Crossing the boundaries: Nurses in the medical domain ; An examination of safety and outcomes in secondary care.

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Crossing the boundaries: Nurses in the medical domain; an examination of safety and outcomes in secondary care

Background and Aims

Nurses' roles, responsibilities and practice have changed and the boundaries between nursing and medicine have blurred. Few studies compare clinical outcomes of patients managed by Advanced Nurse Practitioners (ANPs) and junior doctors in acute secondary care. Aims of the study were to identify any observable differences between ANPs undertaking traditional junior doctor roles and junior doctors in relation to senior doctor congruence with diagnosis and clinical management planning, and clinical assessment practices.

Setting

The study took place in an acute hospital in the UK from April 2009 to August 2010.

Design and methods

This was a retrospective review of clinical records of patients presenting to the emergency medicine division. Data were collected from 311 randomly selected case notes of patients presenting to 10 ANPs and 10 junior doctors. Data were analysed using bivariate and multivariate techniques in SPSS version 19. Analyses were repeated including only patients presenting to Acute Medical Assessment Unit (AMA).

Findings

Statistically significant findings included: patients presenting to junior doctors were older, had more co-existing problems and were prescribed more medicines before presentation. Patients presenting to ANPs were more likely to have chest pain. ANPs were less likely to prescribe medicines. Clinical management plans were less likely to be agreed for patients with more co-existing problems.

There were few inter-professional differences in senior congruence with clinical management planning and diagnosis and clinical assessment practices. These findings are reassuring as nurses' work moves into what was formerly the medical domain.

DECLARATION

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

Signed (candidate)

Date 24th March 2014

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated.

Other sources are acknowledged giving explicit references. A bibliography is appended.

Signed . (candidate)

Date 24th March 2014

STATEMENT 2

I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

Signed (candidate)

Date 24th March 2014

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Tables/Figures/Boxes

List of abbreviations

A&E	Accident and Emergency
AANPE	Association of Advanced Nursing Practice Educators
AMA	Acute Medical Admissions
ANNP	Advanced Neonatal Nurse Practitioner
ANP	Advanced Nurse Practitioner
APN	Advanced Practice Nurse
BMJ	British Medical Journal
bpm	beats per minute
CBC	Complete blood count
CHRE	Council for Healthcare Regulatory Excellence
CNS	Clinical Nurse Specialist
COPD	Chronic obstructive airways disease
CRP	C-Reactive protein
CSA	Candidate Support Advisor
DH	Department of Health
DHSS	Department of Health and Social Services
DVT	Deep vein thrombosis
ECG	Electrocardiogram
ENP	Emergency Nurse Practitioner
EWTD	European Working Time Directive
F1	Foundation Year 1
F2	Foundation Year 2
GMC	General Medical Council
GORDS	Gastro oesophageal reflux disease
GP	General Practitioner
GRADE	Grading of Recommendations, Assessment, Development and Evaluation
GTT	Global Trigger Tool
HO	House Officer
ICN	International Council of Nurses
IHI	Institute of Healthcare Improvement
IQR	Inter-quartile range
LFT	Liver function test
LOS	Length of stay
MSc	Master of Science
MRO	Medical Records Office
NBM	Nil by mouth
NHS	National Health Service
NICE	National Institute of Clinical Excellence
NLIAH	National Leadership and Innovation Agency for Healthcare
NMC	Nursing and Midwifery Council
NP	Nurse Practitioner
NT	Nursing Times
OOH	Out of hours
OPD	Outpatients Department
OSCE	Objective Structured Clinical Examination
PC	Personal computer
PE	Pulmonary embolism

pm	per minute
PREP	Post Registration Education and Practice
RCN	Royal College of Nursing
RCT	Randomised control trial
SHO	Senior House Officer
SOB	Shortness of breath
SPI	Safer Patients Initiative
SPSS	Statistical package for the social sciences
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology
U&E	Urea and electrolytes
UK	United Kingdom
UKCC	United Kingdom Central Council for Nursing, Midwifery and Health Visiting
USA	United States of America
WAG	Welsh Assembly Government

CHAPTER ONE: SETTING THE SCENE

1.0 Introduction and scope of study

Nurses are pushing role boundaries and advancing their practice into what has previously been the medical domain. All nurses must practise according to *The Code: Standards of conduct, performance and ethics for nurses and midwives* (NMC 2008). They must practice safely, act lawfully in their professional practice and personal life and work within the limits of their competence (NMC 2008). When nurses advance their practice they therefore must be safe and competent to do so. This study compares competence and safety of junior doctors and Advanced Nurse Practitioners (ANPs) when ANPs take on medical roles within a secondary care setting. Chapter one sets the scene in the development of advanced nursing practice and the research question, study aims and objectives and study setting are set out.

Chapter two explores the key drivers in the development of advanced practice. Inter-professional differences between medicine and nursing are explored, as these may influence and impact on shifting boundaries and changing clinical roles at the medical – nursing interface. The development of nursing is described to contextualise the development of advanced practice, which is critically analysed from an international perspective. A systematic review of studies that compare nurses and doctors, where nurses have crossed boundaries and taken on roles previously in the medical domain is presented. Comparative studies are described and analysed, and gaps identified in the published literature. The identified gaps in the published knowledge base demonstrate how the study's research question, aims and objectives arose.

Chapter three presents the design of the study including methods, participants, data collection, analysis, ethical considerations and issues of rigour. Chapter four then presents the findings of the data. Chapter five presents a discussion of the strengths and limitations of the study and, in the light of these, its findings. It then compares the findings to previous studies. Chapter six summarises the study findings and new knowledge generated, and suggests implications for clinical practice and education and further research.

1.1 Background

Nursing roles and scope of practice are dynamic and continually changing. Nursing has seen a transformation in the United Kingdom (UK) and globally. Since the 1970s there has been a rapid shift in roles, responsibilities and practices of nurses and the boundaries between nursing and medicine have become increasingly blurred. Nurses are advancing their practice beyond that of initial registration and carrying out many roles, tasks and responsibilities which previously lay in the medical domain. They are moving past skills' extension where they take on parts of doctors' technical work, for example siting intravenous cannulae, to advancing their practice to include full assessment, diagnosis and clinical management, using clinical discretion (Dowling *et al* 1995, Lloyd-Jones 2005, Barton 2006a, Gardner *et al* 2007). These developments have contributed to a plethora of new roles and titles, for example Nurse Practitioner, Advanced Nurse Practitioner, Clinical Nurse Specialist.

The impetus for this change has come from several directions. In the UK this includes a reduction in junior doctors' working hours following the European Union Working Time Directive (EWTD 2003), increasing incidence of long term diseases, people living longer and advancing technology (Chang *et al* 1999, Distler 2006, Callaghan 2008). Nurses advancing their practice into what was previously the medical domain and the subsequent shift in professional boundaries may have potential impacts on patient safety and outcomes. It is important for the profession of nursing, and the patients they care for, that nurses who are practising at advanced levels and crossing boundaries into the medical domain provide care which is of an equivalent standard to that of junior doctors in terms of diagnosis and clinical management, and is not detrimental to patient outcomes and safety. Although in the UK advanced practice continues to be unregulated at the time of writing, all nurses have a duty of care within the Code (NMC 2008).

There are also important considerations in terms of educational preparation and professional socialisation when one profession takes over responsibilities which previously lay with another, in order to ensure the standards of practice are the same. Doctors and nurses are separate professions that are prepared in different ways. Nursing and medicine have historically and traditionally different development pathways, which are entwined in social, professional and cultural issues. The development of advanced nursing practice is challenges those traditions and divides. Educational preparation of the two professions is discussed in order to identify the differences and similarities and explore the preparedness of Advanced Nurse Practitioners (ANPs) to undertake the advanced roles described.

I have been interested in advanced nursing practice development since I worked as a Candidate Support Advisor (CSA) with the Higher Level Practice Pilot with the United Kingdom Central Council for Nursing, Midwifery and Health Visiting (UKCC) (1999). As a CSA I met many nurses and midwives who were crossing the boundaries into what had previously been the medical domain and this initiated my interest in advanced nursing practice. I am passionate about nursing and midwifery, and about developing the potential contribution of the profession to support patient care. However balanced against this is the need to ensure that nurses are supported and educated and their competence ensured, so that they and their patients are not put at risk. As the needs of patients change along with medical workforce changes, the nursing workforce has been developing to meet care needs. Workforce demands and education and development provision have to be addressed to ensure the right people are delivering the right care.

1.1.1 Defining what advanced practice means

The development of advanced nursing practice, which is not unique to the UK, has resulted in a plethora of titles. These may be understood differently in different settings and by different people, both healthcare professionals and the public. Various titles have been used in many countries where there are differences in both interpretation and implementation, and the extent to which the various roles reflect advanced nursing practice is often not clear (Cameron and Masterson 2000, Bryant-Lukosius *et al* 2004, Furlong and Smith 2005, Barton 2006a). This lack of clear definitions and standards has led to variation in practice and confusion both within and outside nursing (Bartter 2001, Pearson and Peels 2002, Marsden *et al* 2003, Carnwell and Daly 2003).

Often the terms Nurse Practitioner (NP) and Advanced Nurse Practitioner (ANP) are used synonymously, with implicit assumptions that these roles involve advanced practice. However attempts have been made to differentiate between nurse practitioners and advanced nurse practitioners (Carnwell and Daly 2003, Gardner *et al* 2007, Welsh Assembly Government (WAG) 2009). The literature is not consistent in the meanings of these terms. A study in Australia (Gardner *et al* 2007) attempted to define roles of advanced practice nursing (APN) and nurse practitioner (NP) in Australia. The study concluded that in Australia, New Zealand and North America APN is differentiated from the NP through legislative title protection mechanisms which are in place for the NP title. The APN role referred to consultant nurses and clinical nurse specialists whilst nurse practitioners were defined as autonomous practitioners who diagnosed, prescribed medication and made referrals. Gardner *et al* (2007) then go on to say that the NP title protection ensures that the clinician meets the *advanced* and *extended* practice standards required by the registering authority, with a further differentiation being that the APN role reflected *expanded* practice and the NP role reflected *extended* practice. It is difficult to be clear about what the authors mean by extended and expanded practice, and the use of advanced practice with reference to NPs causes further confusion. Extended practice has been defined as the adoption of tasks or roles which were previously the responsibility of other health professionals (Lesa and Dixon 2007, Council for Health Regulatory Excellence (CHRE) (2010). In contrast expanded practice has been defined as practice developed within a nursing role (Lesa and Dixon 2007).

In the USA, during their early development the roles of both Clinical Nurse Specialists (CNS) and NPs were considered synonymous with an advanced level of nursing practice, with NPs being community based and generalist and CNSs working in acute care settings and condition focussed (Carnwell and Daly 2003, Bryant-Lukosius and DiCenso 2004). In the UK literature nurse practitioners have been identified as experienced nurses who undertake advanced clinical roles and have a generalist knowledge base (Barton 2006a). In comparison ANPs' area of practice and knowledge base has been proposed as specialist and narrow (Carnwell and Daly 2003) with both NPs and ANPs practicing autonomously.

The development of advanced practice continued in the UK through the 1980s and 1990s with continued lack of clarity and understanding about what advanced practice *meant*, and with the development of new nursing roles lacking consistency. This was increasingly recognised in the literature, although the nursing and midwifery regulatory body did not produce guidance and clarity (Cameron and Masterton 2000, Thompson 2003)

Modernising Nursing Careers (DH 2006) included a work stream which focussed on advanced practice. The Advanced Practice Toolkit was published, adopting the International Council of Nurses (ICN) and Nursing and Midwifery Council (NMC) (2006) definitions of advanced nursing practice. The ICN (2001) definition is;

"A registered nurse who has acquired the expert knowledge base, complex decision-making skills and clinical competencies for expanded practice, the characteristics of which are shaped by the context and/or country in which s/he is credentialed to practice. A master's degree is recommended for entry level" (unnumbered webpage).

The NMC (2006) revised definition of advanced nursing practice is:

"Advanced nurse practitioners are highly experienced and educated members of the care team who are able to diagnose and treat your healthcare needs or refer you to an appropriate specialist if needed". Advanced nurse practitioners are highly skilled nurses who can:

- Take a comprehensive patient history
- Carry out physical examinations
- Use their expert knowledge and clinical judgement to identify the potential diagnosis

- Refer patients for investigations where appropriate
- Make a final diagnosis
- Decide on and carry out treatment, including the prescribing of medicines, or refer patients to an appropriate specialist
- Use their extensive practice experience to plan and provide skilled and competent care to meet the patient's health and social care needs, involving other members of the health care team as appropriate
- Ensure the provision of continuity of care including follow-up visits
- Assess and evaluate, with patients, the effectiveness of the treatment and care provided and make changes as needed
- Work independently, although often as part of a health care team
- Provide leadership
- Make sure that each patient's treatment and care is based on best practice (NMC 2006 (unnumbered webpage).

This definition remains on the NMC website in 2013. The Scottish Government Toolkit (Scottish Government 2008) proposes that there should be agreement to accept the ICN definition of advanced practice, with the NMC definition being viewed as a contextualisation of the wider international definition, relating particularly to clinical advanced practice. All these definitions address what advanced practice is, whilst the wider issue of confusion in relation to the plethora of titles has not yet been resolved.

As part of *Modernising Nursing Careers* (DH 2006) advanced practice has been defined in the UK as a level of practice, rather than a role or title. It is represented as a particular stage on a continuum between 'novice' and 'expert' practice and can be applied equally to generalist or specialist practice. This can be seen in Figure 1.1

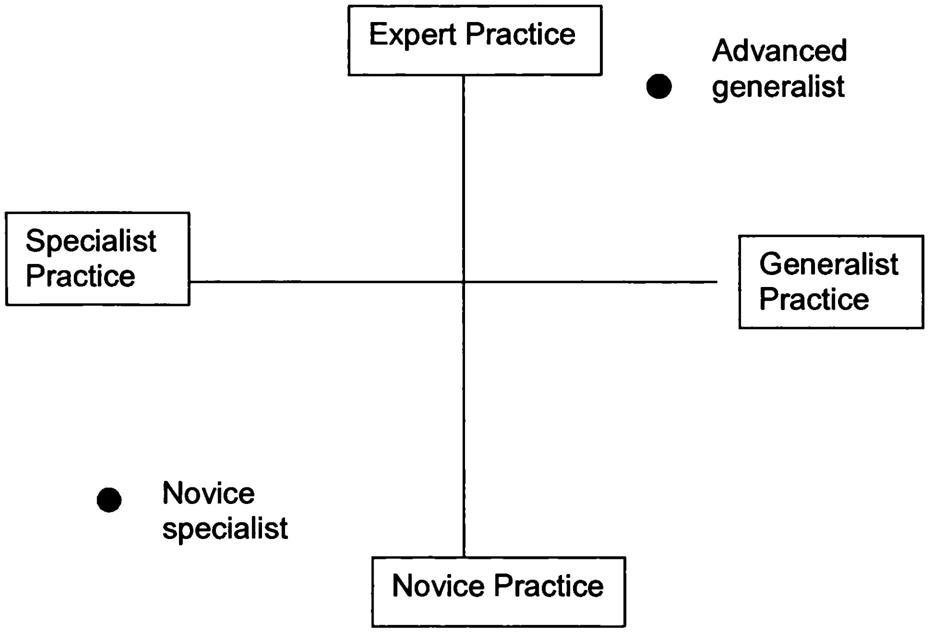


Figure 1.1 Relationship between novice and expert practice, and specialist and generalist practice (Scottish Government 2008)

This definition contradicts previous definitions in which NPs and ANPs were defined by their generalist or specialist base as opposed to level of practice. It does however provide clarity for future development in terms of NPs and ANPs. The Welsh Assembly Government in 2009 offered an explicit differentiation between NPs and ANPs;

> "Individuals taking up specific clinical nurse specialist/nurse practitioner posts must have successfully completed, as a minimum, degree level education in an appropriate subject so that they can demonstrate a level of knowledge in that focussed practice area. They must also have developed their skills and competencies and be able to demonstrate a level of clinical expertise in the chosen specialist area" (p20).
>
> Whilst "ANPs (specialist and generalist) will be graduates and will have completed further study at master's level, e.g. MSc Advanced Clinical Practice. Whilst the specific skills and knowledge base for Advanced Nursing Practice are influenced by the context in which individuals practice, these should be underpinned by autonomous practice, critical thinking, high levels of decision making & problem solving, with a focus on values-based care and practice improvement" (p24).

This infers that NPs and CNSs do not work autonomously whereas ANPs do. The differentiation is also in terms of academic level, with NPs educated to degree level and ANPs educated to Masters level. As the WAG (2009) document states that ANPs' practice is underpinned by autonomous practice, one could perhaps assume that if practice is expert, it is autonomous. The NMC (2006) definition identifies that ANPs work independently. In summary, advanced practice is now determined and defined by the level of practice (expert, autonomous, independent) as opposed to the area (generalist or specialist).

1.2 Regulation

Advanced practice is currently not regulated in the UK, unlike other countries such as USA and Australia, and a significant number of years have been spent considering the issue regulation. In the UK there is concern that as advanced practice increases, malpractice claims against ANPs will increase (Waters 2011). Some believe there is a need to regulate advanced clinical practice in order to ensure public protection (Cameron and Masterson 2000, Thompson 2003). As advanced practitioners are not currently regulated and registered in the UK, there is an inability to identify accurate numbers of nurses who are working at advanced levels of practice.

The lack of clarity regarding advanced practice has been perpetuated by the paucity of guidance from the professional regulating body for nursing and midwifery, currently the Nursing and Midwifery Council (NMC) and formerly the United Kingdom Central Council for Nursing, Midwifery and Health Visiting (UKCC) (Thompson 2003). Cameron and Masterson (2000) refer to a "policy vacuum surrounding the higher levels of clinical practice" (p1086).

The introduction of the Scope of Professional Practice in 1992 (UKCC 1992a) offered the potential to expand practice without the need for certification of new roles and/or tasks. The Scope of Professional Practice made nurses responsible for, and judges of, their own competence and removed restrictive role guidance. This allowed creative development in order to effect change to meet changing needs within a complex system. Individuals and service providers were able to develop roles at differing levels, pace and expectations provided nurses were deemed competent. In a later document the UKCC (1994) identified a need to 'adjust boundaries' for future advanced practice and aspects of the role were identified, although no clear guidance was given regarding level of qualifications and knowledge. In this document it was stated that nurses holding a first degree in their area of practice were specialist practitioners and that there is another level of practice that constitutes advanced practice. This possibly was the forerunner to the proposal that education for advanced practice should be at master's level.

The UKCC began work on the development of a mandatory regulatory framework for higher levels of practice in 1998 (UKCC 1999) in an effort to provide clarity and to protect the public. The UKCC proposed a 'higher level of practice' rather than 'advanced practice'. The report on the pilot was completed and published, however this coincided with the change from the UKCC to the NMC, and the project lost momentum as personnel changed and a new regulating body was born. It was several years later before the issue came to the forefront of the regulating body again. In 2005, following a national consultation, the NMC proposed that 'advanced nurse practitioner' should become a registered title on a sub-part of the Register. There was general agreement with the NMC competencies and educational level for advanced practice. There was also agreement that advanced practitioners needed to meet defined levels of competency and knowledge, and be registered on a separate part of the register. The NMC sought approval from the Privy Council to open a sub-part to the nurses' part of the Register in December 2005.

The NMC waited for further detail from the White Paper '*Trust, Assurance and Safety - the Regulation of Health Professionals in the 21st Century*' (DH 2007) Implementation Plan before progressing, causing further frustration (Association of Advanced Nursing Practice Educators (AANPE) 2007). The Council for Healthcare Regulatory Excellence (CHRE) was commissioned by the Department of Health (DH) to look at regulation for all healthcare workers, and in 2008 called for a risk-based approach to the use of job titles and highlighted risks to the public. In 2010 the Prime Minister's Commission recommended that advanced practice be regulated by the NMC and that titles be protected. However, there followed an election and change of UK government and in 2011 the 'Enabling Excellence' White Paper essentially put a hold on advanced practice regulation (DH 2011). The Paper stated that the Government would not support the health professions' regulators in taking on any new responsibilities or roles which add to the costs to their existing registrants without providing robust evidence of significant additional protection or benefits to the public. It also stated the health professions' regulators would need to demonstrate that advanced practice registers were an appropriate and proportionate use of registrants' fees. At this time the issue of advanced practice regulation in nursing remains unresolved, with the challenges for the NMC and the nursing profession including:

- Demonstration of patient safety.
- Developing the evidence base.
- Fitness to practice issues.
- Protection of title.
- Governmental 'buy in'.

A brief timeline from 1990 is shown in Table 1.1 (adapted from AANPE 2007, Waters 2011).

Table 1.1 Timeline; advanced practice regulation in the UK

1990	The Royal College of Nursing (RCN) launches a diploma course for nurse practitioners.
1992	UKCC introduce Scope of Professional Practice
1994	UKCC agrees on post-registration education and practice arrangements (PREP). The regulatory body pinpoints two levels of post-registration practice – specialist and advanced.
1996	UK taskforce set up to look at regulation of new nursing roles.
1997	UKCC decides not to set standards for advanced practice.
1998	UKCC launches consultation document A Higher Level of Practice looking at how registrants can be assessed and recognised as advanced practitioners. It proposes that all applicants should hold a UK degree or equivalent and have practised for a minimum of three years full time. When the consultation ends, the UKCC's governing body agrees regulation is needed.
2002	Nursing and Midwifery Council (NMC) takes over from the UKCC as nurses' regulatory body.
2004	NMC launches consultation into how nurses in advanced roles should be known and regulated. It proposes that advanced nurses should have 'master's level-thinking'. The consultation sets out competencies that advanced nurse practitioners need to reach, covering management of patient illness, health promotion and disease prevention. It says nurses who attain the competencies will have their advanced status recorded on the NMC register.
2005	NMC agrees to open a further sub-part of the nurses' register for advanced nurse practice (ANP), but has to seek permission from the Privy Council so that legislation can be drawn up. The earliest anticipated date for legislation to be in place is estimated as August 2006. Only nurses who have achieved NMC-set competencies for a registered advanced nurse practitioner will be permitted to use the title advanced nurse practitioner.
2007	The UK-wide White Paper Trust, Assurance and Safety: The Regulation of Health Professionals is launched following the government's response to recommendations set out in the Fifth Report of the Shipman Inquiry.
2008	Department of Health commissions health regulator umbrella body the Council for Healthcare Regulatory Excellence (CHRE) to put together evidence on the changing roles of health workers.
2009	The CHRE publishes calls for a risk-based approach to the use of job titles.
2010	The Commission on the future of nursing and midwifery recommends that advanced practice is regulated. The NMC sets up a project group to examine ANP competencies.
2011	Enabling Excellence White Paper states: 'The Government will not support the health professions regulators in taking on any new responsibilities or roles which add to the costs to their existing registrants without providing robust evidence of significant additional protection or benefits to the public', also states the health professions regulators will need to demonstrate that ... advanced practice registers, which has some professional support but where a compelling case for further regulatory action has yet to be made, are an appropriate and proportionate use of registrants' fees
2012	CHRE review of the NMC

1.3 Advanced practice frameworks and standards

The Advanced Practice Toolkit developed in Scotland as part of 'Modernising Nursing Careers' (DH 2006) has been endorsed by all four UK countries. In Wales the *Framework for Advanced Nursing, Midwifery and Allied Health Professional Practice* (National Leadership and Innovation Agency for

Healthcare (NLIAH) 2010) has been launched and in England the *Advanced Level Nursing: A Position Statement* (DH 2010). This has enabled further clarity and consistency for nurses, employers, educators and the public. However as highlighted by Harrison and Snow (2010) there are some differences between the English and Welsh model which may make it difficult should UK regulation be introduced, although the NMC Chief Executive said the differences were 'helpful' (Harrison and Snow 2010). The models are shown in Table 1.2.

Table 1.2 2010 advanced practice models in England and Wales

Advanced practitioners in England	**Advanced practitioners in Wales**
Will have extensive clinical experience and masters level education or equivalent Can be employed on any pay band Will undergo performance reviews and appraisals Need to meet 28 broad standards within four domains: 1. Clinical/direct care practice 2. Leadership and collaborative practice 3. Improving quality and developing practice 4. Developing self and others	Will be educated to masters level or equivalent Will be at least pay band 7 Will undergo formal assessments Will meet 34 standards within 4 pillars of practice: 1. Clinical practice 2. Management/leadership 3. Education 4. Research Supported by underpinning principles of: a. Autonomous practice b. Critical thinking c. High levels of decision making and problem solving d. Values based care e. Improving practice Could have job title removed if do not meet requirements

(DH 2010, Harrison and Snow 2010, NLIAH 2010,)

The advanced practitioner standards for nurses in England and Wales are provided in more detail in appendix (i). In this document there are similarities in the practice outcomes for advanced nurse practitioners and junior (foundation) doctors particularly within the clinical care themes. Following successful completion of Foundation Year 1 (F1), doctors are able to register with the General Medical Council (GMC). Foundation Year 2 (F2) builds on year 1 after which doctors are eligible to enter specialist training programmes. Appendix (ii) gives further detail relating to F1 and F2 outcomes.

The frameworks for advanced clinical practice applied to nursing are helpful for nurses and service providers in clarifying and defining the role, skills and competencies of advanced practitioners, although there are some differences across the 4 devolved countries of the UK, shaped by the context in each of the countries . The NMC (2006) definition relates specifically to nurses in clinical practice, and I believe should be the overarching definition for all UK nurses working at advanced clinical practice levels.

1.4 Nursing and medical education

A typical full time education programme leading to registration as a nurse in the UK lasts three years. Currently, all UK pre-registration nursing programmes combine time in the clinical setting (50% clinical placement) with time at university (50%). Since 2004 in Wales and 2013 across the UK, all education programmes are at degree level. Prior to this, programmes could be completed at diploma or degree level. Following initial registration, there is a requirement for all nurses to maintain their post registration education and practice (PREP) (NMC 2005) with at least 35 hours of learning activity in the previous three years. Various career pathways exist, one of which is to extend nurses' clinical practice beyond that of initial registration. The curriculum for pre-registration nurse education does not include the standards identified in the advanced practice models in Table 1.2.

In order to develop as an advanced practitioner, there is an expectation that there is a required period of experience following initial registration, and successful completion of an academic education programme for advanced nurse practice at Masters level (NMC 2006, WAG 2009, DH 2010). The education programme should include the standards for advanced practice identified in Table 1.2. Clinical competence assessment of such things as history taking, physical assessment and diagnosis, decide and carry out appropriate treatment, prescribing medications and appropriate referrals for investigations should also be included.

Medical education comprises a five-six year undergraduate programme followed by a two year foundation programme (A four year programme is available for existing graduates with a relevant degree). Whilst universities vary in terms of clinical time, an examination of medical degree programmes on university websites indicated that in the initial two-three years clinical practice is minimal, with the majority of time spent studying theoretical aspects of medicine. The biological and bioscience knowledge provided within an undergraduate medicine curriculum, it is argued, has done much to support the expert status of doctors and their dominant position (Jordan and Hughes 1996), although medical ownership of bioscience has also been questioned (Diers 1988, Molde and Diers 1985, Stilwell 1988).

The Foundation Programme was established as part of a major reform of postgraduate medical education and training in 2005 as part of Modernising Medical Careers (DH 2003). It was designed to bridge the gap between undergraduate and specialist medical training. It builds on undergraduate training to allow foundation doctors to demonstrate performance in the workplace rather than competence in isolated test situations. The Foundation Programme will allow doctors to satisfy the needs of the General Medical Council (GMC) and enter the professional register at the end of Foundation Year 1 (F1). At the end of Foundation Year 2 (F2), they will be ready to enter a specialty training programme (GMC 2009a, 2009b). The first year of the Foundation Programme (F1) builds on the knowledge, skills and competences gained during undergraduate training. On completion of F1, doctors will be able to recognise and deal successfully with the most common clinical and non-clinical situations. The second year of foundation training (F2) builds on F1. The main focus is on training in the assessment and management of the acutely ill patient. F1s and F2s rotate for four month periods around specific areas in secondary care. Following successful completion of the Foundation Programme, doctors are able to enter specialist training programmes.

An important factor to consider is that ANPs are experienced senior nurses, whereas F1s and F2s are recent graduates from medical school at the beginning of their careers. This study examines practitioners currently undertaking a role pre-defined by their employers. An important factor to consider is that ANPs are experienced senior nurses, whereas F1s and F2s are recent graduates from medical school at the beginning of their careers. This study compared different professions at different stages of their career trajectory with different levels of experience. However the ANPs are taking over roles and responsibilities which previously were those of junior doctors (FY1 & FY2), therefore the expectations of competency, patient safety and congruence with senior review, care planning and diagnosis are the same for the roles assessed.

Professional competence encompasses cognitive, technical and emotional skills and is defined by Epstein and Hubert (2002) as '*the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served*' (p246). Patient safety has attracted increasing attention since the 1990s, with the realisation that patient harm, much of which was preventable, occurred more frequently than had previously been thought (Emanuel *et al* 2008). Patient safety is the foundation of good care, and has been defined as the avoidance or prevention of adverse outcomes of injury during the process of care (Vincent 2010). The measures of competence and safety for the purpose of this study were senior doctor congruence with assessment, diagnosis and clinical management of patients, as used in other studies in this area (Sakr *et al* 1999, Lee *et al* 2001, Kinley *et al* 2002, van der Linden *et al* 2010.)

1.5 Research question, aims and objectives

Advanced nursing practice has developed globally, with several drivers identified. A frequently cited driver is the shortage of doctors, which has been compounded in Europe by the European Working Time Directive (EWTD). Nurses advancing their practice beyond that of initial registration are crossing the boundary into what was previously the medical domain. It is important to ensure that patient safety is maintained and that the care delivered by ANPs is as competent as that which is provided by doctors. This drove the research question for this study which was: ‘Are ANPs as competent and safe as junior doctors when they take on medical roles within a secondary care setting?’

The aims of this study were to explore competence and safety of ANPs when ANPs undertake roles in secondary care previously performed by junior doctors.

A comparison was undertaken between ANPs undertaking traditional junior doctor roles and junior doctors in their Foundation Years 1 and 2 (F1s and F2s) by identifying any observable differences in relation to:

(a) Senior doctor congruence in terms of diagnosis and clinical management planning,

(b) clinical assessment practices

Senior doctor congruence with clinical management planning was the primary outcome.

This comparison will inform developments of ANP roles in the host hospital, across Wales and beyond.

The case notes of 311 patients were examined with the following objectives:

1 To compare congruence with senior doctor review of the written records of ANPs and junior doctors (F1s and F2s) of:

- diagnosis
- clinical assessment
- clinical management plan

2 To compare demographics and complexity of patients seen by ANPs and junior doctors

3 To compare history taking, physical examination, clinical investigations, medications prescribed, documentation, adverse events incidence and length of stay of patients seen by ANPs and junior doctors.

4 To identify any disparities/incongruences and suggest strategies to address issues identified

Table 1.3 identifies how the objectives were realised.

Table 1.3 Completion of study objectives

OBJECTIVES	REALISATION
1 Compare congruence with senior doctor review of junior doctor and ANP diagnosis, clinical assessment, and clinical management. • Diagnosis agreed at senior doctor review. • Any diagnosis disagreed at senior doctor review • Additional investigations or assessments ordered by senior doctor. • Clinical management plan agreed by senior doctor.(*primary outcome)	Data extracted from examination of patients' clinical notes. Professionals' written records of clinical assessment, diagnosis, clinical investigations, clinical management and treatment were compared with the documented senior doctor review in unadjusted and adjusted analyses.
2 Compare demographics and complexity of patients seen by ANPs and junior doctors	Data extracted from examination of clinical notes, compared and analysed
3 To compare history taking, physical examination, clinical investigations, medications prescribed, documentation, adverse events incidence and length of stay of patients seen by ANPs and junior doctors. • Number of text lines and number of words. • Number of systems examined • Clinical investigations ordered • Number of medications prescribed • Adverse events occurring before senior doctor review. • Documentation signed and dated. • Legibility of documentation • Length of stay	Data extracted from examination of clinical notes, compared and analysed
4 To identify any disparities/ incongruences and suggest remedial strategies, if needed.	Analysis of findings to identify any disparities/incongruence. Highlight inter-professional differences and relate to literature.

1.6 Study Design

The study was an observational cohort design. Clinical records (n=311) which were written at the time of patient presentation by study participants (10 ANPs and 10 Foundation doctors) between April 2009 and August 2010 were reviewed retrospectively. The case note review took place at least eight weeks following patient presentation to ensure the care episode was completed. Data from case notes were analysed using SPSS (Statistical Package for the Social Sciences), version 19 for Windows with adjusted and unadjusted techniques.

1.6.1 Setting

The study took place in an integrated NHS Trust in Wales. During the data collection period, the Trust merged with two other trusts and six local health boards to become a large University Health Board. Throughout the thesis the study setting is referred to as 'the Trust'.

The Trust provides acute and community care, including cancer care, mental health, learning disabilities, obstetrics and gynaecology, family services and community services. It serves a population of approximately 220,000. The geographical area served includes both rural and urban communities. There are large numbers of retired older adults in some communities. The population increases during holiday periods.

The majority of cases included in the study were from the Emergency and Integrated Medicine Division. Most ANPs worked in this division and most unplanned acute presentations were to this division (Table 1.4). Patients either presented at A&E from where they were transferred to the Acute Medical Assessment Unit (AMA) or directly to the AMA. Patients referred to chest pain 'hot clinics' attended the clinic directly. Acute surgical patients generally presented to A&E before transfer to surgical wards. There was also occasional transfer between specialities/wards/clinics.

Table 1.4 Acute presentations/admissions 2009 and 2010

Division	2009	2010
Emergency and Integrated Medicine	14301	13581
Surgery	7109	6811

The majority of acute presentations were to the Emergency and Integrated Medicine Division (44% - 45% of all acute admissions), with the next most frequent acute presentations to surgery (22%) The majority of planned/elective admissions were surgical (65% - 68%). Additionally there were approximately 900 - 1000 referrals per year to chest pain 'hot clinics' which aimed to see patients within one-two weeks of referral. With regard to management of acute medical referrals from primary care General Practitioners (GPs), the service was been developed so that these patients present mainly to AMA.

The Trust employed over 5500 staff of which 31% were nurses. During the study there were 17 ANPs (using the NMC (2006) definition) working in the Trust. The majority worked in the Emergency and Integrated Medicine Division. The key driver for development of ANPs in the Trust had been a reduction in junior doctors' hours as a result of implementation of the EWTD, and difficulty in recruiting junior doctors. At the time of the study no ANPs participated in junior doctor 'on call' rotas. During the study period there were 32 Foundation doctors in the Trust working clinical rotations of four months length.

1.8 Summary

Advanced nurse practitioners are increasingly crossing boundaries and moving their practice into the medical domain. This brings with it issues about professional boundaries, competency and public safety. With the publication of frameworks for advanced practice in England and Wales, and a four UK countries publication on advanced practice developed as part of Modernising Nursing Careers (DH 2006), there is more clarity about the role and function of advanced practice. However issues around regulation which serves to provide a framework for public safety and protection remain unresolved.

Key drivers for the development of advanced practice such as shortages of junior doctors and raised public expectations remain. Healthcare demands will continue to evolve and change, with those providing healthcare expected and required to meet those needs. As roles and boundaries become more blurred, this may lead to role erosion and possible development of more generic 'hybrid' health workers (Banham and Connelly 2002). Alternatively the different professions may protect their practice areas, 'close ranks' and resist any crossing or blurring of boundaries. It is most likely that there will be a 'meeting in the middle' process. I suggest that there will be an element of professional 'protectionism'. However as health care needs and delivery change, inevitably the requirements and thus roles of health professions will change, and the best way to do this is for the professions to engage and take control of their profession's development. The fundamental issue is that, whoever provides the care it is provided by an appropriately prepared individual who is able to provide care and treatment and ensure the safety of, and best outcomes for, the people who are receiving that care.

Chapter 2: THE LITERATURE

2.0 Introduction

This applied research examines real world settings relevant to practitioners facing difficult and diverse challenges to the provision of healthcare. Many factors have combined to create these challenges including the notion of a 'care gap', brought about by shortages of medical practitioners and medically underserved populations (Diers and Molde 1983, Stilwell 1988, DH 1989, Jordan 1993, Cash and Hannis 1996, Frenk et al 2010). In addition demographic changes have increased the pressures on healthcare provision (Jordan and Griffiths 2004, Crisp and Chen 2014). Changes in the healthcare workforce, role boundaries and medical technology combine to support the theoretical perspectives of the 'care gap' concept.

Advanced Nurse Practitioners (ANPs) are crossing boundaries into the medical domain in response to the care gap, taking on roles and responsibilities which previously have been the preserve of medical colleagues. This chapter explores the key drivers in the development of advanced nursing practice. The inter-professional differences and similarities between nursing and medicine along with the division of labour and how these affect doctor-nurse relationships and perceived power bases are examined. These factors may influence and impact on the shift in inter-professional boundaries and working relationships between ANPs and doctors.

A brief overview of the history and development of nursing is described in order to set the context to present a critical analysis of the development of advanced practice globally and in the UK. As this shift in healthcare boundaries between nursing and medicine has evolved, so has the need to ensure that patient care is not compromised, and this is what has driven the research question for this study; *'Are ANPs as competent and safe as junior doctors when they take on medical roles within a secondary care setting?'*

The systematic review of studies presented in this chapter, with specific reference to comparative studies of nurses and doctors, where nurses have taken on advanced roles, provides the rationale and evidence for the research question and the aims and objectives of the study.

2.1 Key drivers for the development of advanced nursing practice – a policy perspective

There is little discussion in the literature examining whether the development of advanced practice has been a forced evolution as a result of changes in other health professions' working practice or health policy reform (Coombs *et al* 2007), or a natural evolution of nursing. The main drivers cited for the development of advanced practice are discussed below.

Care gaps, where services, treatments and/or care providers are not available to all that require them (Jordan and Hughes 1996). The paucity of services for certain underserved populations, such as those living in poverty, the vulnerable and socially marginalised and ethnic minorities are apparent within different countries to varying degrees (Schober and Affara 2006). The variation is due in part to the different ways of funding and delivering healthcare, and the overall wealth and thus ability of that country to provide funding. However even in countries such as the UK, which has a welfare state and National Health Service, constrained public finances may limit the availability and/or provision of certain treatments or care providers. Additionally, people may not be able to access services and care for a variety of reasons. Examples currently receiving public attention in the UK include services 'out of hours' in primary care, with GPs surgeries providing weekday services only. Although there are out of hours services provided there is a perception that there is a gap in service which ultimately encourages people to seek alternative, often inappropriate, care provision (e.g. hospital A&E departments).

The implementation of the European Working Time Directive (EWTD) which was adopted into UK law in 1998 (Cappuccio et al 2009) is frequently cited as a driver for the development of advanced nursing practice in the UK. The aim of EWTD is to protect the health and safety of the workforce and improve patient safety by regulating rest and time spent in work (Cappuccio et al

2009, Royal College of Physicians 2012). Full implementation for junior doctors has been staggered to the current EWTD of 48 hours per week (averaged over a 26 week period) introduced in August 2009. As a result of EWTD, doctors' working hours have been significantly reduced and the resulting pressures on the delivery of healthcare have created opportunities for nursing. An example of some of the opportunities created includes the introduction of nurse practitioners in the 1990s by the Department of Health in areas such as Accident and Emergency (A&E), preoperative assessment and primary care (McGee 2009).

Health policies and reforms in the UK in the late 1990's and early 2000s have also contributed to new opportunities for developing nursing. The reforms were intended to improve quality and reduce inequalities, and the strategy for nursing published at this time; *Making a Difference. Strengthening the Nursing, Midwifery and Health Visiting Contribution to Health and Healthcare* (DH 1999) identified the essential role nursing would play in the reforms (McGee 2009). These policies and reforms, alongside the introduction of EWTD, contributed to the opportunities to develop and advance clinical nursing practice.

Following devolution in Wales in 1999, responsibility for health matters was devolved to the Welsh Government, and there are differences in the organisation of the English NHS and the NHS systems in the other home countries (Jewell and Wilkinson 2008). However the influences and drivers for advanced practice remain much the same and doctors' and nurses' regulatory bodies (General Medical Council (GMC) and Nursing and Midwifery Council (NMC)) are UK wide. The challenges facing Wales, for example difficulty in recruiting doctors and the rurality of some areas have been highlighted as particular concerns in terms of care provision. (Clarke 2012, White 2012). This has led to a similar demand and need for the development of advanced practice as the rest of the UK.

2.2 Inter-professional differences; perspectives from nursing and medicine

As nurses cross the traditional occupational boundary into medicine, it is important to recognise and understand inter-professional differences as these may impact on and influence working practices. Factors such as gender, education and social class have traditionally differentiated nurses and doctors (Davies 1976, Davies *et al* 1999, Gjerberg and Kjølsrød 2001, Jones 2003, Yam 2004). The difference is often drawn between the nursing holistic, i.e. whole person, approach and the injury/disease focus of medicine. For example, doctors particularly draw a clear distinction between medicine and nursing in that medicine controls the diagnoses and directs treatment and care, whereas nurses claim to have detailed knowledge about patients and provide holistic care. Some would argue that a holistic approach is not the monopoly of nursing, and that ideas of holism, curing and caring are shared (Williams 2000, Snelgrove and Hughes 2000, Tye and Ross 2000, Allen 2001). It is contestable whether attributes such as holism, caring and curing genuinely help to distinguish differences between medicine and nursing, and it is more likely that professional groups choose to identify these attributes in an attempt to define themselves (Sibbald 2000). Some writers believe that preoccupation about professional status is a distraction (Maggs 1996).

Despite these perceived differences in the two professions, organisational, societal and political drivers have led to an overlap in roles and functions between the two healthcare groups. This has challenged the perceived medical control over such things as making diagnoses and directing treatments (Lowe *et al* 2011). If this blurring of occupational boundaries is to be safe and effective, and not result in inter-professional conflict with potential for role ambiguity and erosion, both professions need to work collaboratively together to meet health care needs and demands within a continually changing service driven by such things as an ageing population, chronic diseases, new knowledge and technology and increasing public expectations. Where boundaries between medicine and nursing are blurred there needs to be assurance that the care delivered continues to be safe and effective regardless of the health professional that is providing it.

2.2.1 *Care v Cure*

The care/cure divide is often used to explain the difference between medicine and nursing, with nursing focussed on care and the whole person rather than cure and the disease process attributed to medicine (Leininger 1984, Fawcett 1987, Walby and Greenwell 1994, Baumann *et al* 1998, Radcliffe 2000, Breier Mackie 2006). However this distinction is not made by the UK General Medical Council (GMC) who identify attributes of "the doctor": "Care" features prominently in this list (McKinstry and Dacre 2008). Often the 'care' model and the 'cure' model are discussed as if they are mutually exclusive, and in the debate about the role of health professionals, the two models are placed in opposition - `care vs. cure'. A different view, and my personal perspective, is one that care and cure are at different points on the same continuum which ideally should be used by all health providers depending on patient needs, rather than being separate characteristics of different clinical professionals (Baumann *et al* 1998). Indeed it could be argued that chronic diseases are not curable, rather care is provided to manage the disease, and that care may be provided by doctors, nurses or other healthcare professionals.

In 2003 the RCN published a definition of nursing following consultation with its members and as a result of a working group. The definition agreed and published is "The use of clinical judgment in the provision of care to enable people to improve, maintain or recover health, to cope with health problems and to achieve the best quality of life, whatever their disease or disability until death" (RCN 2003 p4). The inclusion of 'the use of clinical judgement', it could be argued, moves the definition of nursing to another dimension of clinical decision making. It could also be argued that this definition could equally apply to doctors.

The International Council of Nurses, which has 130 federation national nurses association members representing 13 million nurses worldwide offers the following definition: "Nursing encompasses autonomous and collaborative care of individuals of all ages........................ in all settings" (ICN 2010 unnumbered webpage). The interesting use of the terms autonomous as well as collaborative may give some indication as to the move away from a subordinate role.

The RCN and ICN definitions both include 'care' and this supports a view that care is the central dominant domain in nursing (Leininger 1984). Whilst recognising and acknowledging that the meaning of 'care' may differ for different people, I believe that doctors and other health professionals provide 'care' and are concerned with the health of individuals, and that the provision of 'care' is shared between the health professions.

Several theorists have identified similarities between nursing assessment and what is frequently referred to as the medical model. Nurses assess needs by the collection of information and examination and then as a result plan, implement and evaluate care and/or treatment (Henderson 1978). The medical model as described by McGee (2003) suggests that doctors must identify and classify signs and symptoms (through assessment, physical examination, scientific investigations and the collection of information), diagnose and develop an action plan, carry out the plan and evaluate progress. The implementation and evaluation may be carried out by both nurses and doctors, dependent on what the care/treatment and interventions are, although distinctions have been proposed between assessing conditions, attributed to nursing, and diagnosing problems, attributed to doctors (Crow *et al* 1995). This distinction is not applicable to those nurses working at advanced levels who formulate diagnoses, and indeed some would argue that all nurses will identify and diagnose actual and potential problems (McCartney *et al* 1999, Buckingham and Adams 2000).

A further approach to the debate about the difference between the roles, which is important when considering blurring of boundaries, is that which discusses whether nursing and medicine are a science or art. A simple view of this suggests that art is the 'know how' and science is the 'know that' (RCN

2003). Using these simple views, and without entering into the substantial philosophical discourse regarding art and science, I suggest both medicine and nursing need to 'know how' and 'know that'. Some writers assert that medicine is an art *and* a science; that the aim of medicine is primarily to heal, and that doctors have a particular role in diagnosis (Calman 2007, Kirk 2007). Nursing has also been considered an art and a science (Peplau 1988, Kitson 1996, Darbyshire 1999, Watson 2008) and ANPs have a role in making diagnoses based on their examination and assessment.

Health care is complex and dynamic. For example over a century ago only doctors were believed to be skilled enough to use sphygmomanometers, whereas today this is part of the basic nursing assessment (Coombs *et al* 2007). Nursing and medicine, whilst being different professions with different historical routes, are converging in areas that in the past nurses have assisted in, rather than carried out autonomously such as diagnosis and treatment (Hughes 1988). It is important to ensure that the care delivered to the patient is safe and of the highest standard regardless of the professional who is delivering it.

2.2.2 The division of labour

As nurses advance their practice and move into the medical domain, carrying out roles and functions which had previously been carried out by doctors, they are challenging the traditional division of labour between nursing and medicine. The division of labour is a sociological concept which is perceived to be bound by professional struggles and gender relations, and also with interdependence of occupations within a wider landscape (Hughes 2002). It is suggested that professionalism and subsequent professional socialisation has to do with power and politics with professions defining their own tasks, and that nursing lacks power, is dominated by medicine and will never be considered a profession (Salvage 1985, Friedman 2007, Tosh 2007). Historically the medical profession controlled itself and its education, along with the division of labour, with nurses following doctors' orders, with their clinical practice defined by doctors (Friedson 1970, Hughes 1988, Witz 1992). An example of this traditional dominance of medicine is the 1977

Department of Health guidance regarding 'extending' the role of the nurse where some the main points were:

- Nurses may only extend their role in an emergency or as a result of delegation by doctors
- Delegation should occur when the doctors are assured that the nurse is competent to carry out the task
- The task is deemed appropriate for a nurse to perform (DHSS 1977)

The professions of medicine and nursing, and differences in such things as education, status and gender may have wider implications and present challenges and create barriers. This should be understood, particularly in the context of nurses moving their practice into the medical domain and challenging those traditional divisions of labour. Although healthcare has changed, this culture and perceived power base may persist in some quarters (Walsh 2000), with doctors expecting to give their 'permission' to allow a nurse to extend their practice and nurses being seen as a subordinate group in a health care system dominated by doctors and managers. In the past doctors delegated tasks which they felt were simple, with the control remaining with doctors (Walby and Greenwell 1994, Hughes and Allen 2002). There is a view that the traditional division of labour will not be sustainable due to the care gap, or the extent of unfulfilled demand (Jordan and Hughes 1996, Sullivan *et al* 2007). This division of labour has been challenged by nurses working at an advanced level (McGee 2003). Advanced practice is not the result of delegation of tasks, rather it is an autonomous role which requires complex skills such as assessment, diagnosis and treatment.

2.2.3 Doctor-nurse relationships

Inevitably the blurring of professional boundaries will impact on and influence doctor-nurse relationships. In the late 1960s Stein (1967) published a seminal paper outlining what he termed the 'doctor-nurse game', whereby nurses do not make bold, overt recommendations, but rather communicate subtle, verbal prompts in such a way that both the nurses and doctors could act as though the idea came from the doctor (Hughes 1988, Svensson 1996 Jones 2003). This relationship and image was still viewed to be present in the 1970s where the handmaiden image of nurses was still present (Briggs 1972). Stein *et al* (1990) returned to review the 'game' and concluded that whilst the doctor – nurse game was still present, "the majority of nurses now refused to play the game" (Tosh 2007 p 71). Porter (1991) proposed further models of the doctor-nurse relationship as can be seen in Table 2.1.

Table 2.1 Portrayal of doctor-nurse relationships

Stein 1967	Hierarchical relationship in which open disagreement is avoided at all costs. Nurses' recommendations and physicians' requests for recommendations were not communicated directly nor acknowledged as such. Doctors "owned" all decisions whilst nurses felt valued and gained professional satisfaction – but only when both participants played well.
Briggs 1972	"handmaid" image of the relationship between doctors and hospital nurses inherited from the nineteenth century continued to exert a powerful influence.
Stein *et al* 1990	Nursing apparently attempting to change how it relates to all other health professionals and unilaterally refuses to play the game. Recommendations are undisguised and nurses use open assertion to put forward the equal importance of nursing decisions and documentation. Nurse conceptualised as the "stubborn rebel" rather than "willing supplicant" whilst doctors are confused and frustrated by change in attitudes. Nurse education and general maturing of the profession attributed to change
Porter 1991	Identified 4 models of communication: (a) Unproblematic subordination: nurses apparently unquestioningly obedient, with no consultation, explanation or negotiation in decision-making process. Seen mostly with consultants. (b) Informal covert: pretence of unproblematic subordination, no open recommendations or disagreement but some attempt to have input into decision making. Most similar to Stein's (1967) game. (c) Informal overt: deferential stance absent and overt nursing input in decision making without the use of formally sanctioned tools. Widely practised to differing degrees especially by senior nurses with all grades of doctor though not frequently with consultants (d) Formal overt: use of formal tools to guide decision making, i.e. nursing process used and implemented exclusively by the nurse. Found to be chronically under-utilised and thought to be fairly insignificant compared to the strategies involved in informal overt behaviours
Allen 2001, Prowse and Allen 2002	Doctor-nurse game alive and well but goes beyond due to nurses' permanency

(Porter 1991, Allen 2001, Tosh 2007)

All the above descriptions of the doctor-nurse relationship infer subordinate and dominant relationships, with nursing attempting to overcome this, using covert and overt methods. The doctor–nurse relationship is complex, whether this is due to professional differences, gender issues or other factors. What is clear is that the doctor-nurse relationship goes beyond that described by Stein in 1967, partly due to the permanency of nurses compared to junior doctors, and partly due to the organisation of nursing and medical work (Allen 2001). As boundaries between medicine and nursing become blurred, the traditional nurse – doctor divide is being challenged and new nurse – doctor partnerships emerging which do not replicate the previous subordinate/dominant relationships (Gidlow and Ellis 2003).

2.2.4 Gender issues

Some authors suggest that health professions are traditionally bound up in gender issues and stereotypes (Sweet and Norman 1995, Davies 1995, Davies 1996, Witz 1992, Welby and Greenwell 1994, Davies 2002). However the stereotypical view of male doctor and female nurse is no longer accurate, and the analogy presented of a household, with the family consisting of the doctor-father, nurse-mother and patient-child (Davies *et al* 1999) is outdated (Banham and Connelly 2002). Although the patriarchal nature of medicine has been suggested as a major contributor to the existing professional cultures, there are increasing numbers of male nurses and over the last 30 years, more women than men enter all UK medical schools (Davies 2000, Gjerberg and Kjølsrød 2001, McKinstry and Dacre 2008, DH 2009).

Findings from studies looking at relationships between nurses and female doctors are inconsistent. It has been reported that nurses had similar expectations of both male and female doctors, indicating that nurse-doctor relationships are influenced more by profession than gender (Rothstein and Hannum 2007). In contrast it has also been reported that the doctor-nurse relationship **is** influenced by the doctor's gender (Gjerberg and Kjølsrød 2001). This study reported that female doctors felt that the nurses had less respect and confidence in them compared to their male colleagues. Senior positions in medicine and nursing are still disproportionately held by men, which implies that gender issues persist (Tosh 2007), and that nurses are situated in "a position of oppression within a broader patriarchal society" (McCartney *et al* 1999 p 353). Stereotyping and gender issues may continue to have an influence on developing and advancing practice and changing roles and the doctor-nurse relationship, particularly where roles overlap.

2.3 The history and development of nursing

When considering the development of advanced practice, it is helpful to first study the history of nursing generally to understand the context within which advanced practice has developed as consideration of history can have significance when examining contemporary practice (Borsay and Hunter 2012). The written history of nursing generally began to appear from the mid nineteenth century (Abel-Smith, 1960, Davies 1980, Maggs 1987, Dingwall *et al* 1988), whilst by comparison the history of medicine is documented for centuries prior to this, and reference is often made to early records, for example from 3000 BCE (Calman 2007).

The education and registration of nursing is relatively recent. 'Healers' wise women and domestic nurses practised in the eighteenth century and were the first steps to a nursing profession (Borsay 2012). There is a widely held view that nursing forged itself as a profession in the nineteenth century (Hallett 2012) with Florence Nightingale being hugely influential in the shift in educational status of nursing across the world. During the Nightingale era, medicine was already recognised as a profession with power and social influence, whilst Florence Nightingale was struggling to define nursing and its contribution (Tosh 2007) although she was clear that nurses were subordinate to doctors. However she did offer one of the earliest definitions of nursing as the "the act of utilizing the environment of the patient to assist him in his recovery" (RCN 2003 p2). The Nightingale School of Nursing is credited as the first secular nurse training school in the world, with organised nurse training being established in 1860 in St Thomas's Hospital. In the 1880s influential nurses in the UK started to challenge the development of nursing, seeing the future of nursing being in the development of scientific knowledge and technical skills (Hallett 2012). In an effort to improve the status and education of nursing the British Nurses Association (BNA) was formed in 1887, and launched in 1888. The BNA advocated the development of nursing as a profession independent of medicine and distinguished between specialised nursing skills requiring training and unskilled domestic duties (NMC 2010).

The pressure for state registration grew throughout the 1890s but there were disagreements within the profession over the desired form and purpose of the regulatory system. Essentially there was a struggle between the wish to maintain the organisational interests of the hospitals and the desire to construct nursing as a profession which controlled its conditions of work (Dingwall *et al* 1988, Davies 2008). In 1902, a House of Commons Select Committee was established to consider the registration of nurses. However, no action was taken and during the First World War, the campaign was suspended. There is a view that the war provided the final impetus to the establishment of nursing regulation, partly because of the specific contribution made by nurses to the war effort and also as a reflection of the increased contribution of women more generally in society (Hallett 2012). Finally in 1916 the College of Nursing (later the RCN) was founded. Its aims were to promote better training, encourage uniformity across the 1500 nursing schools in England and maintain a register of proficient nurses. A regulatory system was passed in December 1919 with separate Nurses Registration Acts passed for England/Wales, Scotland and Ireland. These Acts established the General Nursing Council (GNC) for England and Wales which became operational in 1923 (Dingwall *et al* 1988). At this time nurses themselves had little power, and many of the terms were drawn up by the medical lobby (Hallett 2012).

The GNC continued until legislative changes in 1979 created the United Kingdom Central Council for Nursing, Midwifery and Health Visiting (UKCC) and four National Boards and the UKCC was set up in 1983. Its core functions were to maintain a register of UK nurses, midwives and health visitors, provide guidance to registrants, and handle professional misconduct complaints. At the same time, National Boards were created for each of the UK countries. In April 2002, the UKCC ceased to exist and its functions were taken over by a new Nursing and Midwifery Council (NMC). The National Boards were also abolished (Davies and Beach 2000, Hall 2005, NMC 2010).

Regulation plays an important part in both nursing and medicine, particularly in relation to public protection. The General Medical Council (GMC) regulates doctors through the Medical Registration Act 1858. It registers doctors for UK practice, sets professional standards, regulates basic medical education, and manages doctors' fitness to practise. Initially the GMC mainly managed serious complaints against doctors. In the 1990s, the GMC set a new direction and a statement of professional standards in *Good Medical Practice* (GMC 2009c) was agreed between profession and public (Irvine 2006). Both the NMC and the GMC have a statutory responsibility to protect the health, wellbeing and safety of the public by ensuring proper standards in the practice. This is achieved by ensuring satisfactory standards of education and training, investigation of fitness for practice issues and upholding professional standards. At this time however, the issue of advanced practice in nursing regulation remains unresolved with the UK Government unwilling to support the health professions regulators in developing advanced practice registers, claiming that a compelling case for further regulatory action has yet to be made, thus inferring that current regulation is sufficient (DH 2011).

Once regulation and education of nurses was established in the 1920s it was inevitable that the development of nursing would continue. The environment in which nursing care is delivered has changed over time (Dingwall *et al 1988*) and nursing has adapted in order to meet healthcare needs. This is particularly the case with advanced practice, which has developed in the UK since the 1980s (Jordan 1993, Reveley 1999, Carnwell and Daly 2003, McLaren 2005, Barton 2006a). The pace of change has implications for practice as safety and competence must be part of any practice undertaken by nurses (NMC 2008). This study aims to ensure the competence and safety of advanced practice nurses working in the study setting is at least of the standard of the junior doctors whose roles and functions they have taken on.

2.4 Advanced practice – a global context

Advanced nursing practice has developed globally, although in different ways which have reflected the health system of the particular country and have been influenced by a variety of societal factors. These factors include the environment in which they evolve, the supply and demand of health personnel, governmental policy and the needs of the population in that country (McLaren 2005, Macdonald *et al* 2006, Minami 2006, McGee 2009). It has often been the case in some areas of the world, out of necessity and without the presence of doctors, that nurses function as the only healthcare providers, for example in rural remote areas and with underserved populations. If nurses are working as the only healthcare provider it is inevitable that their practice will be expanded (Jordan 1993). However, often this practice has only been recognised by anecdotal evidence (Schober and Affara 2006). Consequently there are differences and similarities between the roles in different countries. Although international understanding of the role and agreement on the use of titles is not consistent, and role characteristics are variable (Schober and Affara 2006) the ICN has been monitoring the development of advanced practice across many countries and reports a move towards greater uniformity regarding role definition and education. There is now an increasing consensus about advanced practice globally, with regard to such things as role definition, education and regulation (Schober and Affara 2006).

The initial development of advanced practice is often attributed to the development of specialist nurses, with specialist nurses at the forefront of the development of nursing beyond that of initial registration (Castledine 2003, Schober and Affara 2006). However in the USA, nurse anaesthesia is the oldest advanced nursing speciality, with the first nurse anaesthetist being recorded in 1877 (Bigbee and Amidi-Nouri 2000). The concept of specialist nurses first appeared in the 1940s when the term 'nurse clinician' was used (Storr 1988). In the 1960s and 1970s clinical nurse specialists (CNS) and nurse practitioners (NP) began to appear in USA and Canada. The development of medical specialities and the advancement of technologies contributed to the development of clinical nurse specialists who were deemed to practice at a higher level than the nurses of the day, and were referred to as experts (Storr 1988). As specialist roles developed so did a view that nurses were capable of more demanding roles.

During the 1960s the nurse practitioner movement in the USA also developed in response to demands for improved healthcare and a shortage of trained doctors in primary care, especially in rural and poor populations which created a care gap (Diers and Molde 1983, Jordan 1993, Cash and Hannis 1996). This drove the development of the nurse practitioner role to provide primary and community based care to an underserved population.

In the Nordic countries the development of clinical nurse specialists was similar to that in the USA. However, the nurse practitioner role was slower to develop, possible because initially there wasn't a recognised problem with the supply of doctors (Lorensen *et al* 2002). In the Netherlands it was identified that there would be an apparent shortage of doctors in the 1990s and in 1997, the nurse practitioner role was introduced. Interestingly in Switzerland, policy has been to introduce less well educated nurses in order to drive down costs, with more attention being paid to developing physicians assistants to cope with a shortage of doctors.

The first advanced practitioner programmes were introduced in Australia in 1990, and New Zealand in 2000 although there have been extended roles in remote areas for several decades. Advanced nurse practitioners have been legally recognised since 2001 in Australia and the NP title is regulated in New Zealand (Affara and Schuber 2006, Sheer and Wong 2008). The development of advanced practice in Asia is varied. Korea has a history of advanced practice development since the 1950s, whilst in Taiwan and Hong Kong this is a relatively new development, and in mainland China whilst the need for advanced practice has been identified, education provision and the number of doctors compared to nurses deterred its development (Sheer and Wong 2008). Developments in Singapore, Thailand and Japan date from the early 2000s.

The variations in the global development of advanced practice roles are linked to the political and socio economic background in each country. However notwithstanding this, the advanced practice role has developed rapidly globally in the last two decades. ANPs have emerged as a result of efforts to improve access to care; to address geographical inequalities in the provision of and access to healthcare; to provide services for the underprivileged; to reduce waiting times and, particularly in parts of Europe, as a result of shortages of doctors (McLaren 2005, Affara and Schuber 2006, Sheer and Wong 2008) thus filling a 'care gap'.

2.4.1 Advanced practice in the UK; blurring boundaries

The development of advanced practice in the UK has been attributed in some part to the success of NPs and other roles in the USA (Sheer 2000, McGee 2003, Gardner *et al* 2007) with the term advanced practice beginning to be used in the UK in the 1980s (Jordan 1993, Reveley 1999, Carnwell and Daly 2003, Barton 2006a). At this time the development of nurse practitioners began, with Barbara Stilwell identified as having pioneered the role in primary care (Jordan 1993, Barton 2006a). Suggested reasons for development were reductions in junior doctor hours, shortage of appropriately qualified medical practitioners, patient dissatisfaction with the quality of care, patient demands for greater choice and accessibility, recruitment and retention issues, chronic diseases and the ageing population. National Service Frameworks and government targets were also identified as contributing to the creation of a care gap (Jordan 1993, Jordan and Hughes 1996, Reveley 1999, Por 2008). It was also being reported that nurse practitioners' patients in primary care were older, poorer and socially disadvantaged with complex problems (Diers and Molde 1983, Diers et al 1986, Stilwell 1988).

Key government documents in the UK such as the Cumberlege Report (Department of Health and Social Security (DHSS) 1986), Crown Report (Department of Health (DH) 1989) and NHS Executive Committee (1993) supported the concept of nurse practitioners in primary care. Reports were also published addressing specific problems in London (London Health Planning Consortium 1981, Tomlinson 1992, The King's Fund 1992). Changes in the 1990s in relation to the White Paper 'Promoting Better Health' (DHSS 1987), which set the agenda for primary care and saw the development of GP contracts, also resulted in an increase in practice nurses in general practice (Reveley 1999). Some practice nurses then went on to develop their skills and advance their practice, functioning as nurse practitioners. With the development of advanced nursing practice in primary care came the first moves to introduce nurse prescribing, all be it from a limited formulary initially (DHSS1986, DH 1989, DH 1998, DH 1999, Medicinal Products Act 1992).

Within secondary acute care the development of advanced nursing practice began mainly in A&E Departments with the introduction of Emergency Nurse Practitioners (ENPs). During the 1980s some A&E Departments in the UK began to experiment with what was a North American concept of the nurse practitioner who was able to see, diagnose, treat and discharge 'minor injuries'. This enabled doctors to treat the more urgent and complex patients. A plethora of publications in the late 1980s and1990s (James and Pyrgos 1989, Potter 1990, Read et al 1992, Dudley et al 1993, Robinson 1993, Curry 1994, Beales and Baker 1995, Meek et al 1995, Brebner et al 1996) examined and discussed the developing ENP role. Advanced nursing practice has since continued to develop in other areas of secondary care.

Changes to the way doctors were trained and worked, along with health polices and reforms introduced by the UK government in the 1990s and early 2000s created further opportunities for nursing to innovate and advance practice (McGee 2009). During this time there had been a continued discourse regarding the model of advanced nursing practice, with the concern that if ANPs simply take over task orientated junior doctor work they will lose the very essence of 'nursing'. Some nurses have questioned the wisdom of this move into what was traditionally the medical domain and the 'mini doctor – maxi nurse' debate emerged (Brook and Crouch 2004).

