their funding, and the associated opportunity costs.

The successful conduct of the PRISMATIC study provided clues to how some of the research challenges can be overcome. Chief amongst these was the collaborative approach between policy makers, researchers, and implementers, which enabled a prospective randomised trial design to be employed in one health board prior to decisions to roll out elsewhere. Notwithstanding the implications of a context influenced by the research, similar partnership approaches are likely to be beneficial in further studies of EARS, or indeed other interventions.

A related implication for policy relates to the use (or non-use) of small-scale testing prior to wider expansion. Such testing can support understanding to help inform future decisions, and implementation. However, although pilots, small scale evaluation and quality improvement initiatives were employed, there was little to suggest that learning from these was robust. There is likely benefit in harnessing the shared commitment in interorganisational learning networks, underpinned by enhanced organisation readiness and support for the role of research and evidence in the decision-making process.

As many of the initiatives encountered were short term, yet can take time to bed in, policy makers (and researchers) may in future need to consider longer term implementation and follow up. This potential longer-term effect has been both theorised and observed in recent work around integrated care and hospital avoidance, and in health science more broadly (Dorr, Ross et al. 2021, Stokes, Shah et al. 2021, Cuzick 2022).

A further avenue to consider in future, is how stakeholders fit into future intervention design and research. I would make the case for improved stakeholder involvement at all stages, not merely as an evaluative measure after the event, but also at the planning and conduct stage of both aspects. The involvement of stakeholders, including practitioners, patients and their families in such a way, is more likely to see research embedded and result in research impact (Orton, Lloyd-Williams et al. 2011), (Oliver, Innvar et al. 2014).

Improving the user experience of risk tools can be achieved through enhanced user engagement at all stages of tool development, and a willingness to address identified problems (such as those reported in Tables 27 and 31). The findings herein, suggest that improved integration into clinical systems is key for EARS and similar digital health innovations.

The patient stakeholder group is a clear and obvious target for further engagement, to better understand acceptability, and to determine intervention strategies that better involve them in shared decision making and self-care. As identified in Chapter 9 risk communication is a potential avenue for further exploration, while other approaches to help ‘activate’ patient’s self-management have recently been proposed, including health coaching (Panagioti, Reeves et al. 2018) (Barker, Steventon et al. 2018). However, such approaches would need to address some of the barriers to implementation (something that the prospective use of implementation frameworks such as i-PARIHS can assist in identifying and tackling (Helfrich, Damschroder et al. 2010)). For instance, risk communication and other shared decision-making processes may require training and additional or longer consultations – a challenge in terms of primary care pressures. These changes also relate to a culture shift, that better supports shared decision-making approaches and a move away from transactional experiences of care and the default of clinician as decision maker (Agoritsas, Heen et al. 2015).

Any such shift to increased attention on patients should spark further debate about what EARS tools are for, and how their success is judged. It may be more appropriate for example to place greater emphasis on patient outcomes such as quality of care, patient activation and satisfaction than system outcomes such as emergency admissions. This likely shift is apparent within the core outcome set, developed using consensus methods, for multimorbidity research (Smith, Wallace et al. 2018):

The highest-ranked outcomes were health-related quality of life, mental health outcomes, and mortality. Other outcomes were grouped into overarching themes of patient-reported impacts and behaviors (treatment burden, self-rated health, self-management behavior, self-efficacy, adherence); physical activity and function (activities of daily living, physical function, physical activity); consultation related (communication, shared decision making, prioritization); and health systems (health care use, costs, quality of health care). (Smith, Wallace et al. 2018)

Research priorities

I am currently involved (as co-applicant) with a National Institute for Health Research funded project called PRISMATIC2. This is a three year follow up study to PRISMATIC (Box 1, page 19) and extends the locus of investigation to general practices and CCGs in England (from Wales). This quasi-experimental study aims to assess effects, mechanisms, costs, and patient and healthcare professionals' views related to the introduction of EARS tools in England. In this study we will use routinely collected anonymised clinical data (England wide) to explore impact on outcomes such as admissions, bed days, mortality and costs following EARS introduction (at CCG level). Importantly the study will look at ten years of data and include sub-groups such as those with ambulatory care sensitive conditions (ACSCs). The study will also examine general practice level data and interview GPs and other staff to explore clinician views and behaviour, including any changes in GP led admissions. Finally, we will link with patients to explore their views on EARS, risk communication and behaviour.

PRISMATIC2 will be an important study and throw further light on the effects of EARS introduction at scale, in an efficient study design. However, as a retrospective study it will have limitations that could be addressed in other work. Acknowledging both the PRISMATIC2 study, and the previous points of discussion I posit several research priorities that address gaps in our understanding of EARS and its potential role.

1. Formal investigation of patient acceptability with EARS

Building on the exploratory patient focussed work presented in Chapter 9, I believe there remains an imperative to better understand patient, carer, and family views of EARS. Qualitative approaches would be appropriate in such an endeavour and could address fundamental issues around the rationale for EARS, the use of patient data (without consent), and its place in health and care. This work could be linked to specific EARS interventions or be self-contained. If views are supportive, as in Chapter 9, dissemination may help to further legitimise EARS development and motivate those involved. Either way, such work would address the knowledge vacuum regarding this critical stakeholder group.

The need for this work is furthered by recent developments in implementation science that highlight the importance of acceptability in the 'design, evaluation and implementation of

healthcare interventions' (Sekhon, Cartwright and Francis 2017). Acceptability is a 'necessary condition' for effectiveness of an intervention (Sekhon, Cartwright and Francis 2017), is associated with adherence, and applies to both intervention deliverers and recipients (Diepeveen, Ling et al. 2013). To explicitly address 'acceptability', I would advocate use of the theoretical framework of acceptability (TFA), developed by (Sekhon, Cartwright and Francis 2017). The TFA positions acceptability as a multi-faceted construct that reflects the extent to which people delivering or receiving a healthcare intervention consider it to be appropriate, based on anticipated or experienced responses to the intervention. The TFA consists of seven constructs: affective attitude, burden, perceived effectiveness, ethicality, intervention coherence, opportunity costs, and self-efficacy. There is also a temporal element to the TFA that can be applied to specific interventions, and distinguishes between pre-, during and post-intervention.

2. Development and testing of risk communication guidance

In Chapter 4, I outlined the important link between risk communication and shared decision-making. I find it surprising that through the course of this work, I have identified no guidance relating to EARS risk communication. This is problematic because it reinforces the unequal relationship between clinicians, who have access to the risk information, and the patients, who do not. A key finding from the patient focus group was that patients felt risk communication should be integral to EARS use to support shared decision making. This is consistent with the current NICE guidelines on shared decision making, which encourages the sharing of individualised risk information (NICE 2021).

Consequently, I would be keen to see a project tackling EARS risk communication, with the ambition of developing guidance to support discussions between patients and clinicians.

This project would need to involve researchers, health professionals and patients and their advocates. It would need to be undertaken within a co-production framework, that supports these stakeholders to play a central role, and each contribute different and essential knowledge (Cahn 2000). Iterative approaches would address the necessary steps of developing, testing, and refining co-produced guidance (Hawkins, Madden et al. 2017).

Visual aids may form part of this guidance - as per the risk communication recommendations summarised in Chapter 4 (page 94).

3. Randomised controlled trial of EARS

There is little doubt that the hierarchy of evidence (Figure 5, page 29) remains influential. A well-conducted randomised trial would provide strong evidence as to the merits of specific EARS based interventions. Ideally the specific EARS tool should be user tested, and any intervention underpinned by evidence of acceptability, and context specific risk

communication guidance. From the findings presented herein, adding EARS into general practice without resource, guidance on use, patient involvement and shared decision-making is unlikely to be a worthy of further investigation. I would argue that there has yet to be an EARS study building on solid foundations, with a co-produced intervention, multi-stakeholder involvement, in a supportive context (macro, meso, micro levels), appropriate resources to support users and patients, and rigorous implementation science approaches to support delivery and evaluation. My work suggests that a trial, or programme of work underpinned by these elements is indicated.

The case for such a trial is strengthened by ongoing EARS tool development and implementation. Technical advances in EARS development include the use of machine learning (Rahimian, Salimi-Khorshidi et al. 2018), and as of 2023, artificial intelligence (AI). A BBC Radio 4 feature (5th December 2023) spotlighted an NHS Somerset AI based EARS tool being introduced to GP practices across the South West (NHS Somerset 2023).

The “Brave AI” system, which helps staff to identify vulnerable patients who may otherwise go under the radar, will be rolled out to 30 areas (groups of practices) over the next few months. This follows a successful pilot in care homes in Somerset which reduced resident falls by 35%, attendances to Emergency Departments by 60%, and ambulance call-outs by 8.7%. By using an algorithm to look for patterns in registered patients’ records, the technology assesses an individual’s risk of unplanned hospital admission in the next year. Integrated neighbourhood teams of nurses, pharmacists, therapists, health coaches, social prescribers and doctors then use the information to reach out to those in need. They can then offer to put in place personalised support, such as setting up remote health monitors, offering apps to self-report wellbeing, or linking up with voluntary groups or classes to avoid loneliness. The scheme identifies people who could otherwise have gone unnoticed, such as those without a major diagnosed condition or those who rarely contact their GP. (NHS Somerset 2023)

This intervention is reminiscent of many others reported in this thesis, being well-intentioned but with realistic challenges of implementation and sustainability. In this example, the collection of pilot data, and the inclusion of community resources within integrated teams may help overcome some aspects. Hopefully there are robust, prospective evaluation plans in place, befitting the likely scale of investment. In this case, a randomised trial (with randomisation at individual patient, staff or practice level) would seem feasible, based on parallels of scale and scope with the first PRISMATIC study (Box 1, page 19). However, this may impact on plans for future roll-out ‘across all areas of the region’ (NHS Somerset 2023).

4. Research prioritisation exercise

While I see the above as some of the research priorities emerging from my work in this area, I recognise that a formal research prioritisation exercise would be a valuable exercise. This would provide a forum for stakeholders to come together to identify and prioritise aspects to explore in research. There is UK government support for such efforts (Viergever, Olifson et

al. 2010) (UK Government 2023), and formal processes and guidance have been developed, notably by the James Lind Alliance (James Lind Alliance 2023). Most approaches benefit from facilitated, co-produced and iterative processes to identify important target areas, and where research would make the most difference. The favoured methods of research prioritisation, as recommended by the James Lind Alliance, are surveys to identify 'uncertainties' with follow-up workshops for prioritisation. Research prioritisation would also represent a further opportunity to address the widespread exclusion of patients in consideration of EARS that I have encountered. Furthermore, it offers the chance to balance the research interests of patients and researchers.

Involving stakeholders in an explicit manner in research priority setting can help to: 1) ensure that funding decisions and research meet critical evidence gaps to inform decision making; 2) facilitate shared responsibility and accountability in implementing the research agenda; 3) improve the relevance and legitimacy of research; and 4) ultimately achieve better health outcomes. (Tong, Synnot et al. 2019)

Conclusions

This study provides new evidence about the challenges of addressing emergency admissions, and components of the triple aim of healthcare (patient experience, health, and costs) with risk stratification. I demonstrated that despite limited evidence of positive outcomes for patients or health providers (and indeed evidence to the contrary), EARS has received sustained policy backing for over 15 years. Promotion of the tools therefore was driven by optimism rather than evidence, indicative of a need to better integrate research, policy, and practice.

