Integrating physician associates into the health workforce: barriers and facilitators

Dr Matthew Chak Hin Szeto[1]
Dr Alex Till[2]
Professor Judy McKimm[3]

[1]Chief Registrar in General Medicine, Medway NHS Foundation Trust
[2]Psychiatric Core Trainee, Health Education North West (Mersey), Leadership and Management Fellow, Mersey Care NHS Foundation Trust, Honorary Clinical Senior Lecturer, Swansea University Medical School, National Medical Director's Clinical Fellow 2016–17
[3]Professor of Medical Education and Director of Strategic Educational Development, Swansea University Medical School, Swansea

Corresponding author: Matthew CH Szeto, matthew.szeto@nhs.net

Abstract

Physician Associates (PAs) have been identified as a potential solution to the shortage of healthcare workers in the United Kingdom, but their introduction PAs has not been universally welcomed and some uncertainty exists around their specific roles. This review enhances our understanding of the barriers and facilitators for integrating PAs into the workforce and identifies six key themes to inform future policy decisions at local and national levels.

Key messages

1. Physician Associates (PAs) have been successfully integrated into the UK healthcare workforce in primary and secondary care settings.
2. The barriers to PA integration include lack of statutory regulation, poor understanding of the PA role, and uncertain cost-effectiveness.
3. Successful integration has been facilitated by the flexibility of the PA role and the safety of PA consultation.
4. Implementation of national and local policies are key for PAs to realise their potential as an innovative workforce solution.

Introduction

The need to reform the UK's healthcare workforce has been driven by staff shortages, rising demand, increasing complexity of care, and changes in relationship between professionals (Imison and Bohmer, 2013). The UK government has identified Physician Associates (PAs- also known as Physician Assistants in other countries) as one of the solutions to address the staffing challenge in the NHS (NHS England, 2017; Hunt, 2015). The PA role has been introduced alongside expanded scopes of practise for existing health professionals (e.g. nurse practitioners), many of which have existed for some years.

A PA is defined as 'a new healthcare professional who, while not a doctor, works to the medical model, with the attitudes, skills and knowledge base to deliver holistic care and treatment within the general medical and/or general practice team under defined levels of supervision' (Department of Health, 2012). Since the first UK trained PA graduated in 2007, the profession has experienced steady growth (Aiello and Roberts, 2017). In 2017, there was an estimated 450 qualified PAs in the UK, and up to 1200 PA students. PAs work in a wide range of specialties, with General Practice, Acute Medicine, and Emergency Medicine being the most common (Ritsema, 2017).

The introduction of PAs into the UK healthcare workforce has, however, received a mixed response, with commentaries and anecdotal evidence suggest that introduction of PAs is not universally welcomed (e.g. Bhardwa, 2015; McCartney, 2017). Understanding and addressing the concerns of stakeholders is therefore essential for their successful integration (Greenhalgh et al., 2004). Although the professional development and education of PAs in the UK has been subject to previous review (Hooker and Kuilma, 2011; Merkle et al., 2011; Abraham et al., 2016; Aiello and Roberts, 2017), these publications have not summarised the barriers and facilitators for integrating PAs into the workforce.

Aims and methods

This literature review therefore aims to answer the research question: *'What do stakeholders perceive as barriers and facilitators for the integration of PAs into the UK health system?'*. The objective is to identify and analyse the literature related to the concerns of stakeholders, including government, employers, doctors, PAs, other healthcare professionals, and patients. The purposes are to firstly inform local and national policy makers of practices that enable PA integration, and secondly to recommend areas for further research or exploration.

A scoping review was undertaken using the framework described by Arksey et al(2005). This is an appropriate method to summarise a board range of heterogeneous studies which are relevant to the research question. The scope of this review includes literature relating to PAs working or training in the UK, published between April 2008 and April 2018. This review excluded literature that only relates to PAs in the USA, as they cannot be generalised to the UK context due to the substantial differences in healthcare system, statutory regulation, and PA education (Hooker and Kuilma, 2011; Merkle et al., 2011; Arbet et al., 2012).