The Royal College of Nursing (RCN) expresses the view that the extension of new nursing roles and development of new nursing roles have been developed to provide better or more appropriate care for patients and improving the patient experience (RCN 2004). Notwithstanding the debate and discussion which continues, an environment of clinical and professional change has created new opportunities for nursing (Hallett 2012). I believe that all healthcare professionals need to meet the needs of their users in an ever changing health care landscape, and that advanced practice brings nursing into medicine, and has the potential to improve patient outcomes and experiences.

Advanced nursing practice has developed in response to a range of complex drivers and it is increasingly difficult to draw clear lines between health care occupations. It is not surprising, given the drivers highlighted, that there will be nurses working in a way that straddles the boundary with medicine. This phenomenon is generating discussion in medical journals, with Dowling *et al* (1996) almost 20 years ago stating that "a quiet revolution is occurring in the division of labour between the professions of medicine and nursing" (p12). A few years later debate in 2000 the British Medical Journal (BMJ) and Nursing Times (NT) jointly addressed the perceived differences between nursing and medicine, and concluded that it would refocus the debate about what doctors and nurses do. It was suggested that instead of boundary disputes and substitution squabbles effort could be directed towards capitalising on the wealth of skills that all professionals can bring to bear on solving health problems (Smith 2000). The discourse continued and in 2008 the editor of the BMJ again asked "What's the difference between a doctor and a nurse?" suggesting the differences are harder to identify. The issue explored the shifting and increasingly overlapping territories of the two professions (Carter 2008, Coombes 2008, Knight 2008, Sibbald 2008). Inevitably due to the nature of healthcare, boundaries often cannot be clearly defined and this can cause confusion at the interface between medicine and nursing, and in particular advanced nursing practice where there are clearly overlaps. This may serve to further confuse the issue of what nursing purports to be and sometimes professional competitiveness and boundary issues can detract from opportunities to develop which are controlled from within rather than outside the profession. There is also a view that the stricter the boundaries, the more likely there will be gaps in care (Sullivan *et al* 2007).

Some nurses have questioned the wisdom of the move into what was traditionally the medical domain (Brook and Crouch 2004). There are some critics of advanced nursing practice who suggest that it is being used as a doctor substitute and who believe that advanced practice is merely creating substitute or 'mini' doctors. They believe that nurses may lose their distinctive qualities if they take on doctors' work (Sibbald 2000). This is supported to some extent by the pragmatic reasons that are often given for the development of advanced nursing practice, i.e. reduction in doctors' working hours, and shortage of doctors. It has been suggested that advancing nursing practice is a subtle political effort from both the major political powers to reduce medicine's professional power (McCartney *et al* 1999, Davies 2003). There is also a danger that multi skilled 'hybrid' workers may cause erosion of the individual professions, and that opportunity for one profession may be perceived as a threat by another (Davies *et al* 1999, Banham and Connelly 2002).

An alternative view is that advanced practice is about advancing and enhancing the nursing role to benefit patient care, and is not about taking over medical work (Lowe *et al* 2011). Advanced nursing practice combines nursing and medical roles, bringing nursing and medicine together by bringing medicine into nursing without losing the essence of nursing (Reveley and Haigh 2001, McGee 2003). The RCN (2004) believes that role substitution, role extension and new roles equal better patient care. The RCN further states that nurses are competent to take on aspects of what were previously seen to be a doctor's role, but the way in which they can do that work leads to at least as good patient care and treatment. They believe that the development of new nursing roles has been introduced to provide better or more appropriate care for patients and to improve the patient experience.

I suggest that nurses should see advanced practice as an opportunity to utilise their potential, and should choose to engage with and control their development to ensure that the delivery of healthcare, regardless of the level of practice, is optimal for the patient. As Allen (2001) said, the shifting and blurring of boundaries at the nursing-medical interface should be negotiated, agreed and understood by all concerned as non-negotiated boundary blurring can have implications for professional identity. There are differences in the way in which doctors and nurses are educated and prepared to practice, and in how they are perceived both by colleagues and the general public. There may be societal influences and beliefs which exist prior to career choice which influence that choice (Horsburgh *et al* 2006), so that the cultures which exist, either perceived or real, in medicine and nursing, are perpetuated from initial recruitment onto training programmes.

In healthcare nurses are advancing their practice beyond that of initial registration and taking on what have historically been seen as medical roles, increasingly crossing boundaries into the medical domain. It is essential for the profession and the patients that where this is occurring, the care delivered is as competent and safe as that delivered by doctors. It is important to ensure that nurses advancing their practice are not expected to work in ways for which they are not prepared adequately and are not competent to do. This therefore drives the research question for this study outlined in chapter one:
'Are ANPs as competent and safe as junior doctors when they take on medical roles within a secondary care setting?'

It is acknowledged that ANPs and junior doctors are at different points in their careers and level of experience and this is demonstrated in Table 2 adapted from Carr (2004), who used a model of skills acquisition developed originally by Dreyfus and Dreyfus (1986) and applied it to clinical medicine. When applying this model to ANPs and junior doctors, ANPs are experienced nurses and may already have developed intuition, using previous experience, cues and pattern recognition to inform decision making which may have an effect on their decision making process (Cioffi and Markham 1997, Buckingham and Adams 2000). Junior doctors have limited practical experience to draw on in comparison with ANPs. Applying Carr's model (2004) junior doctors are advanced beginners, whereas ANPs are expert practitioners. Whilst acknowledging these differences, ANPs are taking on junior doctor roles and responsibilities, and therefore it is important to gain assurance that they are as safe and competent as their medical colleagues in the roles they are taking on.

Table 2.2 Dreyfus' model applied to doctors and nurses

Stage	Career level		Application
	Doctors	Nurses	
1 Beginner	Medical student	Student nurse	Learns basics of history taking and examination
2 Advanced Beginner	Foundation years1 & 2, HO, SHO	Newly qualified nurse	Learns to apply skills in selected situations, learns through experience
3 Competent	Registrar	Experienced staff nurse	Learns to plan approach to each patient's situation in a supervised way. Learns pattern recognition.
4 Proficient	Newly appointed consultant	Ward sister Specialist nurse	Manages multiple stimuli, integrates mastered skills
5 Expert	Mid career consultant	Advanced practitioner	Has intuition, attuned to distortions in patterns

Adapted from Carr (2004)

2.5 Comparative studies of advanced nurse practitioners and doctors

To establish the extent and depth of the evidence base, a systematic literature review was conducted to identify studies where comparisons between doctors and nurses who were working at advanced levels crossing boundaries into the medical domain were made with particular reference to clinical outcomes. This informed identification of study outcomes, and where the gaps in the literature were.

2.5.1 Search strategy

In order to review the literature relating to comparisons between doctors and nurses a search for English language articles of the Ovid database which includes the following databases was carried out: Medline 1996 - present, Cinahl 1982 - present, BNI 1994 - present, Embase 1980 - present and PsychInfo 1999 – present. An initial search was undertaken in 2009, with further searches in 2011 and 2013, using the following search terms derived from MeSH headings and terms which were evident from my knowledge of clinical practice. Terms were also added based on the advice of the librarians and from the literature.

- Advanced nurse practitioners
- Advanced nursing practice
- Advanced practice
- Nurse practitioners
- Nursing safety and outcomes
- Nurses role
- Physicians role
- Professional role
- Medical staff
- Treatment outcome
- Comparative studies
- Clinical competence
- Junior doctors
- Comparisons nurse and doctors

The search strategy was kept broad to ensure inclusion of the maximum number of relevant articles, and an overview is shown in Figure 2.1.

Categories were combined and from the original 796 articles identified using the initial search term 'advanced nurse practitioners' 232 were identified as potentially relevant. These articles were further screened by title, abstract and subject headings to identify articles which were primary research and indicated they were comparative studies of nurses and doctors. 48 were accessed fully and inclusion criteria applied to confirm relevance. Inclusion criteria:

- English language
- primary research
- comparing nurses' and doctors' treatment/outcomes/management

18 articles were identified as relevant as they met the inclusion criteria, with a further three articles identified following review of the reference lists of these articles for additional relevant articles.

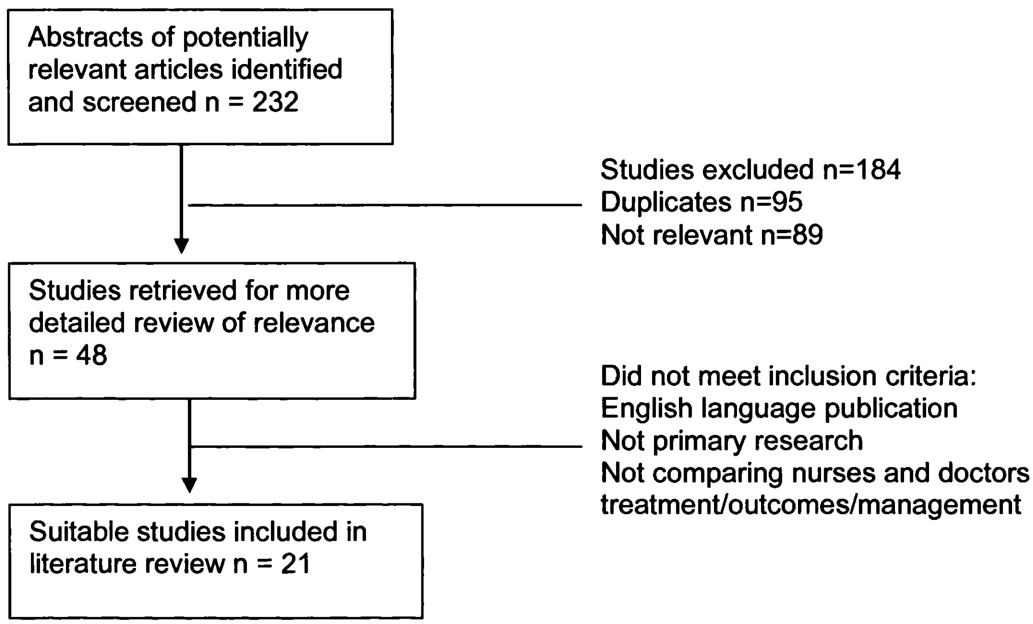


Fig. 2.1: Method of study selection

For the purposes of presenting the literature review carried out as part of this study, key studies, methods, settings and key findings are presented in appendix iii in the following order:

1. Systematic reviews of >1 RCT
2. Randomised control trials
3. Observational studies

When presenting the literature, consideration was given to research hierarchies (Greenhalgh 1997, Grimes and Schulz 2002a, Peat 2002). No inference regarding relative importance is implied, and indeed the systematic reviews include randomised control trials (RCTs) and observational studies. Whilst there is ongoing debate about research hierarchies, the need to match the research question to the appropriate research method and methodological appropriateness is fundamentally important (Pettigrew and Roberts 2003), rather than to be influenced by research hierarchies alone.

Limitations of studies proposed in the GRADE Guidelines (Grading of Recommendations, Assessment, Development and Evaluation, Guyatt *et al* 2004) can downgrade the quality of randomised controlled trials. Therefore, evidence from good quality observational studies can be upgraded to exceed that from RCTs (Guyatt *et al* 2011).

2.6 Issues identified in literature review

2.6.1 Different health professional titles and levels

One of the issues identified in the literature is the different titles and levels of education of the nurses involved in the studies. This supports previous identification of the plethora of titles and lack of clarity surrounding nurse developments both in secondary and primary care. Many of the studies lacked clarity and definitions of the term 'Nurse Practitioner' 'Advanced Nurse Practitioner' and 'Practice Nurse' with some using the term 'appropriately trained nurse' or 'specially trained nurses' and not all defining the level of education and experience of the groups of healthcare professionals they were comparing. Some, but not all, studies included criteria and definitions of the level of nurses that were involved. The studies also compared nurses to different levels of doctors. Table 2.4 demonstrates the different nurse levels and doctor levels of participants in the comparative studies identified.

Table 2.3 Health professionals involved in comparative studies

Compared with General Practitioners/Primary care physicians	
Study	**Nurse training/level**
Laurant *et al* (2004)	Any qualified nurse working as a substitute to a primary care physician
Horrocks *et al* (2002)	Not specified
Dierick van Daele *et al* (2009)	Average 12 years' experience as practice nurses. Undergone a 2 year Masters programme in advanced nursing practice
Mundinger *et al* (2000)	Not specified. NPs have prescribing and admitting rights, work independently.
Schum *et al* (2000)	3 month part time degree level course in managing minor illness.
Kinnersley *et al* (2000)	Nurse practitioner diploma course
Venning *et al* (2000)	Completed a one or two year nurse practitioner course at diploma, degree or masters level. Each NP had been seeing patients as first point of contact for at least 2 years.
Cox and Jones (2000)	In house training programme in managing minor illnesses provided by GPs.
Myers *et al* (1997)	10 years' experience as practice nurse. 3 year nurse practitioner degree level course.
Seale *et al* (2006)	Nurse practitioner diploma course
Compared with Anaesthetists	
Study	**Nurse training/level**
Smith *et al* (2004)	Not indicated
Compared with Junior doctors, House Officer/Senior House Officer	
Study	**Nurse training/level**
Kinley *et al* (2002)	Modules of taught masters courses in advanced practice
Cooper *et al* (2002)	undertaken or were undergoing the English National Board Autonomous Practice course (A33)
Chang *et al* (1999)	Experienced emergency nurses received training and 4 months supervised practice in the management of wounds and blunt limb trauma
Sakr *et al* (1999)	Experienced A&E nurses with at least 4 years' experience and were working towards a 'Development in Autonomous Practice' qualification
van der Linden *et al* (2010)	Masters degree in advanced nursing practice
Lee *et al* (2001)	Elements of training referred to although level and length of training was not clarified.
Compared with Consultants	
Study	**Nurse training/level**
Sharples *et al* (2002)	Not specified
Hill *et al* (1994)	None specified
Osborn *et al* (2010)	Trained in breast examination by a consultant surgeon over a four week period
Ball *et al* (2007)	No training specified. Scope: assess and manage patients with musculoskeletal conditions independently

In relation to educational attainment, only two studies (Dierick van Daele *et al* 2009, van der Linden *et al* 2010) used nurses who had studied advanced practice at masters level, with Venning *et al's* (2000) study including nurses who had studies at diploma degree or masters level. Six studies (Sakr *et al* 1999, Lee *et al* 2001, Kinley at al 2002, Cooper *et al* 2002, Ball *et al* 2007, van der Linden *et al* 2010) compared nurses with junior doctors at a comparative level to F1s and F2s (house officer and senior house officer). Four studies indicated the number of years of experience nurses had, which ranged from 2 – 12 years, and length of experience may affect study findings. The remaining studies did not indicate length of experience.

2.6.2 Outcomes from studies

The reported outcomes of the studies are shown in Table 2.5. The outcomes have been grouped into the following themes;

- patient satisfaction
- diagnostic and clinical management accuracy
- health status/clinical outcomes
- prescribing practice
- investigations ordered
- consultation length
- referral/re-attendance
- quality of care
- safety/untoward incidence
- history taking and routine examination
- documentation quality.

The majority of the studies measured patient satisfaction (n=12 including two systematic reviews*; Hill *et al* 1994, Chang *et al* 1999, Sakr *et al* 1999, Cox and Jones 2000, Kinnersley *et al* 2000, Mundinger *et al* 2000, Schum *et al* 2000, Venning *et al* 2000, Cooper *et al* 2002, Horrocks *et al* 2002*, Laurant *et al* 2004*, Seale *et al* 2006, Dierick van Daele *et al 2009*). Four studies reported senior review to compare congruence with participants' diagnoses (Sakr *et al* 1999, Lee *et al* 2001, van der Linden *et al* 2010, Osborn *et al* 2012). Four studies reported senior review congruence with clinical management (Sakr *et al* 1999, Cooper *et al* 2002, Kinley *et al* 2001/2002, van der Linden *et al 2010*)

Table 2.4 Reported outcomes of studies

PRIMARY CARE SETTING												
Study	Patient satisfaction*	Diagnostic accuracy	Clinical management	Investigations ordered	Number of Prescriptions	Consultation length	Referral rates/ re-attendance	Health status*/ outcomes	Documentation quality	History and physical examination	Quality of care*	Safety
Laurant *et al* 2004**	✓			✓	✓	✓	✓				✓	
Horrocks *et al* 2002	✓			✓	✓	✓	✓	✓			✓	
Dierick *et al* 2009	✓			✓	✓	✓	✓				✓	
Schum *et al* 2000	✓				✓	✓	✓	✓				
Mundinger *et al* 2000	✓							✓				
Kinnersley *et al* 2000	✓			✓	✓	✓		✓				
Venning *et al* 2000	✓			✓	✓	✓	✓	✓				
Cox & Jones 2000	✓							✓				
Seale *et al* 2006	✓				✓	✓						
Myers *et al* 1997					✓	✓	✓					
ACCIDENT AND EMERGENCY SETTING												
Study	Patient satisfaction*	Diagnostic accuracy	Clinical management accuracy	Investigations ordered	Number of Prescriptions	Consultation length	Referral rates/ re-attendance	Health status*/ clinical outcomes	Documentation quality	History and physical examination	Quality of care*	Safety
Cooper *et al* 2002	✓			✓		✓	✓	✓	✓			
Chang *et al* 1999	✓						✓	✓	✓			
Sakr *et al* *1999***	✓	✓	✓	✓		✓	✓			✓		
Van der Linden *et al* 2010		✓	✓									
Ball *et al* 2007				✓	✓		✓					
SPECIALIST AREAS												
Sharples *et al* 2002								✓				
Hill *et al* 1994	✓				✓		✓	✓				
Smith *et al* 2004												✓
Osborn *et al* 2012		✓								✓		
Lee *et al* 2001		✓								✓		
PRE OPERATIVE ASSESSMENT												
Kinley *et al* 2002			✓	✓						✓		

* patient reported ** Costs also reported

Patient satisfaction

Measurement of patient satisfaction was included in many of the studies (n=12 including two systematic reviews*); (Hill *et al* 1994, Chang *et al* 1999, Sakr *et al* 1999, Cox and Jones 2000, Mundinger *et al* 2000, Schum *et al* 2000, Kinnersley *et al* 2000, Venning *et al* 2000, Cooper *et al* 2002, Horrocks *et al** 2002, Laurant *et al** 2009, Dierick van-Daele *et al* 2009). There is considerable heterogeneity in data collection which used either likert-type scales or continuous data scoring, with some also reporting overall satisfaction and sub dimensions. Satisfaction data were collected by means of patient completed questionnaires, or telephone/face to face interviews. Data collection took place at a variety of times, for example immediately following consultation and at different lengths of time following consultation.

The majority of studies (n=7) found that patients were overall more satisfied with the care of the nurses (Hill *et al* 1994, Schum *et al* 2000, Kinnersley *et al* 2000, Venning *et al* 2000, Cooper *et al* 2002, Horrocks *et al** 2002, Laurant *et al** 2009). There was no significant difference in overall satisfaction reported in five studies (Sakr *et al* 1999, Chang *et al* 1999, Cox and Jones 2000, Mundinger *et al* 2000, Dierick van-Daele *et al* 2009). (*Systematic review reported studies separately, no meta-analysis). However as the satisfaction measures were taken at varying times following consultation, it is difficult to assess the impact of these findings. There was also potential selection bias, as patients were required to consent to the study, and also there could be no blinding. Satisfaction has been linked with length of consultation, rather than health outcomes. As consultation length was increased in the majority of nurses' groups this could have affected these findings.

Consultation length

Ten studies (Myers *et al* 1997, Sakr *et al* 1999, Schum *et al* 2000, Kinnersley *et al* 2000, Venning *et al* 2000, Cooper *et al* 2002, Horrocks *et al** 2002, Seale et al 2006, Dierick van-Daele *et al* 2009, Laurant *et al** 2009) reported on consultation length including a systematic review which included six studies and reported statistically significant longer consultation times for nurses in three of the studies, and a systematic review which included five studies and concluded that nurses had statistically significantly longer consultation times. In all but one of the remaining studies (Cooper *et al* 2002) this finding was repeated, including one study which measured time discussing treatment (Seale *et al* 2006), and one which observed time spent assessing patients (Sakr *et al* 1999). Generally time was recorded by the clinician, whilst in one study time was observed by a third party (Sakr *et al* 1999), and in one study consultations were audio taped and consultation times ascertained from the recording (Seale *et al* 2006). It should be noted that in one of the studies (Sakr *et al* 1999) waiting times were significantly less for the ENP group, whilst in another (Cooper *et al* 2002) this was not the case, and no significant difference in waiting times was reported.

Cost implications of longer consultations were highlighted in one study (Schum *et al* 2000) however this study included only a small number of practice nurses with, as the study pointed out, varying mean lengths of consultation times so it would be wrong to draw conclusions or implications about cost from this. It is possible that length of consultation and satisfaction are linked, in that there is more satisfaction with a longer consultation. The impact of longer consultations and need for follow up and further consultations later is an area that should be investigated.

Diagnostic accuracy and clinical management

Four studies measured diagnostic accuracy (Sakr *et al* 1999, Lee *et al* 2001, van der Linden *et al* 2010, Osborn *et al* 2010), with three studies (Sakr *et al* 1999, Lee *et al* 2001, van der Linden *et al* 2010) using reviews by more senior doctors to assess accuracy and one (Osborn *et al* 2010) using radiology investigation results. Nurses in two studies (Sakr *et al* 1999, van der Linden *et al* 2010) were ENPs in A&E departments and both study findings reported there was no statistically significant difference between the two groups in the accuracy of examination. Interpretation of X-rays was similar in the two groups. Lee *et al* (2001) compared diagnostic accuracy in identifying orthopaedic, ophthalmology and cardiac abnormalities at neonatal check by advanced neonatal nurse practitioners (ANNP) and junior doctors and found that ANNPs displayed greater sensitivity than SHOs in detecting hip and eye abnormalities, with no significant difference between ANNPs and SHOs in positive predictive values or effectiveness in detecting cardiac abnormalities. This study concluded that ANNPs were significantly more effective at detecting abnormalities during the neonatal check. Osborn *et al*'s (2012) study compared diagnostic accuracy in diagnosing breast cancer between a nurse practitioner and consultant surgeon using radiography reports, and no significant difference was found. Of the four studies, all were in specific specialist areas; none were carried out in acute secondary care areas.

Three studies measured clinical management accuracy (Sakr *et al* 1999, Kinley *et al* 2002 and van der Linden *et al* 2010). Two studies involved a senior review immediately following initial consultation for research purposes (Sakr *et al*, Kinley *et al*) and in the van der Linden *et al* study, this was measured using radiology report, chart reviews and return visits. None of the studies identified any statistically significant differences between the nurses and doctors. Two of the studies took place in A&E Departments and no significant difference between ENPs and junior doctors related to missing injuries and inappropriate management was found. The third study (Kinley *et al*) took place in pre-operative assessment clinics.

Health status

Eleven studies reported health status and/or clinical outcomes (including two systematic reviews), with follow ups ranging from two weeks following consultation to two years (Hill *et al* 1994, Chang *et al* 1999, Cox and Jones 2000, Mundinger *et al* 2000, Schum *et al* 2000, Kinnersley *et al* 2000, Venning *et al* 2000, Cooper *et al* 2002, Horrocks *et al** 2002, Sharples *et al* 2002, and Laurant *et al** 2009). Health status was patient reported and clinical outcomes were measured using medical records. In all but one study (Hill *et al* 1994) there was no statistically significant difference reported in health status/clinical outcomes. In one study (Cox and Jones 2000) patients reported they were back to normal health statistically significantly sooner in the nurse practitioner group than the GP group, however the differences in outcomes may have been as a result of nurses seeing less unwell patients, and the authors recognise that their analysis does not address this issue completely. Again it should be noted that outcomes were measured in different ways and at different times following initial consultation/contact making comparison difficult, indeed the systematic reviews did not carry out meta-analysis because of this. In seven studies the patient had minor illness and presented in primary care. Two of the studies involved patients presenting to the A&E Department with minor injuries. Two studies involved patients being cared for with specific problems (respiratory and rheumatoid arthritis) which had already been diagnosed.

Prescribing

Ten studies reported prescribing activity (Hill *et al* 1994, Myers *et al* 1997, Seale et al 2006, Schum *et al* 2000, Kinnersley *et al* 2000, Venning *et al* 2000, Horrocks *et al** 2002, Ball *et al* 2007, Laurant *et al** 2009, Dierick van-Daele *et al* 2009). In seven studies (Hill *et al* 1994, Schum *et al* 2000, Kinnersley *et al* 2000, Venning *et al* 2000, Horrocks *et al** 2002, Laurant *et al** 2009, Dierick van-Daele *et al* 2009) there was no statistically significant difference between groups in patterns of prescribing, including a meta-analysis of three studies in one of the systematic reviews.

In one study (Myers *et al* 1997) it was reported that patients seeing GPs were slightly more likely to receive a prescription than those seeing the nurse practitioner. In Ball *et al*'s (2007) study medication was prescribed/advised in 86% of cases seen by SHOs compared to 72% of cases seen by ENPs, however no statistical analysis was applied. In Seale *et al*'s (2006) study whilst similar numbers of recommendations for over the counter remedies were made by GPs and nurses, prescriptions and self-help remedies were approximately twice as common in nurse practitioner consultations.

Investigations

Nine studies reported comparisons of numbers of investigations ordered, including one systematic review which reported on five studies and concluded that nurses undertook more investigations and one which reported on four studies and reported no statistically significant difference. In the remaining studies all but one reported no statistically significant difference in numbers of investigations ordered.

Quality of care

Quality of care as reported by patients was reported in two systematic reviews (Horrocks *et al** 2002, Laurant *et al** 2009). Heterogeneity of measures was considerable and therefore analysis and conclusions were restricted to comment. One of the reviews concluded that nurses made more complete records, scored more for communication and identified physical abnormalities more often, though this was a qualitative analysis.

Safety/outcomes/untoward incidences

Safety and untoward incidences was reviewed in one systematic review (Smith *et al* 2004) which reviewed primary research comparing safety and effectiveness of physicians and nurse anaesthetists. The authors concluded that though they found no significant differences in the safety and outcomes of the different anaesthesia providers, the studies were inherently methodologically flawed and made questionable assumptions. One of the studies obtained data from the Medicare billing records of 217,440 patients undergoing surgical procedures between 1991 and 1994 in Pennsylvania. The principal outcome measures were death within 30 days of admission, in-hospital complication rate and 'failure to rescue rate'. The second involved an uncontrolled unrandomised observational study of 1,000 children undergoing bilateral myringotomy with tympanostomy from1998 – 2000 in a US tertiary children's hospital. This study found the anaesthetic provider was not a predictor of adverse event (p=0.06). A third reported a year long multi-centre study of untoward incidents in anaesthesia in six hospitals in Denmark. Data were obtained from 64,401 anaesthetics and 7,764 incidents were recorded.

It was reported that nurses had an incident rate of about 11%, similar to specialists, with inexperienced doctors having the highest incident rate. The final study analysed billing information of 404,194 patients in 22 states of the USA measuring overall perioperative mortality. No significant difference in risk adjusted surgical mortality rates was found by type of anaesthetic provider, however the data did not allow for identification of whether the death was anaesthesia related.

History taking and routine examination

Four studies reported findings related to history taking and routine examination (Sakr *et al* 1999, Lee *et al* 2001, Kinley *et al* 2002, Osborn *et al* 2010). One of the studies (Lee *et al* 2001) concluded that ANNPs were significantly better at detecting eye and hip abnormalities that the SHOs with a similar trend, though not statistically significant, in the cardiac arm. Two found no significant differences between nurses and doctors (Kinley *et al* 2002, Osborn *et al* 2010), and in one (Sakr *et al* 1999) it was reported that an accurate medical history was taken by ENPs in 76% of cases and by SHOs in 55% of cases. No statistical analysis was reported, although it was reported that in one ENP case and 11 SHO cases there were judged to be missed factors in the medical history that would have altered clinical management (p=0.01).

Referrals/re-attendances

A number of studies (n=11) reported referral rates and/or re-attendance/follow up (Hill *et al* 1994, Myers *et al* 1997, Chang *et al* 1999, Sakr *et al* 1999, Schum *et al* 2000, Venning *et al* 2000, Cooper *et al* 2002, Horrocks *et al** 2002, Ball *et al* 2007, Dierick van Daele *et al* 2009, Laurant *et al** 2009), with the data being extracted from medical records in all but one study, in which data were extracted from patient questionnaires (Schum *et al* 2000). The majority performed statistical analyses on the findings, although two (Myers *et al* 1997, Chang *et al* 1999) reported raw data only. The implications of the findings are difficult to ascertain. Case mix was very different in the studies which could also have affected likely follow up, referral requirements, re-attendance etc. Meta-analysis of three studies in a systematic review (Laurant *et al* 2009) revealed no statistically significant difference in referrals to hospital. This systematic review also did a meta-analysis of three studies which found nurses were more likely to recall patients than doctors.

In a systematic review by Horrocks *et al* (2002) two studies reported referral rates and six studies reported re-attendance, and no statistical significance was found between groups. In two studies (Venning *et al* 2000, Dierick van Daele *et al* 2009) it was reported that nurses asked patients to return for follow up more frequently than doctors and this was statistically significant. In one study (Hill *et al* 1994) nurses were found to be more likely to refer to other professionals. In the remaining studies (Myers *et al* 1997, Chang *et al* 1999, Sakr *et al* 1999, Schum *et al* 2000, Cooper *et al* 2002, Ball *et al* 2007) no statistically significant difference was found between groups in terms of referrals/re-attendance. As previously stated it is difficult to justify any possible conclusions of this data.

Cost analysis

Four studies reported costs (Sakr *et al* 1999, Venning *et al* 2000, Sharples *et al* 2002, Laurant *et al* 2009,), however the methods of cost analysis was different in each case. A systematic review (Laurant *et al* 2009) reported five studies in which four showed no significant difference, and one concluded nurse led care showed net reduction in direct care costs. One study reported salary costs only, without drawing any conclusions (Sakr *et al* 1999). Venning *et al* (2000) reported no significant difference in costs whilst Sharples *et al* (2002) reported costs as related to resource use, predominantly hospital admission and stay, with nurse resource cost statistically significantly higher than doctors.

Documentation quality

One study reported on documentation quality (Cooper *et al* 2002) using a previously validated documentation audit tool which gave a total score from

30. This study found that ENPs had written notes of significantly higher quality than SHOs.

2.6.3 Summary of outcomes

Some of the outcomes are similar but were measured differently. As has been highlighted, differences in case mix, level of nurses and doctors, different methods of data collection and outcome measures make comparisons between studies difficult. Outcomes measured in previous studies enabled (a) identification of gaps and (b) comparison of findings from previous studies with this study where outcomes used were the same.

2.6.4 Research methods

The majority of the studies (n=11, Table 2.6) were RCTs. Of the RCTs five took place in primary care, three in Emergency Departments, one in pre-operative assessment and two in specialist areas. Of the seven observation studies, three were in primary care, two in emergency departments, and two in specialist areas. Three were systematic reviews, two in primary care and one in the specialist area of anaesthetics. No studies identified examined acute presentations in secondary care (apart from A&E). In two studies nurse participants were advanced nurse practitioners with a similar educational preparation as this study. In only six studies were the medical participants junior doctors.

Table 2.5 Research approach and setting

Study	Research design	Methods used	Comments
Laurant *et al* 2009	Systematic review	RCTs and CBAs	Primary care
Horrocks *et al* 2002	Systematic review	RCTs and observational studies	Primary care
Smith *et al* 2004	Systematic review	Various	Anaesthetics
Dierick-van Daele *et al* 2009	RCT	Quantitative – medical records questionnaires	Primary care - 15 GP practices in Holland
Mundinger *et al* 2000	RCT	Quantitative – Medical records and questionnaires	Primary care follow up clinics USA
Schum *et al* 2000	RCT	Quantitative – Medical records and questionnaires	Primary care – five GP practices in England
Kinnersley *et al* 2000	RCT	Quantitative – Medical records, questionnaires and clinical encounter sheets	Primary care – 10 GP practices in England and Wales
Venning *et al* 2000	RCT	Quantitative – medical records, patient completed health status questionnaires	Primary care – 20 GP practices in England and Wales
Kinley *et al* 2002	RCT	Quantitative – further patient assessment and review by senior doctor	Pre-operative assessment
Cooper *et al* 2002	RCT	Quantitative – medical records, questionnaires	A&E, Scotland
Chang *et al* 1999	RCT	Quantitative – medical records, questionnaires	A&E, Australia
Sakr *et al* 1999	RCT	Quantitative – further assessment and review by research registrar	A&E, UK
Sharples *et al* 2002	RCT	Quantitative – medical records, questionnaires	Bronchiectasis clinic UK
Hill *et al* 1994	RCT	Quantitative – medical records, questionnaires	Rheumatoid arthritis clinic, UK
Cox and Jones 2000	Observational study	Quantitative – medical records and telephone interview questionnaires	Primary care – GP practice, UK
Van der Linden *et al* 2010	Observational study	Quantitative – hospital database, medical records	Emergency Department, Holland
Seale et al 2006	Observational study	Mixed methods – medical records and audio tapes	Primary care – 9 GP practices , UK
Osborn *et al* 2010	Observational study	Quantitative – comparison NP and consultant using clinical pro forma	Breast cancer diagnosis
Ball *et al* 2007	Observational study	Quantitative – case note review	A&E, UK
Myers *et al* 1997	Observational study	Quantitative – medical records, questionnaires and audio taped consultations	Primary care – six GP practices, England
Lee *et al* 2001	Observational study	Quantitative – data extracted from clinical pro forma	Neonatal cardiology, ophthalmology and orthopaedic clinics, two UK hospitals

2.7 Gaps in the literature: The need for widened scope

The majority of studies (not including systematic reviews) were either in A&E Departments comparing ENPs and junior doctors (n=5), or in primary care (n=8) comparing nurse practitioners and general practitioners, with a smaller number of studies investigating different specialist areas (n=4). The studies were conducted in UK, Holland, USA and Australia. There is little research evident which looks at secondary/acute care outside A&E, and when the study was based in secondary care it involved specialisms such as, for example, rheumatology, pre-operative assessment, diagnostic breast care rather than general medical or surgical areas.

The studies compare different nurse roles, for example many involve emergency nurse practitioners, practice nurses and nurse practitioners who may not necessarily be working at the advanced level as defined in this study. Although some studies identify the level of training and education the nurses have undergone, some do not. There is also little explanation in some of the studies of the level of expertise/experience of the doctors, and it would appear that readers are expected to know and understand the experience/training for example of SHOs, medical officers, general practitioners, consultant surgeons.

Many of the studies focussed on patient satisfaction, and the majority of health outcomes are self-reported. Fewer studies compared history taking, routine examinations, diagnostic accuracy and appropriate clinical management. I believe these are important outcomes when nurses are moving into these areas of practice which historically have been in the doctors' domain. Many of the studies, particularly in primary care and emergency care, related to minor injuries and illness.

My study is unique in that the setting is a busy integrated NHS Trust and it focusses on general acute presentations in areas predominantly within the Emergency and Integrated Medicine Division. This differs from previous studies, which tended to focus on narrower patient categories such as minor injuries, minor illness, breast care, or rheumatology, rather than the full range of presenting patients. Widening the scope of the study can have disadvantages (which are discussed fully in chapter 5), and this approach aligns more closely to the reality of nursing work in this study setting.

2.8 Summary

The development of advanced nursing practice has been analysed, both globally and in the UK. Differences (and similarities) between the two professions of nursing and medicine have been highlighted, along with issues regarding power and nurse-doctor relationships. Regardless of this, boundaries are being crossed by nurses and overlaps in role and function occurring. Within a political context publications such as the Wanless Report (2002) which advocated nurse practitioners take on around 20% of doctors' work, and a speech by the UK Secretary of State for Health who spoke of the 'liberation of nursing' have also driven these developments (Beecham 2000, Wanless 2002).

Valid and reliable comparative studies are an important source of evidence in order to ensure that patient care is safe and appropriate, and is delivered by professionals with the right skills, knowledge and competence. The systematic literature review of comparative studies revealed a paucity of studies applied to secondary care acute presentations outside A&E departments. Previous studies have focussed predominantly on minor injuries and minor illnesses, as well as specialist areas where diagnosis has already been made. A plethora of methods have been used, with some medical record review and case note analysis evident, although this has been used to predominantly extract data relating to readmission and re-attendance, rather than to assess and compare diagnostic and clinical management accuracy. Only Ball *et al* (2007) identified that they used a case note review to extract data.

Analysis of clinical management has been carried out in three studies, two of which were RCTs; (Sakr *et al* 1999, Kinley *et al* 2001, 2002) and one (van der Linden *et al* 2010) was an observational study. Two of these studies involved a senior doctor reviewer assessing patients immediately after the study participants for research purposes, and one involved data extraction from radiology reports, charts and return visits.

My study compared senior doctor congruence with clinical decisions and clinical management of advanced nurse practitioners who met the defined inclusion criteria with junior doctors, foundation years one and two, working in a range of secondary care areas. Also a comparison of ANP and junior doctor practices in history taking and assessment, investigations ordered and prescribing was undertaken. The research offers a real world view to address the research question; *'Are ANPs as competent and safe as junior doctors when they take on medical roles within a secondary care setting?'* The research methods are presented in detail in chapter 3.

CHAPTER 3: METHODS

3.0 Introduction

This chapter presents the study design, methodology and methods used to address the research question 'Are ANPs as competent and safe as junior doctors when they take on medical roles within a secondary care setting?' and the aims of this study which were to identify any observable differences between ANPs and junior doctors in relation to:

(a) Senior doctor congruence in terms of assessment, diagnosis and clinical management planning

(b) clinical assessment practices

when ANPs undertake traditional junior doctor roles in a secondary care acute setting, practising at advanced levels and crossing boundaries into the medical domain.

The case notes of 311 patients were examined with the following objectives:

1 To compare congruence with senior doctor review of the written records of ANPs and junior doctors (F1s and F2s) of:

- diagnosis
- clinical assessment
- clinical management plan

2 To compare demographics and complexity of patients seen by ANPs and junior doctors

3 To compare history taking, physical examination, clinical investigations, medications prescribed, documentation, adverse events incidence and length of stay of patients seen by ANPs and junior doctors.

4 To identify any disparities/incongruences and suggest strategies to address issues identified

3.1 Research Design

Clinical research falls into two general categories; (1) experimental, where the researcher applies interventions, which can be either randomised or non-randomised and (2) observational where interventions are not assigned (Grimes and Schulz 2002a, Langham *et al* 2011).

Although it is recognised that there exists a hierarchy of evidence, with randomised controlled trials (RCTs) being seen as the gold standard (Parahoo 2006, Grimes and Schulz 2002a, Polit and Beck 2008) they are not always feasible or ethically appropriate. In this study it was important that the research design, methods and approach were feasible, achievable and able to address the research aims and objectives (Muncey 2009). This study was an observational cohort design of case note review and analysis. The choice of method was driven by a desire to address the research aims and objectives. As the service was already developed and no interventions were introduced by me, a trial was not feasible.

All the RCTs and many of the observational studies identified and discussed in chapter two had large research teams rather than a single doctoral student. In three of the studies, assessment of patients by a second expert or assessment by a panel of experts was carried out for research purposes, which would have been costly and time consuming. There was no funding attached to this study so it was not possible to recruit and fund research assistants. This study was completed as part of an academic programme. In addition, this study addressed a broader area of practice, i.e. secondary care, predominantly acute medicine, rather than specific focussed areas of practice such as GP practices, A&E departments, pre-operative assessment and specialist areas of practice as previous studies had.

By reviewing case notes and comparing senior doctor clinical reviews, this study was able to compare congruence with senior doctor review in a naturalistic setting without the time and costs of a second expert or panel of experts reviewing cases. In some previous studies (Sakr *et al* 1999, Kinley *et al* 2001), a second expert carried out a further examination of the patients at the time of presentation. As the participants in this study worked in different areas, this would have been extremely difficult to achieve without a large number of expert reviewers. If this method had been feasible this would therefore have been even more time consuming and costly than for those studies focussing on a single area of practice, as well as also creating further challenges in terms of inter-rater reliability. There is an increasing awareness of observers as sources of measurement error whereby judgements of the different reviewers could be subjective and potentially inconsistent and therefore affect the reliability of the data (Landis and Koch 1977, Parahoo 2006). Limitations are considered in detail in section 5.5.

No methods are perfect, and well designed observational studies offer an alternative to clinical trials. Observational studies often generate hypotheses and uncertainties which can then be addressed using clinical trials. RCTs may be used to answer narrowly focussed questions that arise from observational studies. (Black 1996, Hulley *et al* 2007).

Advantages of observational studies include:

- Whole population used
- Naturalistic setting
- No withdrawals

Advantages of case note review;

- No recall deficits or bias
- Real time events

A typical observational study sequence may begin with descriptive studies which, for example may describe distributions and health related characteristics in a population (Hulley *et al* 2007). They are often the first move into a new area and do not allow assessment of associations (Grimes and Schulz 2002a). Descriptive studies may be followed or accompanied by analytical studies, which compare groups and may evaluate associations. This study includes both description and analysis.

There are a number of categories of observational studies:

- Cross sectional studies where observations are made on a single occasion in time.
- Cohort studies, where observations are made in a group of subjects over time which can be prospective or retrospective.
- Case control studies, where two or more groups are selected, based on the absence or presence of an outcome/disease. (Grimes and Schulz 2002b, Hulley *et al* 2007).
-

In this study a cohort design was the most appropriate in order to achieve the aims and objectives. Cohort studies follow two or more groups from exposure to outcome, and can be prospective in that the sample is identified in the present and followed up in the future, or retrospective, in that the cohort, baseline measurements and follow up have all happened in the past (Cummings 2007).

In terms of this study, case notes were written by participants in the present at the time of patient presentation in a natural setting. The data were then extracted from the case notes retrospectively. A particular disadvantage with prospective cohort studies is the expense, and for rare events or events that may take many years to develop, cohort designs can be slow to show results (Grimes and Schulz 2002b, Cummings 2007). There are issues with sample attrition with prospective studies, as subjects may leave the study for reasons such as moving, choosing to withdraw (Bryman 2004) which causes non-response bias. However in this study no study participants chose to withdraw after consenting to participate.

Retrospective cohort studies have zero control over exposure. They have similar advantages to prospective cohort studies, and also have the advantage of being less costly and time consuming. The data have already been collected (in this study, assessment, diagnoses, treatment plan, consultant review etc. documented in patient case notes) therefore there will be a lack of bias in data collection as the data being analysed was not the original reason for the data collection (Mann 2003). The main disadvantage is that the researcher has little influence over sampling, the quality and nature of the predictor variables, population coverage and the data collected, which was originally collected for another reason (Mann 2003, Cummings *et al* 2007).

Of the three types of observational study, the cohort study usually stands at the top of the hierarchy of clinical observational evidence as it measures events in temporal sequence and can thereby more easily distinguish cause from effect (Grimes and Schulz 2002a). However, observation studies can only report association: causation can only be inferred. It is the most appropriate method to measure incidence of specific events, the natural history of the disease, changes in health states and use of healthcare resources (Langham *et al* 2011).

Generally in observational research, there are three main challenges to overcome, that of chance, bias and confounding variables (Grimes and Schulz 2002c, Hulley *et al* 2007, Newman 2007).

(i) Chance

Strategies for addressing random error in this study were to ensure the sample size was adequate, and in the analysis strategy by using confidence intervals.

(ii) Bias

Higgins *et al* (2011) identify several types of bias. The main areas of bias identified in observational studies are (1) observer bias (2) instrument bias (3) selection bias and (4) subject bias. In this study double entry addressed potential observer bias , the data collection form was piloted and reviewed to address potential instrument bias, along with double entering to check accuracy, and information was obtained from both groups in exactly the same way. In selection bias the question to ask is 'are the groups similar in all important respects?' (Grimes and Schulz 2002c). Inclusion and exclusion criteria were used to ensure comparability both between groups, and for selection of case notes for review. As case note data were extracted retrospectively this prevented any potential subject bias.

(iii) Confounding

Newman (2007) defines confounding as "A confounding variable is one that is associated with the predictor variable and a possible cause of the outcome variable" (p132). Latent, unknown or poorly defined confounders detract from observational studies (Jordan 2006). The only way to eliminate confounding variables is via a prospective RCT (Mann 2003, Jordan *et al* 2009). To minimise this threat to the analysis, this study achieved a relatively homogeneous population by including only ANPs, junior doctors and case notes which met all inclusion criteria and none of the exclusion criteria. It was not possible in this study to match either study participants or cases. I was uncertain whether case mixes would be entirely congruent, however the purpose of the study was not to assess matched pairs with similar case mixes, and this would not have been possible or feasible.

When confounding is present, bias can be reduced providing it was anticipated and required information was collected (Grimes and Schulz 2002c). A strategy used to minimise the potential for missing a confounding variable in this study was to measure as many relevant variables as possible (Mann 2003), for example number of co-existing conditions, number of medications prescribed prior to presentation. In the analysis phase, the statistical technique of modelling was used to adjust for confounders.

In some instances, ANPs and junior doctors did not work in the same areas, as ANPs were introduced to substitute for junior doctors. In addition, in the area where both ANPs and junior doctors worked, when descriptive data were analysed it was found that in the data collected only junior doctors saw patients presenting at weekends and bank holidays. This was not expected as the ANPs could also have been rostered to work during weekends/bank holidays. It was recognised that there has been evidence of worse patient outcomes of patients presenting at weekends, with some studies concluding that weekend admissions have an increased risk of death (Saposnik *et al* 2004, Marco *et al* 2010, Aylin *et al* 2010, Freemantle *et al* 2012, Handel *et al* 2012, Mohammed *et al* 2012). These findings were not consistent in all studies (Schmulewitz *et al* 2005, Khanna *et al* 2011) and it has been proposed that where an increased mortality risk was found this could be as a result of differences in available expertise and resources, and it may be that people with less severe illness may avoid presenting at weekends (Saposnik *et al* 2007, Mikulich *et al* 2011, Mohammed *et al* 2012). It was also found that a weekend admission was not an independent predictor of mortality, and that there were seemingly counter intuitive findings in that the number of comorbidities had an inverse association with mortality (Mikulich *et al* 2011, Handel *et al* 2012). In this study in the AMA area there were consistent staffing levels and senior presence at weekends/bank holidays as well as 24 hour access to diagnostics in emergencies. However as weekend/bank holiday admission is recognised as a potential confounder, analysis of data from weekday presentations only was carried out (n=164). Additionally analysis of data from the area where junior doctors and ANPs both worked was carried out including weekend/bank holiday presentations (n=209) and analysis of all 311 cases.

A simple checklist (appendix iii) for bias and confounding was adapted from Grimes and Schulz (2002c) and was applied to presentation and analysis of findings. The way in which observational studies are reported can have an impact on the ability to assess the study strengths, weaknesses and generalisibility. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines was developed to contribute to improving the quality of reporting of observational studies (von Elm *et al* 2007, da Costa *et al* 2010). The STROBE guidelines were used to ensure accurate, quality reporting of the findings of this study and are shown in Table 6.1 at the end of the chapter six.

3.2 Insider Research

The study was conducted in a single institution which was where I worked and as such could be termed insider research. This term is used to describe projects where the researcher has a direct involvement or connection with the research setting, conducting research in an organisation or culture to which the researcher belongs. For example, professionals may carry out a study in their work setting, also called practitioner research, researchers may be a member of the community they are studying and it has also been postulated that gender and ethnic similarities between researcher and participants can also be classed as insider research (Robson 2002, Hewitt-Taylor 2002, Rooney 2005). Insider research contrasts with the traditional notion of research in which the researcher is an objective outsider studying subjects external to them (Denzin and Lincoln 2000). In this study I had a connection to the study site, in that I was also employed there, although I had not and did not work directly with any of the participants, or in any of the clinical areas where data from cases were collected.

Objectivism underpins the positivist stance and key to the positivist model is that science will produce objective knowledge (Guba and Lincoln 2000). To accurately represent an objective truth or reality, it is argued that the researcher must remain objective and stand outside the phenomenon (Parahoo 2006, Polit and Beck 2008). The researcher is viewed as an `outsider', with subjectivity not allowed to impact on the research. Positivists' views are that true knowledge is measured objectively using quantitative methods (Bowling 1997, Rooney 2005, Polit and Beck 2008).

The concept of validity is argued to be an issue with insider research, due to the researcher's involvement with the subject and subsequent potential lack of objectivity, for example whether participants' behaviour will be affected, whether insider knowledge will lead to misinterpretation of data or making assumptions and whether insider knowledge may lead to missing information (Rooney 2005). However, this study involved the collection of data retrospectively using set variables. Therefore participants' behaviours could not be affected, as at the time of documenting data in the case notes, they would not know that data could subsequently be collected. As set variables were used in data collection, information could not be misinterpreted or missed by me, with second entry checks by my supervisor utilised to confirm this. The variables were determined from previous research and insider knowledge.

In contrast, there are positive aspects of validity argued for insider research, for example the insider researcher may enable respondents to feel more comfortable thus adding richness to the data, and their knowledge may help them explore issues in more depth. Some argue that research of any type can be subject to bias and that at least with insider research this potential is made explicit (Fetterman 1989).

In this study the fact that I worked for the organisation enabled me to have access to potential participants, and I had the insider knowledge of who to ask for advice about things such as access to case notes. However I had not directly worked with any of the participants, although the nurses knew me from my corporate nursing role. I had not worked for any of the directorates, nor had any involvement in service development. I have never worked as an advanced nurse practitioner although I have been involved in curriculum development and had developed an interest in advanced practice following involvement as a support advisor in the UKCC Higher Level Practice pilot in 1999/2000. Therefore I had some knowledge of advanced practice developments and curriculum developments. I had never had any previous contact with any of the junior doctors involved in the study.

Some further benefits of being an insider to this study were:

- I was able to understand the myriad of abbreviations used within case notes.
- I had access to meetings to present the study
- I was known by staff, including those in medical records, Information Department and Coding.
- As an insider I was in a privileged position to interpret data on referral patterns, tests ordered, investigations etc.
- My insider knowledge was used to determine variables.

Due to the nature of data collection I would argue that my insider status in no way threatened the validity of the data and study and I was able to remain objective. Blind double entry of data by my research supervisor confirmed there was no bias. My relationship with the ANPs may have positively impacted on their willingness to participate, as they all expressed willingness. However, I do not feel this affected the internal validity of the study.

3.3 Sample

The sample consisted of two groups of case notes of patients seen by either advanced nurse practitioners or junior doctors. Data were extracted from case notes of patients that the advanced nurse practitioner or junior doctor participants assessed, diagnosed and treated prospectively, using data documented during the course of the patient care episode and not for the purpose of the study. Case note data were retrieved, collected and reviewed retrospectively at least eight weeks following the patient care episode in order to ensure the care episode had been completed. The researcher collected data specific to the study.

3.3.1 Participants

The selection of ANPs and junior doctors was purposive. I aimed to identify a group of people with a particular characteristic i.e. working in secondary care, assessing, diagnosing, and developing clinical management plans for patients.

The nurses were the whole population of ANPs in the study hospital who had:

(i) successfully completed a recognised education programme at Masters level which deemed them competent to practice at an advanced level, and
(ii) were practising in secondary care in a specific NHS Trust (n=17)

The junior doctor participants were volunteers from the Foundation doctors who worked a four month rotation in the Emergency and Integrated Medicine

Division between April 2009 – August 2010 (n=32). The majority of the junior doctors rotated into this division during this time, and the decision to focus predominantly in this area was based on: (i) the majority of ANPs work in this division and (ii) the majority of emergency admissions/presentations were to this division. Table 3.1 shows average throughput per day in each area.

Table 3.1 Average patient activity/throughput per day (source Information Department, BCUHB)

Area	Acute admissions/ presentations 2009	Acute admissions/ presentations 2010	Average emergency throughput/ activity per day
Accident and Emergency total attendees	55135	55723	151 – 153
Acute Medicine	14301	13581	37 – 39
Surgical wards (including gynaecology)	7938	7662	21 – 22
Emergency cardiology clinic referrals	900 - 1000	900 – 1000	Approximately 20 per clinic

Inclusion and external criteria were applied to the prospective participants and are shown in Table 3.2.

Table 3.2 Participants inclusion and exclusion criteria

	ANPs	**Junior doctors**
Inclusion criteria	Successfully completed at least two years of Masters in Advanced Clinical Practice Working in secondary care Assess, diagnose and plan direct clinical management of patients Cases reviewed by senior Consented to participate	Foundation Year 1 or 2 (F1 or F2) Working in secondary care Assess, diagnose and plan direct clinical management of patients Consent to participate Cases reviewed by senior
Exclusion criteria	Not successfully completed at least two full year of Masters in Advanced Clinical Practice Do not carry out full assessment, diagnosis and clinical management planning of patients Patients seen by ANP not reviewed by senior Not consented to participate	More senior than F1 and F2 Do not carry out full assessment, diagnosis and clinical management planning of patients Not consented to participate Cases not reviewed by senior

Recruitment

A total of 17 ANPs were identified who worked for the Trust. All 17 were contacted and given a letter inviting them to participate, along with information about the study. They were asked to complete the consent form if they were willing to participate in the study (appendix iv). All the ANPs indicated they were prepared to participate, however some (n=7) did not meet all the inclusion criteria and met some of the exclusion criteria, in that they worked in specialist areas, and/ or worked autonomously, with no immediate senior reviews taking place which excluded them from the study. This left 10 ANPs who met the inclusion criteria.

All foundation doctors with a rotation in medicine from April 2009 – August 2010 (n=32) were given a letter inviting them to participate, along with information about the study and requested to complete the consent form if they were prepared to participate (appendix iv). Once 10 doctor participants who met the inclusion criteria and none of the exclusion criteria had agreed to participate, no further participants were accepted.

Both health professional groups were given the opportunity to discuss the study further and ask any questions individually. I also attended two lunch time foundation doctor teaching sessions, so that I was available for any questions or queries.

3.3.2 Case notes

Routinely collected data

This study used data which were collected as part of the patient's assessment, diagnosis, treatment and senior review on presentation, with no additional data being collected. The use of routine datasets in observational and other studies is seen as a way to reduce reliance on RCTs, although potentially this may reduce the quality of the research output (Cohen *et al* 2003). Some research questions can be answered using routinely collected data rather than RCTs, although there are issues which may affect validity such as lack of uniformity in coding systems and data structures (Williams *et* *al* 2003). In this study data were extracted from written case notes, where all data were recorded by health care professionals, therefore the potential differences in coding systems and data structures were not relevant.

Two broad methods of case note review are used:

(i) implicit, which is based on expert clinical judgement, whereby the reviewer judges care against what he/she believes that care to be, based on their own knowledge and

(ii) explicit which is based on specific checklists (Ashton *et al* 1999, Luck *et al* 2000, Hofer *et al* 2004, Lilford *et al* 2007).

Alternatives such as direct observation of care are expensive and time consuming, and also have ethical considerations. Therefore although there are issues such as bias, consistency and reliability which have been identified when using case note reviews to assess quality (Smith *et al* 1997, Ashton *et al* 1999, Luck *et al* 2000, Weingart *et al* 2002, Hofer *et al* 2004, Lilford *et al* 2007) this approach still remains the preferred approach in many instances due to the lack of feasible options. This approach also does not disrupt normal care delivery, and is conducted independently of the care givers (Lilford *et al* 2007). It is for all of these reasons that case note review was used in this study. Explicit review was used, with data collected for clearly defined variables which were identified from the literature (Table 3.4). I am not a clinical expert so was not able to use implicit judgements, so this was not a feasible data collection method, and also would not have addressed the study aims and objectives.

Case note inclusion and exclusion criteria

Case notes were reviewed of patients seen by participants in their work areas. The clinical areas were predominantly within the Emergency and Integrated Medicine Directorate (acute medicine, care of the elderly, emergency department) and also included a small number of surgical and gynaecological case notes as one ANP worked in this area. The case note inclusion and exclusion criteria are shown in Table 3.3.

Table 3.3 Case note inclusion and exclusion criteria

Inclusion criteria	***Exclusion criteria***
Patient age over 16 years First point of contact by F1/F2/ANP with senior review for same presenting condition Examination, assessment and diagnosis made Clinical management plan in place	Patient aged under 16 years (as paediatric speciality) Taking own discharge as unable to collect all data required No senior review Major trauma requiring immediate senior input No clinical management plan No examination, diagnosis and assessment documented Case notes completed by health professional other than consenting participants Illegibility of documentation Patient deceased between contact with F1/F2/ANP and access to case notes (difficulty accessing case notes)

3.3.3 Sample size

At thesis inception I was unaware of any studies examining diagnostic and management congruence between senior doctors and juniors or nurse practitioners in general hospitals, apart from pre-operative assessment and emergency departments. This could be attributed to the relative novelty of this pattern of care management. However, a number of studies conducted in pre-operative assessment and emergency department minor injuries indicate that senior doctors disagree with management of juniors and nurses in up to 5.3% of cases (Kinley *et al* 2001, 2002). A lower figure is given by Sakr *et al* (1999). 309 records would be sufficient to test a prevalence of 5.3% around a confidence interval of +/-2.5%. This is based on a rate of underassessment likely to affect management in history taking or physical assessment as judged by expert panels and a senior doctor of 3.69-5.27% (Kinley *et al* 2001, 2002).

A sample of 160 records (80 from each profession) is sufficient to detect a difference of 22% in accurate medical history taking between groups, as assessed by senior doctors, with 80% power and a 5% significance level. This 22% difference, based on Sakr *et al* (1999), represents the difference between a 55% rate in junior doctors and a 76% rate in the NPs. This calculation takes no account of clustering, such as teamworking or different clinical areas (Uitenbroek, 1997). No information on clustering is available in this situation. I was aware that only a relatively large difference in clinical management could be detected. However, this was a pilot study, in a relatively unexplored area, and would provide figures for sample size calculations to inform future work.

3.4 Data collection

3.4.1 Developing the data collection instrument and database

A data collection form was devised to address the aims and objectives of the study and to record the study measures in a standardised way. It was important that the data collection form was simple, easy to use and complete (Peat 2002). Data entry directly into an SPSS database was considered, but it was decided that this would not be practical and would be more time consuming. There also would not be a hard copy of the data collected if this approach was used, and a hard copy is a good back up in case of computer failure and also allows for making checks on data entry quality.

Data were extracted from examination of clinical case notes. Professionals' clinical assessment, diagnosis, clinical investigations, clinical management and treatment were compared with the documented senior review. Demographic data were also extracted to enable demography and complexity of patients seen by the two healthcare professional groups, and analysis identified any congruence in order to suggest strategies to address any disparities. The data collection form can be found in appendix vi.

Case note review variables

Variables were developed in order to address the study aims and objectives, with the primary outcome measure being congruence with senior review of clinical management plan. The variables are shown in Table 3.4, along with, where relevant, studies which have used similar variables. The codebook can be found in appendix vii.

Table 3.4 Variables

Variable	Measures	Reference
Professional group	Professional group	Sakr *et al* 1999 Kinley *et al* 2001, 2002 Sharples *et al* 2001 Kinnersley *et al* 2000 Schum *et al* 2000
All systems assessed	Comprehensiveness of assessment	Kinley *et al* 2001, 2002 Sakr *et al* 1999 Osborn *et al* 2010 Lee *et al* 2001
Diagnosis made Diagnosis congruence with senior review	Diagnostic accuracy	Sakr *et al* 1999 Van der Linden 2010 Osborn *et al* 2010 Lee *et al* 2001
Investigations ordered Additional investigations ordered by senior Investigations extra type	Number ordered Type of investigation	Laurant *et al* 2004 Horrocks *et al* 2002 Dierick *et al* 2009 Kinnersley *et al* 2000 Venning *et al* 2000 Sakr *et al* 1999 Cooper *et al* 2002 Ball *et al* 2007 Kinley *et al* 2001, 2002
New medication prescribed New medications agreed at senior review Medications added at senior review Medications removed at senior review Dose increased or reduced	Prescribing practice Congruence with senior review	Laurant *et al* 2004 Horrocks *et al* 2002 Dierick *et al* 2009 Schum *et al* 2000 Kinnersley *et al* 2000 Venning *et al* 2000 Hill *et al* 1994 Seale et al 2006 Ball *et al* 2007 Myers *et al* 1997
Clinical management plan documented Clinical management plan agreed	Quality of care Congruence with senior review	Sakr *et al* 1999 Kinley *et al* 2001, 2002 Van der Linden 2010
Legibility of notes Notes signed and dated	Documentation quality	Chang *et al* 1999
Number of text lines	Comprehensiveness of assessment	Rosman *et al* 1998, Ramani 2004
Readmission within 30 days Early warning score requiring response Any patient fall Decubiti Shock or cardiac arrest DVT/PE following admission Complication of procedure or treatment Transfer to higher level of care	Adverse event	Institute of Healthcare Improvement (IHI) 2005
Age of patient Sex of patient	Demographics	Diers, 1988

Variable	Measures	Reference
Presenting condition/ reason Additional problems	Case mix Patient complexity	Sakr *et al* 1999 Kinley *et al* 2001, 2002 Sharples *et al* 2001 Kinnersley *et al* 2000 Schum *et al* 2000
Number of medications prescribed prior to presentation	Patient complexity	Laurant *et al* 2004 Horrocks *et al* 2002 Dierick *et al* 2009 Schum *et al* 2000 Kinnersley *et al* 2000 Venning *et al* 2000 Hill *et al* 1994 Seale et al 2006 Ball *et al* 2007 Myers *et al* 1997

The primary outcome in this study was 'clinical management plan agreed by senior doctor at senior review', with senior doctor defined as consultant level. A secondary outcome was senior doctor congruence with the diagnoses made by the ANPs/junior doctors. Establishing a correct diagnosis is essential for good care and misdiagnosis may lead to incorrect clinical management and treatment. All errors have implications for patient care even if the medical consequences of an error are minimal (Bhasale 1998, Sandars and Esmail 2003, Kostopoulo *et al* 2008). In Kostopoulo *et al*'s study, which involved seven scenarios given to 84 GPs and GP Registrars, 78% of incorrect diagnoses were followed by inappropriate management, and in six scenarios diagnostic accuracy was a predictor for appropriate management.

Several further secondary outcomes were also identified and are shown in Table 3.5 as it was felt that these all helped to inform the clinical management plan. In addition, text lines and words count were collected to give an indication of comprehensiveness of assessment and completeness of the records.

Table 3.5 Primary and Secondary Outcomes

Outcome	**Primary/secondary**
Clinical management plan agreed by senior doctor	Primary outcome
Primary diagnosis agreed by senior doctor	Secondary outcome
Secondary diagnosis agreed by senior doctor	Secondary outcome
Any diagnosis disagreed by senior doctor. Any 'no' in the cases	Secondary outcome
Number of systems examined	Secondary outcome
Medications prescribed	Secondary outcome
Medications disagreed by senior doctor	Secondary outcome
Additional investigations ordered by senior doctor	Secondary outcome
Additional plan by senior doctor	Secondary outcome
Adverse events between initial presentation and senior review	Secondary outcome
Signed and dated	Secondary outcome
Legibility	Secondary outcome
Text lines and words	Secondary outcome
Length of stay	Secondary outcome

A database was then developed using SPSS (Statistical Package for the Social Sciences), version 16 for Windows, with codes developed for each of the variables as shown in appendix vi.

3.4.2 Pilot work

The draft data collection form was peer reviewed by a senior nurse colleague and reviewed by my research supervisor before being pilot tested on 10 sets of case notes to ensure it was complete and functional in practice, and also served to check consistency and reliability with cases 1-10. The steps in the pilot procedure are shown in Table 3.6, adapted from Peat (2002).

Table 3.6 Pilot study procedures to improve the internal validity of the data collection form

- Data collection form administered to pilot case notes in the same way it would be for main study
- Time taken to complete data collection form noted to ensure feasibility of data collection method
- Any ambiguous or difficult to answer measures discarded
- Check all questions are answered
- Revise data collection form if necessary

The first 10 case notes that were retrieved and reviewed were entered into SPSS v16. The case notes were photocopied and anonymised and my research supervisor also entered them into an identical SPSS v16 in October

2009. Data were independently entered and tested using Data Builder v4. Following discussion free text variables were added in relation to presenting condition, diagnoses, medication prescribed and added at senior review, to enable comments to be documented.

In addition, following the pilot, all adverse events triggers/categories (IHI 2005), i.e.

- Early warning score requiring response
- Any patient fall
- Decubiti occurring during admission
- Shock or cardiac arrest during admission
- DVT/PE occurring during admission
- Complication of procedure or treatment occurring
- Transfer to higher level of care

were amended to 'occurring prior to senior review' as for the purposes of this study any adverse events occurring after the senior doctor review were not relevant. If any adverse events occurred prior to senior review it could be expected that the risk of such event should be identified by the ANP/junior doctor on assessment. The variable 'readmission within 30 days' was removed as this would have little relevance to the processes carried out by the ANP/junior doctor and reviewed by the senior doctor.