The policy agenda drove a major programme of EARS implementation, involving hundreds of public and commercial organisations as developers, suppliers and commissioners and thousands of users – all with significant resource allocation and opportunity costs. But implementation was consistently hampered by technology and usability issues; by limited health service capacity, clarity, and guidance (evidence based or otherwise), and a lack of patient engagement and robust evaluation. There is little to suggest that EARS has gained significant traction in UK primary care, nor that use can support system wide improvements in care and health service efficiency. However, there may still be opportunities for EARS use in support patient/clinician shared decision making - the value of EARS may well be about the judicious combination of science (EARS data) and art (clinical reasoning), but it remains unclear what that combination looks like.

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Appendices

Appendix 1: Emergency Admission Risk Prediction Tool UK Survey cognitive interview schedule (Chapter 6)

Interviewer: Provide Information Sheet. Explain that interview will be recorded. Explain that we would like to identify interviewees, but can be done anonymously. Confirm consent.

General

Ask respondent to identify any parts that are difficult to understand or to complete.

Probes

Why do you pause/frown/hesitate?

Tell me what you are thinking?

How did you arrive at that answer?

Was that easy or hard to answer?

Understanding of key terms

Probe term: Emergency admission risk stratification or profiling?

Probe: Use of EARPS as acronym?

Question specific

2: Probe term 'clinician' – how will a part time person answer question?

5: Probe: Easy/difficult. How arrived at answer? Should we add a don't know option?

6: Can you repeat the question in your own words?

Probe term – "clinical practice IT system". Probe Do you recognise names of systems/acronyms? Any missing?

Probe: Easy/difficult. How arrived at answer? Do we need this question?

7: Probe: Can you summarise in your own words difference between use and access?

Easy/difficult. How arrived at answer?

8: Can you repeat the question in your own words? Easy/difficult?

9: Can you repeat the question in your own words? Easy/difficult?

Understanding of terms used?

10: Check Understanding of question

11: Can you repeat the question in your own words? Easy/difficult?

Understanding of terms used?

12: Check Understanding of question

13: Check Understanding of question. Easy/difficult?

14: Understanding of "follow up or review (case finding)". Understanding of "service planning or development". Any ambiguity re "service evaluation".

15: Understanding. Easy/difficult. How arrived at answer?

16: Understanding. Easy/difficult. How arrived at answer?

17: Can you repeat the question in your own words?

18. Can you repeat the question in your own words?

19/20/21: any issues?

Appendix 2: Emergency Admission Risk Prediction Tool UK Survey changes following cognitive interviews (Chapter 6)

Changes following cognitive interviews – September 2015.

	not in use	1% to 25%	26% to 50%	51% to 75%	76% to 100%	Don't know
EMIS (Egton Medical Information Systems Limited)/EMIS Web	☐	☐	☐	☐	☐	☐
Microtest - Evolution	☐	☐	☐	☐	☐	☐
TPP SystmOne / The Phoenix Partnership Ltd	☐	☐	☐	☐	☐	☐
VISION (In Practice Systems Limited)	☐	☐	☐	☐	☐	☐
CRC - ISOFT	☐	☐	☐	☐	☐	☐
Other (select option and identify supplier below)	☐	☐	☐	☐	☐	☐

Name of other supplier(s):

* 6. This next section asks questions about access to and use of emergency admission or readmission risk prediction (EARS) tools. By access we mean that either an EARS tool is available in a practice or that the practice has access to data produced by an EARS tool. We distinguish between access and use, as some GP practices with access to EARS tools or data may not

Change: Removed Question 4.

In response to comments and advice saying that not all people would know the specific numbers, removed question asking how many GP practices are in area, as can access other routine sources for reliable information, thereby reducing length of questionnaire.

IV1: Ooh, I don't know, Shall I guess? There were 32 in the PRISMATIC study. I don't know. Neath is approximately 20. 50 maybe. People who deal across the patch would be more in the know. I only had even an educated guess due to PRISMATIC.

IV2: I wouldn't have a clue [how many practices in ABMU] I would guess maybe a 100.

Unless you wanted to know how uninformed people are?

Question 5: MK checked to confirm that Clinical Systems listed were available in Scotland and Northern Ireland.

IV2: no. But they are diff to hospital systems. What areas are these from?

MK: Based on England and Wales. I'm not sure what system is in Scotland, N Ireland.

IV2: seems like a lot of detail. Would people know the proportions using each system?

Change: Edited Question 5.

Based on feedback suggesting "a lot of detail" (IV2) simplified to three answer options (Used by all practices, used by some practices, not used)

*** 6. This next section asks questions about access to and use of emergency admission or readmission risk prediction (EARS) tools. By access we mean that either an EARS tool is available in a practice or that the practice has access to data produced by an EARS tool. We distinguish between access and use, as some GP practices with access to EARS tools or data may not use them.**

**What proportion of ALL GP practices in your CCG/ Health Board/LCG area...?
Please estimate if unsure**

	None	1% to 25%	26% to 50%	51% to 75%	76% to 100%
a) ...currently have access to an EARS tool?	☐	☐	☐	☐	☐
b) ...do you expect to have access to an EARS tool by April 2015?	☐	☐	☐	☐	☐
c) ...have used an EARS tool?	☐	☐	☐	☐	☐
d) ...do you expect to have used an EARS tool by April 2015?	☐	☐	☐	☐	☐
e) ...previously had access to an EARS tool but no longer do so?	☐	☐	☐	☐	☐

Changes: Simplified question. Removed introductory text which had caused some confusion. Took out the 2 time frames. Revised to one question, with proportions..Question became.

6. What proportion of all practices in your CCG/Health Board/LCG area currently have access to an EARS tool?

- ☐ None
- ☐ 1-33%
- ☐ 34-66%
- ☐ 67-99%
- ☐ All (100%)

7. Which EARS tools are currently available to at least one GP practice in your CCG/Health Board/LCG area? Please select up to 5 tools if applicable.

Select from list

EARS tool name 1

EARS tool name 2

EARS tool name 3

EARS tool name 4

EARS tool name 5

*** 8. Which EARS tools are currently available to at least one GP practice in your CCG/Health Board/LCG area? Please select all that apply from the following list .**

Currently Available

Bupa Health Dialog - Integrated Care Manager ☐

Capita (using Johns Hopkins ACG model) ☐

Docobo - Artemus/CS ☐

Doctor Foster Intelligence - High Impact User Manager (HUM) (bespoke model) ☐

Prescribing Services - Eclipse Live ☐

EMIS Web - IQ Risk Stratification (using the QAdmissions model) ☐

Health Analytics ☐

Changes: Removed second part of question that asked about which tools will be available by...? As interviewee hadn't initially spotted it, and even then, the question was speculative.

* 9. How important have each of the following factors been in encouraging GP practices to get access to EARS tools in your CCG/Health Board/LCG area?

	not at all important (0)	1	2	3	4	very important (5)
Clinical leadership	☐	☐	☐	☐	☐	☐
Engagement of practice managers	☐	☐	☐	☐	☐	☐
Research evidence	☐	☐	☐	☐	☐	☐
Case studies of benefits from other areas	☐	☐	☐	☐	☐	☐
Role of CCG/Health Board/LCG	☐	☐	☐	☐	☐	☐
Role of GP clusters or networks	☐	☐	☐	☐	☐	☐
Role of other NHS agencies	☐	☐	☐	☐	☐	☐
Financial incentives attached to GP contracts (e.g. GMS)	☐	☐	☐	☐	☐	☐
Other financial incentives	☐	☐	☐	☐	☐	☐
Local or national service priorities or policy	☐	☐	☐	☐	☐	☐
Local service provision aligned with EARS use	☐	☐	☐	☐	☐	☐

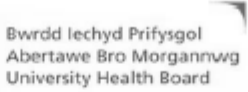
10. If other factors have been important in encouraging GP practices to access EAPRS tools in your area, please let us know what they are in the box below:

Changes: Changed question to replace focus on access alone, to be access and use, so as to avoid people confusing over the two issues. Reduced number of options – removing other financial incentives. Changed structure of question to encourage focus on influences in area, rather than general influences. Removed separate questions 10 and 12, as integrated an 'other' option into previous question – as suggested by JB. Reduced question number by 2.

Other changes...

Tidy up...reduced wording where possible, added introductory page.

Appendix 3: EARS Survey (Chapter 6)



Emergency Admissions Risk Prediction (EARP) - UK survey

Information Page

Background

Tackling costly emergency admissions is a policy imperative for the NHS. In response, the NHS has promoted emergency admission risk prediction (EARP) or profiling tools which use routinely collected patient data to predict those at risk of unplanned hospitalisation, who may benefit from early intervention in primary and community settings. Over recent years various tools have been introduced and GP contracts across the UK have provided incentives for general practices to use them as part of hospital avoidance initiatives. Despite these advances there is limited information about the extent of adoption and use of EARP tools. This study aims to:

- * Identify which UK areas have access to EARP tools and which do not
- * Identify which EARP tools are available
- * Explore factors that encourage or discourage adoption of EARP tools
- * Explore how EARP tools are used, and how use varies by area.

This study will provide an important UK wide snapshot of EARP tool use - to inform future development and use within the NHS. This study builds upon the PRISMATIC trial, which is evaluating the effects on services following the introduction of an EARP tool into one area - see www.trustresearch.org.uk/prismatic.

Who is undertaking the research? Who is funding it?

The study is being undertaken by a team from Swansea University Medical School. PRISMATIC is funded by the National Institute for Health Research, Health Services Delivery and Research Programme. Additional funding to support this aspect of the study has been provided by Abertawe Bro Morgannwg University Health Board.

What we are asking each organisation to do?

We are surveying all Clinical Commissioning Groups (England), NHS Scotland Boards, Welsh Health Boards, and Local Commissioning Groups in Northern Ireland. We are seeking representatives of each organisation (or those able to respond on their behalf) to complete a short online survey, which should take around 10 minutes to complete. A list of organisations that have responded to date is available at <http://www.trustresearch.org.uk/en/earp.htm>

What will happen to the results of this study?

Survey findings will be widely disseminated and all participants will be sent a summary. We will share results with the NHS and the research community. Findings may also inform future studies exploring the effectiveness of interventions using EARP tools.

Who do I contact if I would like more information about the study?

If you have any questions please contact Mark Kingston at Swansea University on [REDACTED] or [REDACTED]

Emergency Admissions Risk Prediction (EARP) - UK survey

Page 1 of 5

- * 1. Which organisation (CCG, Health Board or LCG) does your response relate to? If your response can apply to a number of organisations please list them in the other box below.

Organisation

Other (CCG, Health Board or LCG)

2. Which of the following best describe you?

Please select all that apply

- ☐ Employed by CCG, Health Board or LCG identified in question 1
- ☐ Employed by another CCG, Health Board or LCG
- ☐ GP - employed by practice or self-employed
- ☐ Employed by Commissioning Support Unit (England only)
- ☐ Other (please specify below)

Other

3. Are you a clinician?

- ☐ Yes - GP
- ☐ Yes - other clinical
- ☐ No

Emergency Admissions Risk Prediction (EARP) - UK survey

Page 2 of 5

- * 4. Which clinical practice IT systems are in use in GP practices in your CCG/Health Board/LCG area?
 Please select all that apply and/or write in using the other box.

	Used by all practices in area	Used by some practices in area	Not used	Don't know
EMIS (Egton Medical Information Systems Limited)	☐	☐	☐	☐
Microtest - Evolution	☐	☐	☐	☐
TPP SystmOne / The Phoenix Partnership Ltd	☐	☐	☐	☐
VISION/INPS (In Practice Systems Limited)	☐	☐	☐	☐
CRC - ISOFT	☐	☐	☐	☐
Other (select option and identify supplier below)	☐	☐	☐	☐

Name of other supplier(s)

- * 5. What proportion of all GP practices in your CCG/Health Board/LCG area currently have access to an Emergency Admission Risk Prediction (EARP) tool?