This review is limited to literature published after April 2008 to reflect that most PAs currently working in the UK graduated after 2007(Aiello and Roberts, 2017; Ritsema, 2017). Commentaries, secondary reports of studies, and other opinion pieces were excluded from full text review. Review articles were excluded from data extraction, but they were read in full to provide context for this review, and their reference lists were searched for relevant literature. Non-English language articles were excluded.

Literature searches of PUBMED, MEDLINE, and CINAHL databases were conducted. The search terms used were ("Physician Associate" OR " Physician Assistant") AND ("National

Health Service" , "NHS", "England", "Scotland", "Wales", "Northern Ireland" , OR "United Kingdom"). Additional literature was identified from the reference lists of selected articles and the Faculty of Physician Associates (FPA)(2018) website. The inclusion and exclusion criteria were applied to the abstract of each article, and full text review was undertaken in uncertain cases. Full texts of the selected articles were then read in detail. Key findings related to stakeholders' concerns were extracted. The data were charted using thematic analysis (Pope et al., 2006). Anticipated themes were drawn from the seven Stages of Concerns (American Institutes for Research[AIR], 2016a) in the Concern Based Adoption Model (AIR, 2016b), which has been found to explain empirical studies of innovations in complex organisations (Greenhalgh et al., 2004). Themes were relabelled and modified as driven by the data. The data was also analysed for emergent themes.

Summary of selected articles

Sixty-eight articles were identified after removal of duplicates. Eighteen articles were selected for data extraction and charting (Figure 1 and Table 1).

Figure 1- Article selecti

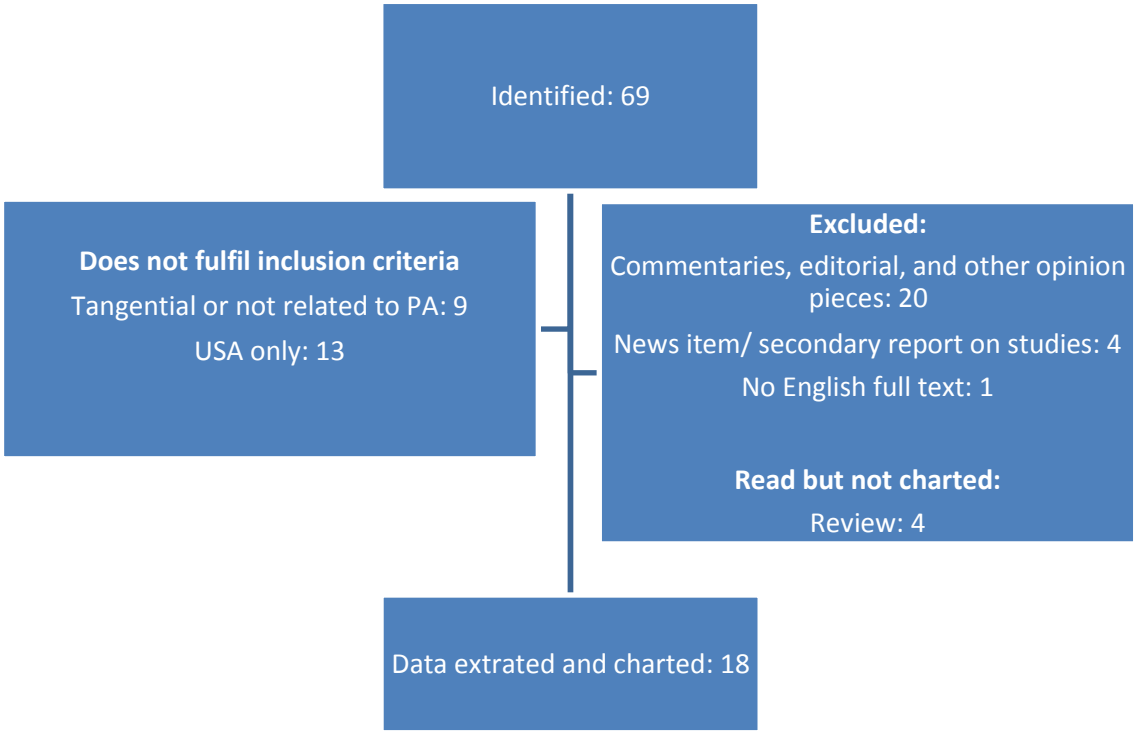
Identified: 69
Does not fulfil inclusion criteria
Tangential or not related to PA: 9
USA only: 13
Excluded:
Commentaries, editorial, and other opinion pieces: 20
News item/ secondary report on studies: 4
No English full text: 1
Read but not charted:
Review: 4
Data extrated and charted: 18