An additional variable of 'length of stay' was added to allow for comparisons between ANPs and junior doctors, which may give an indication of complexity of patients seen by each professional group. 'Number of words' was also included in the subsequent data collection to augment 'number of text lines' as studies have identified the importance of the quality of the initial history taking (Rosman *et al* 1998, Ramani 2004), and the relative importance in accurate diagnosis of the history taking, physical examination and investigations (Hampton *et al* 1975). It was felt that 'number of words' would offer more accuracy than 'number of text lines' in some cases, as number of lines is influenced by such things as size of handwriting text, documents provided for assessment and diagnosis, and the personal writing style of the participant. During the pilot it took approximately 30 minutes to collect the data from each case note and a further 10 minutes to input into the SPSS database.

3.4.3 Identification of cases

Participants were initially asked to record patient identification numbers (G numbers) of patients they had seen so that the patient case notes could subsequently be accessed, using a proforma which preserved anonymity by only recording date and G number until they had recorded 20 cases. However several participants requested that G numbers were identified from admissions in areas where they were working, as they felt that due to pressures and priorities of work, they were too busy to record G numbers and G number identification from admissions was more acceptable and achievable for them. The date range was a four month period for each healthcare practitioner (as this is the length of time junior doctors spend in each area of rotation) between April 2009 and August 2010. In this study, time of day patient was seen was not recorded during the data collection.
In some clinical areas, G numbers are coded to the consultant on call at that time, rather than the ANP or junior doctor who initially assessed, diagnosed and provided a plan of care. Areas that did code or record G numbers to the ANP and/or junior doctor were:

- Accident and Emergency
- Acute Medical Unit
- Rapid Access Chest Pain Clinic

In these areas, G numbers were identified over a four month period by the Trust Information department, and then case notes were identified randomly using SPSS v16 randomisation procedures (junior doctors n=2, ANPs n=6). In all other areas i.e. AMA (for junior doctors), medical wards, surgical wards for the junior doctors (n=8) and ANPs (n=4), six dates were randomised using SPSS v16. All admissions were identified for the six dates by the Trust Information Department, and then case notes were accessed to identify those of consenting participants. Six dates were randomised as it was found that generally each participant would assess, diagnose and plan care for three - four patients on each on call day. This way of identifying G numbers did mean that many more case notes needed to be accessed as case notes identified by date of admission would also include patients seen and admitted by health professionals not participating in the study. However as this was requested by participants, in order to ensure the study could go ahead I accepted that this was the case and would mean that data collection would be more time consuming.

3.4.4 Case note location, access and retrieval

Case notes were accessed from Medical Records Office (MRO) between July 2009 and November 2010. Not all case notes are always situated in this area; for example they may be with medical secretaries, consultants, in other clinical areas, therefore inevitably not all case notes identified could be accessed. I extracted and collected data in the MRO as I didn't want to remove any to another place due to the importance of ensuring case notes were always available, and to protect confidentiality of patient data. When I had completed data extraction, they were returned and tracked back to the shelves.

3.4.5 Data extraction/collection

Some case notes contained few patient care episodes, making identification of the relevant notes fairly easy, whereas some case notes had many care episodes in them so it could take some time to identity the correct admission. Once the relevant care episode was identified, I read through the case notes to ensure they were from one of the participants who had consented. This was particularly relevant for case notes identified from 'on call' and admission dates as different healthcare professionals may potentially have assessed, diagnosed and treated the patient. If the case notes were not from a consenting participant, they were rejected. For the case notes which were randomised using admission dates, I also had admission dates to help me identify the relevant patient episode, whereas if it was the patient identifier which was supplied I was not aware of the exact date. When the relevant patient episode was identified and it was confirmed that the episode was managed by a consenting study participant, and case notes met the inclusion criteria data were extracted using a data collection form which had all variables listed.

Data collection forms were assessed for completeness at the time of data collection in order to follow up any missing items. Patient identifiers (G numbers) were documented to enable subsequent follow up identification of case notes if necessary, for example if there was found to be missing information, but no names were recorded. Participants were recorded by profession and study code only. There was room on the form to include any necessary comments and/or notes in the form of free text.

3.5 Data Analysis

Data from the data collection forms was entered into SPSS version 16 for Windows, without identifiers. Variables were finalised as:

- Professional
- Doctor's grade
- Clinical area
- Age of patient
- Sex of patient
- Date of admission
- Referred from
- Number of systems assessed
- Number of co-existing problems
- Presenting condition/reason
- Diagnosis (1, 2, 3, 4)
- Diagnosis congruence with senior review (diagnosis 1, 2, 3, 4)
- Investigations ordered: Haematology
- Investigations ordered: Chemical pathology
- Investigations ordered: Microbiology
- Investigations ordered: X Ray
- Investigations ordered: ECG
- Other investigations
- Additional investigations ordered by senior
- Investigations extra type
- Number of medications prescribed on presentation
- Number of medication prescribed by ANP/junior doctor
- Type of medication prescribed by ANP/junior doctor
- Medication prescribed by ANP/junior doctor agreed at senior review

- Medication added at senior review
- Type of medication added by senior
- Medication removed by senior
- Dose increased by senior
- Dose reduced by senior
- Clinical management plan documented
- Additional plan at senior review
- Type of additional plan
- Clinical management plan agreed
- Legibility of notes (based on my ability to read the text)
- Notes signed and dated
- Number of text lines in history
- Number of words in history
- Early warning score requiring response
- Any patient fall
- Decubiti on admission
- Decubiti occurring between junior and senior review
- Shock or cardiac arrest between junior and senior review
- DVT/PE occurring between junior and senior review
- Complication of procedure or treatment between junior and senior review
- Transfer to higher level of care prior to senior review
- Adverse event occurring between junior and senior review
- Complications between junior and senior review
- Type of complication
- Length of stay

3.5.1 Screening data prior to analysis

Accuracy of data file

When all data forms had been entered into SPSS, observation of the data file was made to see whether any obvious errors had been made, for example codes input which were clearly incorrect, dates which fell outside data collection period, patient age which fell outside normal expected parameters. One obvious error in date was found, and one obvious error of age, both of which were corrected following checking of the data forms.

As well as data collection forms being assessed for completeness at the time of data collection in order to follow up any missing items, the data set was also examined for missing data following input. Data are often missing when routinely collected data (as in case notes) are collected and used for research purposes (Altman and Bland 2007). The main strategies for handling missing data are: not using variables which have many missing values, omitting individuals who don't have complete data and estimating missing data (Altman and Bland 2007). As suggested by Altman and Bland (2007) strategies to address the problem *post hoc* have limitations, and none were adopted in this relatively small scale study.

On observation of the data set, data were not recorded in the variable 'length of stay' for a number of cases (n=28, ANP=20, junior doctor=4) and three cases where word count was not collected. These were early cases where data for these variables were not collected. The length of stay data not recorded amounted to approximately 9% of all cases, and as such caution was adopted when analysing this data. The remaining data were complete.

Outliers

Descriptive analyses of continuous variables identified outliers, and where appropriate outliers were acknowledged and discussed in analysis. Outliers were checked back to the paper-based data collection forms. Cross tabulations were undertaken to check plausibility e.g. numbers of medicines and problems on admission were expected to be related.

3.5.2 Statistical analyses

Continuous and categorical data were collected (Table 3.7). Continuous data were collected and subjected to tests of normality, before selecting appropriate parametric or non-parametric tests. With the categorical data cross-tabulations and analyses of key variables were undertaken to explore the data and the differences between the two professional groups. Where possible, data were then collapsed to binary categorical variables to facilitate comparisons, given the relatively low numbers in the study Cross-tabulations carried out with the variable 'profession' being the predictor variable and all the remaining categorical variables being outcome variables. Categorical variables were subjected to Chi-square test for independence to explore any statistically significant differences between professions.

Table 3.7 Continuous and categorical variables

Continuous data	Categorical data
Age of patient (years)	Patient gender
Number of co-existing problems on admission/presentation	Clinical area
Number of medications prescribed prior to admission/presentation	Refer from
Number of systems examined	Profession
Number of medication prescribed on admission/presentation	Diagnosis 1 agreed
Number of lines in history taking	Diagnosis 2 agreed
Number of words in history taking	Diagnosis 3 agreed
Length of stay	Diagnosis 4 agreed
	Haematology investigations
	Chemical pathology investigations
	Microbiology investigations
	X-Ray
	ECG
	Additional investigations ordered by senior
	Medication agreed
	Medication added
	Medication removed
	Medication dose increased
	Medication dose decreased
	Clinical management plan documented
	Clinical management plan agreed by senior doctor
	Additional clinical management plan by senior doctor
	Legibility
	Signed and dated
	Any adverse events during admission
	Early warning score done
	Early warning score ignored
	Fall prior to senior review
	Skin assessment
	Shock prior to senior review
	Cardiac arrest prior to senior review
	DVT prior to senior review
	Pulmonary embolism prior to senior review
	Transfer to higher level of care
	Complications prior to senior review

When analysing case notes, if the senior doctor had not disagreed with the clinical management plan, but had added to the plan by, for example, ordering additional investigations, additions and/or changes to prescribed medication, referrals to other health professionals/specialities and nil by mouth orders, the category 'augmented' was recorded. *'Augmented' could be perceived as not complete but competent and safe, or not complete and not safe. In many cases, seniors had the results of laboratory tests or* *radiographic procedures, which informed their decisions to augment the care plan. Data were therefore collapsed in both ways and re-tested.*

Mann-Whitney U test

The Mann-Whitney U test was used to test for differences between professional groups for the continuous variables. This is the non-parametric alternative to the t-test, used when data are not normally distributed. Mann-Whitney U test compares ranks rather than the means in the t-test. (Field 2009)

Chi Square test for independence

This test was used to explore the relationship between two or more categorical variables, one of which was professional group. When there were two categories for each variable, Yates' correction for continuity was used which is designed to compensate for what some believe is an overestimate of the chi-square value when used with a two by two table (Field 2009, Pallant 2010). <20% cells should have expected frequency <5, and none a frequency of 0 (Cochran 1954), though Pallant states that the lowest expected frequency in any cell should be 5 or more (Pallant 2010). When this did not occur, data were collapsed or Fisher's Exact Probability Test was reported, which is a method for computing exact probability when samples are small (Field 2009).

Correlations

Correlations were used to explore the strength of relationship between two variables using Spearman's correlation coefficient if it was found that there was non normal distribution of continuous variables, and also where there were categorical variables (Field 2009). Correlations used are shown in Table 3.8.

Table 3.8 Correlations to explore relationships

Age of patient
Number of coexisting problems
Number of systems examined
Number of medications prescribed prior to presentation
Number of medications prescribed by ANP/junior doctor
Number of lines in history
Number of words in history
Length of stay

Logistic regression

The results of the bivariate analyses were used to construct a regression model. Regression analysis aims to extract the main features of the relationships within the data, some of which may be hidden or less than obvious, and to explain variation in a single outcome variable. In this study the outcome variables were 'clinical management plan agreed by senior at senior review', 'primary diagnosis agreed by senior doctor', 'medications prescribed agreed by senior doctor' and 'medications added by senior doctor', taking into consideration a range of possible predictors.

In this study Backwards LR stepwise logistic regression was used. The forward or backward stepwise logistic regression methods determine automatically which variables to add or drop from the model. Automatic removal reduces subjective selection of variables (Field 2009). Backward stepwise logistic regression is preferable to forward, as forward stepwise logistic regression has a higher risk of Type II error, where it is believed there is no effect, when there is (Field 2009). Some believe that the stepwise methods have no value for theory testing. However these methods are appropriate when no previous research exists on which to base hypotheses for testing, where causality is not of interest, and where there is exploratory model building (Field 2009). Logistic regression analyses were repeated using the 'Enter' method to test and confirm findings.

In this study the outcome variables entered into the models were:

- Clinical management plan agreed by senior doctor YES/NO.
- Primary diagnosis agreed by senior doctor YES/NO

- Medication prescribed by ANP/junior doctor agreed by senior doctor' YES/NO
- Medication added by senior doctor YES/NO

Predictor variables were clinically plausible in that they could potentially influence the outcome variables. Variables entered into the model were selected from the literature and bivariate analyses. The aim of the regression analysis was to account for confounding and identify any relationships between predictor and outcome variables. Logistic regression makes no assumptions about normal distribution and predictors do not have to be normally distributed or of equal variance (Tabachnick and Fidell 2007). Problems can occur if there are too few cases in relation to the number of predictor variables and empty cells may result (Tabachnick and Fidell 2007). Before developing the model a check was made by a cross tabulation to ensure there were no empty cells. However many of the predictor variables were continuous data with large ranges, which may have led to empty cells. Therefore the variables were also collapsed to categorical data for entry into the models. The aim was to ensure that both categories of the outcome variable contained 10-20 respondents for each predictor variable in the model (Bland 2000 p 323). Regression analysis was run with predictor variables as categorical and continuous variables and with each predictor variable individually to validate any findings.

Regression analysis is sensitive to high correlations between predictors (Tabachnick and Fidell 2007, Field 2009, Pallant 2010). As regression only requires one predictor, close correlation between the predictors leads to an inability to obtain unique estimates of the regression coefficients for the predictors. Consequently, testing for this was carried out. This was undertaken for the outcome and predictor variables in each of the final models.

The following predictor variables were entered into the model, as they meet the conditions for this:

- Patient age
- Profession
- Number of systems examined
- Number of co-existing problems
- Number of medications prescribed prior to presentation
- Number of words in history

Continuous predictors were also re-coded to categorical variables. I ensured both categories of the outcome variable contained at least 10 respondents for each predictor variable in the model. Each outcome variable was re-coded as '1' for agreement, and '0' for disagreement as this has been identified as good practice (Dancey *et al* 2012, Plichta and Kelvin 2012).

The Hosmer and Lemeshow test, based on chi-square, was used to assess the overall fit of the model. This test is considered more robust than the traditional chi-square test, particularly if continuous covariates are in the model or sample size is small, both of which were the case in this study. A non-significant finding indicates that the model is a good fit, whereas significance indicates that the model doesn't fit well. It is acknowledged that a poorly fitted model can still have significant predictors (Plichta and Kelvin 2012).

Cox and Snell R^2 and Nagelerke R^2 were reported, although there is some debate about assigned meaning to the R^2. Therefore caution was used in their interpretation (Plichta and Kelvin 2012). The Exp(B) findings were critical as they are the adjusted odds ratio which are a central part of logistic regression results (Field 2009, Pallant 2010, Plichta and Kelvin 2012). It is acknowledged that regression analysis is a technique requiring large data sets, and therefore the findings were treated with caution.

3.6 Demonstrating rigour

The criteria for evaluation of quantitative research are generally accepted as reliability and validity (Giddings and Grant 2009) with other authors (for example Sandelowski 1986) including a third criterion of objectivity though it is assumed that 'scientific inquiry' has to be objective to be valid and reliable. These terms are often referred to under the overarching umbrella term of rigour.

Objectivity refers to freedom from bias, and it is assumed that this is achieved in quantitative research when validity and reliability are established. The belief in quantitative research is that a distance has to be maintained between researcher and subject and data, based on the assumption that there is a knower and a thing to be known.

3.6.1 Reliability

Reliability is the consistency of the measurement, or the degree to which an instrument measures the same way each time it is used under the same condition with the same subjects. In this study, double entry was undertaken by the research supervisor for 10% of the cases (n=31). This ensured that the data collection form and thus the measurements in it were applied consistently. Double entry reliability checks were done on five occasions throughout the data collection and inputting period. On each occasion the two databases were compared using SPSS data builder v4 and a verification file was created in each instance. All cases were discussed and any differences resolved. In six cases profession was anonymised prior to second data entry by the supervisor to remove any potential bias with regard to professions.

Twenty one data forms of cases 192 – 212 were also input during data collection by a colleague of the researcher to assess accuracy of data input. These were input into a second SPSS data base, and then the two inputs were assessed for differences using SPSS data builder v4.

In summary the double entry checks served to ensure reliability and consistency. They also helped to develop codes for variables as unexpected situations arose. All differences highlighted by SPSS data builder v4 were easily resolved.

3.6.2 Validity

Validity refers to whether the tool is measuring what it should be measuring. It is possible to have a reliable measure which is not valid, though reliability is an essential pre requisite of validity, as a valid measure must also be reliable. There are different forms of validity:

External validity

External validity relates to the generalisabilty of the findings to the wider population (Bowling 1997). The question has been asked as to how a single site study can be representative and be applied more generally to other cases (Bryman 2004).

The number of authors discussing the generalisability of single site studies demonstrates the lack of agreement on this matter, although there is an increasingly held view that some generalisation is possible from single site study research (Bassey 2001, Punch 2005, Yin 2003, Lincoln and Guba 2002, Gomm *et al*, 2000, Bryman 2004). Bassey (1999, p14) discusses 'fuzzy propositions' or 'fuzzy generalisations'. These are statements of findings which can be applied in a more general sense than to the specific population being investigated.

Considering sample size in terms of external validity is an important factor in quantitative research in order that generalisations can be made. The sample size in this study was limited by the available resources and the scope of the study. However, it was sufficient to detect a modest difference between professions and prevalence of underassessment which were observed in other studies (Sakr *et al* 1999, Kinley *et al* 2001, 2002) (section 3.3.3).

Internal validity

Internal validity refers to correlation questions. If a study suggests that x causes y, is it sure that x was responsible for variation in y, and not something else i.e. confounding variables? As many variables as possible were measured to reduce the potential for confounding variables, and statistical checks were undertaken, e.g. comparing number of medications with number of problems. All known confounders were incorporated into the model.

Validity is often broken down into content, criterion-related and construct validity, which are more usually applied to questionnaires, however data collection tools such as the one used in this study have to also be valid in that they are collecting what they are meant to collect and these specific aspects are identified and applied, where relevant.

Content validity

Content validity examines how well the assessment represents all aspects of the phenomena being studied, and often depends on subjective, personal judgments about whether the measurements seem reasonable. When identifying variables to be measured in this study, previous study measures were identified which met study objectives, along with adverse events measures which had been used regularly in many UK hospitals (IHI 2005). The research supervisor also reviewed data following the pilot, and conducted blinded double entry checks which are described further in chapter four.

Bias can affect the validity of a study. Higgins *et al* (2011) identify various potential bias:

Selection bias refers to differences between baseline characteristics of the groups that are compared. The unique strength of randomisation is that, if successfully accomplished, it prevents selection bias in allocating interventions to participants. Its success is dependent on sequence generation and allocation concealment. As this study was observational, randomisation did not occur, although case notes or dates of presentation were randomised.

Performance bias relates to systematic differences between groups in the care that is provided, or in exposure to factors other than the interventions of interest. After enrolment into the study, blinding (or masking) of study participants and personnel may reduce the risk that knowledge of which intervention was received, rather than the intervention itself, affects outcomes. Blinding is not always possible, however. In the studies discussed in the literature review blinding was not possible as participants were able to identify whether they were seeing a doctor or nurse. In this study as the participants were completing case notes as part of consultations in a natural environment, and case notes were reviewed retrospectively, participants had no way of knowing those notes may be accessed and reviewed, therefore there was no risk of performance bias.

Detection bias refers to differences between groups in how outcomes are determined. Blinding of outcome assessors may reduce the risk that knowledge of which intervention was received, rather than the intervention itself, affects outcome measurement. I was not blinded as an outcome assessor; however some of the double entry carried out by my supervisor was blinded to profession.

Attrition bias refers to differences between groups in withdrawals from a study. Withdrawals from the study lead to incomplete outcome data. There were no withdrawals from this study.

Reporting bias refers to systematic differences between reported and unreported findings. Within a published report those analyses with statistically significant differences between intervention groups are more likely to be reported than non-significant differences. This sort of 'within-study publication bias' is usually known as outcome reporting bias or selective reporting bias, and may be one of the most substantial biases affecting results from individual studies (Chan and Altman 2005). The STROBE checklist (von Elm *et al* 2007) has been used in this study to ensure complete and appropriate reporting (Table 6.1).

Other biases

In addition there are other sources of bias that are relevant only in certain circumstances. These relate mainly to particular trial designs or in particular clinical settings.

Validity of Global Trigger Tool (GTT) as identification of an adverse event

The GTT is currently being used by many UK NHS Trusts as part of the Safer Patient Initiative and 1000 Lives campaign, and the triggers used in the GTT were variables in this study. In terms of the GTT's measurement validity, it is measuring adverse events which occur during the patient episode. However the adverse events in this study were only measured if they occurred between junior and senior review, with the expectation that risk should be identified at initial ANP/junior doctor review, as any adverse event occurring after this time would not be relevant to this study. Therefore caution was used when analysing this data.

3.7 Ethical approval

Before undertaking this study, local Trust research and development approval and ethical approval were sought and gained (appendix viii). Trust approval included providing evidence of approval and consent from the Trust Caldecott Guardian, The Information Security Manager and the Clinical Director.

3.7.1 *Recruitment*

Potential participants were not obliged to participate in the research and it was essential to make clear that there was no obligation upon them to take part and there would be no penalty if they chose not to take part.

Participants were contacted by letter and provided with an information sheet outlining the purpose of the research (appendix v). This information sheet stated that participation was voluntary and that the participant had the right to withdraw at any time without penalty. It also indicated that the information disclosed would be held securely and treated confidentially. In addition, the participants were required to sign a consent form agreeing to be involved in the research. Consent was obtained without the use of duress.

3.7.2 *Confidentiality*

The fundamental principle which was adhered to was that the identity of all participants was kept strictly confidential, and the data were aggregated and kept strictly anonymous, unless there is a legal or professional obligation to do otherwise. All participants had study identifiers which identified them as nurse or doctor, but do not identify them individually. Patient identities were not collected. All data were presented anonymously.

Permission was sought from the Trust Information Manager to photocopy some of the cases to enable second entry for reliability and consistency checks. All cases were anonymised after photocopying. I transported the photocopies and handed them to my research supervisor who then carried out the second entry checks. All photocopies were kept in a locked drawer and when returned to me after entering data, were shredded and disposed of as confidential waste.

3.7.3 Anonymity

All data has been completely and irrevocably anonymised (National Patient Safety Agency 2007) and is unavailable to commercial sources. It is impossible to identify individual patients or practitioners from the data obtained. Non-intrusive clinical research, including retrospective review of patient case notes, where there is neither inconvenience nor hazard to patients, does not normally require expressed consent (Royal College of Physicians 1999, Jordan *et al* 2009). Study numbers were allocated and no patient or practitioner names were recorded.

3.7.4 Access to patient case notes

With regard to access to patient notes, the following advice was provided by the Trust Information Governance Officer:

'Research using existing Medical Records and not requiring contact with patients: 'If you are an employee or hold an honorary contract, you will not need patient consent to view these records but you must not identify patients at any stage. This research is permitted under Data Protection law'. This study adhered to this principle. In addition the Trust Information Security Manager and Caldicott Guardian approved this study (appendix viii).

3.7.5 Storage of data

Careful steps have been taken to ensure that all sets of data were securely stored. No patient or participant names were recorded. Data were aggregated and only reported as a whole. The only individuals allowed access to the data were myself and my supervisor.

Nurse and doctor participants were coded. The files linking identifiers with project codes were stored only on my Trust-based personal computer (PC). This PC is designated to my sole use and is encrypted and password protected. Larger files, with no identifiers, just project codes, were created and were also accessed by my supervisor. Paper data collection forms were kept in a locked drawer in my office, and shredded following completion of the study.

3.7.6 Practice issues

Following discussion with the Trust Head of Clinical Governance, it was agreed that as the participants are assured anonymity, if during the course of carrying out examination of clinical notes any concerns are identified, these would be passed on to the Risk Manager in general terms without identifying any individuals. Clinical supervisors within the clinical areas have a duty to supervise the participants on a day to day basis. The patient notes were examined at least 8 weeks following initial contact.

Should suboptimal practice have been detected during the course of the clinical aspects of this study, it would remain strictly confidential. Should unsafe practice have been observed or disclosed, I would have followed the guidance of my professional body (NMC 2008) and informed appropriate personnel within the Trust accordingly. All participants were informed of these principles before the start of the project. The importance of reporting unsafe practice has been further reiterated with the publication of the Francis Report (2013).

3.8 Summary chapter three

After careful consideration of which design and methods would address the study aims and objectives, and were feasible, a single site case study design was adopted. An observational cohort approach was used, with variables recorded from patient case notes, which had been completed by consenting health professional as part of a patient care episode.

Variables were identified from the literature and developed to address the study aims and objectives, and a data collection form was designed and piloted, with some amendments being made following the pilot. Data were entered into SPSS v16, with double entry being made for data entry accuracy, reliability and consistency.

Data analysis was carried out using descriptive and inferential statistics to compare the two professional groups: cross tabulations, Chi square test for independence and correlations. The results of the bivariate analyses were then to be used to construct a regression model.

Chapter four presents the findings arising from the data analyses.

Chapter 4: FINDINGS

4.0 Introduction

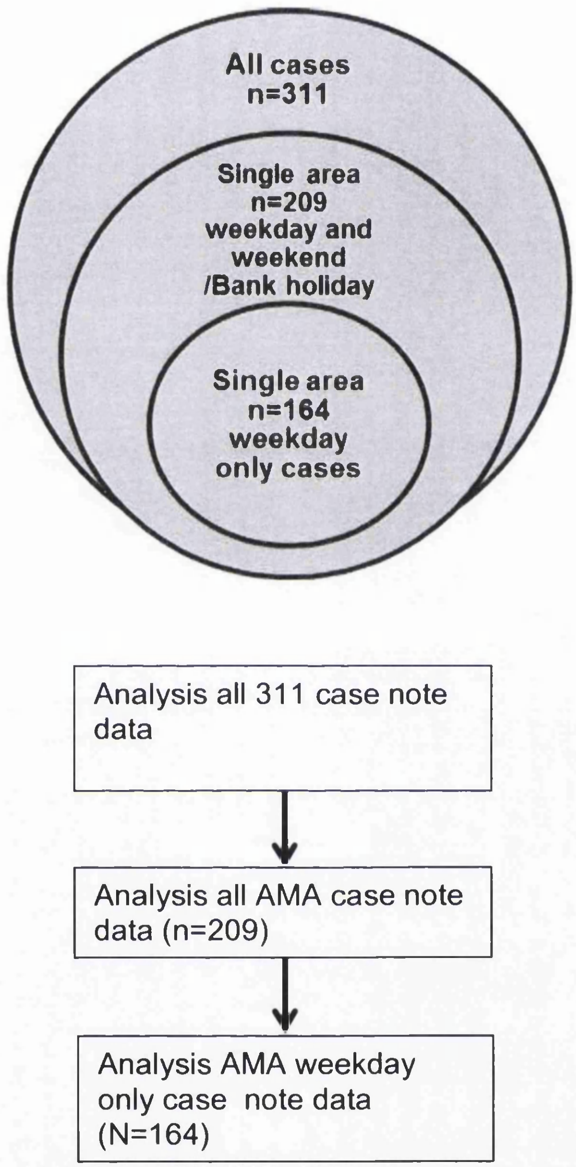
Data from case notes of patients presenting to 10 junior doctors and 10 ANPs in a four month period between April 2009 – August 2010 were reviewed. Data were collected from 152 case notes from ANPs and 159 case notes from junior doctors (Table 4.1).

A total of 847 potential case notes were identified. Of these 196 were not available in Medical Records, 254 case notes involved a health professional who was not a consenting participant, 29 had no senior review, and 57 case notes were from patients who had since deceased (Figure 4.1). The case notes of deceased patients are not readily accessible in this hospital, therefore, data were collected from the remaining 311 case notes.

In one area (AMA) junior doctors and ANPs worked together. In the remaining areas ANPs were substitutes for junior doctors. This was recognised as a potential confounder, as a different case mix could influence findings and statistical analysis was also conducted in the only clinical area, AMA, where both junior doctors and ANPs worked (n=209). In this area, patients with acute medical presentations were seen and assessed. A further potential confounder, day of the week, was recognised and in AMA all weekend/bank holiday presentations were seen by junior doctors. Therefore further analysis of weekday only AMA presentations was carried out (n=164). Three separate analyses were carried out (Fig 4.1):

- data from all 311 cases.
- data from all 209 AMA presentations
- data from 164 acute AMA weekday presentations

Fig. 4.1 Analyses of case notes



4.1.1 Participants

All 10 junior doctors in the study worked in acute medicine, with cases from one doctor who also worked in a surgical area included. During Foundation Years 1 and 2 (F1 and F2), doctors rotate around clinical areas in four month blocks. Therefore when identifying case notes for review, the four month period when they were working in acute medicine was used, with the total data collection period being from April 2009 – August 2010. ANPs included in the study worked mainly in acute medicine (n=9) with 1 working in acute surgery. ANP cases were randomly selected during a four month period between April 2009 and August 2010. A breakdown of clinical areas from which case note data were collected is shown in Table 4.1.

Table 4.1 Case notes reviewed by area

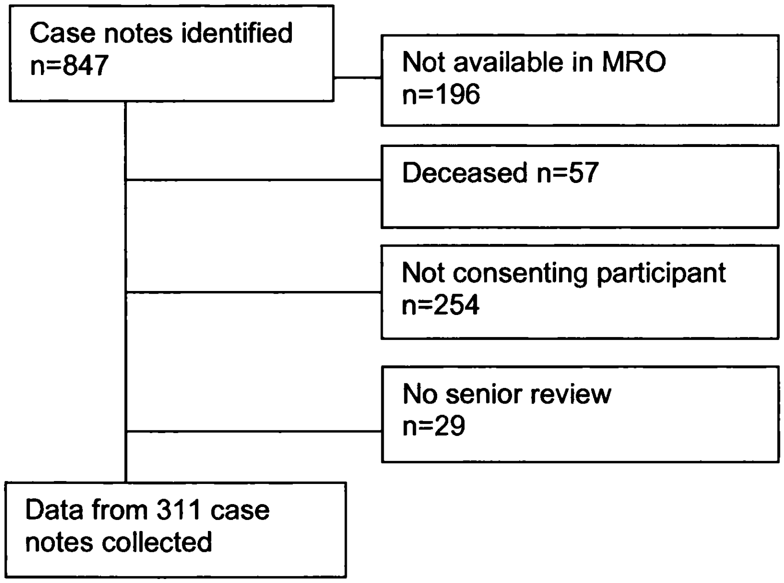
Area	**ANP n (%)**	**Junior Doctor n (%)**	**Total n (%)**
Accident and Emergency Department	0 (0%)	34 (21.4%)	34 (10.9%)
Acute medical admissions	86 (56.6%)	123 (77.5%)	209 (67.2%)
Surgery	18 (11.8%)	2 (1.3%)	20 (6.4%)
Medical wards	18 (11.8%)	0 (0%)	18 (5.8%)
Rapid Access Clinics	30 (19.7%)	0 (0%)	30 (9.7%)
Total	152 (100%)	159 (100%)	311 (100%)

In the acute medical admissions area, case data from both junior doctors and ANPs were collected. A small number of case data were collected from both professions in surgery, with cases from one of the healthcare professions collected in the remaining areas.

4.1.2 Case note retrieval

Case notes were accessed from Medical Records Office (MRO). Often case notes are located elsewhere, for example with medical secretaries, consultants, and in clinical areas, and therefore not all case notes identified could be accessed. MRO staff retrieved approximately 51% of the case notes accessed (n=304), with the remainder being retrieved from filing shelves by the researcher (n=290).

Figure 4.2 Flowchart showing case note access and retrieval



For ANP cases a total of 384 case notes were identified. Of these 15 were not used as the patient was deceased, 95 case notes were not available in Medical Records Office (MRO), for example they were in Coding, with consultants or in use in other clinical areas. A further 122 case notes were accessed and not used as either (i) there was no senior review or (ii) the ANP participant was not the admitting health professional.

For the junior doctor participants, a total of 463 cases were identified. Of these 101 were not available in MRO, 42 were deceased and 161 were accessed but not used as either there was no senior review or they did not involve the relevant health professional participant.

Not all case notes were coded to the junior doctor/ANP; in some cases case notes were coded to the consultant ‘on call’ at the time of presentation. This was the case for four ANPs and eight junior doctors. For these participants dates when they were working were randomised and then case notes of patients presenting on those dates were accessed, with those not involving the ANP/junior doctor participants rejected (Figure 4.1 and Table 4.2, 4.3 and 4.4).

Table 4.2 Retrieval and access of case notes; ANPs

ANP code	Case notes accessed and used	accessed not used (no senior review or *not consenting participant)	not in MRO	Deceased	Total cases identified
N1	19	27	12	0	57
N2	16	1	8	0	25
N3	14	2	7	0	23
N4	13	0	11	5	29
N5	12	29	14	3	58
N6	16	25	9	1	51
N7	16	2	8	1	27
N8	19	16	6	2	43
N9	14	1	11	0	27
N10	13	1	7	3	24
N11	0	18	2	0	20
Total	152	122	95	15	384

Table 4.3 Retrieval and access of case notes; Junior doctors

Doctor Code	Case notes accessed and used	accessed not used(no senior review or *not consenting participant)	not in MRO	Deceased	Total cases identified
D1	18	5	11	0	34
D2	17	12	9	1	39
D3	16	4	13	0	33
D4	15	27	9	8	59
D5	13	25	12	8	58
D6	18	16	11	4	49
D7	15	15	7	1	38
D8	17	23	11	7	58
D9	16	16	12	13	57
D10	14	18	6	0	38
Total	159	161	101	42	463

* In some cases date of presentations/admission were used to identify notes, rather than specific patient identifiers for that particular participant, therefore admissions seen by other health professions accessed.

Table 4.4 Reasons for not using accessed notes

	No senior review	Not study participant*	Total
ANPs	25	97	122
Doctors	4	157	161

**Specific patient identifiers related to the participants were able to be accessed for six ANPs and two doctors. For the remaining participants (ANP n=4, junior doctor n=8), presentations for dates when the health care professional participant was working were randomised and all case notes were accessed. This led to case notes of presentations for non-participants who were also working on those days being accessed, but not used.*

Time taken to review case notes

At the start of the data collection, it took approximately one hour to review and record data for three sets of case notes. As the researcher became more experienced, data from up to six sets of case notes could be collected per hour.

4.1.3 Double entry data checking

Double entry was undertaken by my research supervisor for 10% of the cases (n= 31). This ensured that the data collection form and the data collected were applied consistently. Double entry checks were done on five occasions. On each occasion the two databases were compared using SPSS data builder v.4 and a verification file was created in each instance. All cases were discussed and any differences resolved. In six cases 'profession' was anonymised prior to second data entry by the supervisor to remove any potential bias with regard to professions.

Twenty one data forms of cases 192–212 were also input during data collection by a colleague of the researcher to assess accuracy of data input. These were input into a second SPSS data base, and then the two inputs were assessed for differences using SPSS data builder v.4.

Cases 1 – 7

The first three cases were double entered in October 2009 by my research supervisor, and the following differences identified;

Case 1 – no medications found – this was due to the fact that the prescription chart had not been photocopied therefore the information was not available to the supervisor. It was agreed to photocopy 3 full sets to include medication charts and all investigations which were subsequently double entered and agreed.

Case 2 – it was agreed that there was disagreement with diagnosis between junior and senior.

Case 3 – supervisor had four medications prescribed prior to admission, researcher had five – resolved as five on further examination.

The three double entered cases were reviewed by researcher and supervisor and:

- Text variables were added to indicate where disagreements and extra management had arisen.
- Coding was changed for diagnosis agreed to give a 'neither agree nor disagree' code from senior. This would not be confused with a change in diagnosis.
- Variables for number of text lines and number of words in history were added.
- A further code was added to 'agreed second diagnosis' as in one case the senior made a second diagnosis, where the junior hadn't.

It was recognised that my clinical judgement may have to be used in relation to the variable 'clinical management plan agreed'. It was agreed that the 'augmented' variable would be used when additions were made to the clinical management plan by the senior doctor but the clinical management plan was not disagreed. Rules for categorisation were drawn up and agreed. For example, if an additional examination was ordered or medication prescribed, the clinical management plan was judged to be augmented. However if several changes were made, and diagnosis not agreed 'clinical management plan agreed' was categorized as 'no'. The double entry by my supervisor validated my judgements.

My supervisor and I disagreed on legibility; however it was recognised that this is a subjective judgement and as I would be making this judgment for all case notes reviewed, this would enable some consistency.

Cases 4-20 –Double entry check November 2009

Of the 17 cases, only two had more than overnight stays. Also the supervisor noted that in six cases she could see no rationale for hospitalisation, and the seniors were making similar comments. To take this into account an additional 'length of stay' variable was added and data from case 28 included this variable.

Cases 39 – 43 - Double entry check April 2010

Differences highlighted for these five cases were discussed and resolved, specifically: My supervisor found more co-existing problems in two cases. However it was noted that she was also using drug history to inform co-existing problems, whilst I was only counting those listed in the case notes. In one case for example, the list of medicines indicated that other problems co-existed which had not been recorded.

Cases 217 – 222- double entry check, 'professions' removed

In these cases (n=6) profession was anonymised prior to second data entry by the supervisor to remove any potential bias with regard to professions. No bias in relation to professions was identified, and all differences were resolved. Specifically, apart from differences highlighted in spelling, use of capitals, and slight differences in text line and word counts, in two cases my supervisor had indicated more co-existing problems. This judgement was made based on medical history recorded and medication on admission. It was agreed that co-existing problems count should only include those recorded, although this does highlight omissions in history taking documentation.

All other differences were resolved on discussion and data input by the researcher agreed. Mismatches were discussed and the majority were related to differences in spelling, use of capitals etc. and so were not relevant. On each occasion of double entry checking, all cases where mismatches were highlighted were then checked and discussed. The mismatches are shown in Table 4.5.

Table 4.5 Mismatches in double entry

Variable	Data entry differences	Resolution
Medications prescribed by ANP/junior doctor	Additional medication x 2 recorded by researcher	Second entry did not have access to prescription charts – charts accessed and researcher entries agreed
Investigations ordered by ANP/junior doctors	Additional investigations recorded by researcher	Checked and agreed as correct
Days stay	not recorded by second entry	Data not available to second entry
Systems examined	Not agreed in 5 cases	Case notes reviewed and data agreed
Number of coexisting problems	Not agreed in 4 cases	Case notes reviewed and data agreed (noted that supervisor was using drug history to indicate coexisting problems, even if not documented)

Based on these results, double entry agreement was considered good.

Cases 192 – 212 - Double entry for input accuracy check.

Data forms of cases 192 – 212 (n=21) were also input during data collection by a colleague to assess accuracy of data input. These were input into a second SPSS data base, and then the two inputs were assessed for differences using SPSS data builder v.4. There were differences identified in terms of use of capital letters, inputting the order of investigations differently and spelling which were irrelevant. Three additional differences were observed which, on further examination of the data forms, were found to be input/code errors by the second person. These were case 192 'second diagnosis agreed', case 202 'systems examined' and case 205 'diagnosis agreed'. This confirmed the accuracy of data input by the researcher.

4.1.4 Case narratives

Narratives were written to provide illustrative examples of cases (n=10). These cases were selected from the cases used for double entry reliability checks. As photocopies of the cases were taken to facilitate double entry, this enabled opportunity to also write the case narratives prior to the photocopies being destroyed. The ten that were then selected were cases which would enable illustration of relevant points, for example if the senior doctor disagreed with a clinical management, or if additions were made to medications prescribed. Two examples are given in Box 1, and the remaining narratives can be found in appendix ix. Examples of case narratives are used in chapter five for relevant illustrative purpose.

Box 4.1 Examples of case narratives

Example 1

An 89 year old gentleman was referred to Acute Medical Unit by his GP with a 5 day history of epigastric discomfort. He was seen on presentation by an ANP. Past medical history was recorded as COPD and chest infections and he was an ex-smoker. History of presenting condition was recorded as epigastric discomfort worse at night, radiating to the left chest wall, and felt like 'burning' on occasions. There was no history of nausea, vomiting, diarrhoea, fever, dysuria or haematuria. The patient had a good appetite and reported no weight loss.

He was married, and lived with his wife. He was fully mobile.

Drug history was recorded as:
Ventolin 100 mcg 2 puffs qds
Seretide 100 bd

On examination temperature 36.4°C, pulse 85 bpm, respiratory rate 14 pm, blood pressure 179/86 mmHg, $Sa0^2$ 97%. Cardiovascular system, respiratory system and abdomen were examined and no abnormalities detected, and chest was clear.

Differential diagnoses were:
GORDS
?? cardiac event

Investigations ordered: CBC, UEs, LFTs, Troponin T, glucose, chest X-Ray and ECG were ordered. All investigations were reported as normal.

At senior review the consultant did not make a diagnosis, and did not mention either of the diagnoses made by the ANP. However he noted that all investigations were normal and discharged the patient home.

Example 2

A 35 year old male presented at A&E with a history of pleuritic chest pain. He was seen and examined by an F2. A history was recorded of being woken that morning by pain in the left side of his chest with no radiation, worse on inspiration and being very short of breath. He reported stopping smoking 2 weeks previously, normally fit and well, no previous DVT/PE, no nausea or vomiting and no haemoptysis.

Observations were recorded as temperature 36.6°C, pulse 60 bpm, respiratory rate 16 pm, blood pressure 156/86 mmHg, O^2 saturation 97%. No systems examinations were recorded.

Chest X-Ray, D Dimer, CBC, UEs, CRP, Troponin T and ECG investigations were requested. ECG was noted to show T wave inversion, Q waves in III.

Clexane 134mg s/c and cocodamol 30/500 po were prescribed.

Diagnosis of PE was made and the patient was referred to physicians.

At senior review it was noted that chest was clear, chest X-Ray was normal, and there was no evidence of PE. A diagnosis of ?viral pleurisy was made, Brufen and paracetamol were prescribed by the senior, and the patient was discharged home.

4.2 Findings; Continuous Variables

Table 4.6 gives a breakdown of the descriptive statistics for the continuous variables. It is then further broken down into professions (Table 4.7), followed by tests for normality.

Table 4.6 Descriptive statistics for continuous variables

Continuous data	N	Mean (5% trimmed mean)	SD (standard deviation)	Median	Range (min-max)	Inter-quartile range (min-max)
Age of patient (years)	311	64.07 (64.79)	20.04	67	82 (17-99)	31 (49-80)
	209	63.00 (63.55)	20.13	65	81 (18-99)	32 (48-80)
	164	62.04 (62.52)	19.63	64	81 (18-99)	31 (48-78.75)
Number of medications prescribed prior to presentation	311	4.26 (4.03)	3.67	4	15 (0–15)	5 (1–6)
	209	4.18 (3.91)	3.69	4	15 (0–15)	5 (1–6)
	164	4.13 (3.85)	3.8	3	15 (0–15)	5 (1–6)
Number of co-existing problems on presentation	311	2.36 (2.24)	1.86	2	9 (0–9)	3 (1–4)
	209	2.46 (2.34)	1.94	2	9 (0–9)	3 (1–4)
	164	2.46 (2.32)	2.03	2	9 (0–9)	3 (1 – 4)
Number of medications prescribed on presentation	311	0.86 (0.69)	1.31	0	7 (0–7)	1 (0 – 1)
	209	0.92 (0.76)	1.37	0	7 (0–7)	2 (0 – 2)
	164	0.82 (0.65)	1.33	0	7 (0–7)	2 (0 – 1.75)
Number of systems examined	311	3.5 (3.52)	0.91	3	6 (0–6)	1 (3 - 4)
	209	3.76 (3.79)	0.85	4	6 (0–6)	1 (3 – 4)
	164	3.75 (3.78)	0.85	4	6 (0–6)	1 (3 -4)
Number of lines in history taking	311	10.86 (10.84)	4.16	11	27 (1-28)	6 (8–14)
	209	11.6 (11.55)	3.69	12	23 (3–26)	5 (9–14)
	164	11.88 (11.83)	3.68	12	23 (3-26)	5 (9–14)
Number of words in history taking	*308*	*64.62 (64.52)*	*27.96*	*62*	*144 (2–146)*	*43 (43–86)*
	209	70.26 (69.79)	24.66	67	116 (16–132)	41 (50–91)
	164	72.3 (71.75)	23.87	69	114 (18–32)	38 (54–92)

Table 4.7 Continuous data by profession

Variable	Sample	Profession	N	Mean (5% trimmed)	SD (standard deviation)	Median	Range (min-max)	Inter-quartile range
Age of patient	311 cases	ANP	152	58.64 (58.92)	18.67	61	80 (17-97)	29 (45-73.75)
		Jnr doctor	159	69.26 (70.45)	19.98	76	81 (18-99)	30 (55-85)
	209 cases	ANP	86	54.19 (54.23)	17.82	56.5	81 (18–99)	24 (41.5–66)
		Jnr doctor	123	69.16 (70.43)	19.41	75	76 (19–95)	30 (55– 85)
	164 cases	ANP	86	54.19 (54.23)	17.82	56.5	76 (19-95)	24 (41.5-66)
		Jnr doctor	78	70.69 (71.7)	17.91	75	81 (18-99)	29 (56-85.25)
Number of medications prescribed prior to presentation	311 cases	ANP	152	3.87 (3.59)	3.602	3	15 (0–15)	5 (1-6)
		Jnr doctor	159	4.64 (4.45)	3.696	4	15 (0–15)	5 (2-7)
	209 cases	ANP	86	3.41 (3.05)	3.52	2	15 (0 -15)	4 (1–5)
		Jnr doctor	123	4.72 (4.51)	3.72	4	15 (0–15)	5 (2–7)
	164 cases	ANP	86	3.41 (3.05)	3.52	2	15 (0–15)	4 (1-5)
		Jnr doctor	78	4.94 (4.73)	3.96	4.5	15 (0–15)	(1.75-8)
Number of co-existing problems on presentation	311 cases	ANP	152	2.11 (1.98)	1.914	2	8 (0–8)	3 (0.25-4)
		Jnr doctor	159	2.60 (2.50)	1.779	3	9 (0-9)	3 (1-4)
	209 cases	ANP	86	2.15 (1.98)	2.05	2	8 (0–8)	4 (0 – 4)
		Jnr doctor	123	2.68 (2.58)	1.84	3	9 (0–9)	3 (1 – 4)
	164 cases	ANP	86	2.15 (1.98)	2.05	2	8 (0–8)	4 (0 - 4)
		Jnr doctor	78	2.81 (2.7)	1.95	3	9 (0-9)	3 (1 - 4)
Number of medications prescribed on presentation	311 cases	ANP	152	0.26 (0.13)	0.714	0	5 (0–5)	0 (0-0)
		Jnr doctor	159	1.43 (1.30)	1.49	1	7 (0-7)	2 (0-2)
	209 cases	ANP	86	0.22 (0.07)	0.77	0	5 (0–5)	0 (0 – 0)
		Jnr doctor	123	1.41 (1.29)	1.49	1	7 (0–7)	2 (0 – 2)
	164 cases	ANP	86	0.22 (0.07)	0.77	0	5 (0–5)	0 (0-0)
		Jnr doctor	78	1.47 (1.36)	1.49	1	7 (0-7)	2 (0-2)
Number of systems examined	311 cases	ANP	152	3.47 (3.48)	0.913	3	5 (0–5)	3 (3-4)
		Jnr doctor	159	3.53 (3.57)	0.899	4	5 (1-6)	4 (3-4)
	209 cases	ANP	86	3.92 (3.92)	0.79	4	4 (2–6)	1 (3 – 4)
		Jnr doctor	123	3.64 (3.68)	0.87	4	5 (0–5)	1 (3 – 4)
	164 cases	ANP	86	3.92 (3.92)	0.79	4	4 (2-6)	1 (3-4)
		Jnr doctor	78	3.56 (3.6)	0.88	4	5 (0-5)	1 (3-4)
Number of lines in history taking	311 cases	ANP	152	10.91 (10.95)	4.455	11	27(1-28)	11 (8-14)
		Jnr doctor	159	10.82 (10.67)	3.867	10	23 (3-26)	10 (8-13)
	209 cases	ANP	86	12.93 (12.94)	2.84	13	11 (7–18)	4 (11–15)
		Jnr doctor	123	10.67 (10.5)	3.93	10	23(3-26)	5 (8–13)
	164 cases	ANP	86	12.93 (12.94)	2.84	13	11 (7-18)	4 (11 -15)
		Jnr doctor	123	10.73 (10.49)	4.14	10	23 (3-26)	5 (8-13.25)
Number of words in history taking	311 cases	ANP	152	65.71 (68.89)	30.5	66.5	144 (2–146)	66.5 (44-87.75)
		Jnr doctor	156	63.56 (62.66)	25.295	61	114 (16-130)	39 (43-82)
	209 cases	ANP	86	78.09 (78.2)	20.59	76	94 (39–132)	34 (61.75 – 95.25)
		Jnr doctor	121	64.69 (63.8)	25.84	61	114 (16 – 130)	40 (43.5 – 83.5)
	164 cases	ANP	86	78.09 (7.82)	20.59	76	94 (39 – 132)	34 (61.75 – 95.25)
		Jnr doctor	77	65.83 (64.67)	25.7	61	112 (18-130)	38 (44 – 82)

4.2.1 Tests for Normality

Continuous data were tested for normal distribution to enable appropriate use of statistical tests (Table 4.8).

Table 4.8 Tests for normality

Continuous data	Kolmogorov-Smirnov		Shapiro-Wilk	
	statistic	P value	statistic	P value
Number of medications prescribed prior to presentation	0.12	<0.001	0.92	<0.001
Number of medications prescribed by ANP/junior doctor	0.34	<0.001	0.69	<0.001
Number of lines in history taking	0.06	0.010	0.99	<0.001
Number of words in history taking	0.06	0.009	0.99	0.030
Number of co-existing problems on presentation	0.17	<0.001	0.92	<0.001
Age of patient	0.09	<0.001	0.96	<0.001
Number of systems examined	0.17	<0.001	0.92	<0.001

The tests of normality were also carried out within the two health professional groups, with results shown in Table 4.9.

Table 4.9 Tests for normality by profession

Continuous data	Profession	Kolmogorov-Smirnov		Shapiro-Wilk	
		Statistic	p value	Statistic	p value
Number of medications prescribed prior to presentation	ANP	0.14	<0.001	0.89	<0.001
	Junior doctor	0.10	<0.001	0.94	<0.001
Number of medications prescribed by ANP/junior doctor	ANP	0.48	<0.001	0.41	<0.001
	Junior doctor	0.21	<0.001	0.84	<0.001
Number of lines in history taking	ANP	0.09	0.002	0.97	0.005
	Junior doctor	0.11	<0.001	0.97	0.003
Number of words in history taking	ANP	0.05	0.200	0.99	0.120
	Junior doctor	0.1	0.002	0.96	<0.001
Number of co-existing problems listed on presentation	ANP	0.21	<0.001	0.89	<0.001
	Junior doctor	0.14	<0.001	0.94	<0.001
Age of patient	ANP	0.08	0.012	0.98	0.037
	Junior doctor	0.15	<0.001	0.92	<0.001

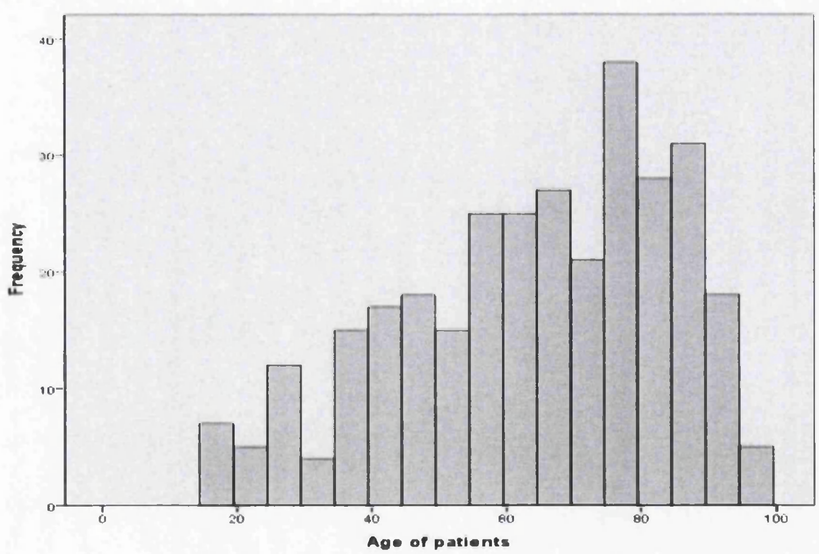
None of the continuous data showed normal distribution when the whole sample was analysed. When tests for normality were carried out within the two health professional groups, only one variable, 'number of words in history' by the ANPs, had a distribution not significantly different from normal, with the remainder showing non-normal distribution. These findings were repeated when the 209 AMA cases were analysed. When the 164 AMA weekday cases only were analysed, three variables, 'age of patient, 'number of lines in history and 'number of words in history' by the ANPs had a distribution not significantly different from normal, with the remainder showing non-normal distribution. All junior doctor cases were non-normally distributed. Accordingly, non-parametric statistical tests were used.

4.2.2 Continuous data – statistical analyses

Age distribution of patients

The age of patients was from 17 years – 99 years old, (range 82) and was non-normally distributed (chart 4.2). The median age was 67 years, with an interquartile range of 31 (49 years – 80 years).

Fig. 4.3 Age distribution of patients



Mann-Whitney U test revealed a significant difference in the age of patients seen by the two professions. Patients presenting to junior doctors were statistically significantly older than patients presenting to ANPs.
311 cases, junior doctors' patients median age 76 years, ANPs' patients median age 61 years, $U = 7965.5$, $z = -5.196$, $p = <0.001$
209 AMA cases, junior doctors' patients median age 75 years, ANPs' patients median age 56.5 years, $U = 2878$, $z = -5.605$, $p = <0.001$
164 AMA weekday cases, junior doctors' patients median age 75 years, ANPs' patients median age 56.5 years, $U = 1689.5$, $z = -5.48$, $p = <0.001$.

Systems examined

Data were recorded from case notes relating to the number of systems examined by each of the professions (Table 4.10).

Table 4.10 Number of systems examined by profession

Number of systems examined	Total Frequency (%)	ANP Frequency (%)	Junior doctor Frequency (%)
0	2 (6%)	0 (0%)	2 (1.3%)
1	4 (1.3%)	3 (2%)	1 (0.6%)
2	22 (7.1%)	12 (7.9%)	10 (6.3%)
3	133 (42.8%)	70 (46.1%)	63 (39.6%)
4	110 (35.4%)	46 (30.3%)	64 (40.3%)
5	39 (12.5%)	20 (13.2%)	19 (11.9%)
6	1 (0.3%)	1 (0.7%)	0 (0%)
Total	311 (100%)	152 (100%)	159 (100%)

Distribution was non-normal, therefore a Mann-Whitney U test was carried out. It revealed no statistically significant difference between professions (ANPs median = 3, n=152, doctors median = 4, n=159) of the number of systems examined. $U=11335.5$, $z = -1.01$, $p = 0.31$. However when the 209 sample was analysed, there was a statistically significant difference between the professions, with ANPs examining more systems than junior doctors. (ANPs n=86, median = 4, junior doctors, n=123, median = 4, $U=4427$, $z = -2.15$, $p = 0.03$). Findings were similar in the 164 sample, with ANPs examining more systems than junior doctors (ANPs median = 4, n=86, doctors median = 4, n=78), $U = 2667$, $z = -2.44$, $p = 0.01$.

Co-existing problems on presentation

Data were collected of the number of co-existing problems patients had on presentation, and findings are as below (Table 4.11).

Table 4.11 Number of co-existing problems on presentation

Number of co-existing problems	Frequency (%)
0	58 (18.6%)
1	66 (21.2%)
2	41 (13.2%)
3	64 (20.6%)
4	44 (14.1%)
5	23 (7.4%)
6	6 (1.9%)
7	6 (1.9%)
8	2 (0.6%)
9	1 (0.3%)
Total	311 (100%)

When number of co-existing problems is split into professions the following was found (Table 4.12):

Table 4.12 Number of co-existing problems on presentation by profession

Number of co-existing problems	Sample	ANP Frequency (%)	Junior doctor Frequency (%)	Total Frequency (%)
no co-existing problems	311 cases	38 (25%)	20 (12.6%)	58 (18.6%)
	209 cases	24 (27.9%)	15 (12.2%)	39 (18.7%)
	164 cases	24 (27.9%)	10 (12.8%)	34 (20.7%)
1 co-existing problem	311 cases	36 (23.7%)	30 (18.9%)	66 (21.2%)
	209 cases	17 (19.8%)	21 (17.2%)	38 (18.2%)
	164 cases	17 (19.8%)	12 (15.4%)	29 (17.7%)
2 co-existing problems	311 cases	18 (11.8%)	23 (14.5%)	41 (13.2%)
	209 cases	12 (14%)	19 (15.4%)	31 (14.8%)
	164 cases	12 (14%)	10 (12.8%)	22 (13.4%)
3 co-existing problems	311 cases	21 (13.8%)	43 (27%)	64 (20.6%)
	209 cases	9 (10.5%)	35 (28.5%)	44 (21.1%)
	164 cases	9 (10.5%)	24 (30.8%)	33 (20.1%)
4 co-existing problems	311 cases	21 (13.8%)	23 14.5%)	44 (14.1%)
	209 cases	14 (16.3%)	15 (12.2%)	29 (13.9%)
	164 cases	14 (16.3%)	8 (10.3%)	22 (13.4%)
5 co-existing problems	311 cases	12 (7.9%)	11 (6.9%)	23 (7.4%)
	209 cases	5 (5.8%)	9 (7.3%)	14 (6.7%)
	164 cases	5 (5.8%)	7 (9%)	12 (7.3%)
6 co-existing problems	311 cases	2 (1.3%)	4 (2.5%)	6 (1.9%
	209 cases	1 (1.2%)	4 (3.3%)	5 (2.4%)
	164 cases	1 (1.2%)	3 (3.8%)	4 (2.4%)
7 co-existing problems	311 cases	2 (1.3%)	4 (2.5%)	6 (1.9%)
	209 cases	2 (2.3%)	4 (3.3%)	6 (2.9%)
	164 cases	2 (2.3%)	3 (3.8%)	5 (3%)
8 co-existing problems	311 cases	2 (1.3%)	0	2 (0.6%)
	209 cases	2 (2.3%)	0	2 (1%)
	164 cases	2 (2.3%)	0	2 (1.2%)
9 co-existing problems	311 cases	0	1 (0.6%)	1 (0.3%)
	209 cases	0	1 (0.8%	1 (0.5%)
	164 cases	0	1 (1.3%)	1 (0.6%)

As there was non-normal distribution of 'number co-existing problems on presentation', Mann-Whitney U test was used to test for statistical significance in differences between the two groups. Mann-Whitney U test revealed a statistically significant difference in the number of co-existing problems patients had on presentation. Patients presenting to junior doctors had statistically significantly more co-existing problems than those presenting to ANPs in all samples tested.

311 cases - $U = 10075$, $z = -2.57$, $p = 0.01$

209 cases - $U = 4324.5$, $z = -2.27$, $p = 0.02$

164 cases - $U = 2667$, $z = -2.29$, $p = 0.02$

Number of medications prescribed prior to presentation

Data were collected of the number of medications patients were already prescribed on presentation. The distribution of medications prescribed prior to presentation for ANPs and doctors was non-normal, ANPs median 3, IQR 5 (1–6), junior doctors median 4, IQR 5 (2–7). Findings are shown in Table 4.13.

Table 4.13 Number of medications prescribed prior to presentation

Number prescribed on presentation	**ANP Frequency (%)**	**Junior doctor Frequency (%)**	**Total Frequency (%)**
0	29 (19.1%)	31(19.5%)	60 (19.3%)
1	22 (14.5%)	6 (3.8%)	28 (9%)
2	15 (9.9%)	17 (10.7%)	32 (10.3%)
3	14 (9.2%)	14 (8.8%)	28 (9%)
4	20 (13.2%)	14 (8.8%)	34 (10.9%)
5	13 (8.6%)	20 12.6%)	33 (10.6%)
6	10 (6.6%)	9 (5.7%)	19 (6.1%)
7	5 (3.3%)	12 (7.5%)	17 (5.5%)
8	3 (2%)	7 (4.4%)	10 (3.2%)
9	6 (3.9%)	12 (7.5%)	18 (5.8%)
10	2 (1.3%)	3 (1.9%)	5 (1.6%)
11	7 (4.6%)	9 (5.7%)	16 (5.1%)
12	3 (2%)	1 (0.6%)	4 (1.3%)
13	1 (0.7%)	1 (0.6%)	2 (0.6%)
14	0 (0%)	2 (1.3%)	2 (0.6%)
15	2 (1.3%)	1 (0.6%)	3 (1%)
Total	152 (100%)	159 (100%)	311 (100%)

The box and whisker plot (Figure 4.4) illustrates the distribution of the continuous data relating to number of medications prescribed prior to presentation for all 311 cases. The box shows the median (black horizontal line) and the 25th and 75th centiles which are the bottom and top of the box (IQR). The whiskers above and below the box show the values within 1.5 IQR below the 25th centile and 1.5 IQR above the 75th centile (Bruce *et al* 2008). Values outside this range are outliers, in this case shown by case numbers 87, 228 and 235

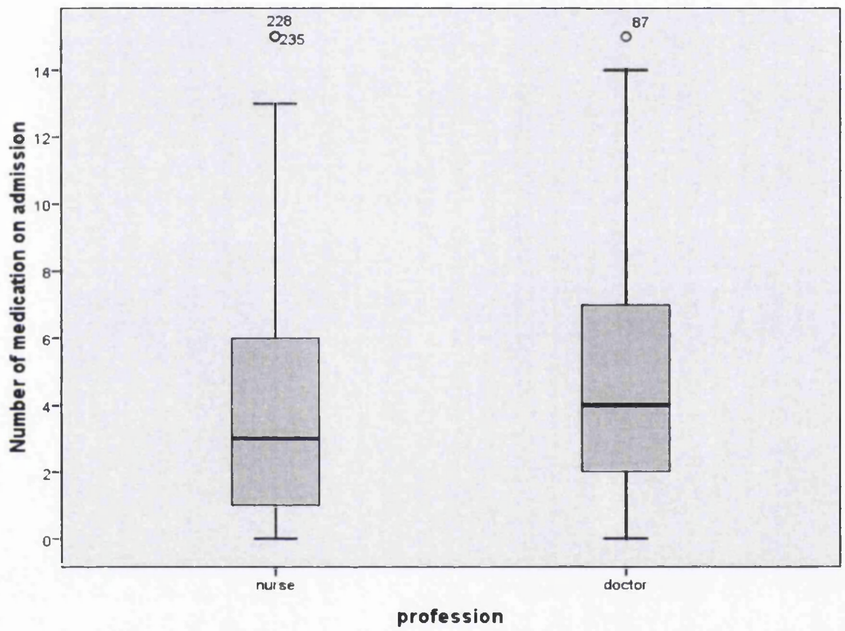


Figure 4.4 Box and whisker plot showing patients' number of medications prior to presentation by profession

Mann-Whitney U test showed a statistically significant difference in the number of medications patients were prescribed prior to presentation, with patients presenting to ANPs having less medication prescribed than patients presenting to junior doctors. This finding was consistent in all three analyses (Table 4.14).

Table 4.14 Medication prescribed prior to presentation – statistical analysis

Sample	Profession	Median	U	Z	p value
311	ANPs	3	10545	-1.95	0.05
	Junior doctors	4			
209	ANPs	2	14105.5	= -2.77	0.01
	Junior doctors	4			
164	ANPs	2	2574.5	-2.58	0.01
	Junior doctors	4.5			

Medication prescribed by ANPs and junior doctors

Data were collected of medication prescribed by the ANPs and junior doctors. In 184 cases (59.2%) no medication was prescribed (Table 4.15).

Table 4.15 Number of medications prescribed by profession

Number of medications prescribed on presentation	ANP Frequency (%)	Junior doctor Frequency (%)	Total Frequency (%)
0	127 (83.6%)	57 (35.8)	184 (59.2)
1	17 (11.2%)	37 (23.3)	54 (17.4)
2	5 (3.3%)	30 (18.9)	35 (11.3)
3	1 (0.7%)	19 (11.9)	20 (6.4)
4	1 (0.7%)	11 (6.9)	12 (3.9)
5	1 (0.7%)	2 (1.3)	3 (1)
6	0 (0%)	2 (1.3)	2 (0.6)
7	0 (0%)	1 (0.6)	1 (0.3)
Total	152 (100%)	159 (100%)	311 (100%)

A Mann-Whitney U test revealed a statistically significant difference in the number of medications prescribed by ANPs and junior doctors. Junior doctors prescribed significantly more medication than ANPs. This finding was consistent with all three analyses (Table 4.16).