Please estimate if unsure

- ☐ None
☐ 1-33%
☐ 34-66%
☐ 67-99%
☐ All (100%)

* 6. Which EARP tools are currently available to at least one GP practice in your CCG/Health Board/LCG area?

Please select all that apply from the following list. .

	Currently Available
Bupa Health Dialog - Integrated Care Manager	☐
Capita (using Johns Hopkins ACG model)	☐
Docobo – ArtemusICS	☐
Doctor Foster Intelligence – High Impact User Manager (HUM) (bespoke model)	☐
Prescribing Services - Eclipse Live	☐
EMIS Web - IQ Risk Stratification (using the QAdmissions model)	☐
Health Analytics	☐
Health Intelligence - Risk Stratification & Case Finding module (using the Combined model)	☐
ISD Scotland - SPARRA or iSPARRA (using the Combined model)	☐
North of England CSU – RAIDR (using the Combined model)	☐
NWIS (Wales) – PRISM	☐
MedeAnalytics	☐
Optum (United Health) – HealthNumerics-RISC	☐
PI Benchmark - Care & Health Trak	☐
NECS RIADR (using the Combined Model)	☐
Serco	☐
Sollis Clarity Patients (using Johns Hopkins ACG model)	☐
Sussex Risk Stratification Tool	☐
TPP System One	☐
Arden CSU - VENTRIS risk stratification tool (using the Combined model)	☐
Vision - basic tool	☐
Vision (using QAdmissions model)	☐
Other (please specify below)	☐

Please identify any other EARP tools that are available in your area

* 7. Thinking about your CCG/Health Board/LCG area in particular, how important have each of the following been in encouraging GP practices to access and use EARP tools?

Please rate each factor using a scale of 0=not at all important to 5=very important.

	not at all important (0)	1	2	3	4	very important (5)
Clinical leadership	☐	☐	☐	☐	☐	☐
Engagement with practice managers	☐	☐	☐	☐	☐	☐
Research evidence	☐	☐	☐	☐	☐	☐
Case studies of benefits from other areas	☐	☐	☐	☐	☐	☐
Role of CCG/Health Board/LCG	☐	☐	☐	☐	☐	☐
Role of other NHS agencies	☐	☐	☐	☐	☐	☐
Role of GP clusters or networks	☐	☐	☐	☐	☐	☐
Financial incentives (e.g. through enhanced services)	☐	☐	☐	☐	☐	☐
Local or national service priorities or policy	☐	☐	☐	☐	☐	☐
Local service provision aligned with EARP use	☐	☐	☐	☐	☐	☐

Other (please specify)

* 8. Thinking about your CCG/Health Board/LCG area in particular, how important have the following been in inhibiting GP practice access to and use of EARP tools?

Please rate each factor using a scale of 0=not at all important to 5=very important.

	Not at all important (0)	1	2	3	4	Very important (5)
Lack of research evidence	☐	☐	☐	☐	☐	☐
Lack of training/expertise in using EARP tools	☐	☐	☐	☐	☐	☐
Cost associated with introduction	☐	☐	☐	☐	☐	☐
Information governance issues	☐	☐	☐	☐	☐	☐
Issues with software or hardware	☐	☐	☐	☐	☐	☐
Resistance from clinical leaders	☐	☐	☐	☐	☐	☐
Lack of interest from practice staff	☐	☐	☐	☐	☐	☐
Lack of alignment with local or national service priorities or policy	☐	☐	☐	☐	☐	☐
Workload of GP practice staff	☐	☐	☐	☐	☐	☐
Workload of other health and social care staff	☐	☐	☐	☐	☐	☐
Issues with integration of EARP tool with clinical systems	☐	☐	☐	☐	☐	☐

Other (please specify)

Emergency Admissions Risk Prediction (EARP) - UK survey

Page 5 of 5

9. Which of the following options describe how EARP tools are currently used in your area?

Please select all that apply

- ☐ to identify patients for follow up or review (case finding) by GP practice staff
- ☐ to identify patients for follow up or review (case finding) by non GP practice staff
- ☐ to inform service planning or development by groups of practices (e.g. practice clusters or networks)
- ☐ to inform service planning or development work at CCG/Health Board/LCG level
- ☐ in relation to service evaluation/s
- ☐ Not applicable - no EARP tools used
- ☐ Other uses - please summarise

10. What role has your CCG/Health Board/LCG played in determining how EARP tools are used in your area?

11. Are GP practices in your CCG/Health Board/LCG area currently financially incentivised (financial year 2015/2016) to use an EARP tool? Select all that apply.

- ☐ Yes - via an Enhanced Service
- ☐ Yes - via a local scheme
- ☐ No
- ☐ Don't know

* 12. In your CCG/Health Board/LCG area, are you aware of any service developments (primary, community, secondary or voluntary sectors) that have come about due to the introduction of EARP tools?

Please select one option only

13. If yes please briefly describe the new services introduced or changes to existing services. (For example who provides the service(s) in question? How does the use of EARP data influence how the service operates?)

14. Does your CCG/Health Board/LCG have access to aggregate (population level) EARP data?

- ☐ Yes
- ☐ No
- ☐ Don't know

15. Are you aware of any of the following uses of risk prediction in your CCG/Health Board/LCG area?

	Yes	No	Don't know
Use of emergency admission or readmission risk prediction tools by hospital staff (i.e. use in secondary care)	☐	☐	☐
Use of population level risk prediction tools to predict frailty	☐	☐	☐
Use of population level risk prediction tools to predict pharmacy costs	☐	☐	☐
Use of population level risk prediction tools to predict healthcare costs	☐	☐	☐

* 16. Would you...?

	Yes	No
...wish to receive a summary of findings from this survey.	☐	☐
...be willing to be contacted regarding further research in to the development and use of predictive risk tools.	☐	☐

If yes to either please provide an email address here:

17. Any other comments?

Appendix 4: Checklist for Reporting Results of Internet E-Surveys (CHERRIES) (Chapter 6)

Design	Description	Page/s
Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In “open” surveys this is most likely.)	Ch6, Participants and recruitment, p137
IRB (Institutional Review Board) approval and informed consent process		
IRB approval	Mention whether the study has been approved by an IRB.	Ch6, ethical approval, p139
Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	Ch6, Participants and recruitment, p137
Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	N/A
Development and pre-testing		
Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	Ch6, survey instrument, p138
Recruitment process and description of the sample having access to the questionnaire		
Open survey versus closed survey	An “open survey” is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey).	Ch6, survey instrument, p138
Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)	Ch6, Participants and recruitment, p137
Advertising the survey	How/where was the survey announced or advertised?	Ch6, Participants and recruitment, p137
Survey administration		
Web/E-mail	State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?	Ch6, Participants and recruitment, p137
Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results.	N/A
Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?	Ch6, Participants and recruitment, p137
Incentives	Were any incentives offered (eg, monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?	Ch6, Participants and recruitment, p137
Time/Date	In what timeframe were the data collected?	Ch6, Participants and recruitment, p137
Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.	N/A
Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.	h6, survey instrument, p138
Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	Ch6, survey instrument, p138
Number of screens (pages)	Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.	Ch6, survey instrument, p138
Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-response option such as “not applicable” or “rather not say”, and selection of one response option should be enforced.	Ch6, results, p139
Review step	State whether respondents were able to review and change their answers	N/A
Response rates		
Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	N/A
View rate (Ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!).	N/A
Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called “recruitment” rate.	N/A

Completion rate (Ratio of users who finished the survey/users who agreed to participate)	The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate “informed consent” page or if the survey goes over several pages. This is a measure for attrition. Note that “completion” can involve leaving questionnaire items blank. This is not a measure for how completely questionnaires were filled in. (If you need a measure for this, use the word “completeness rate”.)	N/A
Preventing multiple entries from the same individual		
Cookies used	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis?	Ch6, profile of responses, p139
IP check	Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user. If so, mention the period of time for which no two entries from the same IP address were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis?	N/A
Log file analysis	Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.	Ch6, results, p139
Registration	In “closed” (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done.	N/A
Analysis		
Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	Ch6, analysis, p139
Questionnaires submitted with an atypical timestamp	Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.	Ch6, Participants and recruitment, p137
Statistical correction	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods.	N/A

Adapted from Eysenbach G. Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [published correction appears in doi:10.2196/jmir.2042]. *J Med Internet Res*. 2004;6(3):e34. Published 2004 Sep 29. doi:10.2196/jmir.6.3.e34

Appendix 5: Participant Information Sheet - Commissioner Interviews (Chapter 7)



Information sheet for UK Emergency Admission Risk Prediction (EARP) Staff Interviews

27th June 2016: Version 1

We would like to invite you to take part in a research study. Before you decide to take part, you need to understand why we are doing the research and what it would involve for you. Please take time to read the following information carefully. Feel free to ask questions if there is anything you have read that is not clear or if you would like more information. Please take time to decide whether you would like to take part.

Background

Tackling emergency admissions has become a policy target for health organisations. Many countries have introduced emergency admission risk prediction (EARP), which use routinely collected patient data to predict those at risk of unplanned hospitalisation. Those identified may then benefit from intervention - typically in primary and community settings. In recent years, various tools have been introduced in the UK, and general practice contracts have included incentives encouraging their use. Despite these advances, there is limited information about the introduction of EARP and similar tools (e.g. predicting frailty). We recently completed an online survey of UK health boards and commissioning groups, with 164 responses from 235 organisations invited (70%). The survey provided an overview of the uptake of risk tools across the UK. We aim to explore this further in the current study.

Why are we undertaking this study?

Building on the results of the survey, we are now undertaking follow-up interviews with organisations that completed the survey. We aim for better understanding of:

- How primary care organisations use emergency admission and frailty risk prediction tools in different parts of the UK.
- What factors encourage or discourage adoption of EARP and frailty tools (including reasons why some areas do not use them).
- Service changes following the introduction of EARP and frailty tools.
- Whether organisations have sustained the use of EARP and frailty risk tools.
- What interviewees perceive as the research priorities relating to EARP and frailty tools.

We intend to inform the decisions the NHS and wider stakeholders make about implementing risk prediction tools with the information we generate. We also hope to identify priority areas for research in this field. This study builds upon the PRISMATIC trial, which is measuring the effects on services following the introduction of an EARP

tool into 32 general practices in one area - www.trustresearch.org.uk/prismatic. The PRISMATIC study is currently at the reporting stage.

Who is undertaking the research? Who is funding it?

The study is being undertaken by a team from Abertawe Bro Morgannwg University (ABMU) Health Board and Swansea University Medical School. Funding has been provided by ABMU in order to support this study.

What we are asking you to do?

We would like you to take part in a short, semi-structured interview discussing the use (or non-use) of EARP and frailty tools in your area. The interview should last between 20 and 30 minutes. We will undertake most interviews by telephone, although a face-to-face interview may also be possible. Interviews will be recorded and transcribed. Recordings will be accessible only by the research team and stored on a secure area of the Swansea University Medical School server.

Why are you inviting me?

The research team are contacting those who expressed an interest in participating in future research when completing the EARP survey. We are planning to conduct up to 20 interviews in total. These will represent a range of UK nations and areas, including organisations where GP practices do not currently have access to EARP or frailty risk tools.

Do I have to take part? What are the risks?

No. Taking part in the research is entirely voluntary. We do not believe there are any risks involved in helping with this research.

What will happen to the results of this study?

All responses will be anonymous with no identifiable information in our outputs. To help the findings reach decision makers in the NHS and elsewhere, we will communicate findings widely through a summary report, conference presentations, an open-access (freely available) journal article and online publicity. All participants will be sent a summary of findings.

What happens next?