Table 1- Summary of selected papers

Summary of selected papers	
Survey Studies	**Participants**
Ritsema and Paterson, 2011	PAs
Williams and Ritsema, 2014	Doctors
Ritsema and Roberts, 2016	PAs
Nasir et al., 2017	Students - PAs, Doctors, Other healthcare professionals
Halter et al., 2017a	Doctors, Employers
Rizzolo et al., 2017	Students - PAs
Ritsema, 2017	PAs
Wheeler et al., 2017	PAs
Interview Studies	**Participants**
Drennan et al., 2011	Doctors, Employers
Farmer et al., 2011	PAs, Doctors, Other healthcare professionals, patients
Jackson et al., 2017	Doctors, Other healthcare professionals, Patients
Halter et al., 2017b	Patients
Mixed method studies	**Participants**
White and Round, 2013	PAs, Doctors, Other healthcare professionals
Drennan et al., 2014	PAs, Doctors, Other healthcare professionals, Employers, Patients
Drennan et al., 2015	PAs, Doctors, Patients
Other studies	**Participants**
Arbet et al., 2012	Students- PAs
de Lusignan et al., 2016	Doctors, PAs
Howie, 2015	PAs

The most common study designs were survey study (n=8), followed by interview study (n=4) and mixed methods study (n=3). Three articles (Drennan et al., 2015; de Lusignan et al., 2016; Halter et al., 2017b) appeared to be part of a larger study (Drennan et al., 2014), and some findings were duplicated.

Table 2 illustrates how the anticipated themes were modified as driven by the data, resulting in 6 final themes. Information and personal concerns were found to be intimately related, so they were merged. Subsequently, the information-personal concerns of patients were found to be distinct to that of healthcare professionals, resulting in two separate themes. No data were charted to the 'unconcerned' stage (which is not surprising given that

those unconcerned with PAs are unlikely to be studied) and no additional themes emerged from the data.

Table 2- Summary of themes

Anticipated themes	Final themes
Information concerns Personal concerns	Increase understanding of the PA role among healthcare professionals to overcome initial resistance Patients accept PAs despite incomplete understanding
Management concerns	Lack of statutory regulation as a major barrier
Consequence concerns	PA consultation are safe, but cost effectiveness is unclear.
Collaborative concerns	Role of PAs can evolve to meet demands of employers
Refocusing concerns	Comparing PAs to other healthcare professionals

THEME 1: Increase understanding of the PA role among healthcare professionals to overcome initial resistance

Studies of doctors and other healthcare professionals described a poor understanding of the PA role (White and Round, 2013; Williams and Ritsema, 2014; Jackson et al., 2017), which

was repeatedly cited as a barrier to PA integration. This finding was also echoed by a survey of PAs (Ritsema and Roberts, 2016). The lack of understanding resulted in resistance and hostility in existing healthcare professionals, who saw PAs as competition for jobs and training opportunities (White and Round, 2013; Drennan et al., 2011). Some doctors also viewed introduction of PAs as a mean of devaluing their profession (Jackson et al., 2017), and solely a cost-saving measure (Williams and Ritsema, 2014). However, as healthcare professionals have gained more knowledge of the PA role, initial hostility has given way to seeing PAs as valuable members of the team (Farmer et al., 2011; White and Round, 2013). Similar experiences were observed when Advanced Nurse Practitioners (ANPs) were first introduced (Jackson et al., 2017).

Healthcare professionals can be educated about the PA role through presentation and induction (Farmer et al., 2011), working together as part of a multi-disciplinary team (White and Round, 2013), and observing PAs' consultations (Drennan et al., 2011). An interprofessional learning session involving PA students and other undergraduate healthcare professionals also facilitated better understanding of the PA role (Nasir et al., 2017). Furthermore, the FPA (2017a) has published a wide range of literature to help employers and other stakeholders understand the PA role.