Table 4.16 Medication prescribed by ANPs and junior doctors

Sample	Profession	median	U	Z	p value
311	ANP	0	5885	-8.82	<0.001
	Junior doctor	1			
209	ANP	0	2579.5	-7.1	<0.001
	Junior doctor	1			
164	ANP	0	1563	-6.88	<0.001
	Junior doctor	1			

Number of lines and words in history taking.

Tests for normality revealed non-normal distribution in the whole data set and when professions were tested separately, apart from 'number of words in history taking' for ANPs all distribution was non-normal. Therefore Mann-Whitney U test was performed to identify any statistical difference between the health professional groups in terms of lines and words written in the history taking.

The Mann-Whitney U test revealed no significant difference in the lines written in history taking between ANPs and doctors, $U = 11438.5$, $z = -0.82$, $p = 0.41$. The Mann-Whitney U test also revealed no statistically significant difference in number of words written in history taking between ANPs and doctors $U = 10924$, $z = -1.19$, $p = 0.23$.

However there was a statistically significant difference when the 209 sample was tested, with ANPs writing more lines and words than junior doctors. Number of lines: $U = 3213$, $z = -4.84$, $p = <0.001$. Number of words: $U = 13.41$, $z = -4.22$, $p = <0.001$. This was also the case when analysing 164 cases: Number of lines: $U = 2024.5$, $z = -4.39$, $p = < 0.001$, Number of words: $U = 2225.5$, $z = -3.61$, $p = < 0.001$

4.2.3 Presenting conditions

Presenting conditions were recorded in full text, and patients presented with a wide range of conditions, which are shown in Table 4.17.

Table 4.17 Breakdown of presenting conditions

Presenting condition	Frequency	Percent
Chest pain	59	19
Shortness of breath	30	9.6
Palpitations	25	8
Unwell	23	7.4
Falls	19	6.1
Collapse	18	5.8
Confusion	9	2.9
Headache	9	2.9
Diarrhoea/Vomiting	9	2.9
Haematemesis	5	2.6
Rash	4	1.3
Overdose	4	1.3
Chest tightness	4	1.3
Chest infection	4	1.3
Painful leg ulcer	4	1.3
Post menopausal bleeding	4	1.3
Abdominal pain	3	1
swollen leg	3	1
Stress incontinence	3	1
Shakes tremors	3	1
Menorrhagia	3	1
Left sided weakness	3	1
Fits	3	1
Back pain	3	1
Loss of consciousness	3	1
Prolapse	2	0.6
Malaena	2	0.6
Haemoptysis	2	0.6
Dysphasia	2	0.6
Dizzy	2	0.6
Dehydrated	2	0.6
Cough	2	0.6
Cellulitis	2	0.6
Atrial fibrillation	2	0.6
Alcohol withdrawal	2	0.6
Hypertension	2	0.6
Weakness slurred speech	1	0.3
Urine incontinence	1	0.3
Tinnitus	1	0.3
Rigors	1	0.3
RIF pain	1	0.3
Raised potassium ECG changes	1	0.3

Presenting condition	Frequency	Percent
Right hip replacement	1	0.3
Pyrexia	1	0.3
Pelvic pain	1	0.3
Panic attacks	1	0.3
Numb arm and hand	1	0.3
Neck pain	1	0.3
Neck and shoulder ache	1	0.3
Low Hb	1	0.3
Loss of balance	1	0.3
Lethargy	1	0.3
Left arm swelling	1	0.3
Jaw drop	1	0.3
Hip pain	1	0.3
Hallucinations	1	0.3
Fractured ankle	1	0.3
Exacerbation COPD	1	0.3
Epigastric discomfort	1	0.3
Endometriosis	1	0.3
Drowsy	1	0.3
Double vision	1	0.3
Difficulty with swallow and speech	1	0.3
CO2 poisoning	1	0.3
Cerebral haemorrhage	1	0.3
Bizarre behaviour	1	0.3
Asthma	1	0.3
Abnormal PV bleeding	1	0.3
Total	311	100

Presenting condition by profession

Presenting condition was then broken down by profession and is shown in Table 4.18. As can be seen, the majority of patients presenting to ANPs presented with chest pain, whereas presenting conditions was more diverse for patients presenting to junior doctors.

Table 4.18 Presenting conditions of patients seen by ANPs and Junior doctors

Presenting condition	**ANPs**			**Junior doctors**		
	311 cases Frequency (%)	**209 cases Frequency (%)**	**164 cases Frequency (%)**	**311 cases Frequency (%)**	**209 cases Frequency (%)**	**164 cases Frequency (%)**
Chest pain	43 (28.3%)	34 (39.5%)	34 (39.5%)	16 (10.1%)	12 (9.8%)	7 (9%)
SOB	13 (8.6%)	9 (10.5%)	9 (10.5%)	17 (10.7%)	14 (11.4%)	10 (12.8%)
Palpitations	20 (13.2%)	8 (9.3%)	8 (9.3%)	5 (3.1%)	3 (2.4%)	2 (2.6%)
Unwell	9 (5.9%)	6 (7%)	6 (7%)	14 (8.8%)	9 (7.3%)	7 (9%)
Falls	5 (3.3%)	0	0	14 (8.8%)	10 (8.1%)	0
Collapse	4 (2.6%)	3 (3.5%)	3 (3.5%)	14 (8.8%)	9 (7.3%)	3 (3.8%)
Confusion	1 (0.7%)	0	0	8 (5%)	8 (6.5%)	5 (6.4%)
Diarrhoea and/ or vomiting	0	0	0	9 (5.7%)	7 (5.7%)	3 (3.8%)
Headache	6 (3.9%)	6 (7%)	6 (7%)	3 (1.9%)	2 (1.6%)	1 (1.3%
Others	51 (33.6%)	20 (23.2%)	20 (23.2%)	59 (37.1%)	49 (39.8%)	35 (44.9%)
Total	152 (100%)	86 (100%)	86 (100%)	159 (100%)	123 (100%)	78 (100%)

Presenting conditions were also recoded as categorical variables and differences between professions tested for significance.

4.3 Categorical data

The categorical variables are shown in appendix x.

Continuous and text data were also recoded to categorical data for ‘age’, ‘number of systems examined’, ‘number of co-existing problems’, ‘number of medications prescribed prior to presentation’, ‘presenting condition’ and ‘number of medications prescribed by ANP/Junior doctor’ (Table 4.19).

Table 4.19 Continuous variables and text recoded as categorical variables

Variable	Categories	311 cases Frequency (%)	209 cases Frequency (%)	164 cases Frequency (%)
Age of patient	17-50 years Over 50 years	81 (26%) 230 (74%)	58 (27.8%) 151 (72.2%)	48 (29.3%) 116 (70.7%)
Number of systems examined	2 or less 3 4 5 or more	28 (9%) 133 (42.8%) 110 (35.4%) 40 (12.9%)	11 (5.3%) 65 (31.1%) 96 (45.9%) 37 (17.7%)	9 (5.5%) 49 (29.9%) 79 (48.2%) 27 (16.5%)
Number of systems examined	3 or less 4 or more	161 (51.8%) 150 (48.2%)	76 (36.4%) 133 (63.6%)	58 (35.4%) 106 (64.6%)
Number of co-existing problems on presentation	0 1 2 3 4 5 6 or more	58 (18.6%) 66 (21.2%) 41 (13.2%) 64 (20.6%) 44 (14.1%) 23 (7.4%) 15 (4.8%)	39 (18.7%) 38 (18.2%) 31 (14.8%) 44 (21.1%) 29 (13.9%) 14 (6.7%) 14 (6.7%)	34 (20.7%) 29 (17.7%) 22 (13.4%) 33 (20.1%) 22 (13.4%) 12 (7.3%) 12 (7.3%)
Number of co-existing problems on presentation	0 1-3 4 or more	58 (18.6%) 171 (55%) 82 (26'4%)	39 (18.7%) 113 (54.1%) 57 (27.3%)	34 (20.7%) 84 (51.2%) 46 (28%)
Number of co-existing problems on presentation	None 1 or more	58 (18.6%) 203 (81.4%)	39 (18.7%) 170 (81.3%)	34 (20.7%) 130 (79.3%)
Number of medication prescribed prior to presentation	None 1 or more	60 (19.3%) 251 (80.7%)	40 (19.1%) 169 (80.9%)	32 (19.5%) 132 (80.5%)
Presenting condition	1 chest pain 2 shortness of breath 3 falls 4 collapse 5 palpitations 6 confusion 7 unwell 8 headache 9 diarrhoea and/or vomiting 10 other	59 (19%) 30 (9.6%) 25 (8%) 23 (7.4%) 19 (6.1%) 18 (5.8%) 9 (2.9%) 9 (2.9%) 9 (2.9%) 110 (35.4%)	46 (22%) 23 (11%) 10 (4.8%) 12 (5.7%) 11 (5.3%) 8 (3.8%) 15 (7.2%) 8 (3.8%) 7 (3.3%) 69 (33%)	41 (25%) 19 (11.6%) 5 (3%) 6 (3.7%) 10 (6.1%) 5 (3%) 13 (7.9%) 7 (4.3%) 3 (1.8%) 55 (33.5%)
Presenting condition	1 chest pain 2 other	59 (19%) 252 (81%)	46 (22%) 163 (78%)	41 (25%) 123 (75%)
Medication prescribed by ANP/Junior doctor	1 Yes 2 No	127 (40.8%) 184 (59.2%)	85 (40.7%) 124 (59.3%)	59 (36%) 105 (64%)

Age of patient

When 'age of patient' was re-coded to '17-50 years' and 'over 50 years' a Chi-square test (with Yates' Continuity Correction) indicated a statistically significant association between profession and age of patient (Table 4.20), with patients presenting to junior doctors being older. This supported the findings when continuous data were analysed.

311 cases X^2 (df = 1, n=311) = 7.95, p=0.005, OR 2.17 95% CI 1.29–3.65

209 cases X^2 (df = 1, n= 209) = 13.34, p =<0.001, OR 3.3 95% CI 1.76 – 6.2

164 cases X^2 (df = 1, n=164) = 12.6, p= <0.001, OR 3.96 95% CI 1.87–8.38.

Table 4.20 Age of patients presenting to ANPs and junior doctors

Profession	Sample	17 – 50 years Frequency (%)	Over 50 years Frequency (%)	Total Frequency (%)
ANP	311	51 (33.6%)	101 (66.4%)	152 (100%)
	209	36 (41.9%)	50 (58.1%)	86 (100%)
	164	36(41.9%)	50 (58.1%)	86 (100%)
Junior Doctor	311	30 (18.9%)	129 (81.1%)	159 (100%)
	209	22 (17.9%)	101 (82.1%)	123 (100%)
	164	12 (15.4%)	66 (84.6%)	78 (100%)

Systems examined as categorical variables

On analysis of 'systems examined', as a categorical variable; (two or less, three, four, five or more) the Chi-square test with linear by linear association indicated no statistically significant association between profession and systems examined. X^2 (df=1, n=311) = 0.7, p=0.4. However when the 209 and 164 cases samples were tested, the Chi-square test with linear by linear association indicated a statistically significant association between profession and systems examined, with ANPs examining more systems than junior doctors. (209 cases: X^2 (df=1, n=209) = 4.85, p 0.03, 164 cases: X^2 (df=1, n=164) = 6.56, p=0.01). This was the same as findings from the Mann-Whitney U test of the continuous data.

When the data were collapsed to a bivariate 'none-three systems examined' and 'four or more systems examined', there was no statistically significant difference between professions in any of the samples.

311 cases: X^2 (df=1, n=311)=1.74, p=0.19, OR=1.39, 95% CI=0.89–2.16
209 cases: X^2 (df=1, n=209) = 2.84, p= 0.09, OR 0.58 95% CI 0.32–1.04
164 cases: X^2 (df =1, n=164) = 2.58, p = 0.11, OR 0.56 95% CI 0.29–1.07

Co-existing problems on presentation as categorical variables
When this recoded data were tested with Chi-square test with linear by linear association it indicated a statistically significant association between profession and co-existing problems on presentation with patients presenting to ANPs having significantly less co-existing problems, which supported the Mann-Whitney U analysis of the continuous data.
311 cases X^2 (df=1, n=311) = 5.8, p = 0.02
209 cases X^2 (df=1, n=209) = 4.66, p = 0.03
164 cases X^2 (df=1, n=164) = 501, p = 0.02

When 'number of co-existing problems' was collapsed to 'none' and 'one or more' (Table 4.21), there was again a significant difference between professions in all analyses with patients seen by junior doctors having significantly more co-existing problems.
311 cases: X^2 (df=1, n=311) = 7.11, p=0.008, OR 2.32, 95% CI 1.28–4.20.
209 cases: X^2 (df=1, n=209) = 7.23, p=0.007, OR 2.78 95% CI 1.36–5.71.
164 cases: X^2 (df=1, =164) = 4.78, p=0.03, OR 2.63 95% CI 1.17–5.94.

Table 4.21 Number of co-existing problems – none or one or more

Profession	Sample	No co-existing problems Frequency (%)	1 or more co-existing problems Frequency (%)	Total Frequency (%)
ANP	311	38 (25%)	114 (75%)	152 (100%)
	209	24 (27.9%)	62 (72.1%)	86 (100%)
	164	24 (27.9%)	62 (72.1%)	86 (100%)
Junior doctor	311	20 (12.6%)	139 (87.4%)	159 (100%)
	209	15 (12.2%)	108 (87.8%)	123 (100%)
	164	10 (12.8%)	68 (87.2%)	78 (100%)

Medication prescribed prior to presentation as categorical variable

Medication prescribed prior to presentation was collapsed to 'none' or 'one or more' medication prescribed prior to presentation Chi-square test indicated no statistically significant association between profession and medication prescribed prior to presentation in all samples analysed.

311 cases X^2 (df 1, n=311) = 0, p=1, OR = 0.98, 95% CI = 0.55–1.71

209 cases X^2 (df 1, n=209) = 0, p=0.99, OR 1.07 95% CI 0.53–2.15

164 cases X^2 (df 1, n=164) = 0, p 1, OR 1.03 95% CI 0.48–2.24.

This contrasted with the findings when Mann-Whitney U test was used to analyse the continuous data, when there was a significant difference between professions, with patients presenting to junior doctors having been prescribed more medications prior to presentation.

Presenting condition as categorical variable

Chest pain was the most frequent presenting condition. Therefore 'chest pain' and 'other' were also cross tabulated (Table 4.22) and the Chi-square test with Yates' Continuity Correction showed a statistically significant association between professional group with ANPs seeing more patients presenting with chest pain.

311 cases X^2 (df=1, n=311)=16.79, p= 0.001, OR =3.53, 95% CI=1.89 – 6.59

209 cases X^2 (df=1, n=209)=24.44, p=<0.001, OR= 6.05, 95% CI =2.9–12.63

164 cases X^2 (df=1, n=164)=18.78, p=<0.001, OR=6.32, 95% CI=2.73–16.13

Table 4.22 Presenting condition; 'chest pain' or 'other'

Profession	**Sample**	**Chest pain Frequency (%)**	**Other Frequency (%)**	**Total Frequency (%)**
ANP	311	43 (28.3%)	109 (78.7%)	152 (100%)
	209	34 (39.5%)	52 (60.5 %)	86 (100%)
	164	34 (39.5%)	52 (60.5 %)	86 (100%)
Junior doctor	311	16 (10.1%)	143 (89.9%)	159 (100%)
	209	12 (9.8%)	111 (90.2%)	123 (100%)
	164	7 (9%)	71 (91%)	78 (100%)

Number of medications prescribed by ANP/Junior doctor

The continuous variable 'number of medications prescribed by ANP/Junior doctor' was collapsed to 'YES' or 'NO'. This was cross tabulated (Table 4.23) and the Chi-square test with Yates' Continuity Correction showed a statistically significant association between professional groups with ANPs prescribing less than junior doctors in all sample analyses.

311 cases X^2 (df=1, n=311) = 71.23, p=<0.001, OR=0.11, 95% CI=0.06–0.19

209 cases X^2 (df=1, n=209)= 49.05, p=<0.001, OR=0.08, 95% CI=0.04– 0.18

164 cases X^2 (df=1, n=164) =44.34, p=<0.001, OR=0.08, 95% CI=0.03–0.17

Table 4.23 Medication prescribed by ANP/Junior doctor – 'yes'/'no'

Profession	**Sample**	**Medication prescribed YES Frequency (%)**	**Medication prescribed NO Frequency (%)**	**Total Frequency (%)**
ANP	311	25 (16.4%)	127 (83.6%)	152 (100%)
	209	10 (11.6%)	76 (88.4%)	86 (100%)
	164	10 (11.6%)	76 (88.4%)	86 (100%)
Junior doctor	311	102 (64.2%)	57 (35.8%)	159 (100%)
	209	75 (61%)	48 (39%)	123 (100%)
	164	49 (62.8%)	29 (37.2%)	78 (100%)

Patient gender

120 of the case notes from which data were collected were from males (38.6%), and 191 (61.4%) were female. A Chi square test with Yates Continuity Correction showed no statistically significant association between professional group and gender. X^2 (df=1, n = 311) = 1.44, p = 0.23, OR = 0.73, 95% CI = 0.46 – 1.16. There was also no statistically significant difference between professional groups when the 209 sample and 164 samples were analysed. (209 cases X^2 (df=1, n=209) = 0.56, p = 0.45, OR = 1.29, 95% CI = 0.74 – 2.24, 164 cases X^2 (df =1, n=164) = 1.06, p = 0.3, OR = 1.46 95% CI 0.78 – 2.72).

Area patients referred from

The patients were referred from a variety of sources (Table 4.24) with the majority from General Practitioners (n=170, 54.7% of all referrals), followed by A&E (n=79, 25.4%).

Table 4.24 Areas patients referred from

Area referred from	311 cases Frequency (%)	209 cases Frequency (%)	164 cases Frequency (%)
General Practitioner	170 (54.7%)	126 (60.3%)	37 (22.6%)
Accident and Emergency	79 (25.4%)	74 (35.4%)	120 (73.2%)
Via ambulance	30 (9.6%)	0	2 (1.2%)
Other ward	14 (4.5%)	1 (0.5%)	1 (0.6%)
Self	8 (2.6%)	4 (2%)	0
Acute Medical Unit	3 (1%)	0	0
Outpatients Department	3 (1%)	1 (0.5%)	1 (0.6%)
Out of Hours service	2 (0.6%)	1 (0.5%)	1 (0.6%)
Ophthalmology	1 (0.3%)	1 (0.5%)	1 (0.6%)
Community Hospital	1 (0.3%)	1 (0.5%)	1 (0.6%)
Total	**311**	**209**	**164 (100%)**

When data were examined looking at area of referral in relation to each of the health professionals (Table 4.26), the majority of patients seen by ANPs were referred by GPs (n = 126, 82.9%). The majority of patients seen by junior doctors were referred from A&E (n = 72, 45.3%). However it may be that this was influenced by the way in which local services were set up in relation to patient pathways in this Trust.

Table 4.25 Referred from by profession

Referred from	Sample	ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)
A&E	311	7 (4.6%)	72 (45.3%)	79 (25.4%)
	209	2 (2.3%)	72 (58.5%)	74 (35.4%)
	164	2 (2.3%)	35 (44.9%)	37 (22.6%)
GP	311	126 (82.9%)	44 (27.7%)	170 (54.7%)
	209	83 (96.5%)	43 (35%)	126 (60.3%)
	164	83 (96.5%)	37 (47.4%)	120 (73.2%)
Via ambulance	311	0	30 (18.9%)	30 (9.6%)
	209	0	2 (1.6%)	2 (1%)
	164	0	2 (2.6%)	2 (1.2%)
Self	311	0	8 (5%)	8 (2.6%)
	209	0	4 (3.2%)	4 (2%)
	164	0	0	
Ophthalmology	311	1 (0.7%)	0 (0)	1 (0.3%)
	209	1 (1.2%)	0	1 (0.5%)
		1 (1.2%)		1 (0.6%)
Ward	311	13 (8.6%)	31 (19.5%)	44 (14.1%)
	209	0	1 (0.8%)	1 (0.5%)
	164	0	1 (1.3%)	1 (0.6%)
Acute Medical Unit	311	3 (2%)	0 (0)	3 (1%)
OPD	311	2 (1.3%)	1 (0.6%)	3 (1%)
	209	0	1 (0.8%)	1 (0.5%)
	164	0		
Out of hours service	311	0 (0)	2 (1.3%)	2 (0.6%)
	209	0	1 (0.8%)	1 (0.5%)
	164	0	1 (1.3%)	1 (0.6%)
Community hospital	311	0 (0)	1 (0.6%)	1 (0.3%)
	209	0	1 (0.8%)	1 (0.5%)
	164	0	1 (1.3%)	1 (0.6%)

When the two most common referral sources; GP and A&E, were cross tabulated (Table 4.26) the difference between the two professions was statistically significant in all samples. Junior doctors saw less patients referred from GPs and ANPs saw less patients referred from A&E.

311 cases X2 (df=1, n=249) =89.7, p =<0.001, OR 0.03, 95% CI 0.015–0.08

209 cases X^2 (d =1, n=200) =73.56, p=<0.001, OR 0.01, 95% CI 0.003– 0.06

164 cases X^2 (df=1, n=157)=43.78, p=<0.001, OR=0.02, 95% CI 0.006–0.11

Table 4.26 Referral source GP and A&E only

Referred from	Sample	ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)
A&E	311	7 (5.3%)	72 (62.1%)	79 (31.7%)
	209	2 (2.4%)	72 (62.6%)	74 (37%)
	164	2 (2.4%)	35 (48.6%)	37 (23.6%)
GP	311	126 (94.7%)	44 (37.9%)	170 (68.3%)
	209	83 (97.6%)	43 (37.4%)	126 (63%)
	164	83 (97.6%)	37 (51.4%)	120 (76.4%)

When referral data source was collapsed to 'GP' and 'other' (Table 4.27) Chi square test with Yates Continuity Correction showed a statistically significant association between professional group and GP referral or other referral, with ANPs seeing more GP referrals in all samples.

311 cases X^2(df1, n=311)=93.41, p=<0.001, OR=12.67, 95% CI=7.33–21.88

209 cases X^2(df1, n=209)=77.54, p=<0.001, OR=51.47, 95% CI=15.35–172.62

164 cases X^2(df1, n=164) =47.71, p=<0.001, OR=30.66, 95% CI=8.92–105.37.

Table 4.27 Referral source; GP or other

Referred from	Sample	ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)
GP	311	126 (82.9%)	44 (27.7%)	170 (54.7%)
	209	83 (96.5%)	43 (35%)	126 (60.3%)
	164	83 (96.5%)	37 (47.4%)	120 (73.2%)
other	311	26 (17.1%)	115 (72.3%)	141 (45.3%)
	209	3 (3.5%)	80 (65%)	83 (39.7%)
	164	3 (3.5%)	41 (52.6%)	44 (26.8%)

Referral source and complexity of patients, in terms of number of co-existing problems and number of medications prescribed prior to presentation was examined and Mann Whitney U test was carried out. As the majority of cases were either from a GP or via A&E (n=249), these cases were analysed using Mann Whitney U. No statistical significance was found in 'number of coexisting problems' (U = 6039.5, z = -1.3, p = 0.19) and 'number of medications prescribed prior to presentation' (U = 5775, z = -1.79, p = 0.73) between GP referrals and referrals via A&E. The 209 cases sample and 164 cases sample were also analysed and again no statistically significance was found between referral source and complexity.

Day of presentation

Data were examined regarding day of presentation. Findings are presented in Table 4.28.

Table 4.28 Day of presentation

Day of presentation	ANP Frequency (%)	Junior doctor Frequency (%)	Total Frequency (%)
Weekday	146 (96.1%	107 (67.3%)	253 (81.4%)
Saturday	1 (0.7%)	28 (17.6%)	29 (9.3%)
Sunday	4 (2.6%)	23 (14.5%)	27 (8.7%)
Bank Holiday	1 (0.7%)	1 (0.6%)	2 (0.6%)
Total	152 (100%)	159 (100%)	311 (100%)

Data were further collapsed to weekday or weekend/bank holiday and shown in Table 4.29.

Table 4.29 Day of presentation; weekday/ weekend

Day of presentation	Sample	ANP n (%)	Junior doctor n (%)	Total n (%)
Weekday	311	146 (96.1%)	107 (67.3%)	253 (81.4%)
	AMA	86 (100%)	78 (63.4%)	164 (78.5%)
Weekend/ Bank holiday	311	6 (3.9%)	52 (32.7%)	58 (18.6%)
	AMA	0	45 (36.6%)	45 (21.5%)

A Chi square test with Yates Continuity Correction showed a statistically significant association between professional group and day of presentation, with junior doctors seeing more patients at weekends/Bank holiday. X^2 (df=1, n=311) = 40.48, p = <0.001, OR = 11.83, 95% CI = 4.9 – 28.54. None of the presentations to ANPs in AMA were seen outside weekdays.

A Mann-Whitney U test revealed a statistically significant difference in the age of patients and weekday or weekend presentation, with older patients presenting at the weekend. U = 5885.5, z = -2.35, p = < 0.02

Investigations ordered

Overall data for investigations ordered on presentation are shown in Table 4.30.

Table 4.30 Investigations ordered

Investigation	Yes Frequency (%)	No Frequency (%)	Previously done Frequency (%)
Haematology	277 (89.1%)	30 (9.6%)	4 (1.3%)
Chemical pathology	271 (89.1%)	35 (11.3%)	5 (1.6%)
Microbiology	68 (21.9%)	243 (78.1%)	0
X-Ray	201 (64.6%)	105 (33.8%)	5 (1.6%)
ECG	244 (78.5%)	62 (19.9%)	5 (1.6%)

Investigations ordered by either ANPs or junior doctors on presentation which did not fall into haematology, chemical pathology, microbiology, X-Ray or ECG categories are shown in Table 4.31.

Table 4.31 Additional investigations by type

Investigation	Number ordered
Exercise treadmill (ETT)	21
Arterial blood gases (ABGs)	18
Computerised tomography (CT)	16
24 hour electrocardiogram (ECG)	15
Echocardiography (ECHO)	15
Urine dipstick	13
Doppler	4
Ultrasound	4
Magnetic resonance imaging (MRI)	3
Oesophagogastroduodenoscopy (OGD)	3
Angiogram	2
Peak flow	2
24 hour urine collection	1
Bladder scan	1
Blood cultures	1
Myocardial perfusion	1
Cardiology referral	1

Investigations ordered data were further collapsed with ‘previously ordered’ collapsed with ‘no’. Each investigation type ordered by health professional group were analysed using Chi-square tests and results are seen in Table 4.32.

Table 4.32 Investigations ordered collapsed to 'Yes' or 'No'

Investigation	Sample	ANP Yes Frequency (%)	Doctor Yes Frequency (%)	Odds ratio (95% CI)	p value	X^2 (df)
Haematology ordered	311	120 (79%)	157 (98.7%)	0.05 (0.01 - 0.20)	<0.001	29.27 (1)
	209	83 (96.5%)	121 (98.4%)	0.46 (0.75 – 2.8)	0.41*	
	164	83 (96.5%)	77 (98.7%)	0.36 (0.04–3.53)	0.62* Fishers Exact test	0.17 (1)
Chemical pathology ordered	311	120 (79%)	155 (97.5%)	0.1 (0.03-0.28)	<0.001	24.31 (1)
	209	83 (96.5%)	120 (97.6%)	0.69 (0.14–3.51)	0.98	0.001 (1)
	164	83 (96.5%)	76 (97.4%)	0.73 (0.12–4.48)	1* Fishers Exact test	0 (1)
Microbiology ordered	311	13 (8.5%)	55 (34.6%)	0.18 (0.09-0.34)	<0.001	29.33 (1)
	209	5 (5.8%)	49 (39.8%)	0.09 (0.03-0.25)	<0.001	28.83 (1)
	164	5 (5.8%)	30 (38.5%)	0.1 (0.04–0.27)	<0.001	24.06 (1)
X-Ray ordered	311	70 (46%)	131 (82.4%)	0.18 (0.11–0.31)	<0.001	43.31 (1)
	209	65 (75.6%)	100 (81.3%)	0.71 (0.37–1.39)	0.41	0.68 (1)
	164	65 (75.6%)	64 (82.1%)	0.68 (0.32 –1.45)	0.41	0.67 (1)
ECG ordered	311	117/152 (77%)	127/159 (79.9%)	0.84 (0.49 -1.45)	0.63	0.23 (1)
	209	75 (87.2%)	97 (78.9%)	1.83 (0.85 –3.93)	0.17	1.88 (1)
	164	75 (87.2%)	63 (80.8%)	1.62 (0.7 – 3.79)	0.36	0.83 (1)

Table 4.33 shows that when 'investigations ordered' were collapsed to 'yes' and 'no', when all 311 cases were analysed there were statistically significant associations between professional groups and whether haematology, chemical pathology, microbiology and X-Rays were ordered, with ANPs ordering less in all cases. There was no significant difference between professionals in number of ECGs ordered. However when analysing AMA cases only, only microbiology had a statistically significant association with

professions, with ANPs ordering less microbiology investigations than junior doctors.

Data were collected in relation to any additional investigations ordered by the senior at senior review (Table 4.33).

Table 4.33 Additional investigations ordered by senior at senior review

Sample	Y/N	ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)
311	Yes	25 (16.4%)	45 (28.3%)	70 (22.5%)
	No	127 (83.6%)	114 (71.7%)	241 (77.%5)
209	Yes	23 (26.7%)	29 (23.6%)	52 (24.9%)
	No	63 (76.4%)	94 (76.4%)	157 (75.1%)
164	Yes	23 (26.7%)	22 (28.2%)	45 (27.4%)
	No	63 (76.4%)	56 (71.8%	119 (72.6%)

The Chi-square test for independence with Yates' Continuity Correction indicated a statistically significant association between profession and additional investigations added at senior review. The senior doctor added investigations to less ANP cases than junior doctor cases. X^2 (df=1, n=311) = 5.6, p = 0.02, OR 0.5, 95% CI 0.29 – 0.87.

However, this was not found on analysing the AMA cases samples, where no statistically significant difference between professions was found.
209 cases: (X^2 (df1, n=209) = 0.13, p=0.72, OR 1.18, 95% CI 0.63 – 2.23)
164 cases: X^2 (df 1, n=164) = 0.001, p=0.97, OR 0.93 (95% CI 0.47 – 1.85)

Investigations added at senior review

Table 4.35 indicates the investigations that were ordered by the senior at senior review.

Table 4.34 Investigations added by senior doctor

Investigation Type	ANPs	Junior doctors	Total ordered
	Number ordered	Number ordered	
Echocardiography (ECHO)	10	6	16
Computer tomography scan (CT)	5	10	15
Blood cultures	3	3	6
Midstream specimen of urine (MSU)	3	0	3
24 hr electrocardiogram (ECG)	2	3	5
X-Ray	2	3	5
Oesophagogastroduodenoscopy (OGD)	0	3	3
Tilt test	0	2	2
Ultrasound scan	0	2	2
Fasting bloods	2	0	2
Thyroid function tests (TFT)	1	0	1
C-peptide	1	0	1
D-dimer	1	1	2
Carotid Doppler	1	2	3
CT pulmonary angiogram (CTPA)	1	1	2
Erythrocyte sedimentation rate (ESR)	1	0	1
Throat swab	1	0	1
Repeat Troponin T	1	0	1
Sputum culture and sensitivity	1	0	1
Treadmill stress test (TMET)	1	2	3
Pelvic scan	1	0	1
Viral titres	1	0	1
Insulin levels	1	0	1
Blood sugar levels (BM)	0	2	2
Urine dipstick	0	1	1
Blood alcohol levels	0	1	1
Arterial blood gases (ABG)	0	1	1
Bone profile	0	1	1
Electrocardiogram (ECG)	0	1	1
Colonoscopy	0	1	1
Electroencephalogram (EEG)	0	1	1
B12 folate levels	0	1	1
Blood group and X match	0	1	1
Magnetic resonance imaging (MRI)	0	1	1
Sigmoidoscopy	0	1	1
Total	40*	52*	92

*more than one investigation ordered for some patients.

Only one patient had no investigations at all ordered - this patient was initially seen by a junior doctor, and the senior doctor, on review, ordered haematology and chemical pathology investigations.

Medication agreed at senior review

Data from cases were analysed with respect to whether the medication prescribed by ANPs and junior doctors (not including medication prescribed prior to presentation) was agreed by the senior at senior review, and the results are shown below (Table 4.35).

Table 4.35 Medication agreed at senior review

Medication agreed at review (not including medication prior to admission/presentation	**311 cases Frequency (%)**	**209 cases Frequency (%)**	**164 cases Frequency (%)**
Yes, new medication prescribed agreed	150 (48.2%)	104 (49.8%)	66 (40.2%)
No, new medication prescribed disagreed	63 (20.3%)	58 (27.8%)	54 (32.9%)
None ordered by junior or senior	98 (31.5%)	47 (22.5%)	44 (26.8%)
Total	311 (100%)	209 (100%)	164 (100%)

The data were then cross tabulated by profession. In 66 cases seen by ANPs medication was prescribed (43.4%). Of those, 35 cases were agreed by the senior at review (53%), and in 31 cases the senior disagreed with the medication prescribed at review (47%). In 86 (56.6%) cases no medication was prescribed by the senior doctor or ANP.

Medication was prescribed by the junior doctor in 147 cases (92.5%), in 12 cases (7.5%) no medication was ordered by the senior doctor or junior doctor. Of the 147 cases where medication was prescribed, the senior at senior review agreed with 111 cases (75.5%), and disagreed with 36 cases (24.5%). The cross tabulation Table 4.36 shows those cases where medication was prescribed by the ANP/junior doctor, the number agreed and disagreed by senior at senior review by profession.

Table 4.36 Medication prescribed by ANP/junior doctor at presentation and agreed/ disagreed by senior at senior review

Agreed Y/N	**Sample**	**ANP Frequency (%)**	**Junior doctor Frequency (%)**	**Total Frequency (%)**
YES	311	35 (53%)	111 (75.5%)	146 (68.5%)
	209	20 (40%)	84 (75%)	104 (64.2%)
	164	20 (40%)	46 (65.7%)	66 (55%)
NO	311	31(47%)	36 (24.5%)	67 (31.5%)
	209	30 (60%)	28 (25%)	58 (35.8%)
	164	30 (60%)	24 (34.3%)	54 (45%)

The Chi-square test with Yates' Continuity Correction was carried out and indicated a statistically significant association between ANPs and junior doctors in terms of the cases where medication was prescribed by the ANP/junior doctor and was agreed at senior review. Senior doctors agreed with less prescribing by ANPs than junior doctors.

311 cases: X^2 (df1, n=213)=9.66, p= 0.002, OR=0.37, 95% CI=0.2-0.68

209 cases: X^2 (df1, n=162) = 16.93, p=<0.001, OR=0.22, 95% CI=0.11-0.45

164 cases X^2 (1, n=162) = 6.79, p=0.009, OR=0.35, 95% CI=0.16-0.74

The variable 'none ordered by junior or senior' was then re categorized as 'yes' as it could be assumed that the senior agreed that no medication needed to be prescribed. Table 4.37 shows the frequency and percent when the variable was recoded to a binary variable Y/N, with 'none ordered' re-coded to 'yes'.

Table 4.37 Medication prescribed by ANP/junior doctor at presentation agreed and disagreed by senior at senior review when none ordered = agreed

Agreed Y/N	**Sample**	**ANP Frequency (%)**	**Junior doctor Frequency (%)**	**Total Frequency (%)**
YES (inc. none ordered)	311	121 (79.6%)	123 (77.4%)	244 (78.5%)
	209	56 (65.1%)	95 (77.2%)	151 (72.2%)
	164	56 (65.1%)	54 (69.2%)	110 (67.1%)
NO	311	31 (20.4%)	36 (22.6%)	67 (21.5%)
	209	30 (34.9%)	28 (22.8%)	58 (27.8%)
	164	30 (34.9%)	24 (30.8%)	54 (32.9%)

The Chi-square test with Yates' Continuity Correction was then carried out and indicated no statistically significant association between ANPs and doctors in terms of medication agreed at senior review.

311 cases: X^2 (df=1, n=311) = 0.12, p = 0.73, OR = 1.14 95% CI 0.67 – 1.16

209 cases: X^2 (df=1, n=209) = 3.13, p = 0.08, OR = 0.55 95% CI 0.3 – 1.01

164 cases X^2 (df=1, n = 164) = 0.15, p = 0.69, OR 0.83 95% CI=0.43 -1.6

Amendments to medication prescribed by senior at senior review

Data were collected from cases regarding any amendments made by the senior at senior review to medication prescribed by ANPs and doctors on presentation (Table 4.38).

Table 4.38 Amendments to medication at senior review.

Profession	**Medication added Frequency (%)**	**Medication removed Frequency (%)**	**Dose increased Frequency (%)**	**Dose decreased Frequency (%)**	**Total medication changes Frequency (%)**	**No changes made Frequency (%)**	**Total**
ANP	31 (20.4%)	1 (0.7%)+ 1 (0.7%) prescribed prior to presentation	0 (0)	0 (0)	33 (21.7%)	119 (78.3%)	152 (100%)
Doctor	32 (20.1%)	14 (8.8%) + 3 (1.9%) prescribed prior to presentation	5 (3.1%)	3 (1.9%)	57 (35.9%)	102(64.1%)	159 (100%)
Total	63 (20.3%)	15 (4.8%)+ 4 (1.3%) prescribed prior to presentation	5 (1.6%)	3 (1%)	90 (28.9%)	221 (71.1%)	311 (100%)

In 31 cases (20.4% of all cases seen by ANP) seen by ANPs the senior added medication at review, and in 32 cases (20.1% of all cases seen by doctors) seen by doctors the senior added medication at senior review. When a Chi-square test for independence was carried out with Yates Continuity Correction, it showed no statistically significant difference of medication added at senior review between ANPs and doctors in the 311 cases sample and 164 cases sample:

311 cases: X^2 (df=1, n=311) = 0 .00, p =1.0, OR = 1.02, 95% CI = 0.59 - 1.77

164 cases: X^2 (df=1, n=164) = 0.56, p= 0.45, OR = 1.36, 95% CI = 0.7 – 2.65

However when the 209 cases sample was analysed, it showed a statistically significant difference of medication added at senior review between ANPs and doctors, with the senior doctors at review adding more medications in the ANP cases. X^2 (df=1, n=209) = 6.18, p=0.01, OR=2.33, 95% CI=1.24 – 4.39. Types of medication added by the senior doctor are shown in appendix ix.

Medication removed at senior review

Medication was removed by the senior doctor in 19 cases, 2 (1.3%) from patients seen by ANPs and 17 (10.8%) from patients seen by junior doctors. The expectation that 80% of cells had an expected frequency >5 was not fulfilled, therefore the χ^2 test could not be used (Altman 1991). Consequently, Fisher's Exact Test was used to explain statistical significance. This test confirmed that this relationship was statistically significant (Exact sig. 2-sided = 0.001, df=1, OR 0.68, 95% CI 0.01 - 0.52), with senior doctors removing less medication prescribed by ANPs than junior doctors.

In four cases (one = ANP, three = junior doctor) the medication removed by the senior doctor was medication which had been prescribed prior to admission, not by the admitting health professional. When these cases were not included in the analysis the expectation that 80% of cells had an expected frequency >5 again was not fulfilled, therefore the χ^2 test could not be used (Altman, 1991). Consequently, Fisher's Exact Test was used to explain statistical significance. This test also confirmed that senior doctors removed statistically significantly less medication prescribed by ANPs than junior doctors (Exact sig. 2-sided = 0.001, df 1, OR = 0.07, 95% CI = 0.01 – 0.52).

Changes to doses

The dose of medication prescribed was increased in five cases by the senior doctor. All the cases were those seen by junior doctors. The dose of medication prescribed was reduced in 3 cases by the senior doctor, all of which presented to junior doctors.

Primary Diagnosis Agreed at Senior Review

Data collected for this variable are shown in Table 4.39.

Table 4.39 Primary diagnosis agreed/disagreed by senior at senior review

Primary Diagnosis agreed at senior review	**Sample**	**ANPs Frequency (%)**	**Junior Doctors Frequency (%)**	**Total Frequency (%)**
No diagnosis made	311	5 (3.3%)	4 (2.5%)	9 (2.9%)
	209	0	4 (3.3%)	4 (1.9%)
	164	0	3 (3.8%)	3 (1.8%)
Yes	311	110 (72.4%)	107 (67.3%)	217 (69.8%)
	209	51 (59.3%)(	87 (70.7%)	138 (66%)
	164	51 (59.3%)	58 (74.4%)	109 (66.5%)
No	311	33 (21.7%)	44 (27.7%)	77 (24.8%)
	209	31 (36%)	28 (22.8%)	59 (28.2%)
	164	31 (36%)	16 (20.5%)	47 (28.7%)
Uncertain	311	1 (0.7%)	1 (0.7%)	2 (0.6%)
	209	1 (1.2%)	1 (0.8%)	2 (1%)
	164	1 (1.2%)	0	1 (0.6%)
Not mentioned	311	3 (1.9%)	3 (1.8%)	6 (1.9%)
	209	3 (3.5%)	3 (2.4%)	6 (2.9%)
	164	3 (3.5%)	1 (0.6%)	4 (2.4%)

In cases presenting to ANPs (n=152) 110 (72.4%) primary diagnoses were agreed by the senior doctor at senior review, and 21.7% (n=33) were not agreed. In cases presenting to junior doctors (n=159), 107 (67.3%) were agreed by the senior doctor and 44 (27.7%) were not agreed.

When 'no diagnosis made', 'uncertain' and 'not mentioned' were removed from analysis, leaving only 'yes' and 'no' (Table 4.40) a Chi-square test for independence, with Yates' Continuity Correction, indicated no statistically significant difference in diagnosis agreed at senior review between ANPs and doctors (X^2 (df=1, n=294) = 1.1, p = 0.29, OR = 1.37 95% CI 0.81 – 2.32).

However there was a small statistically significant difference in diagnosis agreed at senior review in the AMA cases with senior doctors agreeing with less ANPs' diagnoses.
209 cases: X^2 (df=1, n=197) = 3.52, p = 0.06, OR = 0.53 95% CI 0.29 – 0.98
164 cases: X^2 (df=1, n=156) = 4.1, p = 0.04, OR 0.45 95%CI 0.22 – 0.92.

Table 4.40 Primary diagnosis agreed – yes/no

Primary diagnosis agreed by senior doctor	Sample	ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)
Yes	294/311	110 (76.9%)	107 (70.9%)	217 (73.8%)
	197/209	51 (62.2%)	87 (75.7%)	138 (70.1%)
	156/164	51 (62.2%)	58 (78.4%)	109 (69.9%)
No	294/311	33 (23.1%)	44 (29.1%)	77 (26.2 %)
	197/209	31 (37.8%)	28 (24.3%)	59 (29.9%)
	156/164	31 (37.8%)	16 (21.6%)	47 (30.1%)

If an assumption is made that if the senior doctor did not mention the primary diagnosis at senior review, primary diagnosis was not agreed, and therefore 'not mentioned' recoded as 'no' the following cross tabulation was produced (Table 4.41).

Table 4.41 Primary diagnosis agreed – yes/no, when 'not mentioned' = 'no'

Primary diagnosis agreed by senior doctor	Sample	ANP Frequency (%)	Junior doctor Frequency (%)	Total Frequency (%)
Yes	300/311	110 (74.3%)	107 (69.5%)	217 (72.3%)
	203/209	51 (60%)	87 (73.7%)	138 (68%)
	160/164	51 (60%)	58 (77.3%)	109 (68.1%)
No	300/311	36 (24.7%)	47 (30.5%)	83 (27.7%)
	203/209	34 (40%)	31 (26.3%)	65 (32%)
	160/164	34 (40%)	17 (22.7%)	51 (31.9%)

A Chi-square test for independence, with Yates Continuity Correction, indicated no significant difference in diagnosis agreed at senior review between ANPs and doctors. X^2 (df=1, n=300) = 1.01, p = 0.32, OR = 1.34 95% CI 0.81 – 2.23. However when the AMA cases were analysed, a Chi-square test for independence, with Yates Continuity Correction, again indicated a small significant difference in diagnosis agreed at senior review between ANPs and doctors. Less primary diagnoses made by ANPs were agreed by the senior doctor at the senior review.

209 cases: X^2 (df=1, n=203) = 3.67, p = 0.06 OR 0.53 95% CI 0.29 – 0.97

164 cases: X^2 (df=1, n=160) = 4.74, p = 0.03 OR 0.44 95% CI 0.22 – 0.88

Second Diagnosis

Data regarding second diagnosis made are shown in Table 4.42.

Table 4.42 Second diagnosis congruence at senior review

Second Diagnosis agreed at senior review	Sample	ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)
No second diagnosis made	311	83 (54.6%)	83 (52.2%)	166 (53.4%)
	209	22 (25.6%)	65 (52.8%)	87 (41.6%)
	164	22 (25.6%)	38 (48.7%)	60 (36.6%)
Yes	311	28 (18.4%)	31 (19.5%)	59 (19%)
	209	23 (26.7%)	26 (21.1 %)	49 (23.4%)
	164	23 (26.7%)	20 (25.6%)	43 (26.2%)
No	311	12 (7.9%)	11 (6.9%)	23 (7.4%)
	209	12 (14%)	8 (6.6%)	20 (9.6%)
	164	12 (14%)	5 (6.4%)	17 (10.4%)
Uncertain	311	1 (.7%)	1 (.6%)	2 (0.6%)
	209	1 (1.2%)	1 (0.8%)	2 (1%)
	164	1 (1.2%)	0	1 (0.6%)
Second diagnosis made by senior but not junior	311	2 (1.3%)	3 (1.9%)	5 (1.6%)
	209	2 (2.3%)	2 (1.6%)	4 (1.9%)
	164	2 (2.3%)	1 (1.3%)	3 (1.8%)
Not mentioned	311	26 (17.1%)	30 (18.9%)	56 (18%)
	209	26 (30.2%)	21 (17.1%)	47 (22.5%)
	164	26 (30.2%)	14 (17.9%)	40 (24.4%)

When 'no second diagnosis made', 'uncertain', 'not mentioned' and 'second diagnosis made by senior but not junior' are removed from analysis, leaving 'yes' and 'no' categories (Table 4.43) a Chi-square test for independence, with Yates Continuity Correction, indicated no significant difference in diagnosis agreed by the senior doctor between ANPs and doctors.

311 cases: X^2 (df=1, n=82) = 0.2, p = 0.89, OR = 0.83 95% CI 0.32 – 2.17

209 cases: X^2 (df =1, n=69) = 0.52, p = 0.47 OR 0.59 95% CI 0.21 – 1.7

164 cases: X^2 (df =1, n=69) = 0.52, p = 0.47 OR 0.59 95% CI 0.21 – 1.7

Table 4.43 Second diagnosis agreed, yes/no

Second Diagnosis agreed at senior review	Sample	ANP frequency (%)	Doctor frequency (%)	Total frequency (%)
Yes	82/311	28 (70%)	31 (73.8%)	59 (72%)
	69/209	23 (65.7%)	26 (76.5%)	49 (71%)
	164	23 (65.7%)	26 (76.5%)	49 (71%)
No	311	12 (30%)	11 (26.2%)	23 (28%)
	209	12 (34.3%)	8 (23.5%)	20 (29%)
	164	12 (34.3%)	8 (23.5%)	20 (29%)

Third Diagnosis

A third diagnosis was made in 20 cases seen by ANPs (13.1%) and 21 cases seen by doctors (13.2%). Of these third diagnoses, the senior doctor agreed with one made by ANPs and one made by junior doctors, and did not agree with nine third diagnoses made by ANPs and five made by junior doctors. In two cases where the senior disagreed with the third diagnosis, it was following return of test results which were able to exclude the third diagnosis.

In 10 of the cases where the ANP made a third diagnosis, and 15 of the cases where the junior doctor made a third diagnosis, this was not mentioned by the senior at senior review. In three cases (all junior doctor cases) the senior doctor made a third diagnosis at review when the junior doctor hadn't.

Fourth diagnosis

In 305 of the cases, no fourth diagnosis was made (ANP n=150, junior doctor n=155). Of the remaining six cases where a fourth diagnosis was made, ANPs made two, and junior doctors made four. In five cases where a fourth diagnosis was made (ANP n=2, doctor n=3) their fourth diagnosis was not mentioned by the senior doctor at review. In the remaining one case seen by a junior doctor, their fourth diagnosis was agreed by the senior doctor. No statistical analysis was made for third and fourth diagnoses as numbers were small.

Up to four provisional diagnoses were made by the ANPs and junior doctors. Data were examined to assess if one of the professions made more provisional diagnoses than the other. Chi-square tests for independence, with Yates' Continuity Correction indicated no significant difference in the number of second, third or fourth diagnoses made by the two professions.

However on analysis of the AMA cases only a Chi-square test for independence, with Yates' Continuity Correction, indicated a statistically significant difference between professions in making a second diagnosis, with junior doctors making less second diagnoses.

209 cases: X^2 (df 1, n=209)=13.47, p=<0.001, OR=0.32, 95% CI=0.18– 0.58
164 cases: X^2 (df 1, n=164) = 7.53, p=0.006, OR=0.39, 95% CI = 0.2–0.74.

Any diagnoses disagreed

Disagreement in diagnosis can be clinically important. Therefore a variable was created to indicate if any diagnoses had been disagreed for each case. The SPSS 'count' syntax was used to create a variable with the number of disagreed diagnoses. This variable was recoded to a binary variable, 'any diagnosis disagreed Y/N and results shown in Table 4.44.

Table 4.44 Any diagnosis disagreed

Any diagnosis disagreed	Sample	ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)
No diagnoses disagreed	311	114 (75%)	112 (70.4%)	226 (72.7%)
	209	50 (58.1%)	92 (74.8%)	142 (67.9%)
	164	50 (58.1%)	60 (76.9%)	110 (67.1%)
One or more diagnoses disagreed	311	38 (25%)	47 (29.6%)	85 (27.3%)
	209	36 (41.9%)	31 (25.2%)	67 (32.1%)
	164	36 (41.9%)	18 (23.1%)	54 (32.9%)

A Chi-square test for independence, with Yates' Continuity Correction, indicated no significant difference in any diagnosis disagreed at senior review between ANPs and doctors. X^2 (df 1, n=311) = 0.6, p = 0.44, OR = 1.26, 95% CI = 0.76 – 2.08.

In contrast, when the AMA cases only were analysed, a Chi-square test for independence, with Yates' Continuity Correction, indicated a statistically significant difference in any diagnosis disagreed at senior review between ANPs and doctors, with senior doctors disagreeing with less junior doctors' diagnoses.
209 cases: X^2 (df =1, n=209) = 5.71, p=0.02, OR=0.47, 95% CI = 0.26–0.85
164 cases: X^2 (df=1, n=164) = 5.71, p=0.02, OR=0.42, 95% CI = 0.21 – 0.82.

Clinical Management Plan

Data were collected as to whether the clinical management plan made by the ANP or junior doctor was agreed by the senior doctor at review. With regard to categorisation an element of clinical judgement was required in relation to how many additions/changes were made, as clinical importance also had to be considered. Examples of how data were categorised as 'yes', 'no' or 'augmented' are given below.

- *Example 1: diagnosis not agreed by senior doctor. Three additional medications prescribed by the senior doctor at review, 'clinical management plan agreed?' categorised as 'no'.*
- *Example 2: Senior doctor also referred patient to cardiology clinic; 'clinical management plan agreed?' categorised as 'augmented'.*
- *Example 3: Senior doctor ordered Nil by Mouth (NBM), and ordered a mid-stream specimen of urine for culture and sensitivity, and an OGD; 'clinical management plan agreed?' categorised as 'no'.*
- *Example 4: Senior doctor ordered thyroid function test; 'clinical management plan agreed?' categorised as 'augmented'.*

In all 311 cases a clinical management plan was documented. Data for senior doctor congruence with the clinical management plans are shown in Table 4.45.

Table 4.45 Clinical management plan agreed by profession

Clinical management plan agreed	Sample	ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)
Yes	311	101 (66.4%)	81 (50.9%)	182 (58.5%)
	209	37 (43%)	72 (58.5%)	109 (52.2%)
	164	37 (43%)	42 (53.8%)	79 (48.2%)
Augmented	311	40 (26.3%)	59 (37.1%)	99 (31.8%)
	209	39 (45.3%)	37 (30.1%)	76 (36.4%)
	164	39 (44.2%)	26 (33.3%)	65 (39.6%)
No	311	11 (7.2%)	19 (11.9%)	30 (9.6%)
	209	10 (11.6%)	14 (11.4%)	24 (11.5%)
	164	10 (11.6%)	10 (12.8%)	20 (12.2%)

Clinical management plans were agreed by the senior doctor at review in 66.4% of cases seen by ANPs (n=101) and 50.9% of cases seen by junior doctors (n=81). 26.3% (n=40) of cases seen by ANPs had the management plan augmented by the senior at senior review, and 37.1% (n=59) of cases seen by junior doctors had the management plan augmented by the senior at senior review. In 7.2% of cases seen by ANPs (n=11) the management plan was not agreed by the senior doctor, and in 11.9% of cases seen by junior doctors (n=19) the management plan was not agreed by the senior at senior review (Figure 4.5).

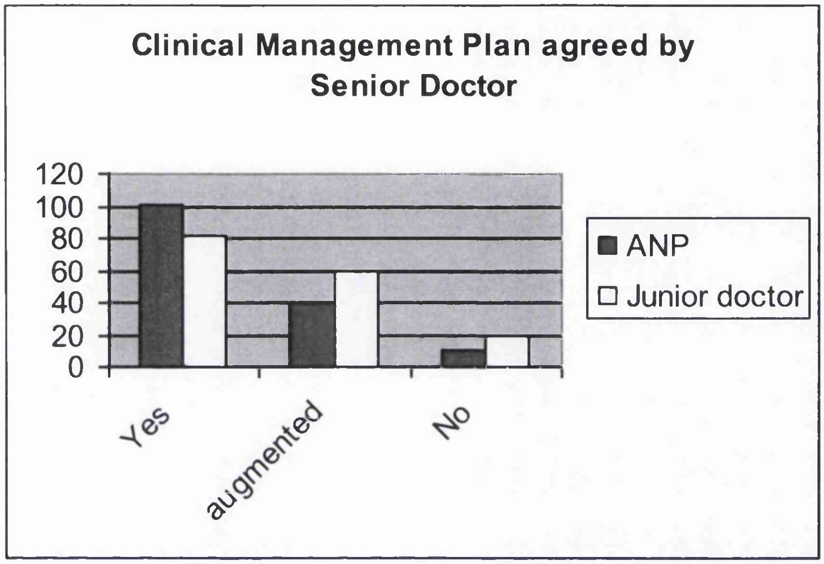


Figure 4.5 Clinical management plan agreed at senior doctor review

A Chi-square test for independence for linear by linear association indicated a significant difference between the two professions of clinical management plan agreed by the senior doctor, with senior doctors agreeing with more ANP clinical management plans than junior doctors. X^2 (df=1, n=311) = 7.15, p=0.007. In contrast when analysing the AMA cases only, there was no statistically significant difference between professions.

209 cases: X^2 (df=1, n=209) = 2.66, p=0.1

164 cases: X^2 (df=1, n=164) = 0.79, p=0.37

Clinical Management Plan agreed, Yes/No only

When only the 'yes' and 'no' categories were included in analysis (n=212) the senior doctor disagreed with 11 ANP cases (9.8%) and 19 junior doctor cases (19%) Chi-square test for independence (with Yates' Continuity Correction) indicated no significant difference between the two professions.

311 cases: X^2 (df =1, n=212) = 2.95, p=0.86, OR = 2.15, 95% CI 0.97 – 4.78

209 cases: X^2 (df=1, n=133) = 0.23, p=0.63 OR 0.72 95% CI 0.29 – 1.78.
164 cases: X^2 (df=1, n=99) = 0, p=1 OR 0.88 95% CI 0.33 – 2.35.

Augmented category

It may be considered that if the senior doctor added to the clinical management plan s/he *did not* agree or *did* agree with the plan made by the ANP/junior doctor. Therefore 'augmented' was collapsed with 'no' and was also collapsed with 'yes' and data are presented in Table 4.46.

Table 4.46 Frequency of clinical management plan agreed /disagreed when augmented collapsed with yes/no

Category	Sample	Augmented collapsed with 'no'			Augmented collapsed with 'yes'		
		ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)	ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)
Yes plan agreed	311	101 (66.4%)	81 (50.9%)	182 (58.5%)	141 (92.8%)	140 (88.1%)	281 (90.4%)
	209	37 (43%)	72 (58.5%)	109 (52.2%)	76 (88.4%)	109 (88.6%)	185 (88.5%)
	164	37 (43%)	42 (53.8%)	79 (48.2%)	76 (88.4%)	68 (87.2%)	144 (87.8%)
no plan not agreed	311	51 (33.6%)	78 (49.1%)	129 (41.5%)	11 (7.2%)	19 (11.9%)	30 (9.6%)
	209	49 (57%)	51 (41.5%)	100 (47.8%)	10 (11.6%)	14 (11.4%)	24 (11.5%)
	164	49 (57%)	36 (46.2%)	85 (51.8%)	10 (11.6%)	10 (12.8%)	20 (12.2%)

When 'augmented' was collapsed with 'no' a Chi-square test for independence (with Yates' Continuity Correction) indicated a statistically significant difference between the two professions in that the senior doctor agreed with more ANP clinical management plans than junior doctors. (ANP yes n=101, 66.4%, junior doctor yes n=81, 50.9%). X^2 (df=1, n = 311) = 7.07, p = 0.008, OR 1.91, 95% CI 1.21 – 3.02.

When the 209 AMA cases were analysed there was a statistically significant difference between the two professions, however in this sample the senior doctors agreed with less ANPs' clinical management plans. (ANP yes n=37, doctor yes n = 72, X^2 (df=1, n=209) = 4.28, p = 0.04 OR 0.54 95% CI 0.31 – 0.93). When the 164 cases were analysed there was no statistically significant difference between the two professions of clinical management plan agreed by the senior doctor. X^2 (df=1, n=164) = 1.51, p = 0.22 OR 0.65 95% CI 0.35 – 1.2.

When 'augmented' was collapsed with 'yes' a Chi-square test for independence (with Yates' Continuity Correction) indicated no significant difference between the two professions of clinical management plan agreed by the senior doctor at review.

311 cases: X^2 (df=1, n=311) = 1.48, p = 0.22, OR 1.74, 95% CI 0.8 - 3.79

209 cases: X^2 (df=1, n=209) = 0.0, p = 1, OR 0.98 95% CI 0.41 – 2.31

164 cases: X^2 (df=1, n=164) = 0.0, p = 1, OR 1.12 95% CI 0.44 – 2.85

Association between diagnosis congruence and clinical management plan congruence

Any association between diagnosis congruence and clinical management plan congruence were explored, using clinical management plan agreed with 'augmented' collapsed with both 'yes' and 'no'. These were cross tabulated with 'primary diagnosis agreed' (Table 4.47). A Chi-square test for independence (with Yates' Continuity Correction) indicated significant statistical associations between clinical management plan agreed and primary diagnosis agreed (Table 4.48).

Table 4.47 Cross Tabulation tables; diagnosis agreed and clinical management plan agreed

Category	**Primary diagnosis agreed**	
	Yes Frequency (%)	**No Frequency (%)**
Augmented collapsed with 'no'		
Clinical management plan agreed YES	146 (84.4%)	27 (15.6%)
Clinical management plan agreed NO	71 (58.7%)	50 (41.3%)
TOTAL	217 (73.8%)	77 (26.2%)
Augmented collapsed with 'yes'		
Clinical management plan agreed YES	209 (79.2%)	55 (20.8%)
Clinical management plan agreed NO	8 (27.7%)	22 (73.3%)
TOTAL	217 (73.8%)	77 (26.2%)

Table 4.48 Statistical analysis of association

Diagnosis agreed variable	Sample	Clinical Management Plan variable	Odds ratio (95% confidence interval)	P value	X^2 (df)
Primary diagnosis agreed (yes/no)	311	'augmented' = 'yes'	10.45 (4.41 – 24.74)	<0.001	35.74 (1)
	209		0.09 (0.03 – 0.24)	<0.001	26.42 (1)
	164		0.1 (0.03 – 0.3)	<0.001	19.57 (1)
Primary diagnosis agreed (yes/no)	311	'augmented' = 'no'	3.81 (2.20 – 6.58)	<0.001	23.04 (1)
	209		0.31 (0.16 – 0.58)	<0.001	12.49 (1)
	164		0.25 (0.12 – 0.53)	<0.001	12.43 (1)

Additional Plan at Review

In 130 of the 311 cases (41.8%), the senior doctor added to the clinical management plans made by the ANPs and junior doctors (Table 4.49). When cross tabulated by profession, in 50 cases presenting to ANPs (32.9%) the senior doctor added to the clinical management plan. There were additional management plans made by the senior doctor at review for 79 cases seen by junior doctors (49.7%).

Table 4.49 Additional plan at senior doctor review by profession

Additional plan at review	Sample	ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)
Yes	311	50 (32.9%)	79 (49.7%)	129 (41.5%)
	209	48 (55.8%)	52 (42.3%)	100 (47.8%)
	164	48 (55.8%)	37 (47.4%)	85 (51.8%)
No	311	102 (67.1%)	80 (50.3%)	182 (58.5%)
	209	38 (44.2%)	71 (57.7%)	109 (52.2%)
	164	38 (44.2%)	41 (52.6%)	79 (48.2%)

A Chi-test for independence (with Yates Continuity Correction) indicated a statistically significant difference for additional plan added by the senior doctor at review between ANPs and junior doctors, X^2 (df=1, n=311) = 8.35, p = 0.004, OR = 0.5 95% CI 0.31 – 0.79. The senior doctor added to significantly less ANPs' plans than junior doctors' plans.

This was not found when analysing the AMA cases only, where no statistically significant difference was found for additional plan added by the senior doctor at senior review between ANPs and doctors.

209 cases: X^2 (df=1, n=209) = 3.19, p = 0.74 OR 1.73 95% CI 0.99 – 3.01

164 cases: X^2 (df=1, n=164) = 0.84, p = 0.36 OR 1.4 95% CI 0.76 – 2.59

The additions to the clinical management plans included additional investigations, additions and/or changes to prescribed medication, referrals to other health professionals/specialities and nil by mouth orders, and are listed below.

Additions to clinical management plans by senior doctor:

- Additional medication
- Additional investigations
- Blood transfusion
- Change medication
- Cardiac referral
- Psychiatric referral
- Epilepsy referral
- Endocrinology referral
- Swallow assessment
- Speech and Language Therapy referral
- Physiotherapy referral
- Dietician referral
- Referral community drugs team
- Referral gynaecology

Signed and Dated

In three of the cases, there was no signature and date, and in 26 cases there was a signature but no date (Table 4.50).

Table 4.50 Documentation signed and dated

Signed and dated	**Frequency**
Yes	282 (90.7%)
No	3 (1%)
Signed not dated	26 (8.4%)
Total	311 (100%)

By profession, 139 (91.4%) cases seen by ANPs were signed and dated, and 13 (8.6%) cases were not. 143 (89.9%) cases seen by doctors were signed and dated, 16 (10.1%) cases were not. Two cases seen by ANPs (1.3%) were not signed and dated, and 11 cases (7.2%) were signed but not dated. One case (0.6%) seen by junior doctors was not signed and dated, and 15 cases were signed but not dated (9.4%) (Table 4.51).

Table 4.51 Signed and dated by profession yes/no

Signed and dated	ANP Frequency (%)	Junior Doctor Frequency (%)
Yes	139 (91.4%)	143 (89.9%)
No	13 (8.6%)	16 (10.1%)
Total	152 (100%)	159 (100%)

A Chi-square test for independence (with Yates Continuity Correction) indicated no significant association between profession and signed and dated cases. 311 cases: X^2 (df=1, n=311) = 0.07, p = 0.79, OR = 0.65 95% CI 0.55 – 2.58). Statistical analysis was not possible for the 209 and 164 cases samples due to low numbers.

Legibility

Legibility of case notes was recorded, and although it was recognised that this is subjective, all data were recorded by the same person so judgement regarding legibility was consistently applied. No documentation was regarded as illegible (Table 4.52).

Table 4.52 Legibility of case notes by profession

Legibility	ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)
Yes	119 (78.3%)	131 (82.4%)	250 (80.4%)
Some difficulty	33 (21.7%)	28 (17.6%)	61 (19.6%)
Total	152 (100%)	159 (100%)	311 (100%)

A Chi-square test for independence (with Yates Continuity Correction) indicated no statistically significant association between ANPs and doctors of legibility.