If you would like to take part please contact the research team (details below) to arrange a convenient time to participate.

Who do I contact if I would like more information about the study?

If you have any questions please contact Mark Kingston or Rhiannon Griffiths on [REDACTED] or email [REDACTED]

Appendix 6: Verbal Consent Script for commissioner interviews (Chapter 7)



GIG
CYMRU
NHS
WALES

Bwrdd Iechyd Prifysgol
Abertawe Bro Morgannwg
University Health Board

Verbal Consent Script for UK Emergency Admission Risk Prediction (EARP) Staff Interviews

5th October 2016: Version 1.1

Interviewer: before using this form, ensure you have confirmed approval to record consent process and begun recording.

Can you confirm you have read and understood the information sheet dated 27th June 2016, version 1, and have had the opportunity to ask questions?

Yes/No *[If no cease interview and provide information sheet.]*

If yes, can you confirm that you are happy to take part?

Yes/No *[If no cease interview]*

Please could you reconfirm that you are happy for the interview to be recorded?

Yes/No *[If no, discuss taking notes only]*

Participant identifier:

Organisation:

Name of person taking consent:

Date:

Start time:

End time:

Appendix 7: Interview guide for commissioner interviews (Chapter 7)

Version (date)	Changes	Changes By
1.0 (27 06 2016)	First draft	MK
1.1 (25 07 2016)	Second draft	MK
1.2 (29 09 2016)	Amends following EARP Qual core team meeting	MK
1.3 (05 10 2016)	Added comments following Pilot interviews	MK
1.4 (09 11 2016)	Post Pilot amendments	MK

EARP QUAL, Semi-structured interview guide

PARTICIPANT ID:

ORGANISATION:

INTERVIEWER:

Date:

Interviewer – complete consent process

1. Could you confirm your job title and describe your role within the CCG/health board/LCG?
2. Please confirm which emergency admission and frailty risk tools if any, are available in your CCG/health board/LCG area?

[Refer to survey responses as prompt]

3. How many general practices have access to?
 - a) An EARP tool (or data)?
 - b) A frailty prediction tool?

[Refer to survey responses as prompt – a percentage band is available but not precise number.

Accept estimate if unsure]

4. What were the main reasons these particular tools were provided in your area?

Prompt if needed: E.g. financial, specific features of tool, tool is supplied with chosen clinical IT system, CSU (England), what role of research evidence?

5. How are the EARP/frailty tools currently used in general practice in your area?

Probe: who uses and how fits with services – describe interventions they form part of.

Probe: any use within practice clusters or at aggregate level?

Probe: Any changes from previous financial years

- a) Please describe the intervention that the EARP/frailty tool is used within, including who uses the tools, which groups of patients are targeted, and what services are provided to identified patients?
- b) In your area, have there been any service developments or changes resulting from the introduction of EARP or Frailty tools?

[Refer to survey responses as prompt]

- c) (England only) Are the risk tools used only in relation to work relating to the unplanned admissions DES?
- 6. Has your CCG/HB/LCG developed local guidance for how the risk tools are used in your area?
 - a) If yes, what format has this guidance been in – i.e. training, guidance documents, presentations?

Probe: Practice staff, CCG/HB/LCG staff

- 7. Looking back at the survey response for your area, the main things that positively influenced the uptake of risk tools were:

[Refer to survey responses as prompt]

- i)
- ii)
- iii)

Could you tell me a little bit more about how each of these factors helped?

- 8. Looking back at the survey response for your area, the main things that hindered the uptake of risk tools were:

- i)
- ii)
- iii)

Could you tell me a little bit more about these factors?

- 9. How have QOF or Directed Enhanced Services influenced how the risk tools have been used in your area?
 - a) [England only?] Do you anticipate these tools being used in your CCG area following the end of the Unplanned Admissions DES in 2017/2018? Why?
 - b) [England only?] What impact do you believe the DES has had?

Probe: on service use (including emergency admissions) and on anything else.

- 10. Are you aware if GPs or others have communicated with patients about their risk?
 - a) If yes, how direct (have they used actual risk scores)
 - b) If yes, what approach to communicating risk was taken?

Probe: letter, face to face consultation, other.

Note – English Enhanced Service encourages high risk patients to be written to as part of their management

11. What do you consider the gaps in your organisation's understanding of how to get the best out of risk tools?

a) What do you think should be the priorities for research into EARP/frailty tool use?

12. What impact do you believe the introduction of risk tools into your area has had?

Probe: on patients, on general practice staff, others

13. What levels of enthusiasm have you observed regarding the use of EA/frailty risk tools in your area, and how has this changed over time?

Probe for perspectives of CCG/Health Board/LCG staff, practice staff, patients

14. Finally, what are your expectations for the use of EA/frailty risk tools in your area over the coming few years?

Probe 2017/2018 and longer term.

Do these tools have a place?

15. Any other points you would like to make regarding EARP/frailty risk prediction?

Appendix 8: COREQ (Consolidated criteria for Reporting Qualitative research) Checklist (Chapter 7)

Topic	Item no	Guide Questions/description	Page no/section
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	Ch7, semi-structured interviews, p 154
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	Ch1, Intro, p23, Ch7, semi-structured interviews, p 154
Occupation	3	What was their occupation at the time of the study?	Ch1, Intro, p18, Ch7, semi-structured interviews, p 154
Gender	4	Was the researcher male or female?	Ch1, Intro, p23, Ch7, semi-structured interviews, p 154
Experience and training	5	What experience or training did the researcher have?	Ch1, Intro, P22, Ch7, semi-structured interviews, p 154
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	Ch7, methods, participants and recruitment, p154
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Ch7, methods, participants and recruitment, p154
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	Ch1, Intro, P18-23
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Ch7, methods, study design, p153
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Ch7, methods, participants and recruitment, p154
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	Ch7, methods, participants and recruitment, p154
Sample size	12	How many participants were in the study?	Ch7, results, Profile of respondents p156
Non-participation	13	How many people refused to participate or dropped out? Reasons?	Ch7, results, p156
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	Ch7, semi-structured interviews, p 154
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	Ch7, semi-structured interviews, p 154
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	Ch7, results, Profile of respondents p156
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Ch7, semi-structured interviews, p 154
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	Ch7, semi-structured interviews, p 154
Audio-visual recording	19	Did the research use audio or visual recording to collect the data?	Ch7, semi-structured interviews, p 154
Field notes	20	Were field notes made during and/or after the interview or focus group?	Ch7, semi-structured interviews, p 154

Duration	21	What was the duration of the inter views or focus group?	Ch7, semi-structured interviews, p 154
Data saturation	22	Was data saturation discussed?	No
Transcripts returned?	23	Were transcripts returned to participants for comment and/or correction?	No
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	Ch7, Analysis and reporting, p155
Description of the coding tree	25	Did authors provide a description of the coding tree?	Ch7, Analysis and reporting, p155
Derivation of themes	26	Were themes identified in advance or derived from the data?	Ch7, Analysis and reporting, p155
Software	27	What software, if applicable, was used to manage the data?	Ch7, Analysis and reporting, p155
Participant checking	28	Did participants provide feedback on the findings?	No
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Ch7, Results, p156-187
Data and findings consistent	30	Was there consistency between the data presented and the findings?	Ch7, Results, p156-187 Ch7, discussion, p187-189
Clarity of major themes	31	Were major themes clearly presented in the findings?	Ch7, Results, p156-187
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	Ch7, Results, p156-187 Ch7, discussion, p187-189

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Appendix 9: Practice staff interviews information sheet (Chapter 8)

Predicting people's risk of needing emergency treatment for a chronic condition: what impact does this have on health and social care services?

Autumn, 2012

Information sheet for Professionals

This information sheet is about a study being carried out by the College of Medicine at Swansea University. It explains:

- why the study is being conducted
- the nature/value of your contribution
- the benefits/consequences of your participation
- why you have been invited to take part.

If there is anything which is not clear, please ask and we will be happy to discuss it with you. Contact details are supplied at the end of this document.

It is entirely your choice whether or not you contribute to the study by taking part in a focus group at the beginning of the study and a possible follow-up interview at a later date.

If you are willing to help, please sign the enclosed consent form stating that you have voluntarily chosen to do so.

Background

Our population contains increasing numbers of older people and people who have one or more chronic conditions. This places greater demands on health and social care services. It is recognised that patients with chronic conditions are not always managed and treated effectively. Too many are admitted to hospital as emergencies. Also, community services are not always available or don't work well together.

To help improve services, some GPs in Wales are starting to use a scoring system to predict people's risk of having an emergency hospital admission in the coming year. All patients are placed into one of four categories from low to high risk.

Why is this study being undertaken?

This study aims to find out whether GPs and other health professionals use this scoring system, how they use this system and their views about it, and how it affects the way people are cared for. For those professionals associated with GP practices where the system has not yet been implemented, views regarding the potential benefit and usefulness of such a system will be sought and comparisons made with the existing practices for managing patients.

This information will help improve the way the predictive risk system is used in the future to benefit patients.

The study has a number of different parts, including the focus groups and interviews with health professionals. Additional information is being collected from patients regarding their quality of life, the quality of the care they have received and their frequency of use of services, as well as information about the cost of using the system.

PTO

Who is conducting the research?

The research is being undertaken by a team from the College of Medicine, Swansea University. It is funded by the Department of Health.

Why have I been asked to take part in this study?

The researchers want to find out professionals' experiences of using a predictive scoring system or their perceived usefulness of using such a system. We would like to gather information at the start of the study when the system is just being implemented in the ABMU Health Board area and at a later date after people have had experience of using the system. Your name has been selected as you are associated with a practice that has agreed to participate in the study or are involved in supporting or commissioning services for patients (in the ABMU area or elsewhere in Wales).

What we are asking you to do?

If you choose to take part, you will EITHER be asked to participate in a focus groups with a possible follow up interview at a later date (GPs, practice managers and specialist nurse practitioners) OR two interviews – one at the beginning of the study and the second around 18 months later (Health care commissioners, planners and managers). We will arrange the focus groups/ interviews at a location and time most convenient to you. The focus groups are likely to last around an hour and the interviews around 35 minutes.

Do I have to take part?

No, it is your choice whether or not you take part. If you decide to take part you may withdraw at any time without the need to give an explanation.

Who will see the information and results about this study?

No-one other than the researchers from the College of Medicine at Swansea University will see the information collected. The data collected will be securely stored and analysed on computers based at the College of Medicine. Your name will not be used in the study or disclosed to anyone by the research team. We would like to record the focus groups/interviews and will use verbatim quotes in reports and journal publications but will not identify any individual contributor.

Who do I contact if I would like more information about the study?

If you have a concern about any aspect of this study, the researchers will do their best to answer your questions. Please contact Mark Kingston, Research Officer, on [REDACTED] or email [REDACTED]



Appendix 10: Interview guide for general practice staff interviews (Chapter 8)

1. A. Last time we talked to you/your practice, you said you mainly used PRISM for[check back to 3 month interview content]

Over the past six months, how has your practice been using PRISM?