THEME 2: Patients accept PAs despite incomplete understanding

Patients also showed little understanding of the PA role, but appeared willing to consult with PAs. This was facilitated by trust derived from their GP practices and the wider NHS, prioritising continuity of care over the type of clinician seen, and recognising the need to take pressure off doctors (Halter et al., 2017b; Jackson et al., 2017). To maintain trust,

patients must be provided with information about the PA role by healthcare organisations and the PAs, otherwise they might feel deceived if they subsequently found out that they consulted with a PA rather than a doctor. Patients also wished for choice in who to consult, as their willingness to consult PAs was condition-dependent (Halter et al., 2017b; Drennan et al., 2014).

THEME 3: Lack of statutory regulation as a major barrier

PAs currently do not have statutory regulation in the UK, therefore are not able to prescribe drugs or request ionising radiation. This differs from practitioners in expanded roles who are able (following training) to carry out a range of activities which were previously only the remit of a doctor. This was stated by all stakeholders as a major barrier to effectively integrating PAs into the workforce (Williams and Ritsema, 2014; Halter et al., 2017a). The impact was felt particularly in providing out-of-hours services (Farmer et al., 2011), in general practice (Halter et al., 2017b) and in home visit settings (Drennan et al., 2011), where there was no immediate access to a prescriber.

The absence of statutory regulation means that doctors perceive a need for additional supervision for PAs (White and Round, 2013; Jackson et al., 2017). In efforts to overcome this and set professional standards, the FPA has published a code of conduct (FPA, 2017b) and administers the Physician Associate Managed Voluntary Register(PAMVR). To remain on the PAMVR, PAs must undertake 50 hours of Continued Professional Development per year and pass a re-certification examination every 6 years (FPA, 2017c). The Department of Health (2017) is consulting on statutory regulation of PAs, and the General Medical

Council(2017) has expressed interest in acting as regulator. This could be a significant step in the integration of PAs into the healthcare workforce.

THEME 4: PA consultations are safe, but cost effectiveness is unclear

The ability to maintain patient safety during PAs' consultations was assessed in two comparative studies. Drennan et al (2015) found no difference in re-consultation rate after an index consultation with either General Practitioners (GPs) or PAs and when patients re-consulted with the same or a related problem, 82% of the PA index-consultations (versus 51% of the GP index consultations) were found to have been appropriate.

De Lusignan et al (2016) compared video records of PA and GP consultations. All PA consultations were judged to be safe. In this study, GPs out-performed PAs in history taking, physical examination, patient management, problem solving, behaviour/ relationship with patients, and anticipatory care, however the GPs in this study were substantially more experienced than the PAs. Patient satisfaction was similar between GPs and PAs (Drennan et al., 2015; Halter et al., 2017b). Drennan et al (2015) also investigated the cost-effectiveness of PAs, and demonstrated a mixed picture. The process of care (e.g. rate of prescribing and referrals) was similar between PAs and GPs. The average consultation time for PAs is longer than that for GPs, with GPs seeing 3 patients for every 2 seen by PAs. The cost per consultation is £34.35 for GPs and £28.14 for PAs, although the costs associated with supervision of PAs could not be determined.

No comparative study exists between PAs and other healthcare professionals in secondary care. The available literature showed high level of satisfaction in patients (Farmer et al., 2011), doctors (Williams and Ritsema, 2014), and other healthcare professionals (White and

Round, 2013). Improving continuity of care and good communication skills were most valued by stakeholders.

THEME 5: Roles of PAs can evolve to meet demands of employers

PAs are dependent practitioners, working in collaborative and supportive relationships with their clinical supervisors (FPA, 2017a). The PA's scope of practice can expand to meet the needs of the employer, however the lack of clear definition in PA's scope of practice has led to doctors feeling unsure about PA's position within a healthcare team (Jackson et al., 2017). The drive to employ PAs came from access time targets, gaps in medical staffing, the desire to improve continuity of care, and the need to support doctors in specialty training (Drennan et al., 2011; Halter et al., 2017a). In primary care, PAs often provide same day appointments. Receptionists use practice guidelines to assign patients to PAs, which have resulted in PAs' patients being younger, having less complex medical backgrounds, and presenting with more minor problems. This then frees up GPs to see the more complex cases (Drennan et al., 2014, 2015).