311 cases: X^2 (df=1, n=311) = 0.59, p = 0.44, OR = 0.77 95% CI 0.44 – 1.35

209 cases: X^2 (df=1, n=209) = 2.93, p = 0.09 OR 2.18 95% CI 0.96 – 4.95

164 cases: X^2 (df=1, n=164) = 3.13, p = 0.08 OR 2.38 95% CI 0.99 – 5.72
During case note review it was noted that in 12 cases senior legibility was difficult, however it was decipherable and therefore I was able to collect the data.

Adverse events

The presence of any adverse events which occurred following initial examination and prior to senior review was recorded, using the Adverse Event (AE) tool categories (IHI 2005). However this tool is normally used for the whole of the hospital stay, whilst for this study any adverse events were only recorded if they occurred between the junior and senior review. The categories collected were fall, pressure ulcer formation, shock, cardiac arrest, deep vein thrombosis, pulmonary embolism, transfer to higher care.

No patient cases had a fall, DVT, pulmonary embolism or pressure ulcer formation between ANP/junior doctor assessment and senior doctor review, nor went into shock. One junior doctor case suffered a cardiac arrest prior to senior review. One ANP case was transferred to a higher level of care and one junior doctor case to specialist tertiary care by the senior doctor at senior review, one following confirmation of myocardial infarction from investigations, the other when diagnosis was made following CT scan of occipital lobe tumour.

Assessment of skin and presence of pressure ulcers on admission/presentation was made in 110 cases (35.4%), 62 (40.8%) of ANP cases and 48 (30.2%) of junior doctors' cases. 4 cases were identified as having pressure ulcer present. Of these one was an ANP case and three were junior doctors' cases. In 201 cases (64.6%) no assessment of skin was made. Of these 201 cases, 59.2% (n=90) of cases seen by ANPs had no assessment made, and junior doctors did not assess 69.8% (n=111) of their cases (Table 4.53).

Table 4.53 Assessment of skin on presentation by profession

Assessment of skin	Sample	ANP Frequency (%)	Junior Doctor Frequency (%)	Total Frequency (%)
Yes	311	62 (40.8%)	48 (30.2%)	110 (35.4%)
	209	59 (68.6%)	44 (35.8%)	103 (49.3%)
	164	59 (68.6%)	29 (37.2%)	88 (53.7%)
No	311	90 (59.2%)	111 (69.8%)	201 (64.6%)
	209	27 (31.4%)	79 (64.2%)	106 (50.7%)
	164	27 (31.4%)	49 (62.8%)	76 (46.3%)

A Chi-square test for independence with Yates' Continuity Correction indicated no statistically significant association between profession and assessing skin integrity. X^2 (df=1, n=311) = 3.37, p=0.07 OR = 0.63 95% CI 0.39 - 1. However, when analysing the AMA cases Chi-square test for independence with Yates' Continuity Correction indicated a statistically significant association between professions, with ANPs assessing skin integrity more frequently than junior doctors.

209 cases: X^2 (df=1, n=209) = 20.52, p = 0.001, OR 3.92 95% CI 2.18 – 7.05

164 cases: X^2 (df=1, n=164) = 15, p = <0.001, OR 3.69 95% CI 1.93 – 7.05

Length of stay

Length of stay was collected using categorical data, and overall lengths of stay are shown in Table 4.54. The two predominant categories were 'less than 24 hours' and over 72 hours.

Table 4.54 Length of stay

Length of stay	Frequency (%)
less than 24 hrs	90 (28.9%)
24 - 48 hrs	38 (12.2%)
49 - 72 hrs	16 (5.1%)
over 72 hrs	109 (35%)
Outpatient	30 (9.6%)
Total	284 (91.3%)
Missing	28 (9%)
Total	311 (100%)

Data relating to length of stay were only collected from cases after case number 28, and in one further case the discharge date was not documented. Therefore 284 cases had length of stay data recorded. 30 cases were seen as outpatients. Length of stay was compared for the two health professional groups with these 58 cases omitted from analysis. 49% of patients seen by ANPs (n=48) had a length of stay less than 24 hours, and 27.1% of patients seen by doctors had a length of stay less than 24 hours. 34.7% of patients seen by ANPs (n=34) and 48.4% of patients seen by doctors had a length of stay greater than 72 hours (Table 4.55).

Table 4.55 Length of stay by profession

Length of stay	**ANP Frequency (%)**	**Junior Doctor Frequency (%)**
Less than 24 hours	48 (49%)	42 (35.6%)
24 – 48 hours	11 (11.2%)	27 (17.4%)
49 – 72 hours	5 (5.1%)	11 (7.1%)
Over 72 hours	34 (34.7%)	75 (48.4%)
Total	98 (100%)	155 (100%)

The 253 cases where discharge data were recorded, and which were not seen as outpatients were subjected to a Chi-square test for independence using linear by linear association (ANPs n=98, junior doctors n=155). The test indicated a statistically significant association between length of stay and health professionals. X^2 (df=1, n=253) = 8.6, p = 0.003, with ANP cases having less length of stay than junior doctor cases. This finding was repeated when the AMA cases were tested; ANPs n=63, junior doctors n=120, X^2 (df=1, n=183) = 21.15, p = <0.001. The statistical significance increased when data were subjected to Chi-square test for independence using linear by linear association when outpatients were re-coded as less than 24 hours. X^2 (df 1, n=283) = 24.5, p = <0.001.

When data were further collapsed to two categories: under 24 hours and over 24 hours, excluding OPD (Table 4.56) a Chi-square test for independence with Yates' Continuity Correction showed a statistically significant difference between ANPs and doctors, with more junior doctor cases having a length of stay more than 24 hours.

311 cases: X^2 (df=1, n=283) = 11.61, p = 0.001, OR 2.58 95% CI 1.52 – 4.39

209 cases: X^2 (df=1, n=183) = 21.57, p = <0.001 OR 4.71 95% CI 2.45 – 9.05

164 cases: X^2 (df=1, n=139) = 28.84, p = <0.001 OR 6.47 95% CI 3.06–13.66

Table 4.56 Length of stay, <24 hrs and >24 hrs by profession (excl. OPD)

Length of stay	Sample	ANP n (%)	Doctor n (%)	Total n (%)
<24 hrs	311	48 (49%)	42 (27.1%)	90 (35.6%)
	209	41 (65.1%)	34 (28.3%)	75 (41%)
	164	41 (65.1%)	17 (22.4%)	58 (41.7%)
>24 hours	311	50 (51%)	113 (72.9%)	163 (64.4%)
	209	22 (34.9 %)	86 (71.7%)	108 (59%)
	164	22 (34.9 %)	59 (77.6%)	81 (58.3%)

4.4 Data Collapse

Categorical data that had more than two variables were recoded as binary variables and further analysis carried out using the Chi-square test for independence. Table 4.57 presents a summary of the variables that were collapsed to binary variables. Tables 4.58 then presents a summary of those binary variables where there was a statistically significant difference between professional groups.

Table 4.58 Data collapse: binary variables

Variable	**Categories**	**How derived**
Age of patient	17 – 50 years Over 50 years	Numbers collapsed
Number of systems examined	0 – 3 4 or more	Numbers collapsed
Co-existing problems	None One or more	Numbers collapsed to none or one or more
Medications prescribed prior to presentation	None One or more	Numbers collapsed to none or one or more
Day of presentation	Weekday Weekend/Bank holiday	Saturday, Sunday and Bank holiday collapsed
Referral source	GP Other	All referral sources not GP collapsed to 'other
Presenting condition	Chest pain Other	All presenting conditions apart from chest pain collapsed to 'other'
Primary diagnosis agreed by senior doctor	Yes/No	Other categories not included in analysis 'not mentioned' collapsed with 'no'
Second diagnosis agreed by senior doctor	Yes/No	Other categories not included in analysis 'not mentioned' collapsed with 'no'
Any diagnosis disagreed by senior doctor	Yes/No	'count' syntax
Haematology investigations ordered	Yes/No	'Previously ordered' collapsed with 'no'
Chemical pathology investigations ordered	Yes/No	'Previously ordered' collapsed with 'no'
Microbiology investigations ordered	Yes/No	'Previously ordered' collapsed with 'no'
X - Ray investigations ordered	Yes/No	'Previously ordered' collapsed with 'no'
ECG investigations ordered	Yes/No	'Previously ordered' collapsed with 'no'
Clinical management plan agreed by senior doctor	Yes/No	Augmented collapsed with 'no' Augmented collapsed with 'yes' 'Yes' and 'No' only
Medication prescribed agreed by senior doctor	Yes/No	'none ordered' collapsed with 'yes'
Medication removed at review by senior doctor	Yes/No	'Previously prescribed medication' collapsed with 'yes' 'Previously prescribed medication removed' not included in analysis
Legibility	Yes/No	Some 'difficulty collapsed' with 'no'
Signed and dated	Yes/No	'Signed not dated' collapsed with 'no'
Assessment of skin integrity	Yes/No	'assessed not present' collapsed with assessed, present'
Length of stay	<24 hours >24 hours	49 – 72 and over 72 hours collapsed to >24 hours

Table 4.58 Bivariate analysis; significant differences between profession groups

DEMOGRAPHICS

Sample	Variable	ANP	Junior Doctor	Odds ratio (95% CI)	P value	X2 (df)
Co-existing problems						
311	None 1 or more	38 (25%) 114 (75%)	20 (12.6%) 139 (87.4%)	2.32 (1.28–4.2)	0.01	7.11(1)
209	None 1 or more	24 (27.9%) 62 (72.1%)	15 (12.2%) 108 (87.8%)	2.78 (1.36–5.71)	0.01	7.23(1)
164	None 1 or more	24 (27.9%) 62 (72.1%)	10 (12.8%) 68 (87.2%)	2.63 (1.17–5.94)	0.03	4.78(1)
Day of presentation						
311	Weekday Weekend/Bank holiday	146 (96.1%) 6 (3.9%)	107 (67.3%) 52 (32.7%)	11.83 (4.9–28.54)	<0.001	40.48(1)
209	Weekday Weekend/Bank holiday	86 (100%) 0	78 (63.4%) 45 (36.6%)	1.58(1.38–1.80)	<0.001 (Fishers Exact)	
164		Not applicable				
Referral source						
311	GP Other	126 (82.9%) 26 (17.1%)	44 (27.7%) 115 (72.3%)	12.67 (7.33–21.88)	<0.001	93.41 (1)
209	GP Other	83 (96.5%) 3 (3.5%)	43 (37.4%) 72 (62.6%)	51.57 (15.35–172.62)	<0.001	77.54(1)
164	GP Other	83 96.5%) 3 (3.5%)	43 (37.4%) 72 (62.6%)	30.66 (8.92–105.37)	<0.001	47.71(1)
Presenting condition						
311	Chest pain Other	43 (28.3%) 109 (78.7%)	16 (10.1%) 143 (89.9%)	3.53 (1.89–6.59)	<0.001	16.79(1)
209	Chest pain Other	34 (39.5%) 52 (60.5%)	12 (9.8%) 111 (90.2%)	6.05 (2.9–12.63)	<0.001	24.44(1)
164	Chest pain Other	34 39.5%) 52 60.5%)	7 (9%) 71 (91%)	6.32 (2.73 –6.13)	<0.001	18.78(1)
Assessment of skin integrity						
311	No significant difference between professions					
209	YES	59 (68.6%)	44 (35.8%)	3.92 (2.18–7.05)	<0.001	20.52(1)
164	YES	59 (68.6%)	29 (37.2%)	3.69 (1.93–7.05)	<0.001	15(1)
Length of stay (excl. OPD)						
311	< 24 hrs > 24 hrs	48 (49%) 50 (51%)	42 (27.1%) 113 (72.9%)	2.58 (1.52-4.39)	0.001	11.61 (1)
209	< 24 hrs > 24 hrs	41 (65.1%) 22 (34.9%)	34 (28.3%) 86 (71.7%)	4.71 (2.45–9.05)	<0.001	21.57(1)
164	< 24 hrs > 24 hrs	41 (65.1%) 22 (34.9%)	17 (22.4%) 59 (77.6%)	6.47 (3.06-13.66)	<0.001	28.84(1)

INVESTIGATIONS

Sample	Variable	ANP	Junior Doctor	Odds ratio (95% CI)	P value	X2 (df)
Haematology investigations ordered						
311	YES	120 (79%)	157 (98.7%)	0.06 (0.01 - 0.23)	<0.001 (Fishers Exact)	25.15(1)
209	No significant difference between professions					
164	No significant difference between professions					
Chemical pathology investigations ordered						
311	YES	120 (79%)	155 (97.5%)	0.12 (0.04 -0.34)	<0.001	19.38(1)
209	No significant difference between professions					
164	No significant difference between professions					
Microbiology investigations ordered						
311	YES	13 (8.5%)	55 (34.6%)	0.18 (0.09-0.34)	<0.001	29.34(1)
209	YES	5 (5.8%)	49 (39.8%)	0.93 (0.04-0.25)	<0.001	28.83(1)
164	YES	5 (5.8%)	30 (38.5%)	0.1 (0.04-0.27)	<0.001	24.06(1)
X - Ray investigations ordered						
311	YES	70 (47.6%)	131 (82.4%)	0.18 (0.11 - 0.31)	<0.001	43.31(1)
209	No significant difference between professions					
164	No significant difference between professions					
Additional investigations ordered by senior doctor						
311	YES	25 (16.4%)	45 (28.3%)	0.5 (0.29–0.87)	0.02	5.6(1)
209	No significant difference between professions					
164	No significant difference between professions					

DIAGNOSIS

Sample	Variable	ANP	Junior Doctor	Odds ratio (95% CI)	P value	X2 (df)
Primary diagnosis agreed						
311	No significant difference between professions					
209	YES	51 (62.2%)	87 (75.7%)	0.53 (0.29– 0.98)	0.06*	3.52(1)
164	YES	51 (62.2%)	58 (78.4%)	0.45 (0.22–0.92)	0.04	4.1(1)
Any diagnosis disagreed						
311	No significant difference between professions					
209	YES	36 (41.9%)	31 (25.2%)	0.47 (0.26–0.85)	0.02	5.70(1)
164	YES	36 (41.9%)	18 (23.1%)	0.42 (0.21–0.82)	0.02	5.7 (1)
Second diagnosis made						
311	No significant difference between professions					
209	YES	62 (72%)	56 (45.2%)	0.32 (0.18 - 0.59)	<0.001	12.84(1)
164	YES	62 (72.1%)	39 (50 %)	0.39 (0.2 - 0.74)	0.006	7.53(1)
Assessment of skin integrity						
311	No significant difference between professions					
209	YES	59 (68.6%)	44 (35.8%)	3.92 (2.18–7.05)	<0.001	20.52(1)
164	YES	59 (68.6%)	29 (37.2%)	3.69 (1.93–7.05)	<0.001	15(1)

CLINICAL MANAGEMENT

Sample	Variable	ANP	Junior Doctor	Odds ratio (95% CI)	P value	X2 (df)
Medication prescribed agreed by senior doctor						
311	YES	35 (53%)	111 (75.5%)	0.37 (0.2-0.68)	0.002	9.66(1)
209	YES	20 (23.3%)	84 (68.3%)	0.22 (0.11 - .45)	<0.001	16.93(1)
164	YES	20 (23.3%)	45 (59%)	0.35 (0.16 - 0.74)	0.01	6.79(1)
Medication added by senior doctor at review						
311	No significant difference between professions					
209	YES	30 (34.9%)	23 (18.7%)	2.33 (1.24–4.39)	0.01	6.17(1)
164	No significant difference between professions					
Medication removed by senior doctor						
311	YES	2 (1.3%)	17 (10.7%)	0.11 (0.03 -0.49)	0.001	10.33(1)
209	YES	1 (1.2%)	11 (9.2%)	0.12 (0.15– 0.93)	0.02 (Fisher's Exact Test)	
164	YES	2 (2.3%)	9 (11.5%)	0.18 (0.04 -0.87)	0.03 (Fisher's Exact Test)	2 (2.3%)
Clinical management plan agreed by senior (augmented=no)						
311	YES	102 (67.1%)	82 (51.6%)	1.92 (1.21 -3.03)	0.008	7.13(1)
209	YES	37 (43%)	72 (58.5%)	0.54 (0.31– 0.93)	0.04	4.28(1)
164	No significant difference between professions					
Additional plan by senior doctor						
311	YES	50 (32.9%)	80 (50.3%)	0.48 (0.31 -0.77)	0.003	8.99(1)
209	No significant difference between professions					
164	No significant difference between professions					

Bivariate analysis – no significant differences in any analyses

The following variables did not have any statistically significant differences between health profession groups:

- Patient gender
- ECG investigations
- Second diagnosis agreed
- Clinical management plan agreed, yes/no only
- Clinical management plan agreed by senior (augmented = yes)

- Medications prescribed agreed at senior review when 'none ordered' = 'yes'
- Legibility
- Signed and dated
- Systems examined when bivariate; 'none-three' or 'four or more'
- Medications prescribed prior to presentation bivariate; 'none' or 'one or more'

Inter professional differences: Continuous variables

There was also a statistically significant difference in age of patient, number of co-existing problems on presentation, number of medications prescribed prior to presentation and number of medications prescribed by the two professional groups. Junior doctors saw older patients with more co-existing problems, more medications prescribed prior to presentation, and prescribed more medications. The differences were the same as the AMA cases analyses. In addition, in the AMA data there were also significant differences in numbers of lines and words in history taking, with ANPs writing more text lines and words than junior doctors.

4.5 Differences in 164, 209 and 311 cases analyses

Any differences between the 164 cases, 209 cases and 311 cases analyses are shown in Table 4.59. The significant statistical associations are shaded grey to illustrate.

Table 4.59 Differences between 311, 209 and 164 cases analyses

Variable	311 cases	209 cases	164 cases
Number of lines in history taking	ANP median = 11 Doctor median = 10 U = 11438.5, p=0.41	ANP median = 13 Doctor median = 10 U = 3213 p=<0.001	ANP median = 13 Doctor median =10 U = 2024.5, p=<0.001
Number of words in history taking	ANP median = 66.5 Doctor median = 61 U = 10924 p=0.23	ANP median=76 Doctor median =61 U = 13.410 p=<0.001	ANP median = 76 Doctor median =61 U = 2225.5 p=0.001
Investigations ordered Haematology	ANPs 120/152 (78.9%) Doctors 157/159 (98.7%) X^2 29.27 p=<0.001	ANPs 83/86 (96.5%) Doctors 121/123 (98.4%) p=0.40 (Fishers Exact)	ANPs 83/86 (96.5%) Doctors 77/78 (98.7%) X^2 0.17 p=0.62 (Fishers Exact)
Chemical pathology	ANPs 70/152 46.1%) Doctors 131/159 (82.4%) X^2 24.31 p = <0.001	ANPs 83/86 (96.5%) Doctors 120/123 (97.6%) p=0.69 (Fishers Exact)	ANPs 83/86 (96.5%) Doctors 76/78 (97.4%) X^2 0 p = 1
X Ray	ANPs 70/152 (46%) Doctors 131/159 (82.4%) X^2 43.31 p = <0.001	ANPs 65/86 (75.6%) Doctors 100/123 (81.3%) X^2 p = 0.41	ANPs 65/86 (75.6%) Doctors 64/78 (82.1%) X^2 0.67 p = 0.41
Additional investigations ordered by senior doctor at review (yes)	ANPs 25/152 (16.4%) Doctors 45/159 (28.3%) X^2 5.6 p = 0.02	ANPs 23/86 (26.7%) Doctors 29/123 (23.6%) X^2 0.13 p = 0.13	ANPs 23/86 (26.7%) Doctors 22/78 (28.2%) X^2 0.001 p = 0.97
Any diagnosis disagreed (yes)	ANPs yes = 38/152 (25%) Doctors yes = 47/159 (29.6%) X^2 0.6 p = 0.44	ANPs yes = 36/86 (41.9%) Doctors yes = 31/123 (25.2%) X^2 5.71 p = 0.02	ANPs No = 36/86 (41.9%) Doctors yes = 18/78 (23.1%) X^2 5.71 p = 0.02
Medications added by senior doctor at review (yes)	ANP yes = 31/152 (20.4% Doctors yes = 23/159 (20.1%) X^2 0.0 p = 1.0	ANP yes = 30/86 (34.9%) Doctors yes = 23/123 (18.7%) X^2 6.175 p = 0.01	ANP yes = 30/86 (34.9%) Doctors yes = 22/78 (28.2%) X^2 0.56 p = 0.45
Clinical management plan agreed by senior; yes, augmented, no	ANP yes 102 (67%), augmented 39 (25.7%), no 11 (7.2%) Doctors yes 82 (51.6%), augmented 57 (35.8%), no 20 (12.6%) X^2 7.5 (1) p = 0.006 (linear by linear)	ANP yes 37 (44.2%), augmented 39 (44.2%), no 10 (11.6%) Doctors yes 72 (58.5%), augmented 36 (29.3%), no 15 (12.2%) X^2 1.99 (1) p = 0.16 (linear by linear)	ANP yes 37 (44.2%), augmented 39 (44.2%), no 10 (11.6%) Doctors yes 42 (53.8%), augmented 26 (33.3 %), no 10 (12.8%) X^2 0.79 (1) p = 0.37 (linear by linear)
Clinical management plan agreed by senior when augmented = NO	ANP yes 101 (66.4%), Doctors Yes 81 (50.9%), X^2 7.07 p = 0.008	ANP yes 37/43 (43%), Doctors Yes 72 (58.5%) X^2 = 4.28, p = 0.04	ANP yes 37/43 (43%) Doctors Yes 42 (52.8%) X^2 1.51 p = 0.22
Additional plan	ANP Yes = 50/152 (32.9%) Doctors Yes = 80/159 (50.3% X^2 8.99 p = 0.003	ANP Yes = 48/86 (55.8%) Doctors Yes = 52/123 (42.3%) X^2 3.19 p = 0.74	ANP Yes = 48/86 (55.8%) Doctors Yes = 37/78 (47.4%) X^2 0.84 p = 0.36
Assessment of skin	ANP 62/152 (40.8%) Doctors 48 (30.2%) X^2 3.37 p = 0.07	ANP 59/86 (68.6%) Doctors 44/123 (35.8%) X^2 20.52 p = 0.001	ANP 59/86 (68.6%) Doctors 29 (37.2%) $X^{2\ 15}$ p = <0.001

4.6 Outcome variables

Outcome variables were defined as:

Primary outcome variable:

- 'Clinical management plan agreed by senior doctor'

Secondary outcome variables were identified as:

- 'Number of systems examined',
- 'Primary diagnosis agreed by senior doctor'
- 'Secondary diagnosis agreed',
- 'Any diagnosis disagreed',
- 'Number of medications prescribed',
- 'Medication prescribed agreed by senior doctor'
- 'Additional investigations ordered by senior',
- 'Additional clinical management plan by senior',
- 'Adverse events occurring before senior review',
- 'Signed and dated', 'legibility',
- 'Number of text lines',
- 'Number of words'
- 'Length of stay'.

Of these, 'clinical management plan agreed', 'any diagnosis disagreed' 'primary diagnosis agreed', 'additional plan by senior', 'number of medications prescribed' 'medications prescribed agreed by senior doctor', number of text lines and words and 'length of stay' were found to have statistically significant differences when ANP and junior doctor groups were compared.

4.7 Correlations

The significant correlations between data, strength of the relationship and whether the relationship is positive or negative are shown in Table 4.60. Age and number of co-existing problems and number of medications prescribed on presentation were positively correlated (i.e. as one increases the other increases), with medium strength. This is clinically reasonable, as one may expect older people to have more co-existing problems, and have more prescribed medication. There was also a small positive correlation between number of co-existing problems and number of medication prescribed by the junior doctor/ANP. Again this is clinically reasonable.

Table 4.60 Significant correlations: all cases (n-311)

Variables		**Spearman's rho**	**Significance**	**Strength**
Age	Number of coexisting problems	0.39	<0.001	Medium +ve
	Number of medications on presentation	0.45	<0.001	Medium +ve
Number of coexisting problems	Medication prescribed by junior doctor/ANP	0.12	0.04	Small +ve

The significant correlations between data in AMA cases (n=209) are shown in Table 4.62. In addition to the correlations in the full sample (n=311) there were also medium strength positive correlations between age, number of medications prescribed by junior doctor/ANP and length of stay. There was a small negative correlation (i.e. as one increases the other decreases) with age and number of words in history, and a medium negative correlation with age and number of lines in history.

There were positive correlations between number of systems examined; number of lines and words in history and number of co-existing problems; number of medications on presentation and length of stay, number of medications prescribed by junior doctor/ANP; number of lines in history and length of stay.

Table 4.61 Significant correlations AMA cases (n=209)

Variables		**Spearman's rho**	**Significance**	**Strength**
Age of patient	Number of coexisting problems	0.40	<0.001	Medium +ve
	Number of medications on presentation	0.46	<0.001	Medium +ve
	Number of medications prescribed by ANP/junior doctor	0.30	<0.001	Medium +ve
	Number of lines in history	-0.30	<0.001	Medium -ve
	Number of words in history	-0.26	<0.001	Small -ve
	Length of stay	0.48	<0.001	Medium +ve
Number of systems examined	Number of lines in history	0.22	0.002	Small +ve
	Number of words in history	0.25	<0.001	Small +ve
Number of co-existing problems	Number of medications on presentation	0.66	<0.001	Large +ve
	Length of stay	0.24	0.001	Small +ve
Number of medications on presentation	Length of stay	0.25	0.001	Small +ve
Number of medications prescribed by ANP/junior doctor	Number of lines in history	-0.20	0.004	Small -ve
	Length of stay	0.38	<0.001	Medium +ve

When the AMA weekday only sample (n=164) was tested there was a small positive correlation between number of medication on presentation and length of stay in the AMA 209 case sample and no correlation between these in the 164 AMA weekday presentations sample. The remaining correlations were the same.

4.8 Logistic regression models

Logistic regression was performed on all three samples to assess the impact of a number of factors on the likelihood that the clinical management plan would be agreed by the senior doctor at review. The predictor variables entered into the models were:

- Profession
- Age of patient
- Number of co-existing conditions on presentation/admission
- Number of medications prescribed prior to presentation/admission
- Number of systems examined
- Word count in history taking
- *Weekday or weekend presentation (311 cases only)

Age of patient, number of co-existing problems, number of systems examined and number of medications prescribed prior to presentation were also entered into the model as categorical variables to ensure that both categories of the outcome variables contained at least 10 responses for each predictor variable in the model.

The outcome variables entered into the models were:

- Clinical management plan agreed by senior doctor (x3)
    - When 'augmented' collapsed with 'no'
    - When 'augmented' collapsed with 'yes'
    - Using 'yes' and 'no' responses only
- Primary diagnosis agreed by senior doctor
- Medication prescribed by ANP/junior doctor agreed by senior doctor
- Medication added by senior doctor

There is evidence in the literature (Kostopolou *et al* 2008), and clinically it is reasonable to assume that if primary diagnosis is agreed by the senior doctor, the clinical management plan will also be agreed. Therefore this was not entered into a model, as there was a likelihood that it would affect results. For the same reason 'number of medications prescribed by ANP/junior doctor was not included, as if the senior doctor had amended prescribing practice, it would also have an effect on the primary outcome.

Regression analysis may be subject to bias from collinearity, or the links between predictor variables (Field 2009, Pallant 2010). As regression only requires one predictor, close correlation between the predictors leads to an inability to obtain unique estimates of the regression coefficients for the predictors. Consequently, Field and Pallant recommend testing for this. This was undertaken for the outcome measures and predictors in each of the final models. For each of the six models, the tolerance level exceeded 0.1, the VIF was less than 10 indicating no serious collinearity problems.

4.8.1 Logistic regression models all cases (n=311)

Clinical management plan agreed when augmented collapsed with NO

The model at step 4 was statistically significant, X^2 (4, n=308) = 40.26 p = <0.001, indicating that the model was able to distinguish between clinical management plan agreed yes/no. The model at step 4 explained between 12.3% (Cox and Snell R squared) and 16.5% (Nagelkerke R squared) of the variance in clinical management plan agreed, and correctly classified 65.6% of cases at step 4, and 59.1% of cases prior to predictors being entered. The Hosmer-Lemeshow Goodness of Fit Test indicated support for the model, X^2 (8, n=308) = 4.39, p = 0.73. The final model included three of the predictor variables which made a unique statistically significant contribution to the model; profession, systems examined, day of presentation and wordcount in history (Table 4.63). ANP as a predictor for clinical management plan agreed (when augmented = no) recorded an odds ratio of 2.53, 95% CI 1.49 – 4.31. Fewer systems examined as a predictor for clinical management plan agreed (when augmented = no) recorded an odds ratio of 0.66, 95% CI 0.49 – 0.88. Less words in the n history was a predictor for management plan agreed (when augmented = no) and recorded an odds ratio of 0.98, 95% CI 0.97 – 0.99. Weekday presentation was less likely to be a predictor for clinical management plan agreed, recording an odds ratio of 0.48, 95% CI 0.24-0.95.

Table 4.62 Model summary; Clinical management plan agreed, augmented = NO

Predictor	**B**	**S.E.**	**Wald**	**Df**	**Sig.**	**Odds Ratio (OR)**	**95% CI for OR**	
Profession (ANP)	0.93	0.27	11.75	1	0.001	2.53	1.49	4.31
Number of systems examined	-0.42	0.15	8.02	1	0.005	0.66	0.49	0.88
Wordcount in history	-0.02	0.01	12.81	1	<0.001	0.98	0.97	0.99
Weekday presentation	-0.73	0.35	4.38	1	0.04	0.48	0.24	0.95
Constant	3.13	0.64	23.84	1	<0.001	22.92		

Primary diagnosis agreed

The model at step 7 was statistically significant, X^2 (5, n=308) = 4.11 p = 0.04, indicating that the model was able to distinguish between primary diagnosis agreed yes/no. The model at step 7 explained between 1.4% (Cox and Snell R squared) and 2.1% (Nagelkerke R squared) of the variance in primary diagnosis agreed, and correctly classified 74.2% of cases at step 4, and 74.2% of cases prior to predictors being entered. The Hosmer-Lemeshow Goodness of Fit Test indicated support for the model, X^2 (8, n=308) = 5.38, p = 0.25. The final model included one predictor variable, number of co-existing problems, which made a unique statistically significant contribution to the model, with less co-existing problems being a predictor, recording an odds ratio of 0.86, 95% CI 0.75-0.99

Table 4.63 Model summary; Primary diagnosis agreed yes/no

Predictor	B	S.E.	Wald	Df	Sig.	Odds Ratio (OR)	95% CI for OR	
Number of co-existing problems	-0.15	0.07	54.12	1	0.04	0.86	0.75	0.99
Constant	1.42	0.23	38.23	1	<0.001	4.13		

Medication prescribed agreed by senior doctor

The model at step 4 was statistically significant, X^2 (5, n=308) = 16.66 p = 0.002, indicating that the model was able to distinguish between medication agreed by senior yes/no. The model at step 4 explained between 5.3% (Cox and Snell R squared) and 8.1% (Nagelkerke R squared) of the variance in clinical management plan agreed, and correctly classified 78.2% of cases at step 4, and 78.2% of cases prior to predictors being entered. The Hosmer-Lemeshow Goodness of Fit Test indicated support for the model, X^2 (8, n=308) = 11.16, p = 0.19.

The final model included three predictor variables which made a unique statistically significant contribution to the model; weekday presentation, number of co-existing problems and number of medications prescribed prior to presentation (Table 4.65). Co-existing problems as a predictor recorded an odds ratio of 0.79, 95% CI 0.66 – 0.95. Less co-existing problems was a predictor for medication prescribed agreed by the senior doctor. Number of medications prescribed prior to presentation as a predictor recorded an odds ratio of 1.12, 95% CI 1.01 – 1.24. More medications prescribed prior to presentation was a predictor for medication prescribed agreed by senior doctor. Weekday presentations recorded an odds ratio of 0.39, 95% CI 0.16-0.97. Weekday presentations were less likely to have medications prescribed agreed by the senior doctor.

Table 4.64 Model summary; Medications prescribed agreed by senior doctor

Predictor	B	S.E.	Wald	Df	Sig.	Odds Ratio (OR)	95% CI for OR	
Number of co-existing problems	-0.23	0.09	5.97	1	0.01	0.79	0.66	0.95
Number of medications prescribed prior to presentation	0.12	0.05	4.94	1	0.03	1.12	1.01	1.24
Weekday presentation	-0.93	0.46	4.07	1	0.04	0.39	0.16	0.97
Constant	2.78	0.58	22.95	1	<0.001	16.12		

Medicines added by senior doctor

The model at step 4 was statistically significant, X^2 (4, n=308) = 18.71 p = 0.001, indicating that the model was able to distinguish between medication added by senior yes/no. The model at step 4 explained between 5.9% (Cox and Snell R squared) and 9.3% (Nagelkerke R squared) of the variance in clinical management plan agreed, and correctly classified 79.2% of cases at step 4, and 79.5% of cases prior to predictors being entered. The Hosmer-

Lemeshow Goodness of Fit Test indicated support for the model, X^2 (8, n=308) = 9.71, p = 0.29.

The final model (Table 4.66) included three predictor variables which made a unique statistically significant contribution to the model; number of co-existing problems, number of medications prescribed prior to presentation and weekday presentation. Co-existing problems as a predictor recorded an odds ratio of 1.23, 95% CI 1.02 – 1.48 with more co-existing problems being a predictor for medication added by senior doctor. Number of medications prescribed prior to presentation was a predictor for medications added by senior doctor, with less medication prescribed prior to presentation being a significant predictor, odds ratio 0.9 95% CI 0.81–0.99. Weekday presentation recorded an odds ratio of 3.8, 95% CI 1.31-11.04, with weekday presentation being more likely to have medications added by senior doctor.

Table 4.65 Model; summary; Medications added by senior doctor

Predictor	B	S.E.	Wald	Df	Sig.	Odds Ratio (OR)	95% CI for OR	
Number of co-existing problems	0.2	0.1	4.45	1	0.03	1.23	1.02	1.48
Number of medications prescribed prior to presentation	-0.11	0.05	4.02	1	0.04	0.9	0.81	0.99
Weekday presentation	1.33	0.54	6.02	1	0.01	3.8	1.31	11.04
Constant	-3.24	0.65	24.5	1	<0.001	0.04		

When clinical management plan agreed by senior doctor when augmented = 'yes', and clinical management plan agreed by senior doctor, 'yes' or 'no' only were entered as primary outcomes there were no significant predictors. There were some variations when predictors were entered separately into the model where the primary outcome in the model was medication prescribed agreed by senior doctor - none of the predictors were significant when entered separately.

4.8.2 Logistic regression models AMA cases (n=209)

Outcome - Clinical management plan agreed when augmented = no

The model at step 6 was statistically significant, X^2 (1 n=207) = 12.33, p = <0.001, indicating that the model was able to distinguish between clinical management plan agreed yes/no. The model as a whole explained between 5.8% (Cox and Snell R squared) and 7.7% (Nagelkerke R squared) of the variance in clinical management plan agreed, and the Hosmer-Lemeshow Goodness of Fit Test indicated support for the model, X^2 (8, n = 207) = 10.31, p = 0.24. The model correctly classified 60.4% of cases at step 6, and 52.7% without any predictors entered. Wordcount in history made a unique statistically significant contribution to the model (Table 4.67), recording an odds ratio of 0.98, 95% CI 0.97 – 0.99, change in -2LL 12.33, with less words in wordcount being a predictor for clinical management plan agreed when augmented was collapsed with no.

Table 4.66 Model summary; Clinical management plan agreed when augmented = no

Predictor	B	S.E.	Wald	Df	Sig.	Odds Ratio (OR)	95% CI for OR	
Wordcount in history	-0.02	0.01	11.52	1	0.001	0.98	0.97	0.99
Constant	1.55	0.45	11.91	1	0.001	4.73		

Outcome – Primary diagnosis agreed by senior doctor

The model at step 6 was statistically significant, X^2 (1 n=195) = 4.99, p = 0.02, indicating that the model was able to distinguish between primary diagnosis agreed yes/no. The model as a whole explained between 2.5% (Cox and Snell R squared) and 3.6% (Nagelkerke R squared) of the variance in clinical management plan agreed, and the Hosmer-Lemeshow Goodness of Fit Test indicated poor support for the model, X^2 (0, n = 195) = 0. The model correctly classified 70.8% of cases at step 6, and 70.8% without any predictors entered. Profession made a unique statistically significant contribution to the model (Table 4.68), recording an odds ratio of 0.49, 95%

CI 0.26 – 0.92, change in -2LL 4.99. Junior doctors were a predictor for primary diagnosis agreed by senior doctor.

Table 4.67 Model summary; Primary diagnosis agreed by senior doctor

Predictor	B	S.E.	Wald	Df	Sig.	Odds Ratio (OR)	95% CI for OR	
Profession (ANP)	-0.71	0.32	4.95	1	0.03	0.49	0.26	0.92
Constant	1.21	0.22	29.2	1	<0.001	3.35		

Outcome; Medication added by senior doctor

The model at step 6 was statistically significant, X^2 (5 n = 207) = 6.58, p 0.01, indicating that the model was able to distinguish between medication prescribed agreed yes/no. The model as a whole explained between 3.1% (Cox and Snell R squared) and 4.6% (Nagelkerke R squared) of the variance in clinical management plan agreed, and the Hosmer-Lemeshow Goodness of Fit Test indicated poor support for the model, X^2 (0, n = 195) = 0. The model correctly classified 74.4% of cases at step 6, and 74.4% without any predictors entered. Profession made a unique statistically significant contribution to the model (Table 4.69), recording an odds ratio of 2.28, 95% CI 1.21 – 4.31, change in -2LL 6.58. ANPs were a predictor for medication added by senior doctor.

Table 4.68 Model summary; Medication added by senior doctor

Predictor	B	S.E.	Wald	Df	Sig.	Odds Ratio (OR)	95% CI for OR	
Profession (ANP)	0.89	0.34	6.93	1	0.01	2.28	1.21	4.31
Constant	-1.45	0.23	39.14	1	<0.001	0.23		

Logistic regressions analysis was also run with each predictor variable individually. These tests confirmed the results above. In summary, less words in history was a significant predictor for 'clinical management plan agreed by senior doctor' when augmented = no on analysis of the AMA 209 case sample. Junior doctor was a significant predictor for primary diagnosis agreed. ANPs were a significant predictor for medications added by senior doctor. There were no significant predictors for 'clinical management plan agreed by senior doctor' when augmented = yes, 'clinical management plan agreed by senior doctor YES/NO only' and 'medications prescribed agreed by senior doctor'.

4.8.3 Logistic regression models AMA weekday only cases (n=164)

Clinical management plan agreed when augmented = no

The model at step 6 was statistically significant, X^2 (2 n=163) = 10.01, p = 0.002, indicating that the model was able to distinguish between clinical management plan agreed yes/no. The model as a whole explained between 6 % (Cox and Snell R squared) and 8% (Nagelkerke R squared) of the variance in clinical management plan agreed, and the Hosmer-Lemeshow Goodness of Fit Test indicated support for the model, X^2 (8, n = 163) = 11.67, p = 0.17. The model correctly classified 62.6% of cases at step 6, and 51.5% without any predictors entered. Wordcount in history (less) made a unique statistically significant contribution to the model (Table 4.70). Less words in history as a predictor for management plan agreed (when augmented = no) recorded an odds ratio of 0.98, 95% CI 0.96 – 0.99.

Table 4.69 Model summary; Clinical management plan agreed when augmented = no

Predictor	B	S.E.	Wald	Df	Sig.	Odds Ratio (OR)	95% CI for OR	
Wordcount in history	-0.02	0.01	9.13	1	0.002	0.98	0.96	0.99
Constant	1.5	0.53	7.92	1	0.005	4.5		

Clinical management plan agreed when augmented = yes

The model at step 6 was statistically significant, X^2 (1 n = 99) = 4.37, p = 0.04, indicating that the model was able to distinguish between clinical management plan agreed yes/no. The model as a whole explained between 2.6% (Cox and Snell R squared) and 5% (Nagelkerke R squared) of the variance in clinical management plan agreed, and the Hosmer-Lemeshow Goodness of Fit Test indicated support for the model, X^2 (1, n = 99) = 2.07, p=0.84. The model correctly classified 87.7% of cases at step 6, and 87.7%

without any predictors entered. Number of co-existing problems (less) made a unique statistically significant contribution to the model (Table 4.71). Less co-existing problems as a predictor for clinical management plan agreed (when augmented = yes) recorded an odds ratio of 0.79, 95% CI 0.63–0.98, change in -2LL 4.37.

Table 4.70 Model summary; Clinical management plan agreed Yes/No only

Predictor	B	S.E.	Wald	Df	Sig.	Odds Ratio (OR)	95% CI for OR	
Number of co-existing problems	-0.24	0.11	4.44	1	0.03	0.79	0.63	0.98
Constant	2.63	0.43	37.52	1	<0.001	13.86		

Clinical management plan agreed Yes/No only

The model at step 6 was statistically significant, X^2 (1 n = 99) = 4.09, p = 0.04, indicating that the model was able to distinguish between clinical management plan agreed yes/no. The model as a whole explained between 4.1% (Cox and Snell R squared) and 6.4% (Nagelkerke R squared) of the variance in clinical management plan agreed, and the Hosmer-Lemeshow Goodness of Fit Test indicated support for the model, X^2 (1, n = 99) = 6.25, p=0.28. The model correctly classified 78.8% of cases at step 6, and 79.8% without any predictors entered. Number of co-existing problems (less) made a unique statistically significant contribution to the model (Table 4.72). Less co-existing problems as a predictor for clinical management plan agreed (yes/no only) recorded an odds ratio of 0.79, 95% CI 0.63–0.99, change in -2LL 4.1.

Table 4.71 Model summary; Clinical management plan agreed Yes/No only

Predictor	B	S.E.	Wald	Df	Sig.	Odds Ratio (OR)	95% CI for OR	
Number of co-existing problems	-0.23	0.12	4.06	1	0.04	0.79	0.63	0.99
Constant	2.02	0.44	21.55	1	<0.001	7.56		

Primary diagnosis agreed

The model at step 6 was statistically significant, X^2 (1 n = 156) = 5.6, p = 0.02, indicating that the model was able to distinguish between clinical management plan agreed yes/no. The model as a whole explained between 3.6% (Cox and Snell R squared) and 5.1% (Nagelkerke R squared) of the variance in clinical management plan agreed. The Hosmer-Lemeshow Goodness of Fit Test indicated poor support for the model, X^2 (0, n = 156) = 0. The model correctly classified 69.9% of cases at step 6, and 70.3% without any predictors entered. Profession made a unique statistically significant contribution to the model (Table 4.73). ANP as a predictor for primary diagnosis agreed recorded an odds ratio of 0.44, 95% CI 0.21–0.88, change in -2LL 5.61. This indicated that ANPs were less likely to have primary diagnosis agreed by senior doctor.

Table 4.72 Model summary; Primary diagnosis agreed

Predictor	B	S.E.	Wald	Df	Sig.	Odds Ratio (OR)	95% CI for OR	
Profession (ANP)	-0.85	0.37	5.38	1	0.02	0.43	0.21	0.88
Constant	1.35	0.29	21.8	1	<0.001	3.87		

When 'medication agreed by senior doctor' and 'medication added by senior' were entered into the model as primary outcomes there were no significant predictors.

In summary 'clinical management plan agreed' was modelled with 'augmented' collapsed with both 'no' and 'yes' and using the 'yes' and 'no' categories only. Less words in the history taking was a significant predictor for clinical management plan agreed with augmented collapsed with no. Less co-existing problems was a significant predictor for clinical management agreed when augmented was collapsed with yes, and when analysing 'yes' and 'no' only. Junior doctor was a significant predictor for 'primary diagnosis agreed by senior doctor'. There were no significant predictors when 'medications prescribed agreed by senior doctor' and 'medication added by senior doctor' were entered as the primary outcomes. Logistic regressions analysis was also run with each predictor variable individually. These tests confirmed the findings. Table 4.74 summarises the significant predictors in each of the models.

Table 4.73 Significant predictors

Sample	Clinical management plan agreed augmented = no	Clinical management plan agreed augmented = yes	Clinical management plan agreed yes no only	Primary diagnosis agreed	Medications prescribed agreed by senior	Medications added by senior doctor
311 cases Significant predictors	ANP Less words in history Less systems examined Day of presentation (not weekday)	No predictors	No predictors	No predictors	Less co-existing problems More medications prior to presentation Day of presentation (not weekday)	More co-existing problems Less medications prescribed prior to presentation Day of presentation (weekday)
209 AMA cases Significant predictors	Less words in history	No predictors	No predictors	Junior doctor	No predictors	ANP
164 AMA cases (weekday only) Significant predictors	Less words in history	Less co-existing problems	Less co-existing problems	Junior doctor	No predictors	No predictors

4.9 Summary chapter four

The primary outcome of this study was senior doctor congruence with the clinical management plans of junior doctors and ANPs. In most cases the initial clinical management plan was not amended by the senior doctor. In some cases the clinical management plan was augmented or revised.

The senior doctors agreed with more ANP clinical management plans than junior doctors when all 311 cases were analysed. However in both the AMA analyses the findings indicated no statistically significant difference between the two professions in terms of clinical management plan agreed by the senior doctor. If the senior had not disagreed with the clinical management plan, but had added to the plan by, for example, ordering additional investigations, additions and/or changes to prescribed medication, referrals to other health professionals/specialities, this was categorised as plan 'augmented'. When 'augmented' was collapsed with 'no' there was a statistically significant difference between professions, with senior doctors agreeing with more ANP cases than junior doctor cases when all 311 cases were analysed. In contrast when the 209 AMA cases were analysed, senior doctors agreed with statistically significantly more junior doctors' clinical management plans. No statistically significant difference between professions was found when 'augmented' was collapsed with 'yes'.

Junior doctors were more likely to prescribe significantly more medicines than ANPs in all three analyses. However the senior doctors removed statistically significantly more prescribed medicines from patients seen by junior doctors than patients seen by ANPs at review in all three analyses.

Senior doctors were more likely to start medicines for ANP cases than junior doctors' cases in the AMA sample which included weekend/bank holiday presentation. Patients seen by junior doctors were older and more complex, in terms of number of co-existing problems and number of medications prescribed prior to presentation, than those seen by ANPs in all three analyses. Older patients were more likely to present at weekends.

In addition statistically significant differences in all three analyses between professional groups were:

- Presenting condition – ANPs saw more patients presenting with chest pain
- Referral source – ANPs saw more patients referred by GPs
- Junior doctors ordered more investigations
- Length of stay – longer length of stay in junior doctor cases
- Weekday/weekend presentation – junior doctors saw more weekend presentations

311 cases only

- Additional plan by senior doctor – more in junior doctor cases
- Senior doctor added more investigations to junior doctors' cases

AMA cases only (n=209 and n=164)

- ANPs examined more systems

- Senior doctors agreed with more junior doctor primary diagnoses, and ANPs had more 'any diagnoses disagreed by senior'
- ANPs made more second diagnoses
- ANPs wrote more lines and words
- ANPs assessed more patients for skin integrity

Six outcomes were analysed by logistic regression:

- 'clinical management plan agreed', yes vs no or augmented,
- 'clinical management plan agreed', yes or augmented vs no,
- 'clinical management plan agreed', yes vs no with augmented cases removed,
- 'primary diagnosis agreed',
- 'medications prescribed agreed by senior doctor'
- 'medications added by senior doctor'.

These outcomes were modelled for each of the samples; 311, 209 and 164 cases (appendix x). Predictors included ANP and weekend presentation for 'clinical management plan agreed' when 'augmented' was re-categorised as 'no' in 311 cases analysis and junior doctors for 'primary diagnosis agreed' in the AMA cases analyses. Fewer 'systems examined' was a predictor for 'clinical management plan agreed' when 'augmented' was re-categorised as 'no' models in the 311 cases analysis but none of the other samples. Fewer 'words in history' was a predictor for 'clinical management plan agreed' when 'augmented' was re-categorised as 'no' for all three sample analyses. Fewer 'co-existing problems' was a predictor for 'clinical management plan agreed' when 'augmented' was re-categorised as 'yes' and when analysing 'yes' and 'no' categories only in the 164 cases analyses, and for 'primary diagnosis agreed' in the 311 cases analysis. When 'medication added by senior doctor' was entered as the outcome, in the 311 cases analysis more co-existing problems, less medications prescribed prior to presentation and weekday presentation were significant predictors. In the 209 cases analysis, profession (ANP) was a predictor for medication added by senior doctor.

Chapter 5: DISCUSSION

5.0 Introduction

Key findings from this study are that ANPs are as competent and as safe as junior doctors when they cross professional boundaries and work in what was previously the medical domain. Few differences between ANPs' and junior doctors' care reached the level of statistically significant difference. No threats to patient safety were identified. Only three adverse events as defined by the Global Trigger Tool (IHI 2005) were recorded, two in the junior doctor sample and one in the ANP sample. In chapter five, the results from this study will be discussed in relation to key findings of previous comparative studies. Strengths and limitations of this study will be identified and debated.

5.1 Study findings

5.1.1 Demographics

In this study the age of patients was statistically significantly higher in patients seen by junior doctors in all analyses. This contrasts with findings from Cooper *et al* (2002), Kinnersley *et al* (2000), Sakr *et al* (1999) and Myers *et al* (1997) where there was no significant difference in age of patients seen by doctors and nurses. It is similar to the findings of van der Linden *et al* (2010), Cox and Jones (2000), Schum *et al* (2000), Hill *et al* (1994) and Dierick-van Daele *et al* (2009). The explanation for this is not clear. The majority of comparative studies identified in the literature review were RCTs (n=11) so it would be expected that patients demographics would be similar in both groups. Three RCTs showed no significant difference, whilst Schum *et al*, Hill *et al* and Dierick-van Daele were also RCTs but found significant differences in age of the two groups with doctors seeing older patients. Myers *et al* (1997) in contrast, was an observational study which found no significant difference in age of patients, whilst two other observational studies found a significant difference in age of patients, again with doctors seeing older patients.

In this study positive correlations between age, number of co-existing problems and number of medications prescribed prior to presentation were found. Mann-Whitney U test also showed significant difference between age and weekday or weekend presentation, with older patients presenting at the weekend. However there were no relationships between weekend and number of co-existing problems, and number of medications prescribed prior to presentation and weekend presentation

It may be that age is related to complexity of patients, which was measured in this study by co-existing problem and number of medications prescribed prior to presentation. In all analyses, there was a statistically significant difference in both number of co-existing problems and medications prescribed prior to admission, with junior doctors' patients having more co-existing problems and more medications prescribed prior to presentation. This could infer that patients seen by junior doctors are 'iller' than those seen by ANPs, although an explanation for this is difficult to offer. This contrasts with the findings of Diers and Molde (1983) who asserted that the first patients nurse practitioners had in their caseloads were the sickest patients, not the healthiest. This was, however, in a primary care environment in the USA in the 1980s. The study by Dierick van-Daele *et al* was conducted as an RCT in primary care and found no difference between the professions of patients with chronic diseases, and as an RCT it should be expected that there should be no difference. However it is also important to highlight that patients had to give informed consent to participate prior to randomisation, so patients who decided not to take part may have had an influence on results. For example, an 'iller' patient may choose not to participate because they specifically wished to see a particular health professional. Myers *et al* (1997) suggested there may be a tendency for more seriously ill patients to choose to consult with a GP, and in their study patients could choose who they wished to see. This choice could also have been influenced by such things as waiting times and patients' previous experiences. In this study, patient allocation was not by patient choice, rather it was driven by the way services were set up and delivered.

Cox and Jones' (2000) study was an observational study, and although the authors suggested that nurses saw less unwell patients their data does not support this completely. The patients in the Cox and Jones' study were presenting with one condition only i.e. sore throat, and were allocated to the practice nurses or GP group dependent on patient choice and appointment availability, so again the patients themselves had influence of which health professional saw them. In terms of this study, although number of co-existing problems and number of medications prescribed prior to presentation gave an indication of patient complexity, this does not necessarily mean that more complex patients present as 'iller' than those less complex patients.

In this study the majority of all patients were referred by GPs (n=170, 54.7%). However when individual professions were examined, the majority of patients presenting to junior doctors were referred from A&E (n=72 45.3%), whilst the majority of patients presenting to ANPs were referred from GPs (n=126 82.9%). This may be influenced by the way in which local services are set up in relation to patient pathways. When data from weekday AMA cases only was examined for referral source, again the majority of cases presenting to ANPs were referred by GPs (n=83, 96.5%). All weekend/bank holiday referrals were from A&E, and presented to junior doctors. Although there is an out of hours GP service at weekends/bank holidays none of the weekend/bank holiday presentations were via this service. It may be that out of hours GP services refer through A&E, but this cannot be confirmed from the data collected.

Although the majority of patients seen by ANPs were referred by GPs, there was no statistical difference in 'number of co-existing problems' and 'number of medications prescribed prior to presentation' of these patients compared to patients presenting through other referral routes. Therefore although it would seem that doctors saw more complex patients this did not appear to be related to where the patients were referred from. The most common presenting conditions of patients presenting to ANPs and doctors differed, although it is difficult to judge from case notes who were the 'iller' patients.

In the 311 cases sample 43 patients seen by ANPs (28.3%) presented with chest pain, 20 patients presented with palpitations (13.2%) and 13 presented with shortness of breath (8.6%). As the 311 cases included rapid access chest pain clinics this would be expected, however this finding was consistent also in the AMA cases which did not include the chest pain clinic cases. Of the AMA cases 34 patients seen by ANPs (45.3%) presented with chest pain, nine presented with shortness of breath (10.5%) and nine (9.3%) patients presented with palpitations (8.1%) .

In comparison, in the 311 cases sample the most common presenting conditions to junior doctors were 17 (10.7%) with shortness of breath, 16 (10.1%) with chest pain and 14 (8.8%) with 'unwell', falls and collapse. In the AMA cases including weekend/bank holiday presentations 14 (11.4%) patients seen by junior doctors presented with shortness of breath, 12 (9.8%) with chest pain and 10 (8.1%) with falls. In the AMA weekday only cases 10 (12.8%) patients seen by junior doctors presented with shortness of breath, 7 (9%) with chest pain and 7 (9%) with 'unwell'.

Patient pathways in relation to rapid access clinics, which are run by consultants and ANPs, could lead to a service developing in which ANPs predominantly see patients presenting with chest pain, and moving into this 'care gap'. This could potentially have implications for junior doctors in terms of developing their knowledge and expertise in this area, particularly as the majority of referrals overall were for chest pain. In this study GPs referred many patients complaining of chest pain, which may have been to access the investigations which are available in secondary care settings. If these presentations are dealt with predominantly by ANPs, GPs in the future may also be more likely to refer on than to treat themselves if they haven't had the experience of dealing with this types of condition.

In terms of level of 'illness' it is difficult to draw conclusions from these findings. Review of case notes did not enable a clinical judgement to be made on which were 'iller' patients. However if complexity is indicated by the number of co-existing problems and medications patients have been prescribed prior to presentation, junior doctors in this study did see more complex patients than ANPs. It could be presumed that more complex patients are more difficult to diagnose and treat. They may also require more investigations and more medications prescribed which could impact on findings and comparisons between the professions. Junior doctors prescribed more and ordered more investigations in this study.

5.1.2 Senior agreement with clinical management plan

The primary outcome of this study was 'senior doctor congruence with the clinical management plan'. In previous studies, senior congruence was measured by 'under assessment likely to cause harm' and 'under assessment possibly causing harm' (Kinley *et al* 2001, 2002), adequacy of care; 'clinically important', 'very important' and 'not important', (Sakr *et al* 1999) 'missed diagnosis' (Osborn 2010), and 'accuracy of diagnosis and treatment' and inappropriate management defined by in which treatment is not administered in accordance with ED protocols (van der Linden *et al* 2010). These would be difficult to assess from the case notes in this study.

In this study 'clinical management agreed' had three possible categories; 'yes', 'augmented' and 'no'. The augmented category was used when additions were made to the clinical management plan by the senior doctor. There had to be some clinical judgement with this in terms of defining when a clinical management plan was augmented and when it was not agreed with, and it is acknowledged that to a certain extent this decision was subjective. For example if there was an additional investigation ordered or medication prescribed, it was judged to be augmented. However if several changes were made, and diagnosis not agreed this was categorised as 'no'. The double entry by my supervisor validated my judgements.

It would have been difficult to use criteria such as number of additions to plan to define whether the variable was categorised as 'augmented' or 'no'. For example, ordering additional investigations may have less clinical implications than allowing someone to eat and drink if they should be nil by mouth (NBM). In future studies it is recommended that criteria are identified and validated which are able to support the judgement regarding agreement, augmentation or disagreement with a clinical management plan and thus enhance reliability. In the previous studies that measured this outcome, a third expert was used at the time of patient presentation and applied their clinical judgement to define difference, potential clinical effect and likelihood of causing harm. There was no tool found to support this decision making, therefore in this study, variables were collapsed both ways, i.e. augmented with no and augmented with yes, as well as analysis of the three categories 'yes', augmented' and 'no'.

The 311 cases sample findings were that senior doctors agreed with more ANP cases using linear by linear analysis and when 'augmented' was collapsed with no. There was no statistically significant difference on analysis of the AMA cases, using linear by linear analysis and when analysing only 'yes' and 'no' categories. However when 'augmented' was collapsed with 'no' there was a statistically significant difference with the senior doctors agreed with more junior doctors' clinical management plans which contrasts with the analysis of all 311 cases.

There were some differences in findings from the three analyses, reasons for which are difficult to hypothesise. ANP senior doctor congruence was greater in the 311 case analysis, which was statistically significant using linear by linear association. There were no statistically significant differences between the professions in both AMA analyses. When 'augmented' was collapsed with 'no' ANP senior doctor congruence was greater when all 311 cases analysed, and senior doctor congruence was greater with junior doctors when analysing AMA cases including weekend and bank holiday presentations. In contrast, there was no significant difference in this analysis when analysing AMA weekday only cases. Of course, as discussed, the 'augmented' category would benefit from agreed clinical criteria in future studies. Alternatively case notes could be reviewed by a clinical expert who could make judgements about likely effect on patients. However, this method brings with it all the limitations of implicit review, as well as the cost and resource implications. It may be that just 'yes' and 'no' categories should have been recorded; however this would still present the dilemma of where to situate case data when additions were made.

When considering the incidence of clinical management plan not agreed by the senior doctor at senior review, Table 5.1 represents the 'no' category when all three categories were recorded. It is evident that in both analyses, clinical management plan was *not* agreed by the senior doctor in less ANP cases than junior doctor cases. This demonstrated the difficulty with categorising 'augmented' and when collapsing this, depending on whether collapsing with 'yes' or 'no', findings which are statistically significant can be different.

Table 5.1 Clinical management plan not agreed

Clinical management plan NOT agreed	ANPs	Junior doctors
311 cases	7.2% (n=11)	11.9% (n=19)
AMA 209 cases	11.6% (n=10)	12.2% (n=15)
AMA 164 weekday only presentations	11.6% (n=10)	12.8% (n=10)

When comparing this to the findings of previous studies, in van der Linden *et al*'s study there was no significant difference in missed injuries or inappropriate management (junior doctors 1.2%, ENPs 2.7%). In Kinley *et al*'s (2001, 2002) study, nurses were judged to have under assessed to an extent that may affect management in 12.8% of their cases compared with 14.9% of doctors cases. In Sakr *et al*'s (1999) study accurate medical history was judged to have been taken in 76% of nurses' cases and 55% of doctors' cases. At least one important error was identified in 9.2% of nurses' cases and 10.7% of doctors' cases. In Cooper *et al*'s study it was found that nurses inappropriately managed 2/102 cases, however this was not statistically significant and was only collected in relation to cases that were referred cases, not all cases

The senior doctors added to the management plan in 48 (55.8%) of cases seen by ANPs and 37 (47.4%) of cases seen by doctors in the 164 cases analysis. This was not a statistically significant difference which contrasts with the findings from the 311 cases sample, where senior doctors added to more junior doctors' plans.

Senior doctors added to the management plan in 32.9% of cases seen by ANPs and 50.3% of cases seen by junior doctors. This difference was statistically significant. When analysing AMA cases only there was no statistically significant difference between the professions in terms of the senior doctor adding to the clinical management plan.

5.1.3 Diagnosis agreed by senior doctor

There is evidence (Kostopolou *et al* 2008), and it is clinically reasonable to assume that diagnosis impacts on clinical management, therefore it could be assumed that an accurate diagnosis will lead to an appropriate clinical management plan. In this study primary diagnosis accuracy (as measured by senior doctor review congruence) was compared to clinical management accuracy (as measured by senior doctor review congruence). In all samples the association was statistically significant. This is similar to the findings of Kostopolou *et al* (2008).

When looking at primary diagnosis *agreed,* in the 311 case sample no significant difference was found between ANPs and junior doctors, although the primary diagnosis was agreed in more ANP cases. In the AMA 209 case sample the senior doctor reviews agreed with more junior doctor cases, and this was significant at the 95% confidence interval. In the AMA 164 weekday only cases the senior doctor reviews agreed with more junior doctor cases, and this was significant. These findings contrast with studies by Van der Linden and Osborn *et al* which found no significant difference in diagnostic accuracy. However, Lee *et al* (2001) found that Advanced Neonatal Nurse Practitioners were significantly better at detecting abnormalities than SHOs. From a professional viewpoint there needs to be confidence that ANPs are no worse than junior doctors at making correct diagnoses, when ANPs take on roles and responsibilities which were previously in the medical domain. In the AMA samples this was not consistent, and senior doctors agreed with more junior doctor cases.

It is important to note that quite high proportions of primary diagnoses were not agreed by the senior doctor in both health profession groups in all analyses. The proportion of primary diagnoses disagreed by the senior doctor in all junior doctor cases ranged from 20% - 28%, and in all ANP cases from 22% - 36%. This raises the question of accuracy of diagnosis by both professions. However, senior doctors had access to test results when they reviewed patients which would help inform their diagnoses.

When data from this study were analysed relating to 'any diagnosis disagreed' there was a statistically significant difference in both AMA analyses, with the senior doctor disagreeing with more ANP diagnoses than junior doctors'. The difference between the two groups was not statistically significant in the 311 cases analysed. However this was in relation to *any* diagnosis disagreed, and in some circumstances health professionals had made up to four provisional diagnoses which would have had an influence on these results, particularly if one group made more provisional diagnoses overall than the other group.

ANPs made significantly more second diagnoses in the AMA 164 weekday cases and the AMA 209 cases analyses. There were no differences between professions in number of third or fourth diagnoses, and no differences in 311 cases sample Further work should be carried out to explore diagnoses, and why in some cases a number of provisional diagnoses are made. For example is the number of provisional diagnoses influenced by the complexity of the patient and/or presenting conditions, lack of confidence in making clinical decisions, test results not available to inform diagnosis.

5.1.4 Investigations ordered agreed by senior doctor

Investigations are important tools to help to formulate a diagnosis (Winkens and Dinant 2002). Overall, in this study investigations were ordered in the majority of cases. Of course the presenting condition will drive the decisions for investigations, however the vast majority of all patients presenting had all investigations apart from microbiology. There is a view that there is overuse of diagnostic tests (Winkens and Dinant 2002) and that accurate history taking and physical examination are more effective diagnostic tools (Hampton *et al* 1975, Rosman *et al* 1998). Certainly in this study, investigations were ordered frequently, although as indicated, no clinical judgement was made as to appropriateness, and only data in relation to investigations added by the senior doctor were collected. There was therefore no way of identifying incidence of inappropriate investigations or overuse. It is acknowledged that many pathways (for example Chest Pain of Recent Onset NICE 2010) identify diagnostic processes, and also advise clinical judgement based on presentation, which the ANP or junior doctor would have done at the time of presentation in order to make a decision regarding investigations required.

In this study findings indicated when analysing the 164 AMA weekday cases and the 209 AMA cases the only statistically significant difference was in microbiology investigations where junior doctors ordered more than ANPs. On analysis of all 311 cases junior doctors ordered statistically significantly more haematology, chemical pathology, X-ray, and microbiology investigations than ANPs

In the studies identified in the literature review, data collected and analysed in relation to investigations were mainly X-Rays, although some studies just recorded 'investigations ordered'. In the Kinley *et al* (2002) study clinical judgement was made as to whether investigations ordered were necessary and it was concluded that doctors ordered more unnecessary tests than nurses. The Kinley *et al* study highlighted that pre-operative investigations are largely determined by protocols and concluded that therefore nurses followed protocols more than doctors. Findings from Ball *et al* (2010), Laurant *et al* (2009), Venning (2000) and Sakr *et al* (1999) found no statistically significant difference in number of investigations/X-Rays ordered. In this study the majority of the investigations had been ordered prior to the senior doctor review. Free text identified one case where the senior doctor cancelled a CT scan.