- *How frequently*
 - *How long do you usually spend each time you review PRISM data*
 - *Who has been involved*
 - *Single user*
 - *Routine practice meetings*
 - *Special meetings to discuss PRISM*
 - *Who with – MDT, GPs, community network staff*
 - *Informal meetings*
 - *Clarify how long other people spend reviewing PRISM data*
 - *How do you use the information provided by PRISM*
 - *Do you review individual or grouped data*
 - *Do you inform the patient that you are using PRISM*
 - *Have you discussed individual Emergency Admissions risk scores with patients?*
2. What has influenced the use of PRISM in your practice in the past six months?
 - Received guidance from
 - ABMU
 - Locality teams
 - Deb Burge-Jones
 - Change of QOF/QPI requirements to identify high risk patients
 - Identifying what works best in this practice
 - Anything which has supported your use of PRISM?
 - Time of year (winter vs summer)
 - Other influences on how you use PRISM?
 3. How has the way you use PRISM changed during the past six months?
 - *Used by different people*
 - *Started then stopped using PRISM*
 - *Only recently started using PRISM*
 - *Change in patients being reviewed through PRISM*
 - *Changed frequency of use – how?*
 4. Please think back to the most recent occasion you used PRISM. Can you talk me through what you did?
 - *Used at screen / reviewed printed lists*
 - *Alone / in meetings*
 - *Which groups of patients (risk levels, conditions, other categories)*
 - *Used in individual patient consultation*
 - *What actions have you taken as a result of the information provided by PRISM...[probe]*
 - *GP consultation in person*
 - *GP consultation by telephone*
 - *GP consultation by home visit*

- *Practice nurse appointment*
 - *Clinic in GP practice (e.g. diabetes, asthma)*
 - *Prepare Active Management Plan*
 - *Communication with / refer to Community Resource Team*
 - *Communication with / refer to district nurse*
 - *Communication with / refer to health visitor*
 - *Refer to community nurse/case manager (e.g. respiratory, mental health, chronic conditions)*
 - *Refer to secondary care*
 - *Communication with / refer to mental health services (identify which)*
 - *Communication with / refer to therapist (e.g. physiotherapist, Occupational Therapist, speech therapist, rehabilitation)*
 - *Communication with / refer to Social Services*
 - *Refer to alternative medicine provider*
 - *Refer to Voluntary Sector service (say what)*
 - *Other.....(please give details)*
 - *Have you needed to identify additional resources when taking action as a result of information provided by PRISM? Probe what.*
 - *Is this action typical of your normal use – what else have you done?*
5. Is there anything that has limited your use of PRISM?
- *Concerns about what it's for/overall purpose*
 - *Practical/technical difficulties with using it*
 - *Issues with web access/password logins*
 - *Lack of integration with practice systems*
 - *Concerns about accuracy – frequency of update, measures feeding into it*
 - *Concerns about data handling and sharing*
 - *Demands on time to access and understand*
 - *Use as performance monitoring tool – compliance, liability*
 - *Does not provide new information*
 - *Unable to respond to identified needs*
- Last time we talked to you, you said ... limited your use of PRISM. How has that changed?*
6. How do you feel about using PRISM at the moment?
- *Do you have a clear understanding of what the tool is for?*
 - *Does it give you new/useful information*
 - *Value for money?*
 - *What has influenced your/your colleagues' use of PRISM?*
 - *How does your experience match your expectations?*
 - *Impact of QOF in deciding how you use PRISM (to be reworded when we know whether the 2014/15 QOF requirements are relevant)*
7. What difference has PRISM made to the way you work and patient care in the past six months?
- *Compared to three months before?*
 - *Compared to pre-PRISM?*
 - *Why?*
 - *Individual changes or organisational changes?*
 - *Extent of your role in communicating / using PRISM in the practice*
 - *Do you think this is making a difference to emergency admissions?*
 - *Do you think this is making a difference to any other outcomes?*
- When we talked to you six months ago, you said PRISM made difference. Why do you think this has changed? (if there is a change)*
8. How do you expect to use PRISM over the next six months?
- *Don't expect to use*
 - *Expect to use differently from past six months*
 - *Focus for discussion*

- *New approach to dealing with patients*
 - *Expected strengths / weaknesses*
 - *Extent of your role in communicating / using PRISM in the practice*
 - *Impact of QOF (depending on 2014/15 QOF requirements)*
 - *Becoming a routine part of practice?*
9. Thank you for telling me again what you think about PRISM. If I talked to your colleagues, would they share your views or do they feel differently?
- *Their experience of using it*
 - *Their experience of impact on their work*
 - *Their expectations for next six months*
 - *Other GPs, practice nurse, practice manager etc.*

Appendix 11: PRISM Use questionnaire (Chapter 8)

- i) Name of practice: _____
 ii) Date of completion: _____

1. Who uses Prism in this practice?

GP (number of GP users)	
Practice Manager	
Other – please list	

2. Please estimate how many times you have logged on to the Prism website in the past nine months.

Never	
1-3 times	
4-6 times	
7-10 times	
11-19 times	
20 or more times	

3. How frequently do you/your practice use data generated by Prism, such as risk scores and risk profiles?

Weekly	
Fortnightly	
Monthly	
Quarterly	
No regular pattern	
Not used	

4. Please estimate how long you usually spend each time you review Prism data.

Up to 15 minutes	
Up to 30 minutes	
Up to 45 minutes	
Approximately 1 hour	
1-2 hours	
More than 2 hours	
No regular pattern	
Not used	
Tried but failed to review Prism data	

5. What actions have you taken for patients identified through Prism? Please select all that apply.

Refer to therapist (e.g. physio, OT, speech, rehab)	
Communicate with or refer to health visitor	
Practice nurse appointment	
Have used Prism but not yet taken any actions	
GP consultation in person	

GP consultation by home visit	
Refer to community nurse or case manager	
Refer to alternative medicine provider	
Chronic conditions clinic in GP practice (e.g. diabetes, asthma)	
GP consultation by telephone	
Not used Prism	
Prepare Active Management Plan	
Refer to Social Services	
Communicate with or refer to mental health services	
Communicate with or refer to the district nurse	
Refer to Voluntary Sector (please identify who below)	
Please detail other actions you have taken or give further information about options listed above	

6. Has anything affected your use of Prism in the past nine months? Please select all options that apply to your practice.

Lack of clarity about Prism	
Demands on time to respond to the data	
Demands on time to access and understand Prism data	
Issues with logging in	
Other (please specify below)	
Concerns about data sharing	
Anxieties about liability	
Concerns about the accuracy of Prism data	
Lack of resources to respond to identified needs	
Website issues - i.e. low speed, error messages	
Concerns that Prism does not provide new information	

6b) Please tell us more about any issues which have affected your use of Prism over the past nine months

7: We are interested to know your views about the usability of the Prism tool. Please rate each of the following using a scale from 1= strongly disagree to 5 = strongly agree

	Strongly disagree				Strongly agree
1. I think that I would like to use this system frequently					
	1	2	3	4	5
2. I found the system unnecessarily complex					
	1	2	3	4	5
3. I thought the system was easy to use					
	1	2	3	4	5
4. I think that I would need the support of a technical person to be able to use this system					
	1	2	3	4	5
5. I found the various functions in this system were well integrated					
	1	2	3	4	5
6. I thought there was too much inconsistency in this system					
	1	2	3	4	5
7. I would imagine that most people would learn to use this system very quickly					
	1	2	3	4	5
8. I found the system very cumbersome to use					
	1	2	3	4	5
9. I felt very confident using the system					
	1	2	3	4	5
10. I needed to learn a lot of things before I could get going with this system					
	1	2	3	4	5

Appendix 12: COREQ (Consolidated criteria for REporting Qualitative research) Checklist (Chapter 8)

Topic	Item no	Guide Questions/description	Page no/section
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	Ch8, methods, interviews, p197
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	Ch1, Intro, P23, Ch8, methods, interviews, p197
Occupation	3	What was their occupation at the time of the study?	Ch1, Intro, P18, Ch8, methods, interviews, p197
Gender	4	Was the researcher male or female?	Ch1, Intro, P23, Ch8, methods, interviews, p197
Experience and training	5	What experience or training did the researcher have?	Ch1, Intro, P18-23, Ch8, methods, interviews, p197
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	Ch8, methods, participants and sampling, p197
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Ch8, methods, participants and sampling, p197
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	Ch1, Intro, P18-23
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Ch8, methods p196
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Ch8, methods, participants and sampling, p197
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	Ch8, methods, participants and sampling, p197
Sample size	12	How many participants were in the study?	Ch8, methods, participants and sampling, p197, Results, p199
Non-participation	13	How many people refused to participate or dropped out? Reasons?	Ch8, methods, participants and sampling, p197, Results, p199
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	Ch8, methods, p197
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	No
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	Ch8, methods, participants and sampling, p197, Results, p199
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Appendix

Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	NA
Audio-visual recording	19	Did the research use audio or visual recording to collect the data?	Ch8, methods, interviews p197
Field notes	20	Were field notes made during and/or after the inter view or focus group?	Ch8, methods, interviews p197
Duration	21	What was the duration of the inter views or focus group?	Ch8, results, p199
Data saturation	22	Was data saturation discussed?	Not discussed
Transcripts returned?	23	Were transcripts returned to participants for comment and/or correction?	No
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	Ch8, analysis. P198
Description of the coding tree	25	Did authors provide a description of the coding tree?	Ch8, analysis. P198
Derivation of themes	26	Were themes identified in advance or derived from the data?	Ch8, analysis. P198
Software	27	What software, if applicable, was used to manage the data?	Ch8, analysis. P198
Participant checking	28	Did participants provide feedback on the findings?	Ch8, discussion, p215-218
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Ch8, results, p199-215
Data and findings consistent	30	Was there consistency between the data presented and the findings?	Ch8, results, p199-215 Ch8, discussion p215-218
Clarity of major themes	31	Were major themes clearly presented in the findings?	Ch8, results, p189-200
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	Ch8, results, p189-200 Ch8, discussion p215-218

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Appendix 13: COREQ (CONsolidated criteria for REporting Qualitative research) Checklist (Chapter 9)

Topic	Item no	Guide Questions/description	Page no/section
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	Ch9, Data collection, p225
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	Ch1, Intro, P18-23
Occupation	3	What was their occupation at the time of the study?	Ch1, Intro, P18
Gender	4	Was the researcher male or female?	Ch1, Intro, P23
Experience and training	5	What experience or training did the researcher have?	Ch1, Intro, P18-23
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	Ch9, Data collection, P225
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Ch9, Participants and sampling, P224-225
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	Ch1, Intro, P21-23
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Ch9, Analysis, p217
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Ch9, Participants and sampling, P215
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	Ch9, Participants and sampling, P224-225
Sample size	12	How many participants were in the study?	Ch9, Results, p226
Non-participation	13	How many people refused to participate or dropped out? Reasons?	Ch9, Participants and sampling, P224-225
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	Ch9, Design and setting p225
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	Ch9, Data collection, p225
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	Ch9, Participants and sampling, P224-225
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Ch9, Data collection, p225
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	Not applicable
Audio-visual recording	19	Did the research use audio or visual recording to collect the data?	Ch9, Data collection, p225
Field notes	20	Were field notes made during and/or after the inter view or focus group?	Ch9, Data collection, p225
Duration	21	What was the duration of the inter views or focus group?	Ch9, Data collection, p225
Data saturation	22	Was data saturation discussed?	No
Transcripts returned?	23	Were transcripts returned to participants for comment and/or correction?	No - not reported
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	Ch9, Analysis, p226
Description of the coding tree	25	Did authors provide a description of the coding tree?	NA
Derivation of themes	26	Were themes identified in advance or derived from the data?	Ch9, Analysis, p226
Software	27	What software, if applicable, was used to manage the data?	Ch9, Analysis, p226
Participant checking	28	Did participants provide feedback on the findings?	NA
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	Ch9, Results, p226-232
Data and findings consistent	30	Was there consistency between the data presented and the findings?	Ch9, Discussion, p232-238
Clarity of major themes	31	Were major themes clearly presented in the findings?	Ch9, Results, p226-232

Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	Ch9, Discussion, p232-238

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Appendix 14: Patient focus group information sheet (Chapter 9)



The use of emergency admission risk prediction tools in primary care – focus group.