A key facilitator for PA integration into the workforce is the potential for PA's scope of practice to expand as relationships with clinical supervisors develop (White and Round, 2013; Drennan et al., 2014). Primary care employers describe an incremental induction process where GPs observed PAs' consultations for minor conditions to ensure safety and competence, before allowing PAs to see more complex cases (Drennan et al., 2011). There is also evidence of evolving scope of practice in secondary care with some PAs reporting undertaking specialist procedures such as skin surgeries, central line insertion, and chest drain insertion (White and Round, 2013; Ritsema, 2017). The supervision arrangements in

secondary care appear to be variable in frequency and nature, with some PAs reporting no ongoing supervision (Wheeler et al., 2017). Further study is required to investigate the effect of supervision on PAs' development, and the associated impact on the healthcare team.

THEME 6: Comparing PAs to other healthcare professionals

In 2017, the median annual pay for full time PAs was £37000 (Ritesma 2017), which is comparable to doctors in training (Review Body on Doctors' and Dentists' Remuneration, 2015) and band 7 nurse practitioners (NHS Employers, 2017). Compared to doctors in training, some doctors felt that PAs were less able to manage complex presentations, uncertainty, and risk (Jackson et al., 2017). PAs took longer time to consult (Farmer et al., 2011) and a medical consultant felt that a PA was less effective than a doctor (Halter et al., 2017a). PAs usually work for a single clinical team (Wheeler et al., 2017), as opposed to doctors in training who rotate through different jobs. Therefore, PAs could provide better continuity of care (FPA, 2017a).

There were mixed views regarding the effectiveness of PAs versus senior nurses/nurse practitioners. Some stakeholders felt that PAs offered no advantage over senior nurses and were more expensive (White and Round, 2013; Halter et al., 2017a), while others found PAs to be more effective and required less supervision (Drennan et al., 2015). Many stakeholders felt that being trained in the generalist medical model gave PAs an advantage over nurses, citing PAs' capacity for differential diagnoses, decision making, willingness to think outside protocol, and flexibility to work in different settings (Farmer et al., 2011; Jackson et al., 2017). Employers expressed difficulties in recruiting all types of healthcare

professionals, but some reported that PA recruitment can be facilitated by developing links with university PA training programmes (Halter et al., 2017a).

Discussion

Expansion of the healthcare workforce is needed to meet current and future demands (NHS England, 2014; Addicott et al., 2015). This literature review shows that PAs can be an effective part of the workforce solution. However, integrating PAs and optimising their effectiveness will be challenging.

1. This review found that **PA consultations are safe, but cost-effectiveness is unclear** (Drennan et al., 2014, 2015). Unsurprisingly, the consultation skills of PAs appeared inferior to that of experienced GPs (de Lusignan et al., 2016), highlighting that PAs are not replacements for GPs. To optimise effectiveness, clear guidelines to define the type of cases suitable for PAs should be developed in collaboration with their clinical supervisors. Further comparative studies in the secondary care setting would be desirable.
2. The uncertainty over future demand and the ambition to implement new care models highlights the need for a flexible and adaptable workforce (Addicott et al., 2015). A key facilitator for PA integration is that the **roles of PAs can evolve to meet demands of employers**. This is facilitated by their generalist training in the medical model, and supportive relationships with their clinical supervisors. Employers must ensure that suitable supervisors are identified before appointing PAs. Clinical supervisors should be aware that PAs' effectiveness may initially be low, but (in line with experiences in other countries) should increase with appropriate support. Early

evidence pointed to marked variation in supervision arrangements for PAs (Wheeler et al., 2017), suggesting that further studies are required to define appropriate supervision for PAs.