The senior doctor ordered additional investigations in 28.3% of junior doctors' cases and 16.4% of ANPs' cases on analysis of all 311 cases, which was a statistically significant difference. It is interesting that junior doctors also ordered more tests overall than ANPs. There was no significant difference between professions when analysing AMA 209 cases and the 164 AMA weekday only cases.

5.1.5 Medication prescribed

In all three analyses, junior doctors prescribed statistically significantly more than ANPs. Prescribing was positively correlated with patient age in the AMA 164 case and AMA 209 case analyses, but was not correlated with patient age in the 311 case analysis. There was a positive correlation between prescribing and co-existing problems in the 311 case analysis, but not in the AMA 209 case and AMA 164 case analyses.

The Kinnersley *et al* (2000), Schum *et al* (2000) and Cox and Jones (2000) studies found no differences between health professionals and the Seale *et al* (2006) study found nurses prescribed twice as much as doctors in primary care. In contrast in 2006 the number of prescriptions written by nurses in primary care was 0.8% (Strickland and Hodge 2008). All the studies which measured prescribing practice were in primary care whereas this study setting was secondary care. Further research should take place regarding non-medical prescribing practices, with identification and examination of any barriers. It is not possible from the findings in this study to identify why ANPs prescribed less. A possible reason may be whether for example they are not confident in their knowledge of pharmacology. In Kyriacos *et al*'s study

(2005) although it was reported that most nurses felt that their understanding of the biological sciences was adequate and all felt confident with their knowledge of anatomy, a need for further education in pharmacology was indicated. Previous studies have identified barriers such as governance procedures, supporting policies, lack of support, role conflict, access to prescribing pads and delays in practicing (Cooper *et al* 2008, Courtenay *et al* 2012, Ross and Kettles 2012, Stewart *et al* 2012)

There was no significant difference in medications added by the senior doctor at review between the two professions when all 311 cases were analysed and when the AMA 164 weekday cases were analysed. However there was a significant difference in medications added by senior doctor in the AMA 209 cases, with ANP cases having more medications added by the senior doctor. It should be noted that at senior doctor review, the results from investigations would be available to help confirm diagnosis which may indicate the need for additional medications to be prescribed.

Interestingly there was a statistically significant difference between professions of medicines removed by the senior doctor at review, with medication prescribed by junior doctors being removed more often. However, it is important to note that the prescribing practice of both groups was limited. There were no statistically significant differences between the professions in medications agreed by the senior doctor in all three analyses when 'none ordered' was re-categorised as 'agreed'.

There was a positive correlation in the AMA 164 cases and AMA 209 cases between number of medicines prescribed, and age of patients and a positive correlation between number of medicines prescribed and number of co-existing problems in the 311 cases. There was also a medium positive correlation between number of medicines prescribed and length of stay. This could provide an explanation as to why the junior doctors prescribed more, as they also saw the older, more complex patients. It would be clinically reasonable to expect patients with more co-existing problems to require more medications.

5.1.6 Documentation

The quality of history taking has been associated with accurate diagnosis with the selection of tests, their interpretation, and subsequent clinical management reliant on the initial clinical suspicion generated in large part by a carefully elicited history (Rosman *et al* 1998, Kostopoulo *et al* 2008). One study which attempted to measure the relative importance of patient history, physical examination and results from laboratory examinations concluded that 66 patients from 80 were diagnosed based on the history (Hampton *et al* 1975).

I counted text lines and words in the history to assess comprehensiveness of history taking; however, I acknowledge that text and word counts do not necessarily indicate quality. Kostopoulo et al (2008) concluded that it does not matter how much information is collected as long as information critical to diagnosis is collected. In this study there were no significant differences between the two groups. The data were collected after the care episode from written case notes, therefore no judgement could be made in terms of quality and accuracy. In future studies quality and accuracy of history taking could be reviewed and assessed if the interactions were observed directly or recorded and analysed by relevant experts against published ‘gold standards’. The reviewers would need relevant clinical knowledge to make these judgements, which would rely on the reviewers’ expertise and might therefore contain an element of subjectivity (Smith et al 1997, Weingart et al 2002, Hofer et al 2004, Luck et al 2007).

ANP/junior doctor legibility of case notes was collected in this study. Although it is acknowledged that the measurement of legibility was a subjective judgement, in this study no significant difference was found between the two groups. This contrasts with one study which assessed legibility of doctors, nurses and other health staff (Lyons *et al* 1998) and found that doctors had worse handwriting than other groups of staff. There was noted, however, difficulty in legibility of the senior doctor review documentation in 11 cases. These cases were not excluded as although legibility was difficult, I was able to read the case notes. Legibility of records is important, as different health professionals may provide care and need to be able to understand previous findings, plan etc. It is also difficult to subsequently review cases if legibility is difficult.

5.1.7 Length of stay

Length of stay was found to be significantly longer for patients seen by junior doctors in all three analyses. However it is interesting to note that a large proportion of all patients were discharged within 24 hours (35.6% excluding OPD cases). This raises the question as to whether they should have presented to acute care initially. It may be that some patients would not be referred to acute care if there were resources more readily available in primary care. For example it may be that diagnostic investigations are not readily available or accessible for GPs, therefore they refer to acute care in order to access diagnostics.

Length of stay had a significant positive correlation with age of patient in the AMA 164 cases and AMA 209 cases, and a significant positive correlation with number of medications prescribed in the AMA 164 cases sample. This relationship is clinically reasonable. There were no correlations with co-existing problems or medicines prescribed and no correlations with length of stay in 311 cases sample.

5.2 Differences between all cases and AMA cases

Findings were generally similar between the 311 cases sample and the AMA 164 and 209 cases samples, however there were some differences which were presented in Table 4.61.

Junior doctors were more likely to order investigations and the senior doctor to order additional investigations and additional management plans for patients seen by junior doctors in the 311 cases group. These differences were not found in both of the AMA cases analyses.

Significantly more diagnoses were disagreed by senior doctors in AMA ANP cases, whilst there wasn't a significant difference in the 311 case analyses. More primary diagnoses were agreed by senior doctors in the AMA junior doctor cases, with no significant difference in the 311 cases sample. As accurate diagnosis is linked to appropriate clinical management (Kostopolou *et al* 2008) it is important that both professions are able to diagnose accurately.

Senior doctors agreed with significantly more clinical management plans in the junior doctors' cases in the AMA sample, and more ANP cases in the 311 cases sample, when 'augmented' was collapsed with 'no'. As has been discussed, as the augmented category was used for additions to the clinical management plan, rather than changes to management and disagreement with diagnosis, the clinical significance of this finding is lower. This does not help to explain the differences between the two samples. It is difficult to hypothesise, and warrants further investigation.

Significantly more medications were prescribed by the senior doctor in the AMA ANP cases whilst there was not a significant difference in 311 cases analysis, although the senior doctors removed more medications in the junior doctor cases. Barriers to prescribing which have been identified (Cooper *et al* 2008, Courtenay *et al* 2012, Ross and Kettles 2012, Stewart *et al* 2012) will need to be addressed UK wide in order to develop this practice safely and appropriately. In this study reasons for not prescribing were not explored, and future studies could examine what reasons and barriers there may be to this.

5.3 Comparison with previous literature

Findings from this study partly support previous findings that overall nurses are as safe as doctors when they take on roles which were previously in the medical domain. There were some differences in findings between the three samples, as has been highlighted. Table 5.6 compares the level of agreement between this study and previous studies.

Table 5.2 Level of agreement with findings from previous studies

Findings 311 cases	Findings AMA cases (n=209 and n=164)	Studies supporting	Studies contrasting	Comments
Age of patients greater in doctor group than ANP group	Age of patients greater in doctor group than ANP group	Van der Linden *et al* 2010 Cox and Jones 2000 Schum *et al* 2000 (not sig)* Hill *et al* 1994* Dierick-van Daele *et al** 2009	Cooper *et al* 2002* Kinnersley *et al* 2000* Sakr *et al* 1999* Myers *et al* 1997	* indicates RCT where it could be expected that, due to randomisation, there would be no difference in demographics.
Gender – no difference between groups	Gender – no difference between groups	Cooper *et al* 2002* Kinnersley *et al* 2000* Schum *et al* 2000* Sakr *et al* 1999* Cox and Jones 2000 Myers *et al* 1997 Dierick-van Daele *et al* 2009 Chang *et al* 1999		* indicates RCT where it could be expected that, due to randomisation, there would be no difference in demographics. However no significant difference found in any other studies.
Systems examined no difference	Systems examined no difference	Sakr *et al* 1999		
Complexity of patients (based on pre-existing conditions and medications prescribed prior to presentation – patients seen by doctors more complex patients	Complexity of patients (based on pre-existing conditions and medications prescribed prior to presentation – patients seen by doctors more complex patients	Cox and Jones 2000 Myers *et al* 1997	Diers and Molde 1983 Dierick-van Daele *et al* 2009	Cox and Jones study postulated nurses saw less unwell patients but not supported statistically, and only in relation to patients presenting with sore throats
Number of medications prescribed prior to presentation – more in doctors' group than ANP group	Number of medications prescribed prior to presentation – more in doctors' group than ANP group			None of the previous studies recorded this data.

Findings 311 cases	Findings AMA cases (n=209 and n=164)	Studies supporting	Studies contrasting	Comments
Number of medications prescribed – junior doctors prescribed more than ANPs	Number of medications prescribed – junior doctors prescribed more than ANPs	Myers *et al* 1997	Kinnersley *et al* 2000* Seale *et al* Cox and Jones Venning *et al* 2000* Schum *et al* 2000* Dierick-van Daele *et al* 2009	In previous studies there was found to be no difference, and in one study nurses prescribed more (Seale *et al*). All these studies were in primary care
Number of medications added by senior doctor – no significant difference	Number of medications added by senior doctor – more ANP cases in AMA 209 cases sample had medications added at senior review. No significant difference in 164 weekday only cases analysis			No previous studies recorded this data
Length of stay – junior doctor cases had longer length of stay	Length of stay – junior doctor cases had longer length of stay		Hoffman *et al* 2005	Only study reporting LoS (no difference found) was a study comparing patient outcome in a sub acute medical intensive care unit
Senior review agreement with clinical management plan; more likely ANPs in 311 cases (yes, augmented, no, linear by liner association)	Senior review agreement with clinical management plan; no significant difference (yes, augmented, no, linear by liner association)	Van der Linden 2010 Osborn *et al* 2010 Sakr *et al* 1999	Cooper *et al* 2002 Van der Linden *et al* 2010 – no significant difference in missed injuries or inappropriate Kinley *et al* (2002)	None of the previous studies or this study found nurse clinical management plan less accurate/appropriate than doctors.

Findings 311 cases	Findings AMA cases (n=209 and n=164)	Studies supporting	Studies contrasting	Comments
Senior review agreement with diagnosis made when augmented = NO, more ANPs in 311 cases (statistically significant)	Senior review agreement with diagnosis made when augmented = NO, more junior doctors in AMA cases (statistically significant) No significant difference between professions when 164 weekday only cases analyses	Cooper *et al* 2002 Van der Linden *et al* 2010 Kinley *et al* 2002	Van der Linden 2010 Osborn *et al* 2010 Sakr *et al* 1999	None of the previous studies or this study found nurse clinical management plan less accurate/appropriate than doctors. There was statistically significant difference in number of diagnoses disagreed in AMA cases (ANPs higher)
Senior review agreement with diagnosis made no significant difference	Senior review agreement with diagnosis made: primary diagnosis more agreement (statistically significant) with junior doctors difference	Lee *et al* 2011 – AANPs significantly better at detecting abnormalities than SHOs		
Any diagnosis disagreed – no significant difference	Any diagnosis disagreed – more ANP diagnoses disagreed in AMA cases		Lee *et al* 2011 – AANPs significantly better at detecting abnormalities than SHOs	
Investigations ordered: junior doctors ordered more haematology, biochemistry, microbiology and X-Ray	Investigations ordered: doctors ordered more microbiology, all others no significant difference	Kinley *et al* 2002 Cooper *et al* 2002	Kinnersley *et al* 2000* Sakr *et al* 1999 Ball *et al* 2011 Dierick-van Daele *et al* 2009 Osborn *et al* 2010	In this study data relating to investigations ordered were collected. No judgement was made as to whether the investigations ordered were necessary. In Kinley *et al* clinical judgment made as to whether investigations ordered were necessary.

Findings 311 cases	Findings AMA cases (n=209 and n=164)	Studies supporting	Studies contrasting	Comments
Documentation, no significant difference	Documentation, no significant difference		Cooper *et al* 2002	Cooper *et al* used a quality of documentation tool and found ENPs higher quality. This study provided line and word count – no judgement as to quality
Additional investigations ordered by senior at review – more in junior doctor group in 311 cases	Additional investigations ordered by senior at review - no significant difference		Sakr *et al* 1999	
Additional clinical management plan by senior doctor - more in junior doctor group in 311 cases	Additional clinical management plan by senior doctor- no significant difference between professions			Not reported in previous studies
Number of lines and words in history – no significant difference	Number of lines and words in history – ANPs more in AMA only			No previous studies recorded this
Assessment of skin integrity – no significant difference	Assessment of skin integrity, ANPs more likely in AMA cases			No previous studies recorded this

5.4 Multivariate analysis

Logistic regression was carried out to identify any variables that could predict the outcome. The primary outcomes entered into models in this study were 'clinical management plan agreed', 'primary diagnosis agreed', 'medications prescribed agreed' and 'medications added by senior doctor'. Predictors were 'patient age', 'number of systems examined', 'profession', 'number of co-existing problems', 'number of medications prescribed prior to admission' and 'number of medications prescribed by ANP/junior doctor'. In addition in the 311 cases' sample 'weekday or weekend/bank holiday presentation' was entered as a predictor. As no conclusion was reached as to whether 'augmented' could be deemed 'yes agreed' or 'no not agreed', logistic regression was carried out when 'augmented' was collapsed with 'no', and when 'augmented' was collapsed with 'yes'. Logistic regression was also carried out with 'yes' and 'no' categories only. In all, 18 models were generated, six for 311 cases, six for AMA cases including weekend/bank holiday presentations (n=209) and six for AMA weekday only presentations (n=164).

Generally the models supported the cross-tabulations and statistical tests which were carried out to ascertain whether there were any statistically significant differences between the two professions. Some of the models were a poor fit (e.g. when outcome = 'medication added by senior doctor', 'primary diagnosis agreed by senior doctor') and where the HL test was 0 these models were checked with my supervisor. Closer examination also indicated that prediction was no better than with the empty model in the following models:

- 'clinical management plan agreed', augmented = yes (n=164)
- 'clinical management plan agreed', yes/no only (n=164)
- 'primary diagnosis agreed' (n=209, n=164)
- 'medication prescribed agreed by senior doctor' (n=311, n=209)
- 'medication added by senior doctor' (n=311, n=209)

The findings from the logistic regressions analyses indicated slight differences, and a larger sample size would be needed to draw any further inferences or conclusions.

It is interesting that less words in history and less systems examined was a significant predictor for 'clinical management plan agreed'. However as has been pointed out, comprehensive documentation may not necessarily indicate that high quality history taking and physical examination has been carried out (Luck *et al* 2000, Hutchinson *et al* 2010). It may also have been that these cases were less complex patients who needed less examination and history documented and were more straightforward to diagnose and clinically manage. It is difficult to propose possible reasons why weekday presentations were less likely to have medications prescribed agreed by senior doctor' and more likely to have medications added by senior doctor and a larger sample size would be needed to explore this further.

When examining the primary outcome 'clinical management plan agreed by senior doctor', profession was only a significant predictor in the 311 case model when 'augmented' was collapsed with 'no'. Seniors were more likely to agree with ANPs than junior doctors. Profession was a significant predictor for 'primary diagnosis agreed' in two of the three samples (n=209 & n=164); senior doctors were more likely to agree with junior doctors than ANPs. As has been previously discussed, diagnostic accuracy was not very high for either professional group, and this is worth further exploration. The findings from this study were that ANPs can provide care at the same level of competence and safety as the junior doctors who previously provided that care.

5.5 Limitations and strengths

It was important for this study that the design and method used were the most feasible and appropriate. The choice of design and method was driven by a desire to address the research aims and objectives, and provide quantitative evidence regarding the service in the relevant Trust. Therefore, careful thought was given to both the research question and the available methods. When considering the most appropriate research and data collection methods, the benefits and strengths of each were considered. However, the limitations of each should also be recognised.

5.5.1 Limitations and strengths of methods

Quantitative data

Quantitative data are derived from the premise that human behaviour can be correctly observed, identified, reported and measured. However, some researchers suggest that the social world does not lend itself to objective forms of measurement and neither can one examine relationships when removed from their everyday situations (Leininger 1984, Bryman 2004). It is viewed by some that it is not possible to understand complex phenomena such as values or feelings, which do not easily lend themselves to quantification and it may not be possible to derive understanding (Parahoo 2006, Bryman 2004). Quantitative research is sometimes considered narrow and not able to capture the reality of human experience, with a main criticism being that human beings are studied as objects (Polit and Beck, 2008). Reported data may not correspond to how individuals behave in naturally occurring situations (Silverman 2001). However there are many examples of how statistics have been used to improve health care, with an early example being Florence Nightingale's work. Her data convinced the British government to provide nursing care, as the data demonstrated that most soldiers' deaths were caused by illness or unattended wounds, rather than on the battlefield (Plichta and Kelvin 2005). Empirical knowledge is used to produce clinical guidelines. The Cochrane Collaboration, which produces and disseminates systematic reviews, produces clinical guidelines (Cochrane Collaboration 2010), as does the National Institute for Clinical Excellence (NICE). NICE develops guidelines which are based on the best available evidence of the most effective care.

Much of the criticism related to quantitative research is in relation to the data collection tools used such as questionnaires and surveys which collect and analyse participants' responses. One criticism is that participants may interpret and respond differently depending on such things as context, experience and perception. This was a study based on real-world clinical case notes, and sought to examine junior doctors' and ANPs' work in naturally-occurring, hospital settings. It did not try to 'force' participants to respond to the pre-formed categories of a formal data collection tool. Quantitative methods in this study were used in the analysis of case notes, and did not in any way depend on questionnaires and surveys and participants' responses. The data were collected from case notes which were completed in a natural setting, and free text comments were also recorded on the data collection form.

Free text is complex to analyse, and in this study the case examples were used for illustrative purposes only. No attempt was made to analyse the free text. It is recognised that the quantitative method of data collection and analysis did not produce the depth of understanding that may have been possible using qualitative data collection methods. However it was the most appropriate to address questions in outcomes' research, using objective, quantifiable data, measured objectively. It enabled opportunity to identify possible relationships between outcome variables and predictor variables. Further studies focussing on such things as decision making could adopt a qualitative approach, which may then offer depth of data in relation to that process.

Observational studies

Randomised clinical trials are often considered to be the 'gold standard' in terms of research designs, with the shortcomings of observational studies well aired (Black 1996, Grimes and Schulz 2002a, Polit and Beck 2008). Observational studies carry with them risks of confounding i.e. extraneous variables and/or influences. For these reasons observational studies cannot attribute causation, only association, with results being given as predictive models. For example if a cohort study finds an association between a predictor and outcome, this may not represent cause and effect, as other variables, known or unknown, and not necessarily captured in the data, may also have an influence on outcomes. The study environment has a major effect on research outcomes with an uncontrolled environment likely to introduce confounding variables (Burns and Groves 2009). In this study, factors likely to have an effect on outcome variables were identified and measured. These included number of co-existing problems, number of medications prescribed prior to presentation, age of patient, referral source, weekday or weekend presentation and presenting condition.

A further criticism of quantitative methodologies is that the more controlled the study, the less likely the research study is near to real life. Therefore control of variables can work against external validity and generalisability (Polit and Beck 2008, Carr 1994). The Hawthorne effect, when knowledge of inclusion in a study may affect behaviour, is another potential issue. This can become a double Hawthorne effect whereby both health professionals and patients may alter their behaviour when aware they are participating in a study (Polit and Beck 2008).This was not an issue in this study, as health professionals and patients would not have been aware that data would be extracted from particular case notes when the care episode was documented.

Evidence from good quality observational studies can be upgraded to exceed that from RCTs (Guyatt *et al* 2011). The three primary reasons for rating up the quality of evidence
(although these are encountered infrequently) are:
1. When a large magnitude of effect exists,
2. When there is a dose response gradient, and
3. When all plausible confounders or other biases increase confidence in the estimated effect (Guyatt *et al* 2011).

In relation to this study, the dose response gradient is not relevant, and a large magnitude of effect did not exist. All known confounders were accounted for.

Case note review

This study involved the collection of data from case notes. Routine data are potentially cheaper to collect than designed data (Williams *et al* 2003), though may not reflect fully the entire care episode (Luck *et al* 2000). The use of routine datasets in observational studies is being seen as a way of reducing reliance on RCTs (Cohen *et al* 2003), although the ability of RCTs to control for confounders and bias is recognised.

In this study the method of data extraction from case notes has strengths and weaknesses. Luck *et al* (2000) suggest that case notes may not reflect all the events that happen during a consultation episode, however the records reflect a real event which has happened in a naturalistic setting. At the time of recording in the case notes, the participants had no way of knowing that those particular records would be extracted and data collected, which therefore reduced any likelihood of observer bias (Lilford *et al* 2007). Explicit criteria based on the literature, and aims and objectives of the study helped to reduce any reviewer bias, however it is accepted that explicit criteria may not capture complexity of the care episode. Retrospective review of case notes meant that the study did not disrupt in any way normal patterns of care (Lilford *et al* 2007), and reflects reality.

An issue related to case note reviews is that of completeness. The only data that can be extracted and recorded is that which is written in the case notes. Non recording does not necessarily mean the event didn't happen, however limited or non-recording will inevitably affect data collection and subsequent analysis and results. For example, in this study 29 case notes were rejected as a senior review was not found. Conversely, comprehensive documentation may not necessarily indicate that high quality history taking and physical examination has been carried out (Luck *et al* 2000, Hutchinson *et al* 2010). In this study data were collected for word and line count. However for reasons as above any findings were interpreted cautiously.

As identified previously, case note reviews only provide a snapshot, and may not be applied consistently by reviewers (Lilford *et al* 2007, Luck *et al* 2000, Hofer *et al* 2004, Smith *et al* 1997, Ashton *et al* 1999). In this study the researcher was the only case note reviewer, with the research supervisor carrying out double entry checks, therefore the data collection was consistent

The UK Global Trigger Tool (GTT) is familiar in NHS hospitals and Trusts across the four UK countries. It has been used by Trusts undertaking the Safer Patients Initiative (SPI) and has been validated. Variables were used from the GTT tool however must be analysed with caution in this study. The tool has been developed to identify organisational/processes which may cause harm rather than measuring the ability of individuals involved in the delivery of the care. It would normally identify adverse events during the whole patient episode, as opposed to the period between initial patient presentation and senior doctor review which was collected in this study. In this study only three adverse events were recorded, two from the junior doctor sample and one in the ANP sample, and they all involved transfer to a higher level of care. In the context of this study this could be viewed as a positive, as severity of presenting condition was identified and acted on promptly.

5.5.2 Limitations and strengths of the study

Setting

As the study was single site, generalisability should be treated with caution. A great deal of discussion has taken place about the generalisibility or external validity of single site research (Bryman 2004). Whilst the findings will have immediate relevance in terms of care delivery, workforce planning and continuing professional development (CPD) in the Trust, it was not the purpose of this study to provide generalisibility, although it is proposed that it can be replicated in other locations. Transfer of these findings to other settings is based on logical or theoretical, rather than statistical, inferences (Mitchell 1983) or practical adequacy (Sayer 1992, Jordan *et al* 1999). It is recognised however that the culture of this particular organisation may impact on the practices of the individuals concerned.

In this study, there was a difference in cases seen at weekends between the two professions. Cases for each of the two professions were therefore not similar in terms of day of the week. Day of the week of presentation could be a potential confounder, so was included in the logistic regression analysis for 311 cases. Weekday presentation was a predictor for medications added by senior and medications agreed by senior. However it would be impossible to generalise from this data due to low numbers.

Participants

The participants were initially approached and introduced to the study by letter. They then volunteered to participate in the study. Volunteer sampling can have limitations. Volunteering is an act of cooperation, and participants may feel they have a moral obligation, and may feel they need to conform. Volunteers may have different reasons for participating than the whole population, and may be more interested and motivated than those who did not, therefore may not be representative (Parahoo 2006). It could also be argued that as an insider researcher I may have had an effect on their decision to participate.

In this study the whole population of ANPs in the study setting initially agreed to participate. I am unable to judge whether they felt obliged to participate, although none indicated this. The junior doctors did not know me at all, and as letters of invitation were sent from me as a doctoral student they may not have been aware that I also worked in the Trust. Again although I am unable to judge whether they felt a moral obligation to participate, there was no indication of this. It is acknowledged that as they self-selected they may have been more motivated and interested than those who did not. However, as they would not know at the time of assessing their patients that those case notes would be selected for data extraction, it is unlikely that they acted and performed clinically in any different way than if they were not participating. As they were not randomly selected, it has to be considered that different participants may have generated different findings. Due to the method of data collection in this study there was no patient volunteer bias. Case notes were randomly identified from cases seen by the ANP and junior doctor participants, patients did not volunteer. A check with the Trust confirmed that research using existing medical records and not requiring contact with patients did not need patient consent to view these records.

Although the ANPs and junior doctors worked in some different areas I was not expecting any differences in case mix and complexity between the different areas, referral systems and professional groups, and wanted a broad range to reflect reality. This was, however, recognised as a potential confounder, as a different case mix could influence findings. Therefore, statistical analysis was also conducted in the only clinical area, AMA, where both junior doctors and ANPs worked (n=209). In this area, patients with acute medical presentations were seen and assessed. A further potential confounder, day of the week, was recognised and in AMA all weekend/bank holiday presentations were seen by junior doctors. Therefore further analysis of weekday only AMA presentations was carried out (n=164).

On analysis of data in the AMA 164 cases, AMA 209 cases and 311 cases it was found that referral routes were different for patients seen by ANPs and junior doctors due to the way in which the service had been organised. This could have introduced bias, particularly in relation to the complexity of patients seen. However Mann Whitney U test revealed no statistical difference between GP referrals and other referral sources using ‘number of coexisting problems’ and ‘number of medications prescribed prior to presentation’ as an indication of patient complexity in all three analyses. As the majority of cases were either from a GP or via A&E in AMA weekday only cases (n=157), in AMA cases (n=200), and 311 cases (n=249), these cases only were also analysed using Mann Whitney U. Again no statistical significance was found in ‘number of coexisting problems’ and ‘number of medications prescribed prior to presentation’ between GP referrals and referrals via A&E.

Sampling

The case note sample size was based on studies in pre-operative assessment and A&E Departments as these were the only studies which measured senior doctor congruence with clinical management, assessment and diagnosis. Due to the lack of similar studies, and therefore the sample size being based on a relatively large difference caution has to be adopted in terms of adequate sample size. Some significant differences were found between professions as identified in chapter 5. Any differences in other outcomes are likely to be relatively small. However these findings need to be confirmed in a larger sample.

Variables

Variables identified had been used in different studies apart from text lines and word count in history taking, which were included and collected in an attempt to assess comprehensiveness of history taking. It could be argued that variables used were based on clinical experience and judgement of researcher and supervisor as to what is important and what data would potentially address the research question. The data collection tool was developed by me for this particular study, so therefore had not previously been proven to be valid and reliable. The data collection tool was validated through a pilot test process. Through the pilot process and double entry by my research supervisor, agreement was reached as to the validity and reliability of the tool. It is recommended that this tool be used in other settings, and in the same setting at a later date, as this would serve to confirm its reliability and validity.

Time of day of patient presentation was not collected. Therefore it was not possible to identify if there were any differences in terms of predictor and outcome variables dependent on time of day. This is acknowledged as a limitation and it is recommended that in future studies time of day of patient presentation is collected. Date cases presented was collected, however due to the nature of service provision within the study site, very few cases presenting at weekends and bank holidays were seen by ANPs.

Data analysis and model

The choice of statistical analyses was informed by the research question, aims and objectives, case note sample size and distribution of the data. Data were collapsed to binary variables where possible to accommodate low numbers and facilitate testing. Whilst bivariate analysis was able to determine the statistical significance of some of the relationships tested, other relationships did not achieve statistical significance. In particular, the primary outcome variable 'clinical management plan agreed by senior doctor' initially had 'clinical management plan augmented' as a category. There were differences when this category was collapsed with 'yes' and 'no'. One could argue that if the clinical management plan was augmented by the senior doctor, it was not agreed. Conversely one could argue that if it was augmented, for example, by adding additional medication, the original plan was agreed as it wasn't changed, merely added to. It could also be argued that the categorisation of the data extracted was potentially subjective, and based on clinical judgement, and this is acknowledged.

In many cases up to four provisional diagnoses were made. Often the senior doctor would make no reference to anything other than primary diagnoses. However I was unable to identify whether this meant they disagreed with the second/third/fourth diagnoses. One could query whether more experience enables diagnosis to be firmer without the need for a number of alternatives. It was also acknowledged that often the senior review took place after investigation results had been received so they had more information on which to make diagnoses. To counter this data relating to diagnoses were analysed and findings presented in a number of ways. For example, primary diagnosis agreed, any diagnoses disagreed, in both samples.

Logistic regression modelling was undertaken to account for confounders. It is acknowledged that regression analysis is a technique requiring large data sets. Logistic regression tends to overestimate odds ratios or beta coefficients when the sample size is less than about 500. The magnitude of this bias depends on the sample size and on the data structure (Nemes *et al* 2009). Therefore findings should be treated with caution.

In logistic regression models, the coefficient R^2 is a measure of how well the model fits the data and is measured on a scale of -1 to +1. According to Field

(2009), a positive value of R indicates that the likelihood of an event occurring increases as the predictor variable increases. However, the smaller the value, the lower the contribution of the variables to the event in question i.e. clinical management plan agreed by senior doctor. All the R^2 values in this study were positive, however they all had small values, with the highest being 0.16, indicating less of a contribution to the outcome.

Data collection: The insider researcher

I could be considered as an insider researcher in this study, as the study was carried out in my own organisation. The advantages of being an insider were that I had a good knowledge of the clinical setting, knew the politics of the organisation, had a degree of credibility with the research participants who knew me and found negotiating access easier than those not known to the participants (Robson, 2002). However, some researchers believe that there may be problems with insider researchers associated with maintaining objectivity (Robson, 2002, Polit and Beck 2008).

Outsider researchers may have the advantage of not being able to judge individual participants' professional skills and capabilities which could increase the objectivity with which they view the data (Bonner and Tolhurst, 2002). In this study, although I may be termed as an insider researcher, I did not have the professional expertise to judge how aspects of the ANP and junior doctor roles were performed. This allowed me to focus on collection of the data objectively. There were some areas which required clinical judgement to be used, for example whether the clinical management plan was agreed, augmented or disagreed by the senior doctor. The application of this judgment was discussed with my supervisor, and double entry by my supervisor enabled confirmation of consistency.

5.6 Summary of limitations

It is recognised and acknowledged that there are limitations in the study design, data collection methods, and data analysis that need to be addressed in future work, as well as limited resources. Recognising that limitations exist is an essential requirement of the research process. Addressing these limitations, where possible, is an important step towards minimising threats to validity e.g. including variables and using logistic regression modelling to account for confounders. However, while every effort was made to reduce the limitations as discussed, some potential solutions e.g. RCT, change in data collection methods, were rejected as the need to reduce limitations had to be balanced against the practicalities of conducting a study in a realistic way. Future work such as larger sample size, will address these limitations.

5.7 Wider implications

The development of advanced nursing practice has been attributed to care gaps brought about predominantly by a shortage of doctors, which in Europe has been compounded by the introduction of EWTD, along with a need for greater provision of long term care (Diers and Molde 1983, Jordan and Hughes 1996, Coombs *et al* 2007, Jones and Jordan 2010). People are living longer and have more complex conditions, and these factors along with the continued shortage of doctors, will continue to contribute to potential care gaps. It has been suggested that advanced practitioners could take on between 20%-70% of work currently undertaken by doctors (Welsh Government 2013). Therefore it is inevitable that globally, UK wide and nationally in Wales advanced nursing practice will continue to develop, and nurses will continue to push the boundaries of their practice in order to address the potential care gaps.

Many of the comparative studies to date have been in primary care. Primary care acts as a gatekeeper to secondary care and as such many of the conditions patients present with in primary care are either minor and are self-limiting or will be referred on to secondary care (Spence 2012). A confounding weakness of previous comparative studies in primary care has been that nurses have not been compared when dealing with more severe illnesses (Spence 2012). If the development of ANPs continues and moves into more general areas of secondary care as opposed to specialities or specific areas, studies will need to address this in a robust and valid way. Whilst RCTs remove potential confounders, they are removed from the real world. It is important to acknowledge and recognise the real world setting, and research evidence is of little use if it is too far removed from reality. Many research questions cannot be addressed by RCTs or quasi-experimental studies, as it is not possible to manipulate the variables, or if it is possible would not be ethical (Polit and Beck 2008).

The data from this study give little indication of differences in decision-making. Generally the two professions were equally likely to reach a diagnosis congruent with that of the senior when analysing diagnoses made in all 311 cases. However there was a statistically significant difference between professions in the AMA cases with the senior doctors agreeing with more primary diagnoses in junior doctor cases than ANP cases. In the AMA cases including weekend/bank holiday presentations the OR and 95% CI indicated a significant difference, though probability was >0.05. This was supported with logistic regression analysis modelling, when junior doctor was a significant predictor for primary diagnosis agreed. In some cases up to four provisional diagnoses were made with ANPs making significantly more second diagnoses in the AMA cases analyses. There was no other significant difference in number of provisional diagnoses made between the professions. Future study should examine whether one profession has a tendency to make more provisional diagnoses than another, and if so to explore this further.

There was a difference in senior congruence with clinical management planning, and further study should explore how this arose. This could be teased out with illustrative examples. It might simply be a limited knowledge base or the health professionals being unfamiliar with the resources available. The difference is small, so a small interview study, for example ten interviews from each profession, would be unlikely to reveal important differences. Future work could include a large interview study on professionals' decision making, for example fifty interviews from each profession. Additionally, interactions might be videoed and analysed (subject to ethical approval) which may offer further information on inter-professional differences in clinical history taking, diagnosis and clinical management planning. This study assumes that the seniors are correct; however this cannot always be justified. This may be a limitation of the study, although it is difficult to identify alternatives unless one uses experts in each condition, which is not feasible

The ANPs in this study prescribed significantly less than the junior doctors. This is mitigated by the fact that there was no significant difference in medications added by the senior doctor in both professions in the 311 sample and 164 samples though the senior doctor added more in ANP cases in the 209 sample analysis. The senior doctor removed significantly more medications from the junior doctor group. This may indicate that generally nurse prescribing was appropriate although perhaps not sufficient. Notwithstanding this, it is recommended that further research is undertaken to examine nurse prescribing, particularly in secondary care. Non-medical prescribing is one example of perceived erosion of professional boundaries (Strickland Hodge 2008) and it may be that there are cultural, organisational and/or professional barriers which need to be addressed. Indeed it has been suggested that, as prescribing is based on safe and accurate diagnosis which would previously lie with doctors, the introduction of non-medical prescribing has been seen as a threat to the power of the medical profession (McCartney *et al* 1999).

Education for advanced practice roles should be considered and evaluated carefully. Issues relating to lack of bioscience and pharmacology education (Jordan and Hughes 1998, Jordan and Potter 1999, Jordan *et al* 1999, Kyriakos *et al* 2005, Logan and Angel 2011, Whyte *et al* 2011) should be addressed to ensure nurses advancing their practice are adequately prepared. For example education approaches such as standardised patient encounters which include simulated clinical encounters and Objective Structured Clinical Examinations (OSCEs) are widely used in medical education (Vessey and Huss 2002). Although there are differing views about whether this is the best way to assess clinical competency (Kurz *et al* 2009), these approaches allow practitioners to practice their skills and enable evaluation of skills in a safe environment. It also enables patterns of knowing to be laid down. As the cultural shift away from traditional models of care delivery continues, changes will be required in both initial nursing preparation at undergraduate level, and post registration to enhance skills and knowledge meet care needs and ensure that nurses practicing at all levels are competent and safe to do so.

Educational standards are needed to ensure adequate preparation for advanced practice in order to govern practice and protect the public (McLaren 2005). In Wales, the majority of Higher Education Institutions deliver a variety of advanced practice education as part their post registration education contracts with the health boards. The Welsh Government recognises the current challenges in delivering healthcare, and the contribution nursing can make and is currently considering commissioning advanced practice education to help meet the challenges associated with a shortage of doctors, the increase in complex health needs and policy changes that are moving healthcare away from hospitals into communities. Furthermore, to ensure a consistent approach across Wales, the Welsh Government recently commissioned work with the aim to develop a 'Gold Standard' for the Education and Commissioning of Advanced Practice. The aims are to help to inform and identify future requirements and education commissioning, and also to inform Health Boards of the infrastructure and support required to help retain advanced practitioners in employment (Welsh Government 2013). This demonstrates the strategic importance of advanced nursing practice in healthcare provision in Wales. In Wales, as with the UK as a whole, the important contribution nursing can make to healthcare continues to be recognised, particularly now in a landscape where there is a shortage of junior doctors.

The need for collaboration between professions has been raised by several authors (Zwarenstein and Reeves 2000, Bryant Lukosius and DiCenso 2004, Furlong and Smith 2005, Lloyd Jones 2005, Williams and Jones 2006, Callaghan 2008). This is set against the challenge of the hierarchical traditions described in chapter two. There is little doubt that nursing will continue to push boundaries, and it is important nurses are adequately prepared to take on new roles and responsibilities. Evaluative and comparative studies should continue to provide evidence that health professional competence and patient safety are maintained.

5.8 Conclusion chapter five

The findings indicated that the referral patterns, case mixes and complexity of patients were different between the two professions. However to mitigate against this potential confounders were included in data collection, analyses of cases in AMA, where both junior doctors and ANPs worked, was carried out, both including and excluding weekend/bank holiday presentations.

Findings indicated that overall ANPs were able to provide a similar level of care to junior doctors in terms of assessment, diagnosis, treatment and clinical management, although there were some differences between the professions which have been identified and discussed. Comparisons were made with senior doctor reviews. Assessment and management practices were also compared between the two groups.

Chapter six discusses implications for clinical practice and education, makes suggestions for further research and identifies new knowledge, before concluding the study.

Chapter six: CONCLUSION

6.0 The study

Much of the research carried out previously in relation to comparative studies of nurses and doctors, where nurses have crossed traditional medical boundaries, has taken place in primary care, emergency departments and specialised areas. The evidence to date is that patients are as satisfied, or more satisfied with care provided by nurses compared with doctors, when nurses are working in the medical domain. Previous studies have concluded that there is no evidence that nurses are less safe or effective than doctors with regard to clinical outcomes, accurate diagnosis and appropriate care when practicing at an advanced level, taking on roles previously carried out by doctors. However, there is a paucity of research with primary clinical outcomes such as accurate assessment, diagnosis and clinical management, particularly in acute secondary care areas.

Drivers such as a reduction in junior doctors' working hours following the European Union Working Time Directive (EWTD), increasing incidence of long term diseases, people living longer and advancing technology (Chang et al 1999, Callaghan 2008, Distler 2006) have added impetus to the development of advanced practice roles, and as a result, advanced practice continues to move into acute medical areas in secondary care. As nurses take on roles traditionally performed by doctors, it is essential to ensure that the same standards of care and patient safety are achieved.

This study was an observational cohort study, using retrospective case note review to examine whether there were any observable differences in clinical practice and senior doctor congruence between ANPs and junior doctors. The primary outcome was senior doctor congruence with clinical management plan. All ANP participants in this study had undertaken relevant professional development to ensure knowledge and competence was in place to support advanced practice. All junior doctors were either in their foundation year one or two. Data were collected from a total of 311 case notes of patients presenting to ANPs (ANP n=10, case notes n=152) and junior doctors in foundation years 1 or 2 (junior doctor n=10, case note n=159). The case notes were analysed in 3 samples; AMA weekday only presentations (n=164), AMA all cases (n=209) and all cases (n=311). Limitations of the study were acknowledged and discussed in chapter five. However notwithstanding the limitations, the study was carried out using the most feasible and practical approach and methods with a strength being that it was in a natural setting.

6.1 Summary of findings

The evidence in this study is that, in an integrated Welsh NHS Trust setting in acute medical care, overall these data suggest that ANPs were as competent and as safe as junior doctors when they crossed professional boundaries and worked in what was previously the medical domain. Few differences between ANPs' and junior doctors' care have been shown to be statistically significant. No threats to patient safety were identified. There were few observable differences between ANPs and junior doctors in terms of clinical assessment, diagnosis and clinical treatment and management. There were some differences in findings from analysis of the 311 cases sample, which included 102 cases where both professions did not work together, analysis of cases from an acute admissions area (AMA) where both professions worked (n=209) and analysis of AMA weekday presentation cases only (n=164).

In all three samples patients presenting to junior doctors were older, and were more complex in that they had more co-existing problems, and had been prescribed more medications prior to presentation. ANP cases were more likely to have been referred by GPs than junior doctors' cases, and were more likely to present with chest pain.

ANPs' clinical management plans were more likely than those of junior doctors to be agreed by seniors when all 311 cases were analysed. However there was no significant difference in senior doctor congruence when AMA cases were analysed. When 'augmented' was collapsed with 'no', senior doctor congruence was more likely in ANPs' cases in 311 cases and junior doctors' cases in AMA.

There were no differences in the accuracy of diagnosis, measured by senior doctor congruence in the 311 cases sample, although the proportion of primary diagnoses disagreed by the senior doctor was 24 – 29% overall. In contrast in the AMA cases sampled primary diagnosis was agreed by the senior doctor in more junior doctors' cases, and more ANP cases had a diagnosis disagreed. In the AMA sample including weekend presentations (n=209) these differences were significant in terms of odds ratio and 95% confidence intervals, though p values were >0.05 and chi-square values were less than the critical values and therefore not significant. In the AMA weekday only sample the p value was <0.05.

Junior doctors were more likely to order investigations, and the senior doctor was more likely to order additional investigations in junior doctors' cases on analysis of 311 cases. Junior doctors were also more likely to prescribe medication than ANPs, with senior doctors adding significantly more medications in ANP cases in AMA.

Multivariate analysis identified significant predictors, though not with all outcomes. In total 18 logistic regression models were tested; in seven models no significant predictors were identified. Some models did not fit the data well; closer examination indicated that prediction was no better than with the empty model and R squared was low. The findings from the logistic regression analyses indicated a larger sample size would be needed to identify predictors with more statistical accuracy.

This study has identified a need for similar studies with larger samples. The sample, restricted to 1 clinical area (AMA) and weekday admissions (n=164), was sufficient to detect a difference of 22% between the 2 professions with 80% power & 5% significance (Uitenbroek, 1997). However, some differences found were <22%, and a larger sample would be needed to demonstrate statistical significance. An 11% difference (43% and 54%) was found in clinical management plan agreement in the AMA weekday only cases (n=164). To test this difference with 80% power and 5% significance, 646 cases from one clinical area would be needed (323 cases in each group) (Uitenbroek 1997).

There were few marked differences in this study, where OR were >2 or <0.5, and congruence with seniors' judgment was closer to ANPs in some outcomes, and closer to junior doctors in others. For example senior doctors agreed with more ANPs clinical management plans when ‘augmented collapsed with ‘no' in the 311 sample and agreed with more junior doctors' clinical management plans in the AMA sample.

The sample restricted to one clinical area (AMA n=209) and weekday only admissions (n=164) was sufficient to detect a difference of 22% between the two professions (160 needed). This study was able to detect a statistically significant difference of:

- 18.8% (23.1% junior doctors - 41.9% ANPs) in ‘any diagnosis disagreed'
- 14.9% (59.3% ANPs - 74.4% junior doctors) in ‘primary diagnosis agreed'

The larger sample (n=311) extended findings outside the single clinical area beyond the nine professionals working in this area and obtained sufficient records to test a 12% prevalence of under assessment. The statistically significant differences in this study in this study were:

- 16.4% ANPs – 28.3% junior doctors in ‘additional investigations by senior doctor'.
- 33.6% ANPs – 49.1% junior doctors in ‘clinical management plan not agreed' when ‘augmented' was collapsed with ‘no'.
- 32.9% ANPs – 49.7%% junior doctors in ‘additional plan by senior doctor'.

6.2 Implications for clinical practice and education

In areas of the medical division of a Welsh integrated Trust, ANPs were as competent and as safe as junior doctors when they took on aspects of junior doctor roles, and there were few observable differences between the two professions. Medicine and nursing are different professions; however available evidence suggests advanced nursing roles can be assimilated safely and appropriately in some areas of patient care.

Findings did identify some differences in diagnosis congruence with senior doctor review, and inaccuracy of diagnosis measured by senior doctor disagreement was fairly high in both professions. Previous research and data from this study have indicated an association between accurate diagnosis and appropriate clinical management (which is also a clinically reasonable association). Vincent (2010) suggests that diagnostic errors deserve more attention from the research community, as they are probably an important contributor of causing harm or providing substandard treatment for patients. Therefore the ability to diagnose accurately, and thus the education related to this skill, should be investigated and promoted. The provision of relevant bioscience education in nursing should be ensured. Prescribing practice in this study was limited in both professions; however nurses prescribed less than junior doctors. Previous studies have highlighted several barriers to non-medical prescribing which need to be addressed.

Education and training for advanced practice should be continually reviewed and evaluated, to ensure it meets the needs of individuals, populations and services, particularly as nursing roles continue to evolve. In my organisation, advanced practitioner roles are now being developed with the expectation that they become part of junior doctor on-call rotas, working alongside their colleagues in general areas in acute care. Advanced nurse practitioners are experienced nurses but they need to have access to education and support to enable them to practice at this advanced level crossing the boundaries at the nursing/medical interface. They cannot be expected to move into areas of care provision for which they are not adequately prepared nor is this acceptable from a patient safety perspective. In order to ensure that the professionals delivering the care are safe and competent to do so, robust workforce planning measures should be put into place to ensure that potential training and education needs are identified in a timely way to ensure service provision is available from appropriately trained and competent healthcare professionals. As traditional models of care delivery change and advanced nursing practice develops generally cognisance should also be taken of undergraduate nurse education. Changes may be required in pre-registration education and pre and post registration education should work in partnership. As nursing develops, skills and knowledge which were not expected of nurses at the point of registration previously may become the norm. As previously highlighted, a century ago only doctors were believed to be skilled enough to use sphygmomanometers, whereas today this is part of the basic nursing assessment (Coombs *et al* 2007). Regular evaluation of nurse education, at both undergraduate and post graduate level is required to ensure that the education and training meets the needs of a complex and dynamic health service.

6.3 Further work

Up to 29% of primary diagnoses overall were disagreed with by the senior doctors in this study. Exploration of clinical decision making processes should be carried out to determine factors which may affect this. Education preparation and provision should be examined to ensure that it is adequate and appropriate. Further work on the relative contribution of history taking, physical examination and investigations to accurate diagnosis should be carried out to enable appropriate training and education to be delivered. This work may also give an indication of the relative contributions of deductive and intuitive decision making in terms of how much or how little clinical intuition may play in the decision making and diagnostic processes.

Small differences in outcomes would be identified by larger sample sizes, therefore the data collection method should be repeated with a larger sample size. As more ANPs work alongside junior doctors it will be possible to achieve larger sample sizes across more clinical areas, where ANPs are on junior doctor rotas. It would be difficult to conduct an RCT, as generally there is only one health professional on call at any one time in acute areas, apart from A&E. It may not also be ethical for patients presenting with acute conditions to be approached regarding RCTs at a time of considerable stress and anxiety. In previous comparative studies utilising RCTs, the presenting conditions have been either minor or not acute therefore explanations and consents regarding entry to RCTs may have been easier to carry out. However a cluster RCT randomised by shift or quasi-experimental study could be conducted.

In this study, the variable 'clinical management plan agreed by senior' had three potential responses; 'yes', 'no' and 'augmented'. The 'augmented' category was used when changes to, for example, medications or investigations were made by the senior doctor. When 'augmented' was collapsed it had an impact on bivariate analysis, as many of the clinical management plans were augmented. In previous studies, a third expert researcher has judged the accuracy of clinical management plans. Although this would be costly, and there is potential for lack of consistency if more than one 'expert' is used, a study which was able to assess clinical management accuracy in different ways may inform and produce new learning. In this study there is an assumption that the senior review is correct; this may not always be the case.

Part of the ANP role includes prescribing. Further exploratory research should be carried out to identify any barriers to independent prescribing which prevent advanced practitioners from utilising this role; the approach should be qualitative to enable depth of understanding. Qualitative research should also be carried out to explore in depth clinical decision making of the two professions. Continual evaluation of safety and outcomes should be carried out as nurses continue to push the boundaries at the medical/nursing interface, ensuring that standards of patient care are maintained.

This study compared ANPs and junior doctors. Future work should compare ANPs and more senior grade doctors. As the ANP role advances ANPs may take on more senior doctor roles.

6.4 New knowledge

Previous studies have been mainly carried out in primary care or in specific focussed areas such as A&E Departments and pre-operative assessment or in specialist areas such as breast care and rheumatology. Comparisons were made with nurses and doctors at various grades and a predominant outcome was patient satisfaction. Where senior congruence was compared, in two studies this was in minor injuries care, and in the third was in pre-operative assessment, in which diagnosis and thus clinical management have been decided prior to presentation for assessment.

This study took place in a real world setting, using case notes to extract data from acute presentations, primarily in medicine. It compared ANPs and junior doctors who met specific inclusion criteria, in a secondary acute care setting. The primary outcome; clinical management plan senior doctor congruence, had not been identified in many previous studies, yet is paramount for safe patient care. As ANPs continue to cross into areas of care previously in the medical domain it is important that steps are taken to ensure they can at least provide as good care as their medical colleagues. Although patient satisfaction is important, patient safety is, I would suggest, even more important, particularly as nurses are crossing boundaries in areas of more complex care.

This study found few observable differences between the two professions, which is reassuring for nursing as a profession as it continues to extend professional boundaries. What is less reassuring is the level of senior disagreement with diagnoses in both professions which inevitably will help to inform clinical management. Hence if diagnosis is incorrect, it is clinically reasonable to suggest that potentially incorrect clinical management may be planned. The factors impacting on accurate diagnoses should be explored further as though one may expect that more systems examined and more detail in history recorded may support accurate diagnosis, interestingly ANPs wrote more words and examined more systems than the junior doctors, but had more diagnoses disagreed by the senior doctor (however they also made more provisional diagnoses).

In previous comparative studies prescribing frequency was not measured and compared. This study found that ANPs prescribed statistically significantly less medication than junior doctors. It is recognised that due to the difference in complexity and presenting condition of the patients these findings should be treated with caution. It is also interesting to consider Weiss *et al*'s (2004) view which is that nurses are less likely to be influenced by patient expectations, and are more likely to adhere to clinical influences on their prescribing practice. In this study senior doctors removed more medications in junior doctors' cases, indicating that more prescribing is not necessarily appropriate management. What is clear is that more work needs to be carried out with regard to non-medical prescribing; both influences and barriers.

6.5 Conclusion

Findings indicated that overall ANPs were as competent and as safe as junior doctors and were able to provide a similar level of care as junior doctors in terms of assessment, diagnosis, treatment and clinical management. This was identified by comparing with senior doctor reviews. Assessment and management practices were also compared between the two groups. Findings indicated that further work is needed, as well as larger sample sizes, to detect smaller differences.

The limitations of this study have been recognised and acknowledged. However the study generated data and findings in a natural setting. This study was unique in that the setting was secondary care acute presentations. The findings indicated that the referral patterns, case mixes and complexity of patients were different between the two professions. However to mitigate against this, potential confounders were included in data collection, and a second analysis of cases in AMA, where both junior doctors and ANPs worked, was carried out.

Advancing nursing roles into the medical domain may lead to each profession struggling to maintain traditional professional boundaries (Sibbald *et al* 2006). However, if the shortage of junior doctors is likely to continue, health care delivery has to be delivered in different ways. It should be recognised that opportunity for one profession may be perceived as a threat to another (Davies 1999). Advancing nursing practice often requires medical mentorship which inevitably involves medical colleagues being willing to relinquish ownership of professional skills (Barton 2006b, 2006c). Nursing must take charge of nursing roles, and ensure the distinctive qualities of nursing are not lost, and should not allow other professions or interested parties to shape its future (Callaghan 2008). Any developments should take place with engagement and negotiation with patient need driving any change. Further evidence is needed on the effect of introducing advanced nurse practitioner roles, with a further need to also to ensure that changes in skill mix are due primarily for the benefit of patients (Carlisle 2004).

There remains a degree of ambiguity around delegation, nurse-doctor substitution, extended roles and expanded roles, which is compounded by the fact that nurses and doctors do not constitute homogenous groups (Williams 2000). Whenever changes in role take place the question should be asked as to whether it will enhance the quality and effectiveness of care. A clearer understanding of extended and expanded practice should be sought to negate the need for continued discussion and debate about terminology. As nurses push the boundaries of practice, robust evaluation of quality and effectiveness of care should take place to ensure they are clinically as safe and competent as the doctors who previously carried out these roles.

Table 6.1 STROBE Statement—Checklist of items that should be included in reports of cohort studies (von Elm et al 2007).

	Item	Recommendation	Reported on chapter/ section
Title and abstract			
	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	i
Introduction			
Background/ rationale	2	Explain the scientific background and rationale for the investigation being reported	1/1.1
Objectives	3	State specific objectives, including any pre specified hypotheses	1/1.5
Methods			
Study design	4	Present key elements of study design early in the paper	1/1.6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	1/1.1.6 3/3.1
Participants	6	Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	3/3.3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers.	3/3.4
Data sources/measurements	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	3/3.4
Bias	9	Describe any efforts to address potential sources of bias	3/3.5
Study size	10	Explain how the study size was arrived at	3/3.3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	3/3.5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding (*b*) Describe any methods used to examine subgroups and interactions (*c*) Explain how missing data were addressed (*d*) If applicable, explain how loss to follow-up	3/3.5

		was addressed (*e*) Describe any sensitivity analyses	
Results			
Participants	13	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	4/4.1
Descriptive data	14	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest	4/4.1 4.2 4.3, 4.4
Outcome data	15	Report numbers of outcome events or summary measures over time	4/4.2, 4.3, 4.4
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (*b*) Report category boundaries when continuous variables were categorized (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	4/4.2, 4.3, 4.4
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	4/4.5, 4.6, 4.7, 4.8
Discussion			
Key results	18	Summarise key results with reference to study objectives	5/5.1
Limitations	19	limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	5/5.5
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar 3studies, and other relevant evidence	5/5.6, 5.7, 6/6.2, 6.3
Generalisability	21	Discuss the generalisability (external validity) of the study results	5/5.5

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Advanced Practice Pillars - Adapted from National Executive Scotland (NES) (2007)

In 2007, NES developed the four Advanced Practice pillars and defined the characteristics of each. These have been adapted for NHS Wales in the table below

Table 1 - Advanced Practice Pillars - Adapted from NES (2007)

1. Management and Leadership

- Identifying need for change, leading innovation and managing change, including service development
- Developing case for change
- Negotiation and influencing skills
- Networking
- Team development

2. Education (either within clinical practice or education sector)

- Principles of teaching and learning
- Supporting others to develop knowledge and skills
- Promotion of learning/creation of learning environment
- Service user/carer teaching and information giving
- Developing service user/carer education materials
- Teaching, mentorship and coaching

3. Research

- Ability to access research/use information systems
- Critical appraisal/evaluation skills
- Involvement in research
- Involvement in audit and service evaluation
- Ability to implement research findings into practice - including use of and development of policies/protocols and guidelines.
- Conference presentations
- Publications

4. Advanced Clinical Practice

- Decision making/clinical judgement and problem solving
- Critical thinking and analytical skills incorporating critical reflection
- Managing complexity
- Clinical governance
- Equality & diversity
- Ethical decision-making
- Assessment, diagnosis referral, discharge
- Developing higher levels of autonomy
- Assessing and managing risk
- Non-medical prescribing in line with legislation.
- Developing confidence
- Developing therapeutic interventions to improve service user outcomes
- Higher level communication skills
- Service user focus/public involvement
- Promoting and influencing others to incorporate values based care into practice
- Development of advanced psycho-motor skills

These pillars are further supported by the following underpinning principles which demonstrate how the role fulfils the requirements of advanced practice.

Table 2 - Underpinning Principles of Advanced Practice - Adapted from NES (2007)

Autonomous Practice
Advanced Practitioners practice autonomously, have the freedom to exercise judgement about actions, in turn accepting responsibility and being held to account for them.

Critical Thinking
Practising autonomously requires "self-regulatory judgement that results in demonstrating the ability to interpret, analyse, evaluate and infer" (Mantzoukas et al, 2007; 33). Critical thinking allows Advanced Practitioners to explore and analyse evidence, cases and situations in clinical practice, enabling a high level of judgement and decision making.

High Levels of Decision Making & Problem Solving
It would be expected that an Advanced Practitioner can demonstrate expertise in complex decision making in relation to their current role. This includes determining what to include in the decision making process, and making a decision based on judgement and critical thinking/problem solving. This in turn affects the ability to practice autonomously.

Values Based Care
At this level of practice, individuals are required to have a high level of awareness of their own values and beliefs. Care is negotiated with service user/carers as an equal partner. 'Working in a positive and constructive way with difference and diversity. Putting the values, views and understanding of individual service users and carers at the centre of everything we do'.

Improving Practice
It is important that Advanced Practitioners deliver advanced practice which is evidence based within service, whilst acting as a positive role model, that enables change regardless of their "job title".

Nationally agreed elements of advanced practice

1 Clinical/direct care practice

Nurses working at an advanced level:

1.1 practise autonomously and are self-directed;

1.2 assess individuals, families and populations holistically using a range of different assessment methods, some of which may not be usually exercised by nurses such as physical examination, ordering and interpreting diagnostic tests or advanced health needs assessment;

1.3 have a health promotion and prevention orientation, and comprehensively assess patients for risk factors and early signs of illness;

1.4 draw on a diverse range of knowledge in their decision-making to determine evidence-based therapeutic interventions (which will usually include prescribing medication and actively monitoring the effectiveness of therapeutic interventions);

1.5 plan and manage complete episodes of care, working in partnership with others, and delegating and referring as appropriate to optimise health outcomes and resource use, as well as providing direct support to patients and clients;

1.6 use their professional judgement in managing complex and unpredictable care events and capture the learning from these experiences to improve patient care and service delivery;

1.7 draw upon an appropriate range of multi-agency and inter-professional resources in their practice; and

1.8 appropriately define the boundaries of their practice.

2 Leadership and collaborative practice

Nurses working at an advanced level:

2.1 identify and implement systems to promote their contribution and demonstrate the impact of advanced level nursing to the healthcare team and the wider health and social care sector;

2.2 provide consultancy services to their own and other professions on therapeutic interventions, practice and service development;

2.3 are resilient and determined and demonstrate leadership in contexts · unfamiliar, complex and unpredictable;

2.4 engage stakeholders and use high-level negotiating and influencing : develop and improve practice;

2.5 work across professional, organisational and system boundaries and proactively develop and sustain new partnerships and networks to in and improve health, outcomes and healthcare delivery systems;

2.6 develop practices and roles that are appropriate to patient and servic through understanding the implications of and applying epidemiolog demographic, social, political and professional trends and developme

2.7 identify the need for change, proactively generate practice innovatio lead new practice and service redesign solutions to better meet the n patients and the service.

3 Improving quality and developing practice

Nurses working at an advanced level:

3.1 are proactively involved in developing strategies and undertaking act that monitor and improve the quality of healthcare and the effective their own and others' practice;

3.2 strive constantly to improve practice and health outcomes so that th consistent with or better than national and international standards th initiating, facilitating and leading change at individual, team, organis and system levels;

3.3 continually evaluate and audit the practice of self and others at indiv and systems levels, selecting and applying valid and reliable approac and methods which are appropriate to needs and context, and acting the findings;

3.4 continually assess and monitor risk in their own and others' practice challenge others about wider risk factors;

3.5 critically appraise and synthesise the outcomes of relevant research, evaluations and audits and apply the information when seeking to improve practice;

2.2 provide consultancy services to their own and other professions on therapeutic interventions, practice and service development;

2.3 are resilient and determined and demonstrate leadership in contexts that are unfamiliar, complex and unpredictable;

2.4 engage stakeholders and use high-level negotiating and influencing skills to develop and improve practice;

2.5 work across professional, organisational and system boundaries and proactively develop and sustain new partnerships and networks to influence and improve health, outcomes and healthcare delivery systems;

2.6 develop practices and roles that are appropriate to patient and service need through understanding the implications of and applying epidemiological, demographic, social, political and professional trends and developments; and

2.7 identify the need for change, proactively generate practice innovations and lead new practice and service redesign solutions to better meet the needs of patients and the service.

3 Improving quality and developing practice

Nurses working at an advanced level:

3.1 are proactively involved in developing strategies and undertaking activities that monitor and improve the quality of healthcare and the effectiveness of their own and others' practice;

3.2 strive constantly to improve practice and health outcomes so that they are consistent with or better than national and international standards through initiating, facilitating and leading change at individual, team, organisational and system levels;

3.3 continually evaluate and audit the practice of self and others at individual and systems levels, selecting and applying valid and reliable approaches and methods which are appropriate to needs and context, and acting on the findings;

3.4 continually assess and monitor risk in their own and others' practice and challenge others about wider risk factors;

3.5 critically appraise and synthesise the outcomes of relevant research, evaluations and audits and apply the information when seeking to improve practice;

3.6 plan and seize opportunities to generate and apply new knowledge to their own and others' practice in structured ways which are capable of evaluation;

3.7 alert appropriate individuals and organisations to gaps in evidence and/or practice knowledge and, as either a principal investigator or in collaboration with others, support and conduct research that is likely to enhance practice; and

3.8 use financial acumen in patient/client, team, organisational and system level decision-making and demonstrate appropriate strategies to enhance quality, productivity and value.

4 Developing self and others

Nurses working at an advanced level:

4.1 actively seek and participate in peer review of their own practice;

4.2 enable patients/clients to learn by designing and coordinating the implementation of plans appropriate to their preferred approach to learning, motivation and developmental stage;

4.3 develop robust governance systems by contributing to the development and implementation of evidence-based protocols, documentation processes, standards, policies and clinical guidelines through interpreting and synthesising information from a variety of sources and promoting their use in practice;

4.4 work in collaboration with others to plan and deliver interventions to meet the learning and development needs of their own and other professions;

4.5 advocate and contribute to the development of an organisational culture that supports continuous learning and development, evidence-based practice and succession planning; and

4.6 have high-level communication skills and contribute to the wider development of those working in their area of practice by publicising and disseminating their work through presentations at conferences and articles in the professional press.

Appendix ii Foundation Year 1 and 2 outcomes

Competences of the Foundation Programme curriculum (2010)

Professionalism Behaviour in the workplace F1and F2 ■ always recognises own level of competence and asks for help from appropriate sources ■ demonstrates the ability and habit of reflection on experience, as well as learning from practice, then instituting appropriate changes in this practice ■ acts with empathy, honesty and sensitivity in a non-confrontational manner ■ respects and supports the privacy and dignity of patients ■ is courteous, polite and professional when communicating with both patients and colleagues ■ has a non-judgemental approach ■ is aware of patient expectations around personal presentation of doctors such as dress and social behaviour ■ in all interactions with both patients and colleagues takes account of factors pertaining to the patient's age, colour, culture, disability, ethnic or national origin, gender, lifestyle, marital or parental status, race, religion or beliefs, sexual orientation, or social or economic status (*The New Doctor*, GMC) ■ encourages an atmosphere of open communication and appropriately directed communication within teams ■ recognises the potentially vulnerable patient, e.g. children, older people, those in need of extra support ■ only shares clinical information, whether spoken or written, with appropriate individuals or groups ■ seeks out role models and tries to learn from the behaviours of the best clinical practitioners and leaders ■ takes part in systems of quality assurance and clinical improvement in clinical work and training.
Health and handling stress and fatigue F1and F2 ■ where relevant, takes responsibility for ensuring that personal or others' health does not compromise that of colleagues or patients ■ ensures own immunisations are up to date.
Time management and continuity of care F1 ■ is punctual for start of shifts, meetings, handovers and other duties ■ keeps a list of tasks prioritises and re-prioritises workload appropriately ■ delegates or calls for help in a timely fashion when s/he is falling behind ■ ensures satisfactory completion of tasks at the end of the shift/day with appropriate handover ■ makes adequate arrangements to cover leave. F2 ■ demonstrates an ability to adjust decision-making in situations where staffing levels and support are reduced (e.g. out of hours) ■ is aware of work pressures on others and takes appropriate action to help reorganise workloads.
Good clinical care Eliciting a history F1 and F2 ■ takes accomplished, concise, targeted history and communicates in complex situations, which include: Clinical: both acute problems and background of chronic illness psychological (e.g. the patient is confused, has psychiatric/psychological problems which impact on physical health) social and personal (e.g. English is not the patient's first language, impaired hearing/vision, learning difficulties) the patient's personal factors (see *The New Doctors'* list in Professionalism) ■ takes account of background issues where relevant and appropriate, including verbal and non verbal cues ■ takes a focused family history, and constructs and interprets a family tree where relevant ■ obtains collateral history when available ■ routinely scrutinises existing patient records ■ manages three-way consultations (e.g. with an interpreter or with a child patient and their family/carers).