November 2018

Information sheet version 1

This information sheet is about a focus group being carried out by Mark Kingston from Swansea University. It explains:

- why the focus group is being conducted
- the nature of your contribution
- the benefits/consequences of your participation
- why you have been invited to take part.

If there is anything which is not clear, please ask and Mark will be happy to discuss it with you. Contact details are provided overleaf. It is entirely your choice whether or not you take part in the study. If you decide to take part we will ask you to participate in a group based discussion known as a focus group (as it is focussed on a particular topic).

Please read through this information and if you are willing to participate, please sign the accompanying consent form.

Background

Our population contains increasing numbers of older people and people who have one or more long term conditions. This places greater demands on health and social care services. It is recognised that patients with long term conditions are not always managed and treated effectively. Too many are admitted to hospital as emergencies. Also, community services are not always available or don't work well together. To help improve services, many GP practices have access to a software tool to predict people's risk of having an emergency hospital admission within 12 months. The tool provides GPs with risk scores for all patients

in their practice, with scores ranging from 1 to 100 (very low to very high risk).

Why is this focus group being undertaken?

We don't know how the general public view such a tool. There has been very little work undertaken to seek the perspectives of this group, with most research focussed on health professionals. The focus group will help address this gap, and inform future research into the use of such tools.

This focus group is part of a wider piece of work, led by Mark, looking at the role of emergency admission risk prediction tools. This work is the focus of Mark's PhD at Swansea University Medical School.

Who is conducting the focus group?

The focus group is being undertaken by Mark Kingston.

Why have I been asked to take part in this study?

We would like to invite you as a member of the SUPER public group, who has expressed interest in supporting research in Wales.

What we are asking you to do?

To participate in a focus group lasting up to 60 minutes.

Do I have to take part?

No, it is your choice whether or not you take part. If you decide to take part you may withdraw at any time without the need to give an explanation.

Who will see the information and results about this study?

The information collected will be securely stored and analysed on computers based at Swansea University. Your name will not be used in the study or disclosed to anyone by the research team. There may be a report and other publications following from this study but they will not identify you personally.

For more information or if you have any concerns...

Please contact Mark Kingston, Researcher on [REDACTED], or email [REDACTED]. Alternatively you can contact Bridie Evans on [REDACTED] [k](#).

Appendix 15: Patient Focus Group Consent (Chapter 9)

Consent Form for Focus Group

V1.0 22 11 2018

Thank you for reading the emergency admission risk prediction study information sheet. If you are happy to participate in this interview study then please complete and sign the form below. Please initial the boxes below to confirm that you agree with each statement:

Please write
Initials in each
box:

- I confirm that I have read and understood the information sheet (v1 22/11/2018) and have had the opportunity to ask questions. ☐
- I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline. ☐
- Focus groups will be conducted with more than one participant. I understand that my responses will be kept confidential by the researcher and other participants. I understand that I must keep what other people say confidential. I understand that my name will not be identified or identifiable in the write up of results. ☐
- I agree for this focus group to be tape-recorded. I understand that the audio recording made of this interview will be transcribed and then destroyed. The transcription will be used for analysis and that extracts (from which I will not be personally identified) may be used in any conference presentation, report or journal article developed as a result. I understand that no other use will be made of the recording without my written permission, and that no one outside the research team will be allowed access to the original recording. ☐
- I understand that direct quotations may be used for academic purposes. I understand that these will be anonymised so that I cannot be identified, and that care will be taken to ensure that other information in the interview that could identify me will not be revealed. ☐
- I agree that my anonymised data will be kept for future research purposes such as publications related to this study after the completion of the study. My data will be stored for five years in line with Swansea Trials Unit Standard Operating Procedures STU-CT033 and STU-CT027. ☐
- I agree to take part in this study. ☐

Participant Name

Date

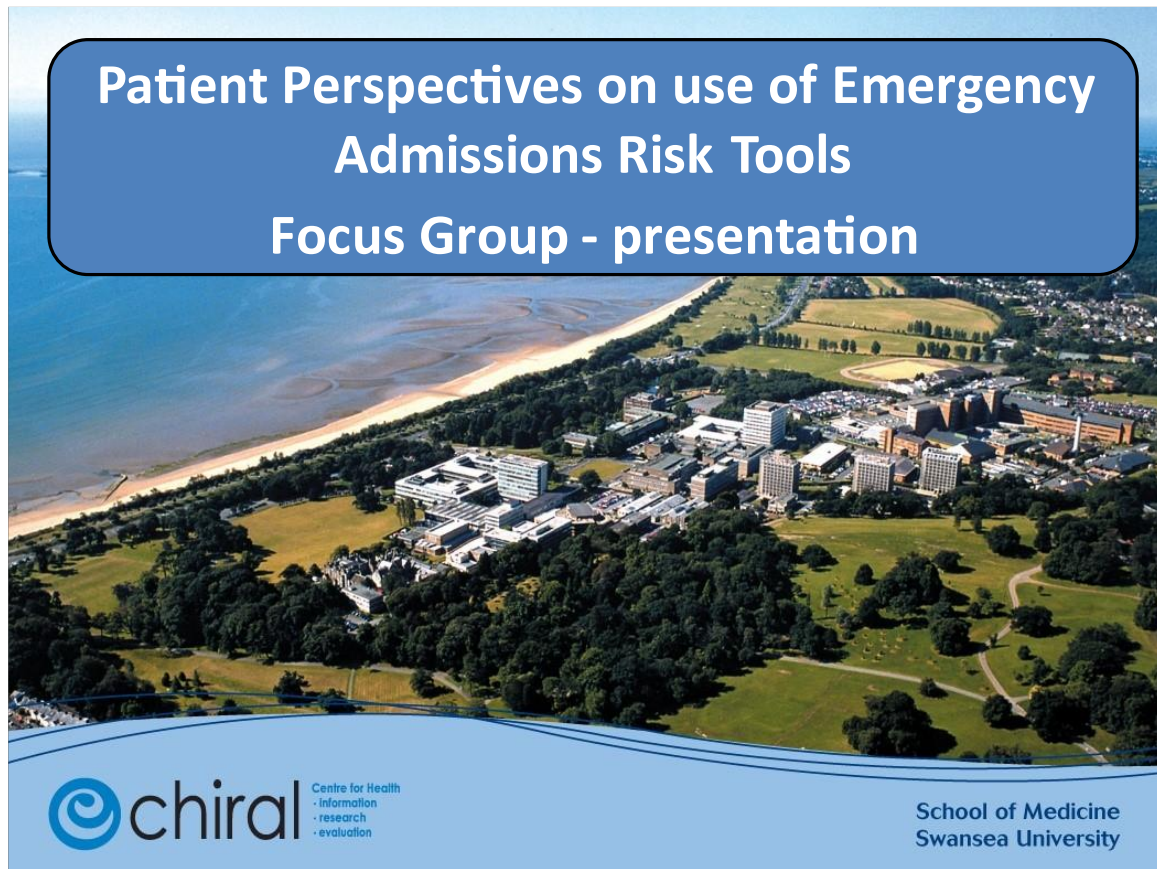
Signature

Researcher Name

Date

Signature

Appendix 16: Patient Focus Group Slides (Chapter 9)



Background

- Emergency admissions - bad outcome for patients and NHS. Can they be avoided?
- Tools predict the likelihood of patients having an **emergency hospital admission** in the following year
 - Based on different factors (e.g. Age, chronic conditions, smoking status)
 - Can group patients into risk levels
 - Tools developed across UK and abroad
- Tools are effective at predicting emergency admissions
- Use supported by Department of Health, Welsh Government, and GP contract payments



How can risk prediction help?

- Support decision making
- Identify those people at high risk of emergency admission
- Identify patients who may benefit from (early) intervention
- Support multi-disciplinary team working approaches
- Support network (groups of practices) approaches to admissions work – clinical commissioning groups in England
- Target specific services and interventions
- Provide insights into patients risk levels and influences
- Encourage patient behaviour change?





Welsh Predictive Risk Service



[My Profile](#) ▶ [My Patients](#) ▶
 Welcome Mr Trainer : [Sign Out](#)

Organisation : **Dummy**

Search using NHS Number Only

NHS Number

[Search](#)

Filter Results by WRPS Variables

Age Group

Gender

No of Chronic Conditions

Diseases

Emergency Admissions

Smoker

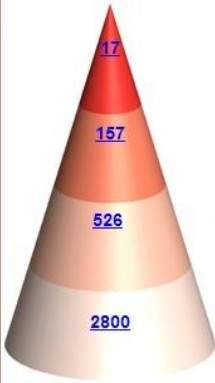
Mental Health

[Apply Filter](#) [Clear Filter](#)

Set New Thresholds using Absolute Risk Score

Set New Thresholds using Relative Risk within Practice Score

Pyramid figures show Absolute Risk Score for surgery population with no WPRS Variable filters applied.



Risk Level	Absolute Risk Score Range	Number of Patients
Level 4: High Risk	from 54.67% to 100.00%	17
Level 3: Moderate Risk	from 21.25% to 54.67%	157
Level 2: Low Risk	from 10.54% to 21.25%	526
Level 1: Very Low Risk	from 0.00% to 10.54%	2800
Total		3500

Number of Patients=3500

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Age Group	Gender	Number of Chronic Conditions			
All	All	All			

First Name	Surname	Gender	Date of Birth	Post Code	Risk Group
	PRISM	Female	01 Jul 1964	PR99 1SM	99.94 %
	PRISM	Male	01 May 1915	PR99 1SM	94.19 %
	PRISM	Female	01 Apr 1958	PR99 1SM	88.80 %
	PRISM	Female	01 Feb 1937	PR99 1SM	87.13 %
	PRISM	Female	01 Apr 1925	PR99 1SM	80.74 %
	PRISM	Male	01 Oct 1930	PR99 1SM	69.35 %
	PRISM	Female	01 Jan 1917	PR99 1SM	66.29 %
	PRISM	Male	01 Apr 1942	PR99 1SM	64.88 %
	PRISM	Male	01 May 1958	PR99 1SM	63.05 %
	PRISM	Male	01 Sep 1920	PR99 1SM	60.37 %
	PRISM	Female	01 Mar 1928	PR99 1SM	59.25 %
	PRISM	Female	01 Jul 1937	PR99 1SM	58.79 %
	PRISM	Male	01 Jun 1910	PR99 1SM	57.81 %



Nhs Number	Name	Date Of Birth	Gender	Post Code	Predictive Risk Score
6178301141	PRISM, RUBY	01 Apr 1925	Female	PR99 1SM	80.74

Demographic Variables in Risk History	
GP Variables in Risk History	
Risk Variable	Value
Neurotic, personality and other nonpsychotic disorders	No
Poisoning	No
Sprains and strains of joints and adjacent muscles	No
Mental and behavioural disorders	Yes
GI disorders	No
Corticosteroid Clinical Use	No
Loop Diuretics	Yes
Narcotic Analgesics	No
Other Antidepressant Drugs	Yes
Penicillinase Res Penicillins	1
Sulphonamides & Trimethoprim	No
Ulcer-Healing Drugs	No
Vitamin B Group	No
Polypharmacy	17
Patient has stated that they are a current smoker	No
Number of chronic conditions (PRISM model)	3
Hospital Admission Variables in Risk History	
Outpatient Variables in Risk History	
Chronic Conditions in Risk History	

PRISMATIC

Aim

- To describe the processes of introducing Prism and to estimate its effects on the delivery of care and resources used.

What happens

- 32 practices receive Prism and training from GP Champion. Technical support from NHS Wales IT Service.
- No specific instruction on how to use.

Sites

- Swansea, Neath Port Talbot, Bridgend

Methods

- Feedback from users (practice staff) – do they like it, do they use it, what influences use?
- Routine anonymous data – (practice data, hospital data) – allows comparison of service use before and after Prism
- Patient questionnaires – exploring quality of life, quality of care and services used



Appendix 17: University, R&D and ethical approval missives



GIG
CYMRU
NHS
WALES

Bwrdd Iechyd Prifysgol
Abertawe Bro Morgannwg
University Health Board

R&D
RESEARCH & DEVELOPMENT
Abertawe Bro Morgannwg University Health Board

Dyddiad/Date: 8 October 2014

Dr Jane Harrison
Assistant Medical Director - Primary Care
Medical Director's Department
Abertawe Bro Morgannwg University Health
Board
Morriston Hospital
Swansea
SA6 6NL

Fax: [REDACTED]
[REDACTED]@wales.nhs.uk
[REDACTED]@wales.nhs.uk

Dear Dr Harrison

Re: Study Title: The uptake of emergency admissions risk prediction tools in UK primary care: A cross sectional study
Short title: UK Survey of EAPRS uptake

Thank you for submitting your revised research protocol to the JSRC for review. The following documents were reviewed:

- UK Survey of EAPRS uptake v1.1 22/09/2014
- EAPRS Survey Draft v1.5 19 09 2014 – please could you correct the date in the footer of the document

The revisions were considered at the meeting held on 1 October 2014 and I am pleased to provide scientific approval of your study with the following suggestion for your consideration:

The revised protocol that JSRC received did not have the invitation letter/email included and one of the reviewers suggested the addition, to that letter/email, of the time that it would take respondents to complete what was being asked of them. It is suggested that you should comply with this and provide, in a revision of that letter/email, a realistic estimate of the time that this would take.

The next stage is to submit your JSRC approved protocol for R&D approval. Please note you are unable to commence the study until all relevant approvals are in place.

R&D Submission (IRAS R&D form)

For submission to R&D, please register with the Integrated Research Application System (IRAS) at www.myresearchproject.org.uk. At login, you will be required to complete a project filter page; this will result in the appropriate forms being generated for your type of study.

Once you have completed your IRAS R&D form you will be required to download from IRAS in XML format. Please then email the form, along with the full dataset (see list attached) to the NISCHR Permissions Co-ordinating Unit (PCU) at NISCHR.PCU.Allwales@wales.nhs.uk for permissions in Wales. Upon receipt of a valid application, the study details will be transferred to the applicable Health Boards for internal R&D Governance review.

Please note that NISCHR PCU have advised that you contact the Research Networks for advice on applying for permissions in other parts of the UK.

JSRC Approval Conditions

As part of the conditions of JSRC approval, you will be required to provide 6 monthly progress reports to the Committee. These progress reports will be an opportunity for you to highlight your study development to the Committee and equally highlight any concerns or difficulties which may have arisen in the study for advice from members. Most importantly, it will provide you with an opportunity to showcase the study progress in the Annual JSRC report.

May I take this opportunity to wish you well with your study.

Yours sincerely



Professor Rhys Williams
Chair, Joint Scientific Review Committee

cc. Mark Kingston, Research Officer, College of Medicine, Swansea University



GIG
CYMRU
NHS
WALES

Bwrdd Iechyd Prifysgol
Abertawe Bro Morgannwg
University Health Board



Dyddiad/Date: 5th June 2015

Mr Mark Kingston
Project and Data Manager
College of Medicine
ILS2
College of Medicine
Swansea University
SA2 8PP



Dear Mr Kingston

Re: EARS UK Survey
IRAS Ref: 168535
Sponsor: Swansea University

Thank you for submitting the above named research proposal to ABMU Health Board for NHS R&D permission. The attached listed documents were reviewed.

Health Board R&D Governance checks have been completed and passed. Please accept this letter as confirmation of local NHS R&D Health Board permission.

As part of Research Governance, you are required to:

1. Adhere to the protocol approved and inform the R&D office and the relevant Research Ethics Committee of any changes to the study, including the end date, for review/approval and record update.
2. For Health Board Sponsored studies, notify the R&D office of serious adverse events immediately upon knowledge, in accordance with local Standard Operating Procedure on Pharmacovigilance and as outlined in your Study Initiation meeting.
3. For Externally Sponsored studies, the Health Board should only be notified of SAEs or Suspected Unexpected Serious Adverse Reaction (SUSAR) arising in local ABMU Patients.
4. Complete any interim and final reports requested by the R&D office. If sponsored by ABMU Health Board, you will be asked to complete a 6 monthly progress report for submission to the Joint Scientific Review Committee along with your final report at study completion.
5. Ensure that your research complies with any relevant regulatory requirements and legislation relating to: Clinical Trials, Data Protection Act 1998, Health & Safety, Caldicott Guidelines, the use of Human Tissue for research purposes, Mental Capacity and ICH Good Clinical Practice (GCP). The R&D team can advise you on applicable regulatory and statutory requirements relevant to your study.
6. Comply with Data Protection requirements, notably no personal or patient identifiable data should leave the Health Board unless explicit consent from the individual or patient has been taken and documented. Unless consent is present, all study related documents must be either fully or linked anonymised. *Identifiable patient data includes name, address, full postcode, date of birth, NHS number and local patient identifiable codes as well as photographs, videos, audio tapes or other images of patients. Personal identifiable information includes the member of staff's name, address, full post code, date of birth, NI*

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www.abm.wales.nhs.uk

Reda Ref: 168535

Page 1 of 5

number and staff number as well as photographs etc' – ABMU Data Protection & Confidentiality Policy, Version 2.1 September 2013.

7. Ensure that all training courses requested by the Sponsor are completed by all relevant members of the research team before any research activity is carried out. All research staff undertaking clinical trials of an investigational medicinal product (CTIMPs) must be GCP trained, and should continue to update their GCP training every 2 years. Copies of GCP certificates should be filed in the Trial Site File, with a copy forwarded to the R&D Department.
8. Ensure the research is undertaken in compliance with all Health Board R&D Standard Operating Procedures (SOPs). The latest versions of all SOPs can be obtained by contacting the R&D Department or from the R&D Intranet pages
9. If the study is sponsored by ABMU Health Board you must notify the R&D Office of your intention to open the study in other sites.
10. For ABMU Health Board Sponsored studies, sign a Conditions of Sponsorship Agreement & attend a Study Initiation meeting as organised by the R&D Department.

NISCHR Clinical Research Portfolio Studies

If your study has been adopted onto the NISCHR Clinical Research Portfolio (CRP), it will be a condition of our permission that the Chief Investigator site uploads local recruitment data onto the portfolio database.

For more information on the process of uploading recruitment data please look at the following link:

<http://www.crncc.nihr.ac.uk/aboutus/processes/portfolio/precruitment>

Uploading of recruitment data will enable NISCHR to monitor research activity within Health Boards, resulting in NHS R&D allocations to be driven by activity.

For more information and advice on the NISCHR Clinical Research Portfolio please email:

portfolio@wales.nhs.uk

Amendments to the Study

Any changes made to the study after the issue of this letter will be treated as an amendment.

Amendments can be 'substantial' or 'non-substantial'. It is the duty of the Sponsor to classify the amendment and notify all relevant regulatory bodies accordingly, this duty may be delegated to the Chief Investigator or other authorised individual.

For a substantial amendment, the Sponsor or delegated individual will be required to submit a Notice of Substantial Amendment form to the REC, NISCHR PCU and MHRA (if applicable). For all ABMU sponsored studies substantial amendments must first be submitted to the JSRC for approval prior to submitting to REC and NISCHR PCU (NISCHR.PCU.Allwales@wales.nhs.uk)

For non-substantial amendments, the Sponsor or delegated individual are required to simply notify the ABMU R&D Department and relevant REC via e-mail or letter of the proposed non-substantial amendment.

Details of how to classify your amendment as substantial or non-substantial are available from Health Research Authority - <http://www.hra.nhs.uk/research-community/during-your-research-project/amendments/>

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Indemnity Arrangements

The Sponsor indemnifies and holds harmless ABM University Health Board, its employees and agents for any harm caused by negligence on behalf of the Sponsor, including any harm caused to participants by the administration of the investigational product. However, please note that the Sponsor will not indemnify ABM University Health Board for any harm caused by negligence on behalf of the research team or other individual or agent.

Please discuss any planned use of in-house work instructions/sops with the Sponsor company during Initiation to ensure localised documents correctly summarise the protocol requirements and this is agreed to, in writing, by the Sponsor Company.

Researchers employed by ABM University Health Board, including those holding Honorary Contract status are indemnified against actions for negligent harm via standard arrangements with Welsh Risk Pool (WRP). Provision for 'no-fault' compensation is limited under the scheme and is only available on an ex gratia, discretionary basis where the Sponsor is a NHS Organisation.

ABM University Health Board reserves the right to suspend approval of any research study where deviation from appropriate RG & GCP standards is uncovered.

May I take this opportunity to wish you well in undertaking the research. We will write to you in the future to request updates on the progress of the research and look forward to receiving outcomes of the study.

Yours sincerely,



PP

Professor J Stephens
Deputy Assistant Medical Director (R&D)
ABMU Health Board

Re: EARS UK Survey
IRAS Ref: 168535
Sponsor: Swansea University

SSI Documents Received

Document:	Subtitle:	Version:
Site-Specific Information form checklist	ABM UHB	
Site-Specific Information Form (signed/authorised pdf or hard copy)	ABM UHB	18 May 2015

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Re: EARS UK Survey
 IRAS Ref: 168535
 Sponsor: Swansea University

R&D Application Documents Received

Document:	Subtitle:	Version:
Other (please specify)	EARS survey draft	V1.7 31.10.14
Research protocol	Protocol EARS Survey 22 09 2014 v1 1 submitted	V1.1 22/09/2014
Letters of invitation to participant	Email invitation	v1.2, 07 May 2015
R&D Application checklist		
Research participant information sheet (PIS) - local version	Survey - ABM UHB - Tracked	v0.3, 14 Jan 2015
Letter from funder	ABM UHB	23 Jul 2014
Summary CV for Chief Investigator (CI)	J Harrison	
Summary CV for Principal Investigator (PI)	M Kingston	
R&D Form (Parts A-D) (signed/authorised pdf or hard copy)		08 May 2015
Research participant information sheet (PIS) - local version		v1.1, 22 Sep 2014
Evidence of insurance or indemnity (non-NHS sponsors only)	Swansea EL-PL Insurance - Expiry 31 Jul 2015	17 Jul 2014

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Dyddiad/Date: 28th September 2016

Mr Mark Kingston
Project and Data Manager
Swansea University Medical School
ILS 2
Swansea
SA2 8PP

ABMU Health Board Research & Development
Swansea University
Floor 1, Institute of Life Science 2
Singleton Park
Swansea
SA2 8PP

 @wales.nhs.uk

Dear Mr Kingston,

Re: EARP QUAL - The Use of Emergency Admissions and Frailty Risk Prediction Tools in UK Primary Care: A Qualitative Study
IRAS Ref: 210166
Sponsor: Swansea University

Thank you for submitting the above named research proposal to ABMU Health Board for NHS R&D permission. The attached listed documents were reviewed.

Health Board R&D Governance checks have been completed and passed. Please accept this letter as confirmation of local NHS R&D Health Board permission.