Examination F1 ■ demonstrates accomplished and targeted examination skills and appropriate use of equipment, including an ophthalmoscope ■ explains and gains appropriate consent for the examination procedure ■ performs a mental state assessment ■ demonstrates awareness of safeguarding children (Levels 1 and 2) and vulnerable adults ■ asks for a chaperone where appropriate. F2 ■ demonstrates the ability to identify, refer, and participate in both the medical assessment and care planning, in cases where a child's and/or vulnerable adult's interests need safeguarding ■ demonstrates an awareness of the potential abuse of older patients, and manages such cases in a similar way to safeguarding children and vulnerable adults.
Diagnosis and clinical decision-making F1 ■ establishes a differential diagnosis and problem list ■ constructs a management plan and communicates requests/instructions to other healthcare professionals ■ pursues further history and examination in the light of the differential diagnosis ■ arranges appropriate basic laboratory tests and other investigations, including radiology, and interprets the results correctly within the context of the particular patient (see Investigations and Procedures section) ■ describes the applicability and limitations of such investigations or tests ■ makes a judgement about prioritising actions on the basis of the differential diagnosis and clinical setting ■ negotiates a treatment plan with patients and allows patients to make informed treatment choices ■ considers appropriate venous thrombo -embolic (VTE) prophylaxis and screening for Methicillin-Resistant Staphylococcus Aureus (MRSA). F2 ■ reviews, and where appropriate, adjusts differential diagnosis in the light of developing symptoms and response to therapeutic interventions ■ takes account of probabilities in ranking differential diagnoses ■ helps other foundation doctors to prioritise their actions and to order appropriate tests and investigations.
Safe prescribing F1 ■ takes an accurate drug history, including self-medication, use of herbal products and enquiry about allergic and other adverse reactions ■ prescribes drugs and treatments (including oxygen and fluids) appropriately, clearly and unambiguously with date and printed surname clearly visible under a signature ■ transfers previous prescriptions accurately and appropriately when patients move between different areas especially for those with chronic diseases ■ discusses drug treatment and administration, including unwanted effects, with patients and, when appropriate, carers, using aids such as patient information leaflets ■ understands and applies the principles of safe prescribing for different patient groups including children, women of child-bearing potential, pregnant women and those with hepatic and/or renal dysfunction ■ demonstrates awareness of, and follows guidelines on, safe use of blood and blood products, including awareness of religious/cultural beliefs ■ prescribes blood products appropriately and recognises transfusion reactions ■ seeks evidence about appropriateness and effectiveness of therapies in making prescribing decisions, including evidence which may be available in NICE, SIGN and local guidelines ■ demonstrates awareness of possible drug interactions ■ uses the *BNF* (and *BNF for Children* where appropriate), plus pharmacy and computer-based prescribing-decision support to access information about drug treatments, including drug interactions ■ performs dosage calculations accurately and verifies that the dose calculated is of the right order
Medical record keeping and correspondence F1 ■ routinely records: comprehensive, accurate, logical medical records and pertinent accounts of history (both acute and long term), examination, investigations, management plans and clinical decisions that are timed, dated and clearly attributable patient's progress and multidisciplinary management plans information given to patients, details of discussion with patients, and patients' views on investigative and therapeutic options

a summary of professional telephone communications and telephone consultations with patients all information in compliance with the Academy of Medical Royal Colleges' *Clinician's Guide to Record Standards (2007)* ■ describes the medico-legal importance of good record keeping. F2 ■ structures letters clearly to communicate the details of long term conditions and the findings and outcomes of acute episodes so that they can be read and understood by other professionals and patients ■ ensures that letters and discharge summaries are written and sent out in a timely and efficient manner ■ demonstrates record keeping and intra/internet access skills to F1 doctors or students.
<u>Safe use of medical devices</u> F1and F2 ■ demonstrates an ability to set up and use appropriate medical devices safely e.g. for monitoring blood pressure, pulse and oxygen saturation, infusion of fluids etc (NB this excludes implantable devices).
Recognition and management of acutely ill patient <u>Promptly assesses the acutely ill or collapsed patient</u> F1 ■ assesses conscious level ■ ensures airway is supported and cleared ■ observes respiratory pattern and rate, identifies inadequate ventilation, and measures oxygen saturation ■ assesses pulse rate, rhythm and volume ■measures blood pressure using automated methods or sphygmomanometer ■ makes a clinical assessment of cardiac output and oxygen delivery (end organ perfusion) ■ measures capillary blood glucose ■ completes comprehensive initial assessment within three minutes. F2 ■ selects, prescribes and ensures timely administration of appropriate antimicrobials in the infected patient (see Good Clinical Care: Safe Prescribing and Infection Control) ■ is capable of leading multidisciplinary team ■ considers and ensures relatives are being supported if present.
<u>Identifies and responds to acutely abnormal physiology</u> F1 ■ calls for help early ■ administers oxygen safely, monitors effectiveness (see Good Clinical Care: Safe Prescribing) ■ identifies oliguria, checks for common causes, intervenes appropriately ■ identifies and tries to correct circulatory failure appropriately. F2 ■ describes where to find normal age-related reference ranges for vital signs in infants and children where appropriate ■ anticipates and prevents deterioration in vital signs ■ recognises patients at risk including those with chronic and co-morbid disease ■ investigates causes of abnormal vital signs.
<u>Where appropriate, delivers a fluid challenge safely to an acutely ill patient</u> F1 ■ selects an appropriate fluid for intravenous resuscitation ■ sets up fluid administration giving-set correctly ■ administers fluid bolus(es), observes response, ensures continued administration with monitoring of effect to desired end-points ■ identifies hypokalaemia, chooses a safe and effective method of potassium supplementation, and monitors the response ■ reviews impact of fluid administration on organ system function. F2 ■ considers additional electrolyte replacement requirements.
<u>Reassesses ill patients appropriately after starting treatment</u> F1 ■ implements a system of checking unstable patients regularly ■ prioritises problems ■ calls for senior and more experienced help if patient does not respond to initial measures. F2 ■ provides clear guidance to medical and nursing colleagues about further monitoring and calling criteria ■ ensures that communication to absent relatives is carried out by someone competent to advise progress

■ considers psychiatric/psychological aetiology (e.g. deliberate self harm).
Undertakes a further patient review to establish a differential diagnosis F1 ■ recognises the importance of iterative review ■ recognises that the acute illness may be an acute exacerbation of a chronic disease ■ assesses for prevention and recognition of acute organ injury. F2 ■ undertakes focused further history-taking in difficult circumstances and/or when the patient is unable to co-operate ■ plans appropriate further investigations to confirm or refute a diagnosis ■ recognises the influence of chronic or co-morbid disease and its treatment on the presentation of acute illness.
Obtains an arterial blood gas sample safely, interprets results correctly F1 ■ takes an arterial sample in an adult safely using a heparinised syringe ■ records results clearly in the case record ■ describes common causes of abnormal values ■ communicates significant acid-base disturbances to others in the team. F2 ■ interprets results in context ■ takes appropriate action to correct abnormalities in acid-base balance and blood gas results.
Manages patients with impaired consciousness, including convulsions F1 ■ appreciates urgency of the situation ■ administers oxygen, maintains airway in unconscious patient ■ places unconscious patient in recovery position, if safe and appropriate
F1 ■ evaluates the patient in pain ■ makes patient comfort a priority ■ prescribes opioid and non-opioid analgesic drugs safely ■ re-evaluates in a timely manner the efficacy of analgesia ■ monitors patients for common side effects of analgesic drugs ■ safely uses anti-emetic drugs to treat and prevent nausea and vomiting. F2 ■ considers the effect of hepatic and renal dysfunction on analgesic pharmacology.
Understands and applies the principles of managing a patient with acute mental disorder including self harm F1 ■ describes and recognises common presenting features of acute mental disorder including disturbance of behaviour, mood, thought/cognition, and perception ■ knows how to access national information systems and does so when necessary ■ does a mental state assessment ■ understands the potential risks to self and others ■ recognises the need for involvement of mental health or more experienced personnel ■ summons experienced help promptly. F2 ■ discusses use of general measures and understands the local protocol for rapid tranquillisation including the associated risks ■ takes appropriate steps to protect the patient, dependants, self and colleagues from harm ■ performs an assessment of mental capacity and communicates the outcome ■ considers underlying causes of severe mental disturbance including acute confusional states, psychosis and substance use/withdrawal
Ensures safe continuing care of patients on handover between shifts, on call staff or with 'hospital at night' team by meticulous attention to detail and reflection on performance F1 accurately summarises and documents the main points of patients' diagnoses, active problems, and management plans ■ provides clear information to colleagues ■ attends handovers punctually and accepts directions and allocation of tasks from seniors.

F2 ■ supports colleagues in forward planning at handover ■ can, and sometimes does, organise handover, briefing and task allocation ■ anticipates potential problems for next shift and takes pre-emptive action.
Resuscitation F1 ■ is trained to the standard of immediate life support. F2 ■ is trained in advanced life support (ALS or equivalent) ■ is trained in basic paediatric life support (for doctors working with infants and children).
<u>Discusses Do Not Attempt Resuscitation (DNAR) orders/advance directives appropriately</u> F1 and F2 ■ describes the criteria for issuing DNAR orders and the level of experience needed to issue them ■ discusses DNARs with multi-disciplinary team and the patient, and can observe or take part in discussions with relatives ■ facilitates the regular review of DNAR decisions and understands actions required if decision is challenged ■ recognises actual and potential conflicts between patients and their relatives.
Discharge and planning for chronic disease management F1 and F2 ■ accurately re-prescribes long-term medications (checking for side effects and significant interactions) (see Good Clinical Care: Safe Prescribing) ■ checks for new complications of long-term illnesses ■ recognises the need for physiotherapy and occupational therapy for inpatients with long term mobility problems ■ starts planning discharge from the time of admission, including early referral to the appropriate members of the multidisciplinary team ■ takes an active part in discharge planning meetings ■ liaises and communicates with patient, family and carers ■ finds out about family dynamics and socio-economic factors influencing success of discharge ■ recognises the potential impact of long term conditions on the patient, family and friends ■ recognises and records when patients are medically fit for discharge ■ ensures with appropriate, timely information that the primary care team is aware of the discharge of patients arranges secondary care follow-up when appropriate ■ evaluates a patient's capacity to care for themselves where appropriate, and to ensure that necessary environmental adaptations and care plans are in place before discharge ■ promotes self-care for patients, where appropriate ■ promotes and encourages involvement of patients in appropriate support networks, both to receive support and to give support to others ■ puts patients in touch with the relevant agency, including the voluntary sector, from which they can access advice and information, and procure equipment and devices to improve quality of life in the home ■ produces a competent, legible immediate discharge summary that identifies principle diagnoses, key treatments/interventions, discharge medication and follow-up arrangements.
Relationship with patients and communication skills <u>Within a consultation</u> F1 ■ is always polite and considerate to patients ■ explains options clearly and checks understanding, encouraging patients with knowledge of their condition to make appropriately informed decisions about their care. F2 ■ provides or recommends relevant written/on-line information for patients ■ deals appropriately with angry or dissatisfied patients.
<u>Breaking bad news</u> ■ demonstrates the ability to 'break' bad news to a patient or carer effectively and compassionately, and provides support when necessary ■ demonstrates ability to communicate complicated or bad news to vulnerable patients, people who are dying, their carers and relatives.
Patient safety within clinical governance

Treats the patient as the centre of care

F1 and F2

■ listens actively and enables patients to express concerns and preferences, ask questions and make personal choices
■ respects the right to autonomy and confidentiality
■ recognises the patient's confidence and competence to self-care and need for support, notably when an acute problem is superimposed on a chronic illness
■ seeks advice promptly when unable to answer a patient's query or concerns
■ respects the patient's right to refuse treatment or take part in research
■ considers care pathways and the process of care from the patient's perspective
■ describes common reactions of patients, family and clinical staff to error
■ places the needs of patients above own convenience without compromising the safety of self or others.

Makes patient safety a priority in own clinical practice

F1

■ identifies and minimises potential risks and main hazards to patients
■ delivers protocol-driven care
■ describes a critical incident and methods of preventing an adverse event
■ identifies or describes a potential complaint and the role of the multidisciplinary team in methods of resolution
■ complies with information governance standards of confidentiality and data protection.

F2

■ provides reliable best practice care based on clinical care pathways, care bundles or protocols
■ maintains professional development to enhance personal contribution to quality of patient care.

F1 and F2

■ works in partnership with patients and colleagues to develop sustainable care plans to manage patients' acute and chronic conditions
■ cross-checks instructions and actions with colleagues, e.g. medicines to be injected
■ draws attention to risks or potential risks to patients regardless of status of colleagues
■ describes ways of identifying and dealing with poor performance in self and colleagues, including senior colleagues.

Understands the principles of quality and safety improvement

F1

■ demonstrates knowledge of how and when to report adverse events and 'near misses' to local and, where appropriate, national reporting systems.

F2

■ describes opportunities for improving the reliability of care following adverse events or 'near misses'
■ describes root-cause analysis.

Complaints

F1 and F2

■ is sensitive to situations where patients are unhappy with aspects of care and seeks to remedy concerns with help from senior colleagues and/or other members of the multi-disciplinary team
■ always behaves in a way that appropriately minimises the risk of causing patient dissatisfaction.

Infection control

F1

■ demonstrates correct techniques for hand hygiene with hand gel and with soap and water
■ consistently uses hand hygiene appropriately in clinical settings
■ follows aseptic technique
■ uses personal protective equipment (gloves, masks, eye protection etc) appropriately
■ adheres to policy regarding the disposal of sharps and clinical waste
■ involves the infection control team at an appropriate early stage
■ takes appropriate microbiological specimens in a timely fashion
■ follows local guidelines/protocols for antibiotic prescribing.
■ informs the competent authority of notifiable diseases.

F2

■ challenges others who are not observing best practice in infection control
■ describes the concept of outbreak management within healthcare settings e.g. diarrhoea on a ward.

Nutritional care

F1 and F2

■ performs a basic nutritional screen

■ identifies major nutritional abnormalities and establishes a management plan, where relevant with other healthcare professional input ■ makes nutritional care part of daily practice.
Health promotion, patient education and public health <u>Educating patients</u> F1 ■ recognises and uses opportunities to prevent disease and promote health ■ explains to patients, as appropriate, the possible effects of lifestyle, including the effects of diet, nutrition, smoking, alcohol and drugs (separately and in combination) ■ advises patients on correct use of medicines, including how to recognise emergence of serious adverse effects ■ identifies potential 'ready to quit' smokers ■ advises on smoking cessation and supportive measures ■ advises appropriate drinking levels or drinking cessation F2 ■ describes the implications of the wider determinants of health ■ describes the impact of health inequalities on the patient.
Ethical and legal issues <u>Medical ethical principles and confidentiality</u> F1 and F2 ■ describes and demonstrates an understanding of the main principles of medical ethics, including autonomy, justice, beneficence, non-maleficence and confidentiality as they apply to medical practice ■ ensures privacy when discussing sensitive issues ■ uses and shares clinical information appropriately or seeks advice when uncertain (see Professionalism: Behaviour in the workplace) ■ seeks timely advice where patient abuse is suspected, while respecting confidentiality ■ modifies patients' management plans in accordance with the principles of patients' best interests, autonomy and rights.
<u>Valid consent</u> F1and F2 ■ describes the principles of valid consent ■ gives the patient appropriate information in a way s/he can understand in order to obtain valid consent ■ obtains valid consent after being trained in the process of consent ■ refers consent requests/queries to senior colleagues when appropriate ■ checks that the patient has understood the relevant information ■ describes mental health legislation in the area of consent.
<u>Legal framework of medical practice</u> F1 ■ discusses the risks of legal and disciplinary action if a doctor fails to achieve the necessary standards of practice and care ■ describes and applies the principles of confidentiality child protection procedures ■ completes death certificates and liaises with the coroner/procurator fiscal ■ completes cremation forms appropriately ■ minimises risk of exposing a pregnant woman to radiation ■ recognises the need for restraint of some patients with mental illness according to the appropriate legal framework F2 ■ discusses the implications of a living will or advance directive ■ initiates restraining orders in some patients with mental illness according to the appropriate legal framework.
Maintaining good medical practice <u>Lifelong learning</u> F1 and F2 ■ learns from experience/experiential learning

■ reviews professional learning needs and takes step to address these
■ maintains a professional development portfolio by recording learning needs and reflections
■ uses WPBAs and MSF to get feedback and improve performance
■ recognises errors and mistakes and demonstrates measures to learn from them
■ arranges and prepares for own appraisal in a timely manner
■ contributes to the appraisal, assessment or review of students and other colleagues.

Research, evidence, guidelines and care protocols

F1 and F2
■ finds and interprets evidence relating to clinical questions
■ supports patients in interpreting evidence
■ appraises recent research, and discusses findings with colleagues to advocate specific action.

Audit

F1 and F2
■ describes the audit cycle and recognises how it relates to the improvement of clinical care
■ has participated in an audit project
■ makes audit links explicitly to learning/professional development portfolios.

Teaching and training

F1
■ undertakes teaching in under or post-graduate education in a one-to-one setting
■ assesses students and other non medical colleagues in training
■ contributes to the assessment or review of students and other colleagues with whom they work.

F2
■ sets educational objectives, identifies learning needs (own and group's) and applies teaching methods appropriately
■ demonstrates appropriate preparation for teaching
■ undertakes small group teaching, including a presentation
■ provides constructive feedback to others including F1 doctors.

Working with colleagues

Communication with colleagues and teamwork for patient safety

F1
■ displays understanding of personal role within the team and is able to support a team leader
■ listens to views of other healthcare professionals
■ takes leadership role and delegates appropriately in the context of own competence
■ demonstrates awareness of local major incident planning and their potential role in any such incident
■ meticulously cross-checks instructions and actions with colleagues (e.g. medicines to be injected)
■ describes ways of identifying and dealing with poor performance in self and in colleagues.

F2
■ shows leadership skills where appropriate and at the same time works effectively with others towards a common goal.

Interface with different specialties and with other professionals

F1
■ shows an understanding of the challenges of providing optimum care within a variety of clinical settings
■ arranges appropriate urgent investigations and chases results when necessary.

F2
■ consistently seeks effective communication with colleagues in other disciplines
■ describes the process of referral from primary to secondary care.

Appendix iii Key papers – comparative studies

Key papers	Methods	Setting and numbers	Key findings including any statistics	Comments
Laurant M, Reeves D, Hermens R, Braspenning J, Grol R, Sibbald B (2004 reviewed 2009)	Cochrane review RCTs (n=13) Controlled before and after (CBA) (n=3)	16 studies: 7 studies first contact and ongoing care 5 studies first contact urgent care 4 studies ongoing management of chronic conditions UK, USA and Canada	*Patient outcomes:16 studies,* 38 outcomes measures, no significant difference in 35, 3 significantly better in nurse led care. *Patient satisfaction:* 7 studies, 35 outcomes measure, no significant difference in 21, 13 significantly better in nurse led care, 1 significantly better in doctor led care. Meta analysis of 3 studies showed patient satisfaction was higher with nurse led care standardised mean difference 0.28, 95% CI 0.21, 0.34 *Patient compliance:* 4 studies, no significant difference *Patient knowledge:* 5 studies, 12 outcomes measured, 8 significantly better for nurse led, 4 no significant difference *Process of care:* 20 outcomes measures, 11 significantly better in nurse led care, 9 no significant difference *Resource utilisation:* consultation length significantly longer by nurses in 3 of 6 studies, no significant difference in 3 *Tests and investigations:* 4 studies, 24 outcomes measured, 5 showed significantly higher rates for nurses, 19 showed no significant differences. *Use of other health care services:* 8 studies, 16 outcomes measured, 1 showed significantly higher rate in nurses, remaining	Methodological quality of all RCTs reported as having shortcomings. Studies dated from 1967 – 2001, some studies significantly dated. Most studies only included small numbers of nurses. Overall similar outcomes for patients, patient satisfaction higher for nurses, nurses tended to have longer consultations and give more information which may have an impact on satisfaction. Preference may be related to perceived seriousness of presenting problem, with patients seeing nurses for less serious problems. No significant differences in such things as prescriptions and ordering of tests.

			15 no significant difference. Meta anlysis found no significant difference in likelihood of referring to hospital. *Recall:* Meta analysis of 3 studies showed nurses significantly more likely to recall patients, relative risk 1.34, 95% CI 1.20, 1.49 *Prescribing:* 5 studies, 6 outcomes, 5 no significant difference, 1 nurses prescribed significantly less. Meta analysis no significant difference.	
Horrocks S, Anderson E, Salisbury C (2002)	Systematic review: RCTs and prospective observational studies	11 trials and 23 observational studies In UK and USA met inclusion criteria UK (n=7) and USA (n=4). This publication focussed on 11 trials. Two independent reviewers with a third if disagreement	*Patient satisfaction:* 9 studies reported patient satisfaction, 1 of which was unpublished. Of these 5 trials reported continuous data The data analysis from studies reporting continuous data were reported as showing considerable heterogeneity (X^2 = 32.01, df = 4, p = <0.00001), all analyses suggested more satisfaction with nurses (z = 2.67, p = 0.008). Three RCTs reported dichotomous data, two of which were in emergency units. No significant difference was found in satisfaction in these studies, odds ratios 1.56, 0.56 and 4.34, overall effect z = 0.85, p = 0.4. *Health status:* 7 trials reported on health status, however meta analysis was not carried out because of the heterogeneity; comparison of results showed no significant difference.	Noticeable heterogeneity was observed on almost all outcomes, which remained after allowing for differences in terms of setting, level of nurse training, and period of tome studied. Overall patients more satisfied with NP care No differences in health status NPs had longer consultations No difference in prescriptions, return consultations or referrals Publication of studies ranged from 1974 – 2001. Observational studies not

			Investigations (5 studies): Nurses undertook more investigations (odds ratio 1.22, 95% CI 1.02 to 1.46, heterogeneity $X^2 = 6.31$, df = 4, p = 0.18, overall effect z = 2.18, p = 0.03) *Consultation length (5 studies):* nurses had longer consultations than doctors (nurses mean length 14.89 minutes, doctors mean length 11.14 minutes, weighted mean difference 3.67, 95% CI 2.05 to 5.29, heterogeneity $X^2 = 81.67$, df = 4, overall effect z = 4.44, p = 0.00001. *Prescriptions (4 studies):* No significant difference between groups in prescriptions (p = 0.8) *Return consultations (6 studies)*: no significant difference between groups (p = 0.6). *Referrals (2 studies);* no statistically significant difference found between groups, p = 0.04 *Quality of care measures (6 studies)* included communication skills, accurate diagnosis, investigations appropriately carried out and appropriate advice on self management or medication. Heterogeneity of measures used restricted analysis to qualitative review. On analysis nurses made more complete records and scored better for communication, gave more information to patients and identified physical abnormalities more often.	reported other than that findings replicated trails for all outcomes apart from cost and investigations, authors also reported shortcomings in designs.

			Cost: 5 studies included data about costs, and used different methods of valuing resources, so not possible to conduct a robust analysis.	
Smith AF, Kane M, Milne R (2004)	Narrative systematic review – variety of methodologies; analysis of billing information, observational clinical studies	4 articles from searches of Medline EMBASE CINAHL and HMIC between 1990 and 2003 Case 1 (USA) 217440 cases, case 2 (USA) 1000 cases, case 3 (Denmark) 64401 cases, case 4 (USA) 404194 cases	Paucity of high level primary evidence make it not possible to draw conclusions regarding differences in patient safety, however no recent high-level evidence found that there are significant differences in safety between different anaesthetic providers, e.g. death rates in one study generally low, ranging from 0.11% for mastectomy to 1.2% after cholecystectomy, with no significant difference in risk adjusted surgical mortality by anaesthesia providers or anaesthesia practice, however data sources did not enable authors to identify if death was related to anaesthesia or not. Outcome measures: death, complications and 'failure to rescue', adverse events during anaesthesia and recovery, critical incidents during anaesthesia and overall perioperative mortality.	Authors suggest all 4 articles reviewed have methodological flaws or questionable assumptions Data collected from 1991 – 2000
Dierick van Daele ATM, Metsemakers JFM Derckx EWC, Spreeuwenberg C Vrijhoef HJM (2009)	Randomized control trial (RCT) 1501 patients NPs n = 817 GPs n = 684 Patients requiring initial consultation	15 general practices in the Netherlands Convenience sample of 12 nurse practitioners (NPs) – intervention group, and 50 general practitioners (GPs) –	*Demographics:* GPs saw patients significantly older than NPs, GPs mean age 46.1 years SD 16.6, NP group mean 42.8, SD 16.5, $p = <0.001$. Most patients in NP group were between 26-45 years (41.5%) whilst in GP group most were in 46-65 years age group (36.9%). Authors unable to provide explanation for this as patients randomly allocated.	NP group had longer face to face consultations, and their patients were invited to more follow ups. No statistical difference in patient satisfaction, health status, medical resource consumption, and

	and over 16 years were invited to participate, if agreed randomly assigned to NP or GP by means of sequentially numbered sealed envelopes containing randomized assignments to the two groups which were provided by an independent person, with codes generated from random number tables.	control group Data extracted from medical records, questionnaires and records of lengths of consultations	Groups comparable in terms of reported number of diagnoses. *Most common diagnosis:* conditions of throat, nose and ears/respiratory tract, NP 31.3% (n = 210), GP 30.2% (n = 169). *Patient satisfaction:* NP mean score 8.19, SD 1.18, GP mean score 8.20, SD 1.26, mean difference -0.015, p = 0.83 *Face to face consultation time:* NP mean 12.22 minutes, (SD 5.7), GP mean 9.20 minutes (SD 4.8), p = <0.001 *Adherence to guidelines (Dutch College of General Practitioners practice guidelines on minor health problems)*: guidelines refer to definition of problem, relevant history questions, clinical investigations, use of prescriptions and referrals: 179 NP consultations and 126 GP consultations were reviewed by authors to assess adherence with guidelines: NPs adherence 79.8%, GPs adherence 76.2% *Percentage of prescriptions given:* no statistical difference (NP 55% n = 411, GP 54.2%, n = 352, p = 0.75). Whether prescriptions new or repeat was not indicated. *Investigations:* no statistical difference (NP 2.4%, n = 18, GP 2.9%, n = 19, p = 0.55) *Referrals:* NP 12%, n = 90, GP 14.2%, n = 92, p = 0.24 *Asked to return:* NP 50.3%, n = 340, GP 41.3%, n = 250, p = 0.001	compliance with practical guidelines. Study concluded that NPs and GPs provide comparable care Data collected in 2006 All NPs were newly graduated in this study, and were allocated more consultation time (NP 15 minutes, GPs 10 minutes) which could have impacted on consultation length.

Mundinger MO, Kane, RL, Lenz ER, Totten AM, Tsai W-Y, Cleary PD, Friedwald WT, Siu AL, Shelanski ML (2000)	Randomised control trial 1981 adults for primary care follow up and ongoing care after an emergency department or urgent care visit (NP n = 1181, physician n = 800). Patients who consented were randomly and blindly assigned to NP (n = 7) or physician (n = 11) group. Considered enrolled on study if attended first follow up appointment (n = 1316, NP n = 806, physician n = 510)	Recruited at 1 urgent care centre and 2 emergency departments in USA, offered follow up appointment at assigned clinic <u>Outcomes:</u> Satisfaction immediately following consultation (patient completed) and at 6 months (Interview) by questionnaire (Likhert scale) Health status questionnaire at 6 months Physiological test results at 6 months for those reporting asthma, hypertension or diabetes (taken at interview) Health service utilisation at 6 and 12 months from medical records	*Satisfaction:* No statistically significant difference in reported overall satisfaction following initial appointment, $p = 0.88$, physicians rated higher at 6 month questionnaire in 1 of the 4 dimensions (provider attributes) 4.2 vs 4.1 where 5 = excellent, $p = 0.05$ *Health status:* no significant difference at 6 months ($p = 0.92$) Physiological test results at 6 months: no significant difference in diabetes ($p = 0.82$) and asthma ($p = 0.77$), significant difference in diastolic measurement for NP (lower) 82 vs 85mmHg $p = 0.04$) *Health service utilisation*: no significant difference at 6 or 12 months	Trial conducted over 26 month period 1995 – 1997 More patients initially allocated to NPs as they were able to take more new patients. Authors conclude that findings strongly support the hypothesis that patient outcomes for nurse practitioner and physician care do not differ in primary care. Participants in the study were predominantly immigrants

Schum C, Humphrey S A, Wheeler D, Cochrane MA, Skoda S, Clement S (2000)	Randomised control trial 1815 patients. Patients requesting same day appointment notified of study and asked to participate – if agree randomly assigned to GP or nurse.	Multicentre 5 GP practices in SE London and Kent, urban suburban and rural 5 practice nurses (NPs), one from each practice, 19 general practitioners (GPs) as controls Data extracted from medical records, patient questionnaires, and recorded times of consultations	*Consultation time:* Nurses spent on average about 2 minutes longer with each patient (mean 10.2 minutes nurse, 8.3 minutes GP, $t = -6.346$, $p = <0.001$, 95% CI difference between means -2.43 to -1.28) *Patient satisfaction:* Significantly more satisfied with nurse care (mean score doctors 76.4, nurses 78.6, $t = -2.365$, $p = 0.018$, 95% CI difference between means -4.07 to -0.38), professional care (mean score doctors 76.7, nurses 79.2, $t = 3.153$, $p = 0.002$, 95% CI difference between means -4.07 to -0.95), and perceived time (mean score doctors 67.7, nurses 73.3, $t = -05.597$, $p = <0.001$, 95% CI difference between means -7.58 to -3.65). Linear regression showed that longer consultations were significantly related to the satisfaction subscales (general satisfaction SE = 0.028 $p = 0.046$, professional care SE = 0.028 $p = 0.049$ and perceived time SE 0.028 $p = <0.001$). Multiple linear regression analysis showed that a significant relationship between the patient's allocation and scores of satisfaction remained after adjusting for time spent in consultation (general satisfaction SE = 0.029 $p = 0.047$, professional care professional care SE = 0.028 $p = 0.004$ and perceived time SE 0.028 $p = <0.001$). If referred to a doctor after being seen by a nurse the mean satisfaction score was 71.7	Authors concluded that nurses offer effective service for patients with minor illness requesting same day appointment. Nurses spent statistically significantly longer with patients, though a significant variation in the mean length of consultation times between nurses was also found (7.9 – 12.8 minutes), and patients were statistically significantly more satisfied with nurses than GPs. The nurse role was relatively new, and followed a 3 month part time course in the management of minor illness.

			as compared with 80 if seen by a nurse and not referred ($p = 0.014$, 95% CI for difference between means of -11.6 to – 4.9) *Prescriptions:* Similar proportions wrote prescriptions (nurses 65.4% n = 482, $X^2 = 0.51$, $p = 0.47$) *Advice:* Nurses reported giving more advice than doctors on self medication (doctors 13.7%, n = 119, nurses 22.2%, n = 193, $X^2 = 21.123$, p = <0.001) and self management (doctors 57.6%, n = 502, nurses 81.7%, n = 709, $X^2 = 117.766$, p = <0.001) *Clinical outcomes/health status:* No statistically significant difference in patient reported clinical outcomes/health status measured after two weeks by means of patient questionnaires and examination of medical records where no response to questionnaires received. ($p = 0.906$) Re-attendance: 89 patients reported returning to surgery in each group, both groups with mean return visits = 2.0. 13/664 GP treated patients attended A&E and 14/675 patients treated by nurses, not statistically significant. 12/664 GP treated patients and 6/675 nurse treated patients reported out of hours calls to GP, not statistically significant.	
Kinnersley P, Anderson E, Parry K, Clement J, Archard L, Turton P,	RCT 1368 patients seen by nurse n = 652, seen by	10 GP practices in South Wales and south east England 6 NPs, number of	Primary outcomes: *Patient satisfaction:* More satisfied with NP care (NP n=652, GP n = 716) (nurses mean score 80.40, doctors 75.62)	No indication of number of GPs 27 practice nurses initially

Stainthorpe A, Fraser A, Butler C, Rogers C (2000)	general practitioner n = 716 6 practice nurses. Patients requesting same day appointments were informed about the study and asked to participate. Those who agreed were randomly allocated by day or within day, depending on practice preferences.	GPs not indicated. Data collection: Patient questionnaires (Likert scale) Clinicians completed encounter sheets Medical records examined 4 weeks after consultation	*Resolution of symptoms at 2 weeks* did not differ between the 2 groups, nor did resolution of concerns at 2 weeks *Secondary outcomes:* Number of prescriptions issued, investigations ordered, referrals to secondary care and re attendances was similar between 2 groups Patients reported receiving significantly more information by NPs, in terms of the cause of the illness (doctors n = 492 (72%), nurses n = 501 (81%) odds ratio 0.58, 95% CI 0.44 – 0.77), relief of symptoms (doctors n = 467 (68%0, nurses 548 (86%) odds ratio 0.32, 95% CI 0.24 – 0.43) and what to do if the problem persists (doctors n = 604 (88%), nurses 584 (93%) odds ratio 0.61, 95% CI 0.41 to 0.90). In all but 1 practice consultations significantly longer by nurses, doctors median 6 minutes (interquartile range 4-8 minutes), nurses 10 minutes (interquartile range 7-14 minutes)	approached, 6 participated NPs had longer consultation time, and patients reported statistically significant greater satisfaction and more information given by NPs. Possible selection bias.
Venning P, Durie A, Roland M, Roberts C, Leese B 2000	Randomised control trial 1292 cases subjected to data analysis nurse practitioners (NPs) n = 641,	Multicentre 20 GP practices in England and Wales, 20 NPs (1 per practice), number of GPs not indicated. Data from consultations	Demographic details presented in percentages only, with the commonest presenting condition being upper respiratory tract infection (n = 475 (36.8%), NPs n = 236 (36.8%), GPs n = 239 (36.7%). *Face to face consultation time:* NPs mean 11.57 minutes (SD 5.79), GPs mean 7.28 minutes (SD 4.80), adjusted mean	Significant statistical difference in mean face to face consultation times, investigations ordered, asked to return (NPs more than GPs) and satisfaction No statistical difference in

	general practitioners (GPs) n = 651) Patients requesting same day appointment were asked to participate. If agreed, randomly allocated using coded block randomisation.	extracted from medical records 2 weeks after consultation. Patients completed health status measure before the initial consultation and 2 weeks after	difference 4.20 minutes, 95% CI 2.98 to 5.41, p = <0.001 *Physical examination:* NPs 88.1%, GPs 92.2%, odds ratio 1.76, 95% CI 0.90 to 3.42, p = 0.097 *Prescriptions issued:* NPs 61% (n = 391), GPs 64.7% (n = 421), odds ratio 0.88, 95% CI 0.66 to 1.17, p = 0.375 *Investigations ordered:* NP 8.7% (n = 56), GPs 5.6% (n = 37), odds ratio 1.66, 95% CI 1.04 to 2.66, p = 0.033 *Asked to return:* NPs 37.2% (n = 236), GPs 24.8% (n = 161) odds ratio 1.93, 95% CI 1.36 to 2.73, p = <0.001 *Patient satisfaction*: adults NPs mean score 4.40, SD 0.52, GPs mean score 4.24, SD 0.52, adjusted mean difference 0.18, 95% CI 0.09 to 0.26, p = <0.001, paediatrics NPs mean score 4.39, SD 0.46, GPs mean score 4.17, SD 0.57, adjusted mean difference 0.23, 95% CI 0.12 to 0.34, p = <0.001 *Cost of care*: no significant difference found *Health status*: No significant difference reported at 2 weeks post consultation.	physical examinations performed, prescriptions issued, cost of care Possible selection bias
Kinley H, Czoski-Murray C, George S, McCabe C, Primrose J, reilly C, Wood, R, Nicolson P, Healy C, Read S, Norman J, Janke H, Alhameed H, Fernades N,	Randomised controlled equivalence/non inferiority trial 1907 patients randomized, 1874 completed trial (nurses n =	Preoperative assessment in four NHS hospitals in England. 3 nurses, 87 doctors Further assessment by one of two	*Baseline characteristics* similar in both groups. *History, examination and test ordering*: In 259 cases it was judged that there was underassessment possibly affecting management; nurses 121/948 (12.8% of assessments) and doctors 138/926 (14.9% of assessments) upper 95% confidence limit	Trial did not reach its planned size. Concluded that appropriately trained nurses are no worse than pre registration house officers in pre operative assessment, although the authors

Thomas E (2001, 2002)	948, doctors n = 926) Patients invited to participate and if agreed randomised at assessment clinic by means of allocation by sealed envelope.	specialist registrars and placed in one of four categories: correct, over assessment, underassessment not affecting management, and underassessment possibly affecting management (primary outcome). A sample was reviewed by one of two consultant panels.	for observed difference (1.1%) was less than clinically important difference (3.7%) implying that nurses no worse overall than doctors in assessing patients. *Over ordering of tests* – house officers ordered nearly twice as many tests as nurses; 218/926 (24%) v 129/948 (14%)	suggest it could be argued that neither group performed well with 1:7 chance of doctor failing to detect something that may affect management, and 1:8 patients seen by nurses doing the same. Disproportionate number of nurse to doctor participants, and the authors noted the variation in the ability of the nurses on each site to take patient histories. Possible selection bias
Cooper MA, Lindsay GM, Kinn S, Swann IJ (2002)	RCT Convenience sample of 199 eligible patients (ENP=99, SHO=100). Patients over 16 years old who had sustained an injury which fell within ENP protocols were invited to participate. If agreed	A&E Dept, Scotland 8 ENPs 12 SHOs Data extracted from clinical records using 'Documentation Audit Tool' Patients asked to complete questionnaire after consultation and 1 month after consultation	*Average waiting time*: SHO 70.1 minutes, ENP 48.6 minutes, $p < 0.001$; 95% CI, 11.2 – 31.8 minutes. *Total consultation time (including treatment time:)* ENP 30.0 minutes SHO 24.9 minutes, $p = 0.115$, 95% CI, -1.3to 11.5 minutes. *X-Rays requested*: ENPs 56.6%, SHOs 47.5%, $p = 0.2$ *Seeking advice from senior:* ENP 64.6% of patients seen. SHOs 21.2% of patients see., p = <0.001, however ENPs had to take advice on X-Ray interpretation, when X-Rays excluded, ENP 20.9%, SHOs 11.5%, $p = 0.21$ *Patients admitted:* ENPs 2.0%, SHOs 6%, p	Data collection two month period1998/1999 Reported ENPs easier to talk to, gave them information on accident and illness prevention and gave them enough information about their injury. Overall more satisfied with the care from ENPs who also had higher quality documentation. Concluded that a larger study with 769 patients in each arm would be required to detect 25

	randomly assigned using sequentially numbered enveloped with randomized assignments. 214 agreed to participate, 5 subsequently withdrawn as they did not see the clinician to which they had been randomly allocated.		= 0.279 *Referred for follow up:* ENP33% (n=34), SHOs 27.5% (n=28) p = 0.358 *Unsatisfactory management judged at follow up clinic:* ENPs = 2, SHOs = 0, p = 0.254 *Patient satisfaction*: response rate 84% (n=168). ENPs n = 87, SHOs n = 81). Patients reported they were very satisfied with their care from both ENPs and SHOs, however overall they were more satisfied with the treatment provided by ENPs (strongly agree or agree with statement 'I am satisfied with the treatment the doctor/nurse practitioner gave me ENP 98.8% (n = 85), SHO 87.7% (n = 81) p = <0.001 *Quality of clinical documentation:* 186 (93.5%) clinical notes were audited four months after the end of the study (13 could not be found) using a previously validated Documentation Audit Tool which scored each set of notes out of 30; ENP n = 94, SHO n = 92, scores: ENP 28.0 of 30, SHO 26.6. of 30 p = <0.001) *Patient one month follow up:* 64% response rate (ENP n = 63, SHO n = 65). No significant difference in time to recovery (p = 0.96), level of symptoms (swelling p = 0.92, stiffness p = 0.80) level of activity (looking after themselves p = 0.58, ability to go to work/school p = 0.40, sleep pattern p =	difference in missed injury Possible selection bias

			0.87, time off work $p = 0.14$) *Further unplanned medical or nursing advice in the month following attendance at A&E*: 20% of patients reported this (ENP 18.3%, SHO 21.5% $p = 0.654$). 3 patients entering the trial had missed injuries, 1 from each group and 1 from the 5 patients who were withdrawn from the study as they did not see the clinician to which they had been randomly allocated.	
Chang E, Daly J Hawkins A, McGirr J Fielding K, Hemmings L, O'Donohue A, Dennis M (1999)	Total sample size 232 participants consisting of supervised 4 month competency trial for 4 NPs (63 patient participants) Randomized control trial unsupervised comparative study 169 participants NPs (n=78) and medical officers (n=91) Patients were asked to	An evaluation of the NP role in a major rural emergency department in Australia Examination of medical records Patient satisfaction questionnaire	*Gender distribution:* Males and females evenly distributed between the 2 groups *Client satisfaction:* 132 participants surveyed (78% of randomized sample, ENP n = 61, medical officer n = 71). Multivariate analysis showed no significant difference between the 2 groups in all areas of care. When asked if they would see the same professional again 60 from 61 treated by ENP, 66 from 71 treated by medical officers responded yes. *Waiting times:* No significant difference in waiting times reported between the 2 groups *Follow up wound assessment by orthopaedic surgeon:* taken up by 16 participants (ENP n = 7, medical officer n = 9). *Patient outcomes:* majority rated between 7 and 10 on a 10 point linear scale. No further statistical data or analysis reported.	Although data analysis techniques reported as multivariate and chi square, limited statistical data and analysis reported. Little indication of which data from supervised competency trial used in reporting. Possible selection bias

	participate, and if agreed randomly allocated to NP or medical officer			
Sakr M, Angus J, Perrin J, Nixon C, Nicholl J, Wardope J (1999)	Randomized control trial in an A&E department of 1453 patients presenting with minor injuries, randomly allocated to junior doctor (SHO) or nurse practitioner (NP). Standard form used to assess the adequacy of care, carried out by a research registrar. Consenting participants randomly allocated using sequentially numbered enveloped with	A&E Department, UK Initial assessment carried out by NP or SHO, then assessed by an experienced emergency physician (research registrar) who took no part in the clinical management. Clinical notes were transcribed by typists and a standard form was used compare the adequacy of the clinical assessment of the two groups with the assessment of the research registrar by another experienced consultant. Observational work study of 94 patient assessments (ENP n = 46, junior doctors n	*Baseline characteristics:* No significant difference in location of injury, type or causes of injury between the two groups. There were slightly more men (n = 510 72.4%) than women in (n = 194, 27.6%) the NP group than the SHO group. *Accurate medical history*: NP 76% (n = 533) SHO 55% (n = 410) *Findings that should have altered management:* NP n = 1, SHO n = 11 p = 0.01. No significant difference between the 2 groups in *adherence to treatment guidelines* (p = 0.18) *examination errors* (p = 0.26). No between group difference in *frequency of requests for radiography*, though both groups requested more than judged necessary by the research registrar Interpretation of X-Rays: *Clinically important differences in radiologist report*: NP 12 (2.7%) SHO 16 (3.6%) p = 0.05 *Follow ups:* No significant between-group difference for follow up arranged, the plans of the NP for follow up concurred with the research registrar more frequently than	Data collected in 1997 Clearly describes experience and training of both groups. Salary cost per hour, and training costs for ENPs given but no further analysis of costs. Possible selection bias

	randomly assigned group.	= 48)	follow up plans made by SHOs but the difference was not statistically significant. (NP n=20, 2.8%, SHO n=35 4.8%, p = 0.06). *Patient satisfaction:* Satisfaction questionnaires were completed by 831 patients and there was no significant difference between the groups. *Assessment time:* direct observational work study of 48 patients seen by junior doctors and 46 patients seen by ENPs, ENPs mean 10.89 minutes (SD 4.6), junior doctors mean 9.02 minutes (SD 4), p = 0.04	
Sharples L D, J Edmunds J, Bilton D, Hollingworth W, Caine N, Keogan M, Exley A (2002)	RCT 80 patients consented to participate randomly allocated to one year of nurse or consultant led care	Bronchiectasis clinic UK Patients followed for 1 year with either doctor led or nurse led care, and followed up for 2 years Data extracted from medical records and patient questionnaires	*Forced expiratory volume in 1 second (FEV_1):* The mean difference in FEV_1 was 0.2% predicted (95% confidence interval – 1.6 to 2.0%, p=0.83). *12 minute walk test*: No significant difference between groups *Health related quality of life*: No significant difference between groups *Resource use:* Nurse led care resulted in significantly increased resource use compared with doctor led care (mean difference £1497, 95% confidence interval £688 to £2674, p<0.001), a large part of which resulted from the number and duration of hospital admissions. The mean difference in resource use was greater in the first year (£2625) than in the second year (£411).	The authors concluded that nurse led care is as safe and effective as doctor led care, however identified that patients in the nurse led care group used more resources, particularly in relation to hospital admissions and stay.

Hill, J., Bird, HA., Harmer, R., Wright, V., Lawton, C. (1994)	RCT: Single blind parallel group study 70 patients with rheumatoid arthritis randomly allocated to Rheumatology Nurse Practitioner (RNP) or Consultant Rheumatologist (CR) for 1 year	One hospital in UK. Data extracted from examination of medical records and patient questionnaires Two tailed non parametric statistical testing used: Mann-Whitney U and Wilcoxon rank sum test.	*Baseline characteristics*: Patients in CR cohort average 4 years older ($p = 0.0262$) No significant difference between groups of years in education (CR mean 10, range 9 - 15, RNP mean 10 range 9 – 14, $p = 0.2542$) and duration of RA in years (CR 10, range 1-40, RNP mean 9, range 1-36, $p = 0.7727$). *Referrals to other professionals*: There was marked difference in referrals made by the CR and RNP to other health professionals (CR n = 6, RNP n = 40). *Medication changes:* CR made 27 medication changes, RNP requested and was granted 23 medication changes. *Assessment of effectiveness*: No significant difference in Ritchie Articular index (AI) on completion of study between the groups ($p = 0.6103$). *Stiffness:* No statistically significant difference in stiffness at the end of the study between the two groups. *Mean pain score:* Significant statistical difference in mean pain score at the end of the study CR mean 2.70, RNP mean score 2.20 $p = 0.0475$. *Psychological assessment*: On completion of the study, there was no significant difference in psychological assessment between the two groups. *Knowledge questionnaire:* At the end of the study the RNP patients mean score 22) knew significantly more than the CR	RNP group significantly less pain more satisfied and acquired greater levels of knowledge by the end of the study. Limited to one consultant rheumatologist and one rheumatology nurse practitioner, 70 patients. No indication of education/training of nurse practitioner.

			patients (mean score 16.21) p = <0.0001. *Overall satisfaction:* RNP patients overall more satisfied that CR patients (Mann-Whitney U p = <0.0001	
Cox, C & Jones, M (2000)	Observational study 1 GP, 1 nurse (435 patients) Some random allocation of appointments, some allocated based on patient request	Semi rural English GP practice Data collected over 6 month period in 1997 Patients over 2 years old presenting with sore throat Of those where this was specified 9% requested to be seen by a general practitioner (n=23) and 48% asked to see a nurse practitioner (n=126) with 44% (n =116) being randomly allocated. Data extracted from medical records	Patient characteristics: Based on criterion, it was felt that nurses saw less unwell people. There was no statistically significant difference between ages of patients, and nurses tended to see younger patients. 392 patients were followed up at 5-7 days by telephone, with 84 who still had sore throat receiving further follow up at 28 days. Statistically significant differences between nurses and GPs in: *Back to normal health* (nurse 64%, GP 53% p = 0.023) *Median number of days for sore throat to settle* (nurse 4 days, GP 5 days, p = 0.0161) *Mean number of days requiring analgesia* (nurse 1.71 days, GP 2.28 days p = 0.03) *Recollection of advice about home remedies* (nurse 76%, GP 54% p = <0.0001) No statistically significant difference: *reconsultation rates* (p = 0.288) and *dissatisfaction* (p = 0.19).	Data collected during a 6 month period in 1997. Analysis of results showed that patients consulting the nurse tended to have better outcomes, however the differences in outcomes may have been as a result of nurses seeing less unwell patients, and the authors recognise that their analysis does not address this issue completely. They highlight a weakness of the study that patients were not randomly allocated, and either requested to see either the GP or nurse themselves or were directed to the nurse or GP by the receptionist depending on appointment availability.
Van der Linden, C., Reijnene R.& Rien de Vos R. (2010)	Descriptive cohort study 1482 patients	Urban Emergency Department, Netherlands.	*Demographic characteristics*: Patient age ENP mean 28.89 years (SD 17.32), SHO mean 32.97 years (SD 19.49),	Data collected during 6 months in 2008. No indication of number of

	Emergency nurse practitioners (ENPs 741, junior doctors/SHOs n = 741) All low care patients seen by ENPs were included in the study, matched with a random sample matched by date seen by junior doctors/SHOs.	Data extracted from hospital electronic database, registration times, discharge times and medical records	p = <0.001. *Time of admission:* Day ENP n = 391 (52.8%) SHO n = 340 (45.9%) p = 0.008, evening - ENP n = 314 (42.4%), SHO 346 (46.7%), no significant difference, night - ENP n = 36 (4.9%) SHO n = 55 (7.4%) p = 0.04 *Chief complaint:* limb problems ENP n = 342 (46.2%) SHO n = 421 (56.8%) p = <0.001, local infections ENP n = 16 (2.2%) SHO n = 31 (4.2%) p = 0.026, eye problems ENP n = 30 (4%) SHO n = 11 (1.5%) p = 0.003 *Diagnostic accuracy*: ENP 97.3% (n = 721) SHO 98.8% (n = 732), not statistically significant. *Missed injury or inappropriate management*: ENPs 20 errors (2.7%) SHO 9 errors (1.2%) relative risk 0.4; 95% CI 0.031 – 1.591, not statistically significant. *Waiting time*: ENP mean 19 minutes (SD 20), SHO mean 20 minutes (SD 21), minimum – maximum 0 -146, 95% CI 18.44 to 20.51, no statistically significant difference. *Length of stay:* SHO group significantly longer, ENP mean 65 minutes (SD 42) SHO mean 85 minutes (SD 56) minimum – maximum 6 – 401, 95% CI 72.32 to 77.41	ENPs and SHOs involved No significant differences in error rate Limitations : ENPs worked primarily in the day and treated lower triage categories Patients brought in by paramedics or referred by GP were not treated by ENPs
Seale, C., Anderson, E.& Kinnersley, P. (2006)	Observational study comparing	9 practices 8 GPs 9 NPs	Quantitative: *consultation time discussing treatment:* NP 224 text passages (mean 12.4 per	Additional paper from original research by Kinnersley *et al* (2002)

	content of talk about treatments by nurse practitioners and GPs.	55 consultations audiotaped (22 GP, 33 NP) and18 matched pairs formed according to age, gender and presenting complaint of patient. Quantitative and qualitative analyses performed.	consultation), GP 113 text passages (mean 6.3 per consultation), mean difference 6.1, 95% CI 1.8 to 10.6, p = 0.007 *Medication:* Similar numbers of over the counter recommendations. Prescriptions and self help recommendations approximately twice as common in NP consultations (NP 3 & 26, Dr. 0 & 13) Qualitative: 3 case studies of paired consultation chosen from 18 matched pairs due to similarity of complaint Case 1 NP time consultation = 11 mins 56 secs, GP 5 mins 55 seconds Case 2 consultation time 16 mins 27 seconds, GP 5 mins 45 seconds Case 3 consultation time NP 10 mins 16 seconds, GP 2mins 8 seconds Transcripts of parts of consultations included in paper with explanation and comment from authors	Data collected 1998 Limited ability to generalise Limited new knowledge presented
Osborn, GD., Jones, M., Gower-Thomas, K., Vaughan Williams, E (2010)	Comparative study, breast diagnostic ability of nurse practitioners and surgeons 126 patient consultations during period March 2007 – March 2008	South Wales DGH 1 Nurse Practitioner (NP) 1 Consultant Surgeon (CS) Patients allocated to NP on the basis of GPs referring letter (not clear how this	No significant mismatch in scoring (p = 0.64) using one way ANOVA Sensitivity and specificity in diagnosing cancer NP 56% and 99% CS 56% and 98% 89% of patients had radiological examination No further statistics or statistical analysis reported	Single NP compared with single consultant surgeon (who has trained the NP) Limited statistics and statistical analysis reported. However there are limitations with this study in that it involved only one nurse practitioner and one consultant surgeon. Although one of the aims

		was done). Findings were recorded on standardised pro forma by the NP along with a clinical score, and then the consultant repeated the examination and process and results compared.		were stated to be comparing history taking, this was only carried out in the context of clinical score assigned after history taking and examination and entered on a study proforma. It is an interesting study in that it is comparing a nurse practitioner with specific training, with a consultant surgeon.
Ball STE, Walton K, Hawes S (2007)	Retrospective case note review, 1 March – 15 May 2005	A&E Department UK Data extracted from 643 case notes of Consultants (n=72), emergency nurse practitioners (ENPs) (n=142), emergency department physiotherapy practitioners (EDPPs) (n=164), middle grade doctors (n=135), senior house officers (SHOs) (n=130)	*X-Ray investigations*: ENPs X-rayed greater proportion (82%) consultants least (68%) but not statistically significant (p = 0.17) *Type of injury:* ENPs saw the greatest proportion of fractures/dislocations (31%) and consultants the least (26%) but this was not statistically significant (p = 0.91). *Advice to patients:* EDPPs recorded giving advice more frequently than other clinicians (96%) whereas consultants recorded doing this the least (81%) p = 0.007 *Structural support:* ENPs recorded giving the most structural support (88%) with EDPPs the least (1.7%) p = <0.001) *Follow up:* EDPPs arranged significantly more physiotherapy follow up (9.2% P = 0.031). *Provision of crutches:* Significant difference in provision of crutches (consultants 26%, EDPPs 1.7% p = <0.001).	Focus more on the emerging role of emergency department physiotherapy practitioners (EDPPs). Comparing different levels of doctors. Noted that retrospective nature of study and case note review does not enable assessment of quality of advice or accuracy of documentation.

			Medication: SHOs recorded prescribing or advising medication the most (85.71%) with consultants recording least (51% $p = <0.001$) *X-Rays:* No significant difference in proportion of X-Rays ordered, proportion of dislocations/fractures and areas of body between groups.	
Myers PC, Lenci B, Sheldon MG (1997)	Observational study, 1000 consultations for urgent problems over a 4 month period. NP n = 500 GP n = 500	GP practice, London suburbs 6 general practitioners (GPs), 1 nurse practitioner (NP). Patients requesting same day urgent appointment were offered an appointment with either a GP or the NP. Data extracted from medical records, 500 patient satisfaction questionnaires for NP consultation, 20 audio taped consultations with NP	*Patient characteristics:* NP group average age 34.9, GP group average age 35.9, NP group female 64%, GP 56% *Presenting problems:* Largest group – respiratory, ear nose and throat, NP22.8%, GP 36.6% *Prescriptions:* NP 64% (n = 322), GP 79% (n = 396), t-test 7.4, highly significant at 5% (no further statistics reported) *Referrals to secondary care:* NPs n = 20, GP n = 18 (no further statistics reported) *Repeat consultations within 14 days:* NP n = 31, GP n = 81 *Average consultation times:* similar for both groups reported (between 7-8 minutes)	This study involved one nurse practitioner and, although it did not state explicitly the number of GPs records involved, the practice was a 6 GP practice. No indication of inclusion/exclusion criteria of participants is given, and patients self select GP or NP consultation. Mixed methods were used and supported previous research and concluded high levels of satisfaction with NP care, and that NPs could safely deal with urgent medical problems in a primary care environment. The study also concluded that patients were safely able to self triage.

Lee TWR, Skelton RE, Skeen C (2001)	Observational prospective study of all infants referred to specialist orthopaedic, ophthalmology and cardiology clinics from1 April 1999 – 31 March 2000	Cardiology, ophthalmic and orthopaedic clinics in two hospitals in NHS, UK. 527 infants recruited Numbers of advanced neonatal nurse practitioners (ANNPs) and senior house officers (SHOs) not identified A standardised proforma was used to record where the child had been born, what sort of neonatal check and been carried out and who had detected the abnormality leading to referral. Data extracted from proforma	*Eye abnormalities:* ANNPs displayed greater sensitivity than SHOs (100% v 33% p = <0.05) *Hip abnormalities*: ANNPs displayed greater sensitivity than SHOs (96% v 74% p = <0.05) No significant difference between ANNPs and SHOs in positive predictive values or effectiveness in detecting cardiac abnormalities.	Conclusion that ANNPs are significantly more effective at detecting abnormalities during the neonatal check.

NB The systematic reviews included, in some cases, studies which are also reviewed individually

Appendix iv Checklist for observational studies (cohort studies); bias and confounding

Question	How and where addressed in study
Is selection bias present? Are participants in the both groups similar in all important respects except for the exposure?	Chapter 3 sections 3.4.1, 3.4.2 Inclusion and exclusion criteria for participants Case complexity was assessed
Is information bias present? Is information about outcome obtained in the same way for both groups	Chapter 3 section 3.5 Data collection and variables exactly the same.
Is confounding present? Could the results be accounted for by the presence of a factor associated with both exposure and outcome but not directly involved in causal pathway?	Chapter 4 sections 4.2, 4.3, 4.4 Measure as many relevant variables as possible. Separate analysis of 164 AMA weekday only cases and 209 AMA cases including weekend/bank holiday presentations. Logistic regression controls for specified variables or characteristics. Unknown confounders chapter 5
If the results cannot be explained by these biases, could they be the result of chance? What are the relevant odds ratio and 95%CI? Is the difference statistically different?	Chapter 4, sections 4.2, 4.3, 4.4 Odds ratios and confidence intervals reported

appendix v **August 2009**

INFORMATION ABOUT THE RESEARCH

I am currently undertaking a part time Doctorate in Nursing Science at Swansea University. I am about to embark on my research study and I would like to invite you to take part in the study. This Information Sheet will explain the purpose of the study and give you more detailed information about how it will be conducted.

Please read this information and take the time to decide whether or not you would like to take part. There is no requirement whatsoever to take part; it is entirely voluntary and you are also free to withdraw at any time, without giving a reason. Please contact me if you have any questions or need further information.

Title of the study

'Crossing the boundaries: Nurses in the medical domain; an examination of outcomes in secondary care: An exploration of the differences, if any, between advanced nurse practitioners and junior doctors in clinical decision-making.'

What is the purpose of the study?

Nurses are taking on advanced roles and crossing boundaries into what was previously the medical domain, carrying out many duties which previously only junior doctors would do, including assessment and diagnosis, carrying out treatments, prescribing medication, ordering and interpreting investigations. The role of the advanced nurse practitioner (ANP) is continuing to develop and evolve.

This study will explore if there are any differences in clinical decision making and the process by which it is reached between advanced nurse practitioners and junior doctors.

Why have you been invited to take part?

I am inviting all nurse practitioners who have successfully completed a recognised accredited programme preparing nurses for advanced practice and FY1s and FY2s in the Trust to take part. You may participate in your own time or I will negotiate with your relevant managers and supervisors to allow you to be released to take part during working hours.

Do you have to take part?

Please note that participation in this study is **entirely voluntary** and it is up to you to decide whether or not to take part. If you do decide to take part, you are still free to withdraw at any time and without giving any reason.

What are the benefits for you if you take part?

You will be able to take part in an important research study.

What will you have to do?

In all your participation will require approximately 10 minutes – 55 minutes of your time in total. As previously stated, you may participate in your own time or I will negotiate with your relevant managers and supervisors to allow you to be released to take part during working hours. I will be as flexible as possible within this to ensure that patient care is not affected.

The study will be based around the following methods:

1 **Analysis of clinical notes**

What you will be asked to do: You will be asked to keep a basic log of patient G numbers only.

What I will do: I will examine the notes using a validated tool already in use in this Trust; The Institute for Healthcare Improvement UK Adverse Event Trigger Tool, and examining the congruence between the initial and senior assessment. All findings will be aggregated and presented as a whole.

2 Interviews (sample of participants only)

What you will be asked: you will be asked to talk through your decision making process and the interview will be taped and transcribed by me for analysis. You will have control of the tape recording and may turn it off at any time.

How long will it take? The interview will take approximately 30-45 minutes of your time.

Where and when will the interview be conducted? The interview will be arranged at a time and place convenient for you, to ensure you are not caused any inconvenience.

What will happen if you choose not to take part?

Participation in part or all of the study is entirely voluntary, and only I will know who chooses not to take part.

What will happen to the findings?

The findings will form the basis for the thesis I will be submitting for the Doctorate in Nursing Science, and it is planned to submit articles for journal publication.

I shall not disclose identities to anyone, including academic supervisors. All data gathered will be treated in confidence and anonymised. Should a legal or professional issue oblige me to discuss any data with colleagues in the Trust, this will be done in confidence.

Careful steps will be taken to ensure that all sets of data are securely stored. Patient names and addresses will not be recorded. No names or any other identifiers will be ascribed to any of the completed logs, information on patient
outcomes, interview tapes or transcripts. Data will be aggregated and only reported as a whole. The computer which will contain the thesis and data is only used by me and is password protected. The only individuals allowed access to the data, either original or transcribed, will be the researcher and supervisor.

Strenuous efforts will be made to ensure that where individual participants' contributions are cited or quoted that they cannot be identified by colleagues, managers, or individuals working outside the Trust.
Finally, if you have any queries or would like to discuss the study in more detail before deciding to participate, please do not hesitate to contact me at any time (contact details below).

Thank you for taking the time to read this information sheet

Lynne Grundy
Head of Professional Nursing and Education
North Wales NHS Trust
Glan Clwyd Hospital
Bodelwyddan
Denbighshire, LL18 5UJ

Tel. no. 01745 534848 (direct line)

August 2009

Dear Colleague

Project Title: Crossing the boundaries; nurses in the medical domain. An exploration of the differences, if any, between advanced nurse practitioners and junior doctors in clinical decision making and outcomes in secondary care

I am currently undertaking a part time Doctorate in Nursing Science at Swansea University. I am about to embark on my research study and I would like to invite you to consider joining the study.

I wish to explore the differences, if any, between advanced nurse practitioners and junior doctors in clinical decision-making. This will involve your participation by recording the identifiers of patients seen so that I can subsequently examine their clinical notes. I shall, at a later date, seek a small number of participants to take part in semi-structured interviews.

In all this would require approximately 10 minutes – 55 minutes of time in total. It is anticipated that this will NOT be in your own time. All data gathered will be treated in confidence and anonymised. Should a legal or professional issue oblige me to discuss any data with colleagues within the Trust, this will be done in confidence and without revealing participant identities.

The project has been reviewed by the Trust Research and Development Committee and the North Wales (Central) Research Ethics Committee.

Participation in this study is entirely voluntary and it is up to you to decide whether or not to take part. If you do decide to take part, you are still free to withdraw at any time and without giving any reason.

If you have any queries or would like to discuss the study in more detail before deciding to participate, please do not hesitate to contact me at any time (contact details below).

If you agree to participate please can you return the enclosed consent form to me by ....