As part of Research Governance, you are required to:

1. Adhere to the protocol approved and inform the R&D office and the relevant Research Ethics Committee of any changes to the study, including the end date, for review/approval and record update.
2. For Health Board Sponsored studies, notify the R&D office of serious adverse events immediately upon knowledge, in accordance with local Standard Operating Procedure on Pharmacovigilance and as outlined in your Study Initiation meeting.
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4. Complete any interim and final reports requested by the R&D office. If sponsored by ABMU Health Board, you will be asked to complete a 6 monthly progress report for submission to the Joint Scientific Review Committee along with your final report at study completion.
5. Ensure that your research complies with any relevant regulatory requirements and legislation relating to: Clinical Trials, Data Protection Act 1998, Health & Safety, Caldicott Guidelines, the use of Human Tissue for research purposes, Mental Capacity and ICH Good Clinical Practice (GCP). The R&D team can advise you on applicable regulatory and statutory requirements relevant to your study.
6. Comply with Data Protection requirements, notably no personal or patient identifiable data should leave the Health Board unless explicit consent from the individual or patient has been taken and documented. Unless consent is present, all study related documents must be either fully or linked anonymised. *'Identifiable patient data includes name, address, full postcode, date of birth, NHS number and local patient identifiable codes as well as photographs, videos, audio tapes or other images of patients. Personal identifiable information includes the member of staff's name, address, full post code, date of birth, NI number and staff number as well as photographs etc'* – ABMU Data Protection & Confidentiality Policy, Version 2.1 September 2013.

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Reda Ref: 210166

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7. Ensure that all training courses requested by the Sponsor are completed by all relevant members of the research team before any research activity is carried out. All research staff undertaking clinical trials of an investigational medicinal product (CTIMPs) must be GCP trained, and should continue to update their GCP training every 2 years. Copies of GCP certificates should be filed in the Trial Site File, with a copy forwarded to the R&D Department.
8. Ensure the research is undertaken in compliance with all Health Board R&D Standard Operating Procedures (SOPs). The latest versions of all SOPs can be obtained by contacting the R&D Department or from the R&D Intranet pages
9. If the study is sponsored by ABMU Health Board you must notify the R&D Office of your intention to open the study in other sites.
10. For ABMU Health Board Sponsored studies, sign a Conditions of Sponsorship Agreement & attend a Study Initiation meeting as organised by the R&D Department.

Clinical Research Portfolio Studies

If your study has been adopted onto the Clinical Research Portfolio (CRP), it will be a condition of our permission that the Chief Investigator site uploads local recruitment data onto the portfolio database.

For more information on the process of uploading recruitment data please look at the following link:
<http://www.healthandcareresearch.gov.wales/uploading-recruitment-data/>

Uploading of recruitment data will enable Health and Care Research Wales to monitor research activity within Health Boards, resulting in NHS R&D allocations to be driven by activity.

For more information and advice on the Health and Care Research Wales Portfolio please email:
portfolio@wales.nhs.uk

Amendments to the Study

Any changes made to the study after the issue of this letter will be treated as an amendment. Amendments can be 'substantial' or 'non-substantial'. It is the duty of the Sponsor to classify the amendment and notify all relevant regulatory bodies accordingly, this duty may be delegated to the Chief Investigator or other authorised individual.

For a substantial amendment, the Sponsor or delegated individual will be required to submit a Notice of Substantial Amendment form to the REC, the lead permission co-ordinating function for the study and the MHRA (if applicable). For all ABMU sponsored studies substantial amendments must first be submitted to the Joint Study Review Committee (JSRC) for approval prior to submitting to REC and Health and Care Research Wales Permissions (Research-permissions@wales.nhs.uk).

For non-substantial amendments, the Sponsor or delegated individual are required to submit the amendment details to the lead permission co-ordinating function for the study. They will then pass the amendment details onto all relevant nations, for Wales this would be Health and Care Research Wales who will notify ABMU R&D Department for review.

Details of how to classify your amendment as substantial or non-substantial are available from Health Research Authority - <http://www.hra.nhs.uk/research-community/during-your-research-project/amendments/>

Indemnity Arrangements

The Sponsor indemnifies and holds harmless ABM University Health Board, its employees and agents for any harm caused by negligence on behalf of the Sponsor, including any harm caused to participants by the administration of the investigational product. However, please note that the Sponsor will not indemnify ABM University Health Board for any harm caused by negligence on behalf of the research team or other individual or agent. Researchers employed by ABM University Health Board, including

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those holding Honorary Contract status are indemnified against actions for negligent harm via standard arrangements with Welsh Risk Pool (WRP).

Please discuss any planned use of in-house work instructions/sops with the Sponsor company during Initiation to ensure localised documents correctly summarise the protocol requirements and this is agreed to, in writing, by the Sponsor Company.

ABM University Health Board reserves the right to suspend approval of any research study where deviation from appropriate RG & GCP standards is uncovered.

May I take this opportunity to wish you well in undertaking the research. We will write to you in the future to request updates on the progress of the research and look forward to receiving outcomes of the study.

Yours sincerely,



Professor J Stephens
Deputy Assistant Medical Director (R&D)
ABMU Health Board

Re: EARP QUAL - The Use of Emergency Admissions and Frailty Risk Prediction Tools in UK Primary Care: A Qualitative Study
 IRAS Ref: 210166
 Sponsor: Swansea University

SSI Documents Received

Document:	Subtitle:	Version:
Other (please specify)	Confirmation that no access to site is needed	
Summary CV for local researchers and research nurses	Dr Bridie Angela Evans CV	
GCP Certificates	Dr Bridie Angela Evans - GCP Certificate	16/06/15
GCP Certificates	Mark Kingston - GCP Certificate	27/07/16
GCP Certificates	Rhiannon Griffiths - GCP certificate	25/08/16
Summary CV for local researchers and research nurses	Rhiannon Griffiths CV	
Research participant information sheet (PIS) - local version	EARP QUAL Information Sheet v1 30 06 2016	V1 - 27.06.16
Research participant consent form - local version	Verbal Consent Script for EARP QUAL 27 06 2016 v1	V1 - 27.06.16
Other (please specify)	Clinical Director Support - Hamish Laing	
Site-Specific Information form checklist	ABM UHB	
Site-Specific Information Form (signed/authorised pdf or hard copy)	ABM UHB	08 Jul 2016

Re: EARP QUAL - The Use of Emergency Admissions and Frailty Risk Prediction Tools in UK Primary Care: A Qualitative Study
 IRAS Ref:
 Sponsor: Swansea University

Application Documents Received

Document:	Subtitle:	Version:
Evidence of insurance or indemnity (non-NHS sponsors only)	Swansea Uni Insurance Proof up to 31 07 2017	31/07/17
Other (please specify)	ABMU JSRC approval	06/05/16
Research protocol	ABMU Protocol Application Form EARP - QUAL v1.1	v1.1 - 12/04/16
Letter from funder	Confirmation of funding from ABMU Health Board - Pathway to Portfolio scheme	16.06.16
R&D Application checklist	Checklist	
Summary CV for Chief Investigator (CI)	D Burge-Jones	
R&D Form (Parts A-D) (signed/authorised pdf or hard copy)		27 Jul 2016
University Ethics Committee Correspondence	Approval	06 May 216
Summary CV for Principal Investigator (PI)	M Kingston	12 Aug 2014
Evidence of insurance or indemnity (non-NHS sponsors only)	Employers, Public and Products liability - Expiry date: 31 Jul 2016	20 Jul 2016



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Canolfan Gwasanaethae
Busnes
Business Services
Centre

Research Ethics Committee for Wales

*Ymchwil Ethegau Aml-Ganolfan yng
Nghymru*

6 Llawr, Ty Churchill
17 Ffordd Churchill
Caerdydd, CF10 2TW

Website / Gwefan :
www.nres.npsa.nhs.uk

Sixth Floor, Churchill House
17 Churchill Way
Cardiff, CF10 2TW

Ffon : [REDACTED]
Ffacs : [REDACTED]

e-mail / e-bost :
[REDACTED]@wales.nhs.uk

Telephone : [REDACTED]
Fax : [REDACTED]

11 October 2010

Professor Helen Snooks
Professor in Health Services Research
Swansea University
School of Medicine
Singleton Park
Swansea SA2 8PP

Dear Professor Snooks

Study Title: Predictive risk stratification: impact on care for people with or
at risk of chronic conditions
REC reference number: 10/MRE09/25

Thank you for your letter of 01 October 2010, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chairman.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Mental Capacity Act 2005

I confirm that the committee has approved this research project for the purposes of the Mental Capacity Act 2005. The committee is satisfied that the requirements of section 31 of the Act will be met in relation to research carried out as part of this project on, or in relation to, a person who lacks capacity to consent to taking part in the project.

Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

The Committee has not yet been notified of the outcome of any site-specific assessment (SSA) for the non-NHS research site(s) taking part in this study. The favourable opinion does not therefore apply to any non-NHS site at present. I will write to you again as soon as one Research Ethics Committee has notified the outcome of a SSA. In the meantime no study procedures should be initiated at non-NHS sites.

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

For NHS research sites only, management permission for research ("R&D approval") should be obtained from the relevant care organisation(s) in accordance with NHS research governance arrangements. Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at <http://www.rdforum.nhs.uk>.

Where the only involvement of the NHS organisation is as a Participant Identification Centre (PIC), management permission for research is not required but the R&D office should be notified of the study and agree to the organisation's involvement. Guidance on procedures for PICs is available in IRAS. Further advice should be sought from the R&D office where necessary.

Sponsors are not required to notify the Committee of approvals from host organisations.

- The word "date" should be removed from the title section of the information sheets, as the date is contained in the footer of the same documents with the version number.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

You should notify the REC in writing once all conditions have been met (except for site approvals from host organisations) and provide copies of any revised documentation with updated version numbers.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date
Investigator CV		19 August 2010
Protocol	3	26 April 2010
NIHR Service Delivery and Organisation Programme letter of confirmation of funding		20 November 2009
REC application	signed in ink by Professor Snooks, and Ceri Jones, sponsor's representative	17 August 2010
Covering Letter	signed Professor Snooks	23 August 2010
Summary/Synopsis	4	02 August 2010
Letter from Sponsor	signed Ceri Jones, Swansea University	19 November 2010
Interview Schedules/Topic Guides	Qualitative interview schedule, version 3	24 August 2010
Letter of invitation to participant	3	20 August 2010
GP/Consultant Information Sheets	2	21 August 2010
Participant Information Sheet: Professionals	1	22 September 2010
Participant Consent Form	4	21 September 2010
Response to Request for Further Information	Letter signed Professor Snooks	01 October 2010
Participant Information Sheet	4	21 September 2010
Participant Information Sheet: Carer	4	21 September 2010
Participant Consent Form: Professionals	1	21 September 2010
Participant Consent Form: Carers	4	20 September 2010
Questionnaire: Client Service Receipt Inventory Questionnaire	2	23 August 2010

Questionnaire: SF12 - Your Health and Well-Being		
Questionnaire: Quality of Care Monitor Questionnaire	2	23 August 2010
Evidence of insurance or indemnity	UM association certificate of insurance; Swansea University; expires 31 July 2011	
Referees or other scientific critique report	SDO comments; and response from researchers	

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Now that you have completed the application process please visit the National Research Ethics Service website > After Review

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

The attached document "After ethical review – guidance for researchers" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Progress and safety reports
- Notifying the end of the study

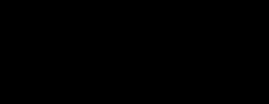
The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

We would also like to inform you that we consult regularly with stakeholders to improve our service. If you would like to join our Reference Group please email referencegroup@nres.npsa.nhs.uk.

10/MRE09/25

Please quote this number on all correspondence

Yours sincerely



Dr Gordon Taylor
Chairman

Email: @wales.nhs.uk

Enclosures:

"After ethical review – guidance for researchers"

Copy to:

Dr Hayley Hutchings, Swansea University