Yours sincerely

Lynne Grundy
Head of Professional Nursing and Education
North Wales NHS Trust (Central)
Glan Clwyd Hospital, Bodelwyddan
Denbighshire, LL18 5UJ
Tel. no. 01745 534848 (direct line)

CONSENT FORM

Title of Project: **An exploration of the differences, if any, between advanced nurse practitioners and junior doctors in clinical decision-making.**

Name of Researcher: Lynne Grundy

Please initial box

1. I confirm that I have read and understand the information sheet dated August 2009 (version 3) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that the interview that I participate in will be audio-taped and transcribed. ☐

3. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason. ☐

4. I give my permission for the researcher to use suitably anonymised verbatim Quotations from the interview in which I am taking part. ☐

5. I agree to take part in the above study. ☐

Name of Participant	Date	Signature
____________________	______________	________________

Researcher	Date	Signature
____________________	______________	________________

When completed, 1 for participant; 1 for researcher

Appendix vi **Data collection sheet**

Patient ID .... date of presentation/admission..................

variable	Code	comments
Professional		
Drs grade		
Clinical area		
Age of patient		
Sex of patient		
All systems assessed		
Referred by?		
Presenting condition		
Additional problems		
Diagnosis		
Additional diagnosis		
Diagnosis congruence with senior review		
Investigations ordered		
Additional investigations ordered by senior		
Investigations extra type		
No. medications on admission/presentation		
No. Medication prescribed		
Medications agreed at senior review		
No. Medications added at senior review		
No. Medications removed at senior review		
Dose increased		
Dose reduced		
Clinical management plan documented		
Clinical management plan agreed		
Legibility of notes		
Notes signed and dated		
Number of text lines / words?		
Length of stay		
Readmission within 30 days		
Early warning score requiring response		
Any patient fall		
Decubiti on admission		
Decubiti during inpatient episode		
Shock or cardiac arrest		
DVT/PE following admission evidenced by imaging or +/or D dimmers		
Complication of procedure or treatment		
Transfer to higher level of care		
Adverse event		

Appendix vii

Codes for variables

No. of variable	Variable name	Variable description	Code
1	studyID	Study number	numeric
2	ageofpt	Age of patient in years	numeric
3	sexofpt	sex of patient	1 = male 2 = female
4	clinicalarea	clinical area	1 = A&E 2 = AMU 3 = surgery
5	dateadmission	date admitted/presented	numeric date form dd.mm.yy
6	weekday/weekend	day of week presented	1 weekday 2 Saturday 3 Sunday 4 Bank holiday
7	referfrom	origin of referral/presentation	1 = A&E 2 = GP 3 = self 4 = ophthalmology
8	profession	Profession of admitting person (junior doctor F1/F2 or ANP	1 = nurse (ANP) 2 = doctor
9	docgrade	if Dr what grade; F1 or F2	1 = FY1 2 = FY2
10	systexamined	Number of systems examined during assessment	numeric
11	prescond	Presenting condition/complaint	full text
12	prescondcode	IC10 code	
13	coexprobnumber	Number of co existing problems on presentation	numeric
14	diagnosis1	1st diagnosis	full text
15	diagnosis2	2nd diagnosis	full text
16	diagnosis3	3rd diagnosis	full text
17	diagnosis4	4th diagnosis	full text
18	diag1agreed	1st diagnosis agreed by senior at review	1 = yes 2 = no 3 = uncertain 4 = diagnosis augmented by senior 5 = diagnosis neither confirmed nor refuted by senior
19	disagreementdiag1	reason for disagreement	full text

20	diag2agreed	2nd diagnosis agreed by senior at review	0 = no 2nd diagnosis 1 = yes 2 = no 3 = uncertain 4 = diagnosis augmented by senior 5 = diagnosis neither confirmed nor refuted by senior
21	diagreediag2	reason for disagreement	full text
22	diag3agreed	3rd diagnosis agreed by senior at review	0 = no 3rd diagnosis 1 = yes 2 = no 3 = uncertain 4 = diagnosis augmented by senior 5 = diagnosis neither confirmed nor refuted by senior
23	disagreediag3	reason for disagreement	full text
24	diag4agreed	4th diagnosis agreed by senior at review	0 = no 4th diagnosis 1 = yes 2 = no 3 = uncertain 4 = diagnosis augmented by senior 5 = diagnosis neither confirmed nor refuted by senior
25	disagreediag4	reason for disagreement	full text
26	investigationyn	haematology investigation	1 = yes 2 = no
27	haemtype	Type of investigation	full text
28	investigation	chemical pathology investigation	1 = yes 2 = no
29	chemtype	Type of investigation	full text
30	microbiolinv	microbiology investigation	1 = yes 2 = no
31	microtype	Type of investigation	full text
32	Xray	X Ray investigation	1 = yes 2 = no
33	Xraytype	Type of investigation	full text
34	ECG	ECG	1 = yes 2 = no
35	investigatadd	any additional investigations orederd by doctor or ANP not included in above	full text
36	investextra	Extra investigations ordered by senior	1 = yes 2 = no 3 = uncertain
37	investaddsnr	Description of additional investigations ordered by senior	full text

38	medadm	Number of medications patient already taking on admission/presentation	numeric
39	medpresc	Number of medications prescribed by junior doctor/ANP	numeric
40	medtypepresc	Description of medication prescribed by junior doctor/ANP	full text
41	medagreed	medication prescribed by junior doctor/ANPagreed at senior review	1 = yes 2 = no 3 = none ordered
42	medadd	medication added at senior review	1 = yes 2 = no 3 = uncertain
43	medaddtype	Decsription of medication added by senior	full text
44	medrem	medication removed by senior at senior review	1 = yes 2 = no 3 = uncertain
45	doseincr	dose increased by senior at senior review	1 = yes 2 = no 3 = uncertain
46	dosedecr	dose decreased by senior at senior review	1 = yes 2 = no 3 = uncertain
47	plandocu	management plan documented by junior doctor/ANP	1 = yes 2 = no 3 = uncertain
48	planextra	additional management plan made by senior at review	1 = yes 2 = no
49	extraplan	Description of additonal plan made by senior at senior review	full text
50	planagreed	Clinical management plan agreed by senior at senior review	1 = yes 2 = no 3 = uncertain 4 = augmented by senior
51	legibility	legibility of case notes	1 = yes 2 = no 3 = some difficulty
52	signdate	case notes signed and dated	1 = yes 2 = no
53	textline	number of text lines in history	numeric
54	wordcount	number of words in history	numeric
55	AEany	Any adverse events from initial contact to senior review	1 = yes 2 = no 3 = uncertain
56	EWSdone	Early warning score done by junior doctor/ANP	1 = yes 2 = no
57	EWSignored	Early warning score ignored	0 = EWS not done 1 = yes
58	fall	Patient fall to time of senior review	0 = no fall 1= yes

59	decubiti	Pressure ulcer risk assessed by junior doctor/ANP	1 = yes present 2 = no assessment 3 = assessed and none present
60	decubitistay	Pressure ulcer development to time of senior review	0 = no PU 1 = yes
61	shock	Shock developing to time of senior review	0 = no shock 1 = yes
62	carrest	Cardiac arrest to time of senior review	0 = no cardiac arrest 1 = yes
63	DVT	DVT to time of senior review	0 = no DVT 1 = yes
64	PE	PE to time of senior review	0 = no PE 1 = yes
65	transfer	Transfer to higher level of care to time of senior review	0 = no transfer to higher level of care 1 = yes
66	complications	Complications to time of senior review	0 = no complications 1 = yes
67	complication	Description of complications	full text
68	comments	Any further comments	free text
69	lengthstay	Length of stay	0=<24hrs 1=24-48 hrs 2=49-72 hrs 3=>72 hrs 4=discharge not documented 5=Outpatient
70	daystay	Number of days admitted for	numeric
71	readmission	Any readmission within 30 days of discharge	0=no readmission 1=readmission within 30 days
72	planagreedYN	Clinical management plan agreed by senior at senior review wneh augmented = 'no'	1=plan agreed 2=plan augmnented or plan not agreed
73	signedanddated	case notes signed and dated when missing date = 'no'	1=yes 2=no
74	medagreedYN	medication agreed by senior at senior review when 'none ordered' = yes	1=yes 2=no
74	legibilityYN	Case notes legible when 'some difficulty' = 'no'	1=yes 2=no
76	agreedplanYN	clinical management plan agreed by senior at senior review when 'augmented' = 'yes'	1=yes 2=no
77	LOS	Length of stay under or over 24 hrs	0=<24hrs 1=24hrs or more

78	sysexrecode	Number of systems examined during assessment recoded to categorical	2=2 or fewer systems examined 3=3 systems examined 4= 4 systems examined 5 = 5 or more systems examined
79	coexprobrecode	number of coexisting problems on presentation recoded to categorical	0 = 0 coexisting problems 1 = 1 coexisting problem 2 = 2 coexisting problems 3 = 3 coexisting problems 4 = 4 coexisting problems 5 = 5 coexisting problems 6 = 6 or more coexisting problems
80	haemyn	haematology tests when previously taken = no	1=yes 2=no
81	chemyn	chemical pathology investigation when previously taken = no	1=yes 2=no
82	microyn	microbiology investigation when previously taken = no	1=yes 2=no
83	ecgyn	ECG when previously taken = no	1=yes 2=no
84	xrayyn	X Ray investigation when previously taken = no	1=yes 2=no
85	medremyn	medications removed when medication on admission removed by senior = 'yes'	1=yes 2=no
86	anynodiagnosis	Number of diagnoses diasagreed by senior	0 = 0 diagnosis disagreed 1 = 1 diagnosis disagreed 2 = 2 diagnoses disagreed 3 = 3 diagnoses disagreed
87	adiagnosisdisagreedyn	Any diagnoses disagreed by senior at senior review	0 = 0 diagnosis disagreed 1 = 1 or more diagnosis disagreed
88	anyyesdiagnosis	Number of diagnoses agreed by senior at senior review	0 = 0 diagnosis agreed 1 = 1 diagnosis agreed 2 = 2 diagnoses agreed 3 = 3 diagnoses agreed
89	adiagagreedyn	Any 1 diagnosis agreed by senior at senior review	0 = 0 diagnosis agreed 1 = 1 or more diagnosis agreed
90	planyan	clinical management plan agreed by senior at senior review recoded 'yes', 'augmented', 'no'	1= yes 2 = augmented 3 = no
91	LOSOPD	Length of stay when outpatient redcoded as <24 hrs	0=<24hrs 1=24-48 hrs 2=49-72 hrs 3=>72 hrs 4=discharge not documented 5=Outpatient
92	medremprevious	Previously prescribed medicines included in removed by senior	1 = yes 2 = no

93	medagreednoney	medication agreed by senior at senior review when 'none ordered' = yes	1 = yes 2 = no
94	primary diagnosis	diagnosis agreed yes/no.other	0 other 1 yes 2 no
95	plan agreed	plan agreed yes no only	0 augmented or uncertain 1 yes 2 no
96	plan agreed	augmented = no	1 = yes 2 = no
97	plan agreed	augmented = yes	1 = yes 2 = no
98	plan agreed	augmented = yes	0 no 1 yes
99	plan agreed	augmented = no	0 no 1 yes
100	primary diagnosis agreed	agreed yes/other	0 no/other 1 yes
101	coexistprobs	none or 1 or more	0 none 1 1 or more
102	medsadm	none or 1 or more	0 none 1 1 or more
103	anyseconddiag	any second diagnosis	0 no 1 yes
104	anythirddiag	any third diagnosis	0 no 1 yes
105	anyfourth	any fourth diagnosis	0 no 1 yes
106	referfromGP	GP refer or other	1 GP 2 other
107	prescode	chest pain or other	1 chest pain 2 other
108	wkwkend	weekday or weekend/bank holiday	1 weekday 2 weekend/bank holiday
109	diag2YN	2nddiagnosis made yes/no only	0 other 1 yes 2 no
110	sysexam	systems examined 0or1ormore	0 none examined 1 1 or more systems examined
111	medprescYN	medicines prescribed on presentation yes/no	1 yes 2 no
112	diag1disagree	diagnosis 1 disagreed	1 yes 2 no
113	PUYN	skin assessment	1 yes 2 no
114	medremall	any medication removed including prescribed prior to presentation	1 yes 2 no
115	seconddiag	second diagnosis agreed when no mention = no	0 other 1 agreed 2 disagreed
116	primary diagnosis	Primary diagnosis agreed recoded for LR	0 no

			1 yes
117	planagreedYorN	management plan agreed YN	0 no 1 yes 2 no
118	medsagreedrecode	medicines prescribed agreed by senior	0 no 1 yes
119	medsaddedYN	medicines added by senior	0 no 1 yes
120	coexistingprobscat	coexisting problems categorical	0 none 1 1 2 2 3 3 4 4 5 5 or more coexisting problems
121	agecat	age categorical	1 17-26 yrs 2 27 - 36 yrs 3 37 - 46 yrs 4 47 - 56 yrs 5 57 - 66 yrs 6 67 - 76 yrs 7 77 yrs and over
122	ageunderover	age under 50/over 50	1 17 - 50 yrs 2 over 50 yrs
123	coexistingforlog	coexisting problems categorical	0 no problems 1 1-3 problems 2 4or more problems
124	medadmcat	number of medicines prescribed prior to presentation	0 none 1 1 - 5 2 6 - 10 3 more than 10
125	systemsexamcaterecode	number of systems examined categorical	1 3 or less examined 2 4 or more examined
126	wordcountcat	word count categorical	1 0 - 50 words 1 over 50 words

NHS WALES GIG CYMRU Ymddiriedolaeth GIG Gogledd Cymru
North Wales NHS Trust

North Wales Central Research Ethics Committee
Medical Support Services
The Old Rec Hall
Wrexham Maelor Hospital
Croesnewydd Road
Wrexham
LL13 7TD

Tel: 01978 726377
Fax: 01978 725365

04 September 2009

Mrs Lynne Grundy
Head of Professional Nursing and Education
Ysbyty Glan Clwyd
North Wales NHS Trust

Dear Mrs Grundy,

Study title:	**Crossing the boundaries: Nurses in the medical domain; an examination of safety and outcomes in secondary care.**
REC reference:	**08/WNo02/8**
Amendment number:	**AM02 v1**
Amendment date:	**01 September 2009**

The above amendment was reviewed at the meeting of the Sub-Committee held on 02 September 2009.

Ethical opinion

The members of the Committee taking part in the review gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

However amendments have been requested in the Participant Information Sheet.

- Why have you been invited to take part? paragraph to read "You may participate in your own time or I will negotiate with your relevant managers and supervisors to allow you to be released to take part during working hours."
- What are the benefits for you if you take part? sentence to read "You will be able to take part in an important research study" only as CPD no longer applies.
- Inclusion of statement You will have control of the tape recording and may turn it off at any time within What you will be asked section of interviews paragraph.

Point 4 of the Consent form should refer to researcher in the singular.

North Wales Central Research Ethics Committee

Attendance at Sub-Committee of the REC meeting on 02 September 2009

Name	Profession	Capacity
Miss Joy Hickman	Consultant Orthodontist	Expert
Ms [illegible] Vincent	Lay Member	Lay

Also in attendance:

Name	Position or reason for attending
Ms Tracy Hughes	Research Ethics Committee Co-ordinator

Approved documents

The documents reviewed and approved at the meeting were:

Document	Version	Date
Letter of invitation to participant	3	28 August 2009
Participant Consent Form	3	28 August 2009
Participant Information Sheet	3	28 August 2009
Notice of Substantial Amendment (non-CTIMPs)	AM02 v1	01 September 2009

Membership of the Committee

The members of the Committee who took part in the review are listed on the attached sheet.

R&D approval

All investigators and research collaborators in the NHS should notify the R&D office for the relevant NHS care organisation of this amendment and check whether it affects R&D approval of the research.

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.

08/WNo02/8:	**Please quote this number on all correspondence**

Yours sincerely

Tra Hughes

Ms Tracy Hughes
Committee Co-ordinator

E-mail: tracy.hughes@new-tr.wales.nhs.uk

Enclosures: List of names and professions of members who took part in the review

Copy to: Dr Sue Jordan, School of Health Sciences, Swansea University, Swansea SA2 8PP
Mrs Lona Tudor-Jones, R&D Manager, North Wales NHS Trust

Study Title:	
L: SIGNATURE SECTION	
Clinical Director	Signature:
Date:	Print Name:
Directorate/General Manager	Signature:
Date:	Print Name:
Support Services (if appropriate)	Signature:
Date:	Print Name:
Clinical Supervisor	Signature:
Date:	Print Name:
As **Clinical Supervisor** you are responsible for the care of the participants, you are also responsible for the actions of the researcher in relation to the patients until the issue of an Honorary Contract	
If the Research is being undertaken for a degree or higher degree, the signature of the **Academic Tutor** is required to validate the scientific merit of this proposal.	
* **Academic Tutor**	Signature: [illegible]
Date: [illegible]	Print Name: [illegible]
If the Research involves the use of personal data, the signature of the relevant **Data Protection Officer/Information Security Manager** at the appropriate Trust is required.	
Data Protection Officer / Information Security Manager	Signature:
Date:	Print Name:
If the Data Protection Officer / Information Security Manager advised that advice should be sought from the local Caldicott Guardian, the signature of the **Caldicott Guardian** is required.	
'I confirm that the arrangements to deal with Patients-Identifiable information are lawful and the use of data requested as described in the proposed research is compliant with Data Protection Principals.'	
Caldicott Guardian	Signature:
Date:	Print Name:

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Study Title: Crossing the boundaries: Nurses in the medical domain: an examination of safety and outcomes in secondary care.

L: SIGNATURE SECTION

Clinical Director	Signature:
Date:	Print Name:
Directorate/General Manager	Signature:
Date:	Print Name:
Support Services (if appropriate)	Signature:
Date:	Print Name:
Clinical Supervisor	Signature:
Date:	Print Name:

As **Clinical Supervisor** you are responsible for the care of the participants, you are also responsible for the actions of the researcher in relation to the patients until the issue of an Honorary Contract

If the Research is being undertaken for a degree or higher degree, the signature of the **Academic Tutor** is required to validate the scientific merit of this proposal.

Academic Tutor	Signature:
Date:	Print Name:

If the Research involves the use of personal data, the signature of the relevant **Data Protection Officer/Information Security Manager** at the appropriate Trust is required.

Data Protection Officer / Information Security Manager	Signature: [illegible]
Date: 19.2.08	Print Name: STEWART SMITH

If the Data Protection Officer / Information Security Manager advised that advice should be sought from the local Caldicott Guardian, the signature of the **Caldicott Guardian** is required.

'I confirm that the arrangements to deal with Patients-Identifiable information are lawful and the use of data requested as described in the proposed research is compliant with Data Protection Principals.'

Caldicott Guardian	Signature:
Date:	Print Name:

Comment [J35]: Page: 11
Trust staff : Have management reporting arrangements for the research been made clear to your line manager and head of department?
Non-Trust staff: Have the appropriate heads of department at the appropriate Trust been advised and agreed to management reporting arrangements for the research?

Comment [J36]: Page: 11
If you are awaiting the issue of a Honorary Contract, your Clinical Supervisor will need to sign accepting care for the participants until the Honorary Contract is issued.

Study Title: Crossing the boundaries: Nurses in the medical domain; an examination of safety and outcomes in secondary care.	
L: SIGNATURE SECTION	
Clinical Director	Signature:
Date:	Print Name:
Directorate/General Manager	Signature: J. Galvani.
* Date: 26.02.08	Print Name: JILL GALVANI
Support Services (if appropriate)	Signature:
Date:	Print Name:
Clinical Supervisor	Signature:
Date:	Print Name:
As **Clinical Supervisor** you are responsible for the care of the participants, you are also responsible for the actions of the researcher in relation to the patients until the issue of an Honorary Contract	
If the Research is being undertaken for a degree or higher degree, the signature of the **Academic Tutor** is required to validate the scientific merit of this proposal.	
Academic Tutor	Signature:
Date:	Print Name:
If the Research involves the use of personal data, the signature of the relevant **Data Protection Officer/Information Security Manager** at the appropriate Trust is required.	
Data Protection Officer / Information Security Manager	Signature:
Date:	Print Name:
If the Data Protection Officer / Information Security Manager advised that advice should be sought from the local Caldicott Guardian, the signature of the **Caldicott Guardian** is required.	
'I confirm that the arrangements to deal with Patients-Identifiable information are lawful and the use of data requested as described in the proposed research is compliant with Data Protection Principals.'	
Caldicott Guardian	Signature: J. Galvani.
Date: 22.02.08	Print Name: JILL GALVANI

Comment [j35 Trust staff : Have reporting arrangem research been mad line manager and t department? Non-Trust staff: I appropriate heads at the appropriate advised, and agree management repor arrangements for t

Comment [j36 If you are awaiting Honorary Contract Supervisor will ne accepting care for until the Honorary issued.

Study Title: Crossing the boundaries: Nurses in the medical domain; an examination of safety and outcomes in secondary care.

L: SIGNATURE SECTION

Clinical Director Supervisor	Signature:
Date:	Print Name:

Directorate/General Manager	Signature:
Date:	Print Name:

Support Services (if appropriate)	Signature:
Date:	Print Name:

~~**Clinical Supervisor**~~ C. D.	Signature:
Date: 25.02.08	Print Name: Brian Tiernan

As **Clinical Supervisor** you are responsible for the care of the participants, you are also responsible for the actions of the researcher in relation to the patients until the issue of an Honorary Contract

If the Research is being undertaken for a degree or higher degree, the signature of the **Academic Tutor** is required to validate the scientific merit of this proposal.

Academic Tutor	Signature:
Date:	Print Name:

If the Research involves the use of personal data, the signature of the relevant **Data Protection Officer/Information Security Manager** at the appropriate Trust is required.

Data Protection Officer / Information Security Manager	Signature:
Date:	Print Name:

If the Data Protection Officer / Information Security Manager advised that advice should be sought from the local Caldicott Guardian, the signature of the **Caldicott Guardian** is required.

'I confirm that the arrangements to deal with Patients-Identifiable information are lawful and the use of data requested as described in the proposed research is compliant with Data Protection Principals.'

Caldicott Guardian	Signature:
Date:	Print Name:

Comment [j35]: Trust staff : Have a reporting arrangeme research been made line manager and he department? Non-Trust staff: Ha appropriate heads of at the appropriate Tr advised, and agreed management reportin arrangements for the

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30/05/07 version 11

Appendix ix

Case Narratives

Case 1

A 50 year old female presented to the Acute Medical Unit (AMU) at 13.30 hrs having been referred via her General Practitioner (GP). The presenting complaint was chest pain which had been suffered for 6 days. The chest pain was central, radiating through to her back, lasting 20-45 minutes, and occurring 1 - 3 times daily. Associated symptoms included breathlessness, nausea and clammy feeling.

She initially presented to her GP 6 days ago, following the first attack, when GTN was prescribed. The GP reported poor compliance with medication due to memory loss, and the patient reported that she had not taken her medication following an attack the morning of presentation due to outside advice that it would 'give her a headache'.

Other medical problems included insulin dependent diabetes, hypertension, asthma and depression. She was assessed, examined, diagnosed and treated by an advanced nurse practitioner (ANP).

The patient lived with her 2 daughters and received incapacity benefit.

On presentation the patient had the following drug history:

- Novarapid TDS
- Solo Star OD
- Aspirin OD
- Ramipril OD
- Simvastatin OD
- Venaflaxin OD
- Ranitidide OD
- Detrosisil OD
- Gabopentin PRN
- Quitepine PRN
- Ventolin PRN
- GTN PRN

The cardio vascular system (CVS), respiratory system (RS) and abdomen were examined. On examination the patient was found to be tachycardic with no audible murmurs and no ankle oedema, good bilateral air entry and a soft abdomen with no tenderness.

The ANP identified strong risk factors of hypertension, insulin dependent diabetes mellitus, and a smoker, and also a family history of ischaemic heart disease, and wished to rule out a cardiac event.

The following investigations were carried out:

CBC, Troponin T, glucose, lipids/HDL, urea and electrolytes, liver function tests, thyroid profile, CK, chest X Ray, ECG.

The patient was reviewed by the on call consultant at 16.10 hrs. Cardiac event was ruled out by results and no further diagnosis was made by the consultant. She was discharged home with an outpatient exercise treadmill appointment.

Case 2
A 62 year old man was referred from A&E to AMU at 13.45hrs where he had presented with itching and rash which started the evening before, followed by swelling of the hip area, hands and lower lip, along with redness over knees. He also complained of a headache and feeling a lump in his throat on presentation. He was initially assessed, examined, diagnosed and treated by a Foundation Year 1 (FY1) doctor
He had been taking naproxen intermittently for backache, and had had a ruptured appendix and incisional hernia in the past. He was married, a non smoker with full functional status. No medication apart from naproxen for back pain was taken/prescribed.
The cardio vascular and respiratory systems and abdomen were examined by the FY1 and no abnormalities were detected. Well demarcated large areas of redness and swelling were noted over the hip area. Redness and swelling was also noted over the knees and hands, especially the palms.
A diagnosis of urticaria ?cause was made by the FY1 who prescribed piriton 4 mg and ordered the following investigations:
ECG, CBC, CRP, UE, glucose

The patient was reviewed by the consultant on call at 20.45hrs. The consultant diagnosed an allergy to naproxen, and he was advised to stop taking it. A 7 day course of prednisilone was prescribed, along with continuation of piriton. The patient was discharged home with advice to re-present at A&E if he had any breathing problems.

Case 3
A 69 year old lady, with a history of asthma, was referred to AMU from A&E following presentation to A&E via 999 ambulance call and was seen on presentation by a junior doctor (FY1). The patient presented with shortness of breath, and gave a history of having a cold for the previous 2 weeks, and reported coughing up green/yellow sputum.

The history taking related that the previous night when she had felt very short of breath which was worse on exertion and she called 999. On presentation to AMU the shortness of breath had improved, she was able to mobilise without shortness of breath, and had no cough.
The patient reported feeling better and reported no bowel/urinary symptoms, no weight loss, good appetite, usually fit and well, and there was no pain on deep inspiration.
The patient was an ex smoker, fully mobile at home, was widowed and lived alone. She worked as a cleaner.
Drug history was documented as:

- Bendroflumethiazide 2.5mg od
- Spiriva 18 mcg od
- Naftidrofuryl oxalate 100 mg tds
- Ramipril 10 mg od
- Symbicort bd

On examination temperature 36.6^{oC}, pulse 92 bpm, blood pressure 161/92 mmHg, $Sa0^2$ 92% breathing air.
Systems examined: cardiovascular system, respiratory system, gastrointestinal system/abdomen. Central nervous system was not formally assessed.
A differential diagnosis was made of infective exacerbation of asthma/COPD.
CBC, CRP, glucose, UEs, chest X-Ray, ECG, peak flow, and sputum culture investigations were ordered. Salbutamol prn was prescribed.
Senior review was carried out 6 hours later where diagnosis of exacerbation of asthma/COPD was agreed. The senior prescribed 5 days prednisilone and the patient was discharged home with an outpatient appointment with the respiratory consultant in 8 – 12 weeks.
Although in past medical history hypertension was indicated as 'no' , this patient was taking ramipril at the maximum dose advised in the British National Formulary (2010) and bendroflumethiazide 2.5 mg daily. BP was also noted to be 161/92 mmHg on admission.
The patient also presented taking naftidrofuryl oxalate 100mg tds, which is prescribed for peripheral vascular disease, although there is no mention of this in current history or past medical history.

Case 4
This 49 year old female patient was seen by a junior doctor (FY1) on presentation to Acute Medical Unit following referral from the GP. The patient presented with chest pain and gave a history of a lower respiratory tract infection 7 weeks ago. The GP prescribed prednisilone, amoxicillin and clarithromycin to treat this.
A past history was recorded of asthma, and history of the current presenting condition was given as right sided pleuritic pain for 6 weeks which had rendered the patient inactive. For the last 3 days the patient had suffered with fever and left sided chest pain.
The patient was married, lived with her husband and family and was normally fully mobile and independent.
Drug history was recorded as:

- Quar? (difficult legibility)
- Serevent
- HRT

(no doses recorded)

On examination temperature 36.6^{0}C, pulse 88 bpm, respiratory rate 16 pm, blood pressure 107/77 mmHg, $Sa0^2$ 100%.
The cardiovascular system, respiratory system and abdomen were examined. Chest was clear, with pain on inspiration over left inferior ribs.
Differential diagnoses of:

1. Lower respiratory tract infection
2. ?pleural effusion
3. ?PE were made.

Investigations ordered were chest X-Ray, ECG, CRP, U&Es, LFT, CBC and D-Dimer as PE suspected.

The patient was reviewed by a consultant later in the day. Diagnosis of likely musculoskeletal pain was made. DVT was excluded by investigations, and the consultant ordered arterial blood gases and bone profile investigations. If these investigations were normal the patient could be discharged home with analgesia. Investigations were normal and the patient was discharged.

Case 5
An 89 year old gentleman was referred to Acute Medical Unit by his GP with a 5 day history of epigastric discomfort. He was seen on presentation by an ANP. Past medical history was recorded as COPD, chest infections and he was an ex smoker. History of presenting g condition was recorded as worse at night, radiating to the left chest wall, and felt like 'burning' on occasions. There was no history of nausea, vomiting, diarrhoea, fever, dysuria or haematuria. The patient had a good appetite and reported no weight loss. He was married, and lived with his wife. He was fully mobile.
Drug history was recorded as:

- Ventolin 100 mcg 2 puffs qds
- Seretide 100 bd

On examination temperature 36.4°C, pulse 85 bpm, respiratory rate 14 pm, blood pressure 179/86 mmHg, $Sa0^2$ 97%. Cardiovascular system, respiratory system and abdomen were examined and no abnormalities detected, and chest was clear.

Differential diagnoses were:

1. GORDS
2. ?? cardiac event

Investigations of CBC, UEs, LFTs, Troponin T, glucose, chest X-Ray and ECG were ordered. All investigations were normal.

At senior review the consultant did not make a diagnosis, and did not mention either of the diagnoses made by the ANP. However he noted that all investigations were normal and discharged the patient home.

Case 6
A 35 year old male presented at A&E with a history of pleuritic chest pain. He was seen and examined by an FY2. A history was recorded of being woken that morning by pain in the left side of his chest with no radiation, worse on inspiration and very short of breath. He reported stopping smoking 2 weeks previously, normally fit and well, no previous DVT/PE, no nausea or vomiting and no haemoptysis.

Observations were recorded as temperature 36.6^0C, pulse 60 bpm, respiratory rate 16 pm, blood pressure 156/86 mmHg, O^2 saturation 97%. No systems examinations were recorded.

Chest X-Ray, D Dimer, CBC, UEs, CRP, Troponin T and ECG investigations were requested. Clexane 134mg sc and cocodamol 30/500 po were prescribed.
ECG was noted to show T wave inversion, Q waves in III.
Diagnosis of PE was made and the patient was referred to physicians.

At senior review it was noted that chest was clear, chest X-Ray was normal, and there was no evidence of PE. A diagnosis of ?viral pleurisy was made, Brufen and paracetamol were prescribed by the senior, and the patient was discharged home.

Case 7

A 75 year old lady presented to AMU via A&E with a history of vomiting overnight every 20 minutes, and complaining of upper mild abdominal pain. She was seen by the junior doctor on AMU and gave a history of loose stools for some months. Current medication was recorded as:

- Metformin 500mg TDS
- Glicazide 40mg OD
- Simvastatin 40mg ON
- Candesartan 4 mg BD
- Carvidalol 6.25 mg BD
- ISMN 20mg OD
- Omeprazole 20mg OD
- Levithyroxine 50 mcg OD
- Amitryptoline 20 mg ON

Past medical history was documented as angina, hypertension, diabetes, hypothyroid, previous TIA and peptic ulcer. She had also suffered with recurrent UTIs.
This lady was married and living wither husband, and was fully independent.
On physical examination, CVS, RS, GIT, CNS examined, mild tenderness upper abdomen, nil else.
Investigations ordered:
FBC, U&E, LFT, CRP, blood cultures, CXR, ECG, and MSU.

Cyclizine 50mg IV, Cefuroxime 1.5g IV TDS, metronidazole 400mg PO TDS and IV fluids prescribed.

Diagnosis
?Gastroenteritis
?UTI

On review by consultant, LFTs and CXR noted as normal. Senior noted that previously has been diagnosed with IBS. Diagnosis unclear, ?UTI, ?gastroenteritis.

Medication was changed to cephalexin, and additional investigation of renal ultrasound as outpatient ordered.

Case 8
A 35 year old female was seen in AMU following referral by her GP with a history of right sided pleuritic pain for 8 days, gradually worsening over the last 2 days. She was seen and examined on presentation by an ANP. Risk factors of oral contraceptive and recent aeroplane flight were recorded.
No previous medical history was recorded, and the patient was fully mobile and independent.
Medication currently prescribed – oral contraceptive.
CVS and RS were examined and nil found.
Investigations ordered were:

- D Dimer
- ECG
- Chest X-Ray

Provisional diagnoses were made of:

1. Musculoskeletal pain
2. Rule out PE

At senior review, D Dimer noted as negative, and diagnosis of musculoskeletal pain made, Patient prescribed analgesia and discharged.

Case 9
A 34 year old male was referred to AMU by their GP with loss of consciousness and head injury 2 days previously and feeling unwell since. The patient was seen and examine don presentation by an ANP. The ANP recorded that the patient had been referred to neurologists in 1999 with h/o ?passing out and epilepsy excluded. The patient had psoriasis nil else. He was married and lived with his family independently. He was not prescribed any medication on presentation.
CVS, abdomen, RS and CNS were examined. No medication was prescribed
Investigations:
FBC, U&Es, ECG, X-Ray facial bones.

Provisional diagnoses made of:

- Pre syncope attack due to ?hypoglycaemia
- Rule out cardiac cause

At senior review additional investigations ordered – C peptide and pre insulin levels, fasting blood glucose, and patient discharged home.

Case 10
An 80 year old female was referred from Ophthalmology with a history of diplopia with binocular vision. Had been discharged 2 weeks previously following admission for falls, and developed diplopia on day of discharge. No previous medical history recorded, and patient lives alone and is normally fully independent.
Drug history:

- Aslendronic acid
- Calcichew

T 36.6, pulse 78, RR 14, BP 131/84, Sa02 96%

CVS, RS, abdomen, CNS, skin examined.
Differential diagnosis:
Diplopia 6^{th} Nerve palsy

FBC, U&E, Ca alb, CRP, thyroid profile, LFTs, ECG, chest X-Ray, CT and MRI head ordered.

At senior review diagnosis agreed and patient admitted awaiting investigation results.

Appendix x categorical variables

Variable	Categories	311 cases	209 cases	164 cases
		Frequency (%)	Frequency(%)	Frequency(%)
Patient gender	Male	120 (38.6%)	92 (44%)	71 (43.3%)
	Female	191 (61.4%)	117 (56%)	93 (56.7%)
Clinical area	Accident and Emergency Department (A&E)	34 (10.9%)		
	Acute Medical Unit (AMA)	209 (67.2%)	209 (100%)	164 (100%)
	Surgery	20 (6.4%)		
	Community hospital	18 (5.8%)		
	Rapid access clinics	30 (9.7%)		
Refer from	A&E	79 (25.4%)	74 (35.4%)	37 (22.6%)
	General Practitioner (GP)	170 (54.7%)	126 (60.3%)	120 (73.2%)
	Self	8 (2.6%)	2 (1%)	0
	Ophthalmology	1 (0.3%)	1 (0.5%)	1 (0.6%)
	Ambulance	30 (9.6%)	2 (1%)	2 (1.2%)
	Other ward	14 (4.5%)	1 (0.5%)	0
	AMU	3 (1%)	1 (0.5%)	1 (0.6%)
	Outpatients Department (OPD)	3 (1%)	1 (0.5%)	1 (0.6%)
	Out of Hours service (OOH)	2 (0.6%)	1 (0.5%)	1 (0.6%)
	Community hospital	1 (0.3%)		
Profession	ANP	152 (48.9%)	86	86
	Doctor	159 (51.1%)	123	78
Weekday/ Weekend	Weekday	253 (81.3%)	164 (78.5%)	164 (100%)
	Saturday	29 (9.3%)	22 (10.5%)	
	Sunday	28 (9%)	22 (10.5%)	
	Bank holiday	2 (0.6%)	1 (0.5%)	
Diagnosis 1 agreed	No diagnosis made	9 (2.9%)	4 (1.9%)	3 (1.8%)
	Yes	217 (69.8%)	138 (66%)	109 (66.5%)
	No	77 (24.8%)	59 (28.2%)	47 (28.7%)
	Uncertain	2 (0.6%)	2 (1%)	1 (0.6%)
	Not mentioned	6 (1.9%)	6 (2.9%)	4 (2.4%)
Diagnosis 2 agreed	No diagnosis made	166 (53.4%)	87 (41.6%)	60 (36.6%)
	Yes	59 (19%)	49 (23.4%)	43 (26.2%)
	No	23 (7.4%)	20 (9.6%)	17 (10.4%)
	Uncertain	2 (0.6%)	2 (1%)	1 (0.6%)
	Not mentioned	5 (1.6%)	47 (22.4%)	40 (24.4%)
	2nd diagnosis by senior, not junior	56 (18%)	4 (1.9%)	43 (1.8%)
Diagnosis 3 agreed	No diagnosis made	267 (85.9)	173 (82.8%)	134 (81.7%)
	Yes	2 (0.6%)	2 91%)	2 (1.2%)
	No	14 (4.5%)	11 (5.3%)	10 (6.1%)
	Not mentioned	25 (8.1%)	20 (9.5%)	15 (9.2%)
	3rd diagnosis by senior, not junior	3 (1%)	3 (1.4%)	3 (1.8%)
Diagnosis 4 agreed	No diagnosis made	305 (98.1%)	205 (98.1%)	160 (97.6%)
	Yes	1 (0.3%)	0	0
	No	0	0	0
	Uncertain	0	0	0
	Not mentioned	5 (1.6%)	4 (1.9%)	4 (2.4%)
	4th diagnosis by senior, not junior	0	0	0

Variable	Categories	311 cases	209 cases	164 cases
		Frequency (%)	Frequency(%)	Frequenc (%)
Chemical pathology investigations	Yes No Previously done	271 (87.1%) 35 (11.3%) 5 (1.6%)	203 (97.1%0 4 (2.9%) 0	159 (97%) 5 (3%)
Microbiology investigations	Yes No Previously done	68 (21.9%) 243 (78.1%) 0	54 (25.8%) 155 (74.2%) 0	35 (21.3%) 129 (78.7%)
X-Ray	Yes No Previously done	201 (64.6%) 105 (33.8%) 5 (1.6%)	165 (78.9%) 44 (21.1%) 0	129 (78.7%) 35 (21.3%)
ECG	Yes No Previously done	244 (78.5%) 62 (19.9%) 5 (1.6%)	172 (82.3%) 36 (17.2%) 1 (0.5%)	138 (84.1%) 26 (15.9%)
Additional investigations ordered by senior	Yes No	70 (22.5%) 241 (77.5%)	52 (24.9%) 157 (75.1%)	45 (27.4%) 119 (72.6%)
Medication agreed	Yes No None ordered by junior or senior	146 (46.9%) 67 (21.5%) 98 (31.5%)	107 (51.2%) 52 (24.9%) 50 (23.9%)	66 (40.2%) 54 (32.9%) 44 (26.8%)
Medication added	Yes No	63 (20.3%) 248 (79.7%)	53 (25.4%) 156 (74.6%)	52 (31.7%) 112 (68.3%)
Medication removed	Yes No Previously prescribed removed	15 (4.8%) 292 (93.9%) 4 (1.3%)	12 (5.7%) 193 (92.3%)	11 (6.7%) 153 (93.3%)
Medication dose increased	Yes No	5 (1.6%) 306 (98.4%)	5 (2.4%) 204 (97.6%)	5 (3%) 159 (97%)
Medication dose decreased	Yes No	3 (1%) 308 (99%)	3 (1.4%) 206 (98.6%)	0 164 (100%)
Clinical management plan documented	Yes No	311 (100%) 0	209 (100%)	164 (100%) 0
Clinical management plan agreed by senior	Yes Augmented No	184 (59.2%) 96 (30.9%) 31 (10%)	109 (52.2%) 76 (36.4%) 24 (11.5%)	79 (48.2%) 65 (39.6%) 20 (12.2%)
Additional clinical management plan by senior	Yes No	130 (41.8%) 181 (58.2%)	100 (47.8%) 109 (52.2%)	85 (51.8%) 79 (48.2%)
Legibility	Yes Some difficulty No	250 (80.4%) 61 (19.6%) 0	175 (83.7%) 34 (16.3%)	138 (84.1%) 26 (15.9%) 0
Signed and dated	Yes No signed not dated	282 (90.7%) 3 (1%) 26 (8.4%)	205 (98.1%) 3 (1.4%) 1 (0.5%)	160 (97.6%) 3 (1.8%) 1 (0.6%)

Variable	Categories	311 cases	209 cases	164 cases
		Frequency (%)	Frequency (%)	Frequency (%)
Early warning score done	Yes No	0 311 (100%)	0 209 (100%)	0 164 (100%)
Early warning score ignored	Not done Yes	311 (100%) 0	209 (100%) 0	164 (100%)
Fall prior to senior review	Yes No Fall after senior review	0 307 (98.7%) 4 (1.3%)	0 209 (100%)	0 164 (100%)
Skin assessment	Yes pressure ulcer present Assessed not present Not assessed	4 (1.3%) 106 (34.1%) 201 (64.6%)	3 (1.4%) 100 (47.8%) 106 (50.7%)	3 (1.8%) 85 (51.8%) 76 (46.3%)
Shock prior to senior review	Yes No	0 311 (100%)	0 209 (100%)	0 164 (100%)
Cardiac arrest prior to senior review	Yes No	1 (0.3%) 310 (99.7%)	0 209 (100%)	0 164 (100%)
DVT prior to senior review	Yes No	0 311 (100%)	0 209 (100%)	0 164 (100%)
Pulmonary embolism prior to senior review	Yes No	0 311 (100%)	0 209 (100%)	0 164 (100%)
Transfer to higher level of care	Yes No	2 (0.6%) 309 (99.4%)	1 (0.5%) 208 (99.5%)	1 (0.6%) 163 (99.4%)
Complications prior to senior review	Yes No	0 311 (100%)	0 209 (100%)	0 164 (100%)
Length of stay	Less than 24 hrs 24-48 hours 48-72 hours over 72 hours discharge not documented outpatient missing data	90 (28.9%) 38 (12.2%) 16 (5.1%) 109 (35%) 1 (0.3% 30 (9.6%) 27 (8.7%)	75 (35.9%) 29 (13.9%) 11 (5.3%) 68 (32.5%) 26 (12.4%) 0 0	58 (35.4%) 19 (11.6%) 8 (4.9%) 54 (32.9%) 25 (15.2%) 0 0

Appendix xi Types of medication added by senior doctor at review

Drugs added by senior	BNF section	ANP Frequency	Junior Doctors Frequency	Senior total additions
Analgesia				
• Analgesia type not stated	4.7.1	4	2	6
• Paracetamol	4.7.1	1	1	2
• Cocodamol	4.7.1	1		1
Calcium channel blockers				
• Amlodipine	2.6.2		1	1
Non steroidal anti inflammatory drugs				
• Ibuprofen	10.1.1	1		1
Antibiotics				
• Amoxicillin	5.1.1	3	3	6
• Cefuroxime	5.1.2	2	2	4
• Clarithromycin	5.1.5	2		2
• Penicillin	5.1.1	1		1
• Metronidazole	5.1.11		2	2
• Ciprofloxacin	5.1.12		1	1
• Tazocin	5.1.1		1	1
• Vancomycin	5.1.7		1	1
• Meroperem			1	1
Anxiolytics				
• Chlordiazepoxide	4.1.2		1	1
Diuretics				
• Furosemide	2.2.3	1		1
Drugs affecting rennin-angiotensin system				
• Ramipril	2.5.5		1	1
Nitrates				
• GTN	2.6.1	1		1
Anti anginal drugs				
• Nicorandil	2.6.3		1	1
Lipid regulating drugs				
• Simvastatin	2.12	2		2
Antiplatelet drugs				
• Aspirin	2.9	5		5
• Clopidogrel	2.9	2		2
• Dipyridamole	2.9	2		2
Anticoagulants				
• Clexane	2.8.1	3	2	5
• Warfarin	2.8.2	1		1
Beta-adrenoreceptor blocking drugs				
• Atenolol	2.4	2		2
• Bisoprolol	2.4	2	1	3

• Metoprolol	2.4	1		1
Iron deficiency • Ferrous sulphate	9.1.1	1		1
Cardiac glycosides • Digoxin	2.1.1	1		1
Glucocorticoid therapy • Prednisolone	6.3.2	2	1	3
Antithyroid drugs • Carbimazole	6.2.2	1		1
Proton pump inhibitors • Omeprazole	1.3.5	1		1
Nebulisers	3.1.5	1		1
Epilepsy control • Carbamazepine	4.8.1	1		1
Hypnotics • Zopiclone	4.1.1	1		1
Total		41*	24* (+1 illegible)	65 (+1 illegible)

Appendix xii

Logistic regression analysis syntax

311 cases

Outcome: Clinical management plan agreed when 'augmented' collapsed with 'no'.

Continuous predictors

```
LOGISTIC REGRESSION VARIABLES planagreedrecode
  /METHOD=BSTEP(LR) profession wkwkend ageofpt systexamined coexprobnumber medadm
wordcount
  /CONTRAST (profession)=Indicator
  /CONTRAST (wkwkend)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	308	99.0
	Missing Cases	3	1.0
	Total	311	100.0
Unselected Cases		0	.0
Total		311	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
no	0
yes	1

Categorical Variables Codings

		Frequency	Parameter coding (1)
weekend	weekday	251	1.000
	weekend	57	.000
profession	nurse	152	1.000
	doctor	156	.000

Block 0: Beginning Block

Classification Table[a,b]

	Observed		Predicted aug=norecoded no	Predicted aug=norecoded yes	Predicted Percentage Correct
Step 0	aug=norecoded	No	0	126	.0
		Yes	0	182	100.0
	Overall Percentage				59.1

a. Constant is included in the model.
b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.368	.116	10.068	1	.002	1.444

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	profession(1)	6.718	1	.010
		wkwkend(1)	.981	1	.322
		Ageofpt	.283	1	.595
		Systexamined	13.627	1	.000
		Coexprobnumber	2.868	1	.090
		Medadm	.310	1	.577
		Wordcount	19.471	1	.000
	Overall Statistics		38.275	7	.000

Block 1: Method = Backward Stepwise (Likelihood Ratio)

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	41.107	7	.000
	Block	41.107	7	.000
	Model	41.107	7	.000
Step 2[a]	Step	-.055	1	.815
	Block	41.052	6	.000
	Model	41.052	6	.000
Step 3[a]	Step	-.152	1	.697
	Block	40.901	5	.000
	Model	40.901	5	.000
Step 4[a]	Step	-.645	1	.422
	Block	40.256	4	.000
	Model	40.256	4	.000

a. A negative Chi-squares value indicates that the Chi-squares value has decreased from the previous step.

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	375.633[a]	.125	.168
2	375.688[a]	.125	.168
3	375.839[a]	.124	.168
4	376.484[a]	.123	.165

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	12.084	8	.147
2	8.493	8	.387
3	6.295	8	.614
4	5.287	8	.726

Contingency Table for Hosmer and Lemeshow Test

		aug=norecoded = no		aug=norecoded = yes		
		Observed	Expected	Observed	Expected	Total
Step 1	1	21	22.379	10	8.621	31
	2	19	18.277	12	12.723	31
	3	18	16.413	13	14.587	31
	4	11	14.965	20	16.035	31
	5	12	13.417	19	17.583	31
	6	18	11.933	13	19.067	31
	7	8	10.342	23	20.658	31
	8	11	8.501	20	22.499	31
	9	7	6.186	24	24.814	31
	10	1	3.588	28	25.412	29
Step 2	1	21	22.381	10	8.619	31
	2	20	18.269	11	12.731	31
	3	15	16.397	16	14.603	31
	4	13	14.981	18	16.019	31
	5	13	13.398	18	17.602	31
	6	17	11.978	14	19.022	31
	7	7	10.333	24	20.667	31
	8	11	8.487	20	22.513	31
	9	7	6.186	24	24.814	31

	10	2	3.590	27	25.410	29
Step 3	1	20	22.371	11	8.629	31
	2	21	18.221	10	12.779	31
	3	15	16.352	16	14.648	31
	4	14	15.034	17	15.966	31
	5	13	13.473	18	17.527	31
	6	15	11.957	16	19.043	31
	7	8	10.277	23	20.723	31
	8	11	8.495	20	22.505	31
	9	7	6.227	24	24.773	31
	10	2	3.594	27	25.406	29
Step 4	1	21	22.273	10	8.727	31
	2	20	18.818	12	13.182	32
	3	17	16.780	15	15.220	32
	4	12	14.880	19	16.120	31
	5	16	13.304	15	17.696	31
	6	14	11.928	17	19.072	31
	7	8	10.280	23	20.720	31
	8	10	8.056	20	21.944	30
	9	6	6.066	25	24.934	31
	10	2	3.616	26	24.384	28

Classification Table[a]

			Predicted		
			aug=norecoded		
	Observed		no	yes	Percentage Correct
Step 1	aug=norecoded	no	62	64	49.2
		yes	40	142	78.0
	Overall Percentage				66.2
Step 2	aug=norecoded	no	62	64	49.2
		yes	39	143	78.6
	Overall Percentage				66.6
Step 3	aug=norecoded	no	61	65	48.4
		yes	37	145	79.7
	Overall Percentage				66.9
Step 4	aug=norecoded	no	58	68	46.0
		yes	38	144	79.1
	Overall Percentage				65.6

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	profession(1)	.895	.280	10.202	1	.001	2.447
	wkwkend(1)	-.710	.348	4.149	1	.042	.492
	ageofpt	-.002	.007	.054	1	.815	.998
	systexamined	-.402	.148	7.405	1	.007	.669
	coexprobnumber	-.071	.088	.660	1	.416	.931
	medadm	.020	.045	.190	1	.663	1.020
	wordcount	-.017	.005	12.288	1	.000	.983
	Constant	3.293	.808	16.602	1	.000	26.911
Step 2[a]	profession(1)	.910	.273	11.075	1	.001	2.483
	wkwkend(1)	-.711	.349	4.165	1	.041	.491
	systexamined	-.404	.147	7.522	1	.006	.668
	coexprobnumber	-.075	.086	.754	1	.385	.928
	medadm	.017	.043	.151	1	.697	1.017
	wordcount	-.017	.005	12.579	1	.000	.983
	Constant	3.185	.663	23.098	1	.000	24.177
Step 3[a]	profession(1)	.905	.273	11.008	1	.001	2.473
	wkwkend(1)	-.716	.348	4.226	1	.040	.489
	systexamined	-.407	.147	7.630	1	.006	.666
	coexprobnumber	-.054	.067	.644	1	.422	.947
	wordcount	-.017	.005	12.673	1	.000	.983
	Constant	3.227	.655	24.239	1	.000	25.201
Step 4[a]	profession(1)	.929	.271	11.746	1	.001	2.533
	wkwkend(1)	-.729	.348	4.383	1	.036	.482

systexamined	-.416	.147	8.024	1	.005	.660
wordcount	-.017	.005	12.808	1	.000	.983
Constant	3.132	.641	23.844	1	.000	22.917

a. Variable(s) entered on step 1: profession, wkwkend, ageofpt, systexamined, coexprobnumber, medadm, wordcount.

Model if Term Removed

Variable		Model Log Likelihood	Change in -2 Log Likelihood	df	Sig. of the Change
Step 1	profession	-193.090	10.547	1	.001
	wkwkend	-189.957	4.280	1	.039
	ageofpt	-187.844	.055	1	.815
	systexamined	-191.664	7.695	1	.006
	coexprobnumber	-188.148	.663	1	.416
	medadm	-187.911	.190	1	.663
	wordcount	-194.262	12.892	1	.000
Step 2	profession	-193.580	11.473	1	.001
	wkwkend	-189.992	4.297	1	.038
	systexamined	-191.761	7.834	1	.005
	coexprobnumber	-188.222	.757	1	.384
	medadm	-187.920	.152	1	.697
	wordcount	-194.463	13.239	1	.000
Step 3	profession	-193.617	11.395	1	.001
	wkwkend	-190.101	4.362	1	.037
	systexamined	-191.891	7.942	1	.005
	coexprobnumber	-188.242	.645	1	.422
	wordcount	-194.599	13.358	1	.000
Step 4	profession	-194.340	12.197	1	.000
	wkwkend	-190.506	4.528	1	.033
	systexamined	-192.427	8.371	1	.004
	wordcount	-195.005	13.526	1	.000

Variables not in the Equation

			Score	df	Sig.
Step 2[a]	Variables	ageofpt	.054	1	.815
	Overall Statistics		.054	1	.815
Step 3[b]	Variables	ageofpt	.016	1	.898
		medadm	.152	1	.697
	Overall Statistics		.206	2	.902
Step 4[c]	Variables	ageofpt	.188	1	.665
		coexprobnumber	.645	1	.422
		medadm	.039	1	.843
	Overall Statistics		.851	3	.837

a. Variable(s) removed on step 2: ageofpt.
b. Variable(s) removed on step 3: medadm.
c. Variable(s) removed on step 4: coexprobnumber.

Outcome: Clinical management plan agreed when 'augmented' collapsed with 'no'.

Categorical predictors

```
LOGISTIC REGRESSION VARIABLES planagreedrecode
  /METHOD=BSTEP(LR) profession wkwkend ageunderover coexistingforlog medadmcat
systemsexamcaterecode wordcountcat
  /CONTRAST (profession)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (wkwkend)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Clinical Management Plan agreed when 'augmented collapsed with 'yes'

Categorical predictors

```
LOGISTIC REGRESSION VARIABLES planagreedrecoded
  /METHOD=BSTEP(LR) ageunderover coexistingforlog medadmcat systemsexamcaterecode
wordcountcat profession wkwkend
  /CONTRAST (ageunderover)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /CONTRAST (profession)=Indicator
  /CONTRAST (wkwkend)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
LOGISTIC REGRESSION VARIABLES planagreedrecoded
  /METHOD=BSTEP(LR) profession wkwkend ageofpt systexamined coexprobnumber medadm
wordcount
  /CONTRAST (profession)=Indicator
  /CONTRAST (wkwkend)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Clinical Management Plan agreed, Yes/No only
Categorical predictors

```
LOGISTIC REGRESSION VARIABLES planagreedYorN
  /METHOD=BSTEP(LR) profession wordcountcat systemsexamcaterecode medadmcat
coexistingforlog ageunderover wkwkend
  /CONTRAST (profession)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /CONTRAST (wkwkend)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
USE ALL.
COMPUTE filter_$=(planagreedYorN  2 ).
VARIABLE LABELS filter_$ 'planagreedYorN  2  (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
LOGISTIC REGRESSION VARIABLES planagreedYorN
  /METHOD=BSTEP(LR) profession wkwkend ageofpt systexamined medadm wordcount
coexprobnumber
  /CONTRAST (profession)=Indicator
  /CONTRAST (wkwkend)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Primary diagnosis agreed
Categorical predictors

```
LOGISTIC REGRESSION VARIABLES primarydiag
  /METHOD=BSTEP(LR) profession wkwkend wordcountcat systemsexamcaterecode medadmcat
coexistingforlog ageunderover
  /CONTRAST (ageunderover)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
```

```
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /CONTRAST (profession)=Indicator
  /CONTRAST (wkwkend)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
LOGISTIC REGRESSION VARIABLES primarydiag
  /METHOD=BSTEP(LR) profession wkwkend ageofpt systexamined coexprobnumber medadm
wordcount
  /CONTRAST (profession)=Indicator
  /CONTRAST (wkwkend)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Medicines prescribed agreed by senior doctor

Categorical predictors

```
LOGISTIC REGRESSION VARIABLES medsagreedrecode
  /METHOD=BSTEP(LR) profession wkwkend ageunderover coexistingforlog medadmcat
systemsexamcaterecode wordcountcat
  /CONTRAST (profession)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /CONTRAST (wkwkend)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
FILTER OFF.
USE ALL.
EXECUTE.
LOGISTIC REGRESSION VARIABLES medsagreedrecode
  /METHOD=BSTEP(LR) profession wkwkend ageofpt systexamined coexprobnumber medadm
wordcount
  /CONTRAST (profession)=Indicator
  /CONTRAST (wkwkend)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Medicines added by senior doctor at review

Categorical predictors

```
LOGISTIC REGRESSION VARIABLES medsaddedYN
  /METHOD=BSTEP(LR) profession wkwkend ageunderover coexistingforlog medadmcat
systemsexamcaterecode wordcountcat
  /CONTRAST (profession)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /CONTRAST (wkwkend)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
LOGISTIC REGRESSION VARIABLES medsaddedYN
  /METHOD=BSTEP(LR) profession wkwkend
  /CONTRAST (profession)=Indicator
  /CONTRAST (wkwkend)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

AMA cases n = 209

Clinical Management Plan agreed when 'augmented' collapsed with 'no'.

Categorical predictors

```
LOGISTIC REGRESSION VARIABLES planagreedrecode
  /METHOD=BSTEP(LR) profession ageunderover coexistingforlog medadmcat
systemsexamcaterecode wordcountcat
  /CONTRAST (profession)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
USE ALL.
COMPUTE filter_$=(clinicalarea = 2 ).
VARIABLE LABELS filter_$ 'clinicalarea = 2  (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
LOGISTIC REGRESSION VARIABLES planagreedrecode
  /METHOD=BSTEP(LR) profession ageofpt systexamined coexprobnumber medadm wordcount
  /CONTRAST (profession)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Clinical management plan agreed when augmented collapsed with yes

Categorical predictors

```
LOGISTIC REGRESSION VARIABLES planagreedrecoded
  /METHOD=BSTEP(LR) profession coexistingforlog medadmcat systemsexamcaterecode
wordcountcat ageunderover
  /CONTRAST (profession)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
LOGISTIC REGRESSION VARIABLES planagreedrecoded
  /METHOD=BSTEP(LR) profession ageofpt systexamined coexprobnumber medadm wordcount
  /CONTRAST (profession)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Clinical Management Plan agreed, Yes/No only

Categorical predictors

```
LOGISTIC REGRESSION VARIABLES planagreedyesnoonly
  /METHOD=BSTEP(LR) profession ageunderover coexistingforlog medadmcat
systemsexamcaterecode wordcountcat
```

```
  /CONTRAST (profession)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
USE ALL.
COMPUTE filter_$=(clinicalarea = 2 & planagreedyesnoonly  2).
VARIABLE LABELS filter_$ 'clinicalarea = 2 & planagreedyesnoonly  2 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
LOGISTIC REGRESSION VARIABLES planagreedyesnoonly
  /METHOD=BSTEP(LR) profession ageofpt systexamined coexprobnumber medadm wordcount
  /CONTRAST (profession)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Primary diagnosis agreed

Categorical predictors

```
GET
  FILE='C:\Users\ly074054\Desktop\dissertation\lynne1012 (2).sav'.
DATASET NAME DataSet1 WINDOW=FRONT.
USE ALL.
COMPUTE filter_$=(clinicalarea = 2 & primarydiagnosis  2).
VARIABLE LABELS filter_$ 'clinicalarea = 2 & primarydiagnosis  2 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
LOGISTIC REGRESSION VARIABLES primarydiagnosis
  /METHOD=ENTER profession ageunderover coexistingforlog medadmcat
systemsexamcaterecode wordcountcat
  /CONTRAST (profession)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
LOGISTIC REGRESSION VARIABLES primarydiagnosis
  /METHOD=ENTER profession ageofpt systexamined coexprobnumber medadm wordcount
  /CONTRAST (profession)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Medicines prescribed agreed by senior doctor

Categorical predictors

```
LOGISTIC REGRESSION VARIABLES medsagreedrecode
  /METHOD=ENTER profession ageunderover coexistingforlog medadmcat
systemsexamcaterecode wordcountcat
  /CONTRAST (profession)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (wordcountcat)=Indicator
```

```
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
LOGISTIC REGRESSION VARIABLES medsagreedrecode
  /METHOD=ENTER profession ageofpt systexamined coexprobnumber medadm wordcount
  /CONTRAST (profession)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Medicines added by senior doctor at review

Categorical predictors

```
LOGISTIC REGRESSION VARIABLES medsaddedYN
  /METHOD=ENTER profession ageunderover coexistingforlog medadmcat
systemsexamcaterecode wordcountcat
  /CONTRAST (profession)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
LOGISTIC REGRESSION VARIABLES medsaddedYN
  /METHOD=ENTER profession ageofpt systexamined coexprobnumber medadm wordcount
  /CONTRAST (profession)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

AMA cases weekday presentations only n = 164

Clinical Management Plan agreed when ‘augmented’ collapsed with ‘no’
Categorical predictors

```
USE ALL.
COMPUTE filter_$=(clinicalarea = 2 & dayofweek = 1).
VARIABLE LABELS filter_$ 'clinicalarea = 2 & dayofweek = 1 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
LOGISTIC REGRESSION VARIABLES planagreedrecode
  /METHOD=BSTEP(LR) profession ageunderover coexistingforlog medadmcat
systemsexamcaterecode wordcountcat
  /CONTRAST (profession)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5)
```

Continous predictors

```
LOGISTIC REGRESSION VARIABLES planagreedrecode
  /METHOD=BSTEP(LR) profession ageofpt systexamined coexprobnumber medadm wordcount
  /CONTRAST (profession)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Clinical Management Plan agreed when ‘augmented’ collapsed with ‘yes’
Continuous predictors

```
USE ALL.
```

```
COMPUTE filter_$=(clinicalarea = 2 & dayofweek = 1 ).
VARIABLE LABELS filter_$ 'clinicalarea = 2 & dayofweek = 1  (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
LOGISTIC REGRESSION VARIABLES planagreedrecoded
  /METHOD=BSTEP(LR) profession ageofpt systexamined coexprobnumber medadm wordcount
  /CONTRAST (profession)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Clinical Management Plan agreed, Yes/No only

Categorical predictors

```
USE ALL.
COMPUTE filter_$=(planagreedYorN  2 & clinicalarea = 2 & dayofweek = 1).
VARIABLE LABELS filter_$ 'planagreedYorN  2 & clinicalarea = 2 & dayofweek = 1
(FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
LOGISTIC REGRESSION VARIABLES planagreedYorN
  /METHOD=BSTEP(LR) profession ageunderover coexistingforlog medadmcat
systemsexamcaterecode wordcountcat
  /CONTRAST (profession)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5)
```

Continuous predictors

```
USE ALL.
COMPUTE filter_$=(planagreedYorN  2  & clinicalarea = 2 & dayofweek = 1).
VARIABLE LABELS filter_$ 'planagreedYorN  2  & clinicalarea = 2 & dayofweek = 1
(FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
LOGISTIC REGRESSION VARIABLES planagreedYorN
  /METHOD=BSTEP(LR) profession ageofpt systexamined medadm wordcount coexprobnumber
  /CONTRAST (profession)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5)
```

Primary diagnosis agreed by senior doctor

Categorical predictors

```
USE ALL.
COMPUTE filter_$=(clinicalarea = 2 & dayofweek = 1  ).
VARIABLE LABELS filter_$ 'clinicalarea = 2 & dayofweek = 1   (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
LOGISTIC REGRESSION VARIABLES primarydiagagreed
  /METHOD=BSTEP(LR) profession ageunderover coexistingforlog medadmcat
systemsexamcaterecode wordcountcat
  /CONTRAST (profession)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
```

```
  /CONTRAST (ageunderover)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
LOGISTIC REGRESSION VARIABLES primarydiagagreed
  /METHOD=BSTEP(LR) profession ageofpt systexamined coexprobnumber medadm wordcount
  /CONTRAST (profession)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Medicines prescribed agreed by senior doctor

Categorical predictors

```
LOGISTIC REGRESSION VARIABLES medsagreedrecode
  /METHOD=BSTEP(LR) profession wordcountcat systemsexamcaterecode medadmcat
coexistingforlog ageunderover
  /CONTRAST (profession)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
USE ALL.
COMPUTE filter_$=(clinicalarea = 2 & dayofweek = 1).
VARIABLE LABELS filter_$ 'clinicalarea = 2 & dayofweek = 1 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
LOGISTIC REGRESSION VARIABLES medsagreedrecode
  /METHOD=BSTEP(LR) profession ageofpt systexamined medadm wordcount coexprobnumber
  /CONTRAST (profession)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Medicines added by senior doctor at senior review

Categorical predictors

```
LOGISTIC REGRESSION VARIABLES medsaddedYN
  /METHOD=BSTEP(LR) profession wordcountcat systemsexamcaterecode medadmcat
coexistingforlog ageunderover
  /CONTRAST (profession)=Indicator
  /CONTRAST (ageunderover)=Indicator
  /CONTRAST (coexistingforlog)=Indicator
  /CONTRAST (medadmcat)=Indicator
  /CONTRAST (systemsexamcaterecode)=Indicator
  /CONTRAST (wordcountcat)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Continuous predictors

```
LOGISTIC REGRESSION VARIABLES medsaddedYN
  /METHOD=BSTEP(LR) profession ageofpt systexamined coexprobnumber medadm wordcount
  /CONTRAST (profession)=Indicator
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```