3. A key challenge is to **increase understanding of the PA role among healthcare professionals to overcome initial resistance**. Such initial resistance is not specific to PAs, as similar resistance has been reported when other professionals have taken on work traditionally expected to be undertaken by doctors (Coombes, 2008). This review shows healthcare professionals (especially doctors) have concerns regarding the erosion of their professional identity, job security and training opportunities (Drennan et al., 2011; White and Round, 2013). Employers should utilise resources, such as those published by the FPA, to explain how PAs can complement existing roles. Studies into the impact of PAs on training and job opportunities for existing healthcare professionals are recommended.
4. The **lack of statutory regulation is a major barrier** to PA's effectiveness. This point was highlighted in the pilot programme more than a decade ago (Farmer et al., 2011). The recent government consultation on regulation of medical associate professions (Department of Health, 2017) is a welcome development, but legislation must progress at a quicker pace to maximise PAs' effectiveness.
5. **Patients accept PAs despite incomplete understanding of their role**, and appear unlikely to become a barrier to PA integration if they are provided with information and choice of clinicians (Halter et al., 2017b).
6. When stakeholders **compare PAs to other healthcare professionals**, each have relative strengths and weaknesses. Many professionals have demonstrated capacity for expanding their scope of practice to fulfil local needs (Abraham et al., 2016),

however there are staff shortages across all professions (Nuffield Trust, 2017). Therefore, in a general healthcare setting, the decision on which mid-level practitioner to employ may be determined by local factors such as availability, familiarity, and links to training programmes.

Conclusion

This review has developed understanding of the perceived barriers and facilitators to integrating PAs into the UK healthcare workforce. Undoubtedly, strong and proactive leadership is required at all levels for PAs to fulfil their potential (Edwards et al., under review) and this review has suggested recommendations (Table 3) and further research questions (Table 4) which will help PAs to develop into a vital and valued profession within the NHS.

Table 3- Recommendations for policy makers

National policy
Accelerate legislative process for statutory regulation, to enable prescribing drugs and ordering ionising radiations
Local policy
Develop strategies to inform existing staff of the PA role, and how it could complement existing roles.
Identify appropriate supervisors who understand the development trajectory of PAs before PA appointments.
Develop and regularly review policies defining what cases are suitable for PA
Establish relationship between Universities and potential employers

Implement strategy to inform patients of PA involvement in their care

Table 4- Questions for further study

What impact does the introduction of PAs have on the training and employment opportunities of existing healthcare professionals?
What impact does the introduction of PAs into secondary care multi-disciplinary teams have on safety, processes of care, and patient outcomes?
What is the nature and frequency of supervision required for PAs in routine clinical practice and in training to expand their scope of practice?

References

Abraham, J., Whiteman, B., Coad, J., Kneafsey, R. (2016) Development and implementation of non-medical practitioners in acute care. *Brit. J. Nurs*. 25 (20), 1129–1134.

Addicott, R., Maguire, D., Honeyman, M., Jabbal, J. (2015) *Workforce planning in the NHS*. The King's Fund.

Aiello, M. & Roberts, K. A. (2017) Development of the United Kingdom physician associate profession. *J. Am. Acad. Physician Assist.* [Online] 30 (4), 1–8.

American Institutes for Research (2016a) *Stages of Concern | Concerns-Based Adoption Model* [online]. Available from: https://www.air.org/resource/stages-concern-concerns-based-adoption-model (Accessed 7 April 2018).

American Institutes for Research (2016b) *Concerns-Based Adoption Model (CBAM)* [online]. Available from: https://www.air.org/resource/concerns-based-adoption-model-cbam (Accessed 7 April 2018).

Arbet, S., Parle, J., Lathrop, J.L. (2012) UK and US Physician Assistant Student Performance on an International Test of Core Biomedical Science Knowledge. *Internet J. Allied Health Sci. Pract*. 10 (3), article 5.

Arksey, H. & O'Malley, L. (2005) Scoping studies: towards a methodological framework. Int. J. Soc. Res. Methodol. 8 (1), 19–32.

Bhardwa, S. (2015) Physician associates plough same furrow as advanced nurse practitioners. *Indep. Nurse*. 6–6.

Coombes, R. (2008) Dr Nurse will see you now. *BMJ*. [Online] 337a1522.

Department of Health (2012) *Competence and curriculum framework for the physician associate*. [online]. Available from: http://www.fparcp.co.uk/download-handler/?mid=58&lid=1.

Department of Health (2017) *The regulation of medical associate professions in the UK*.

Drennan, V., Levenson, R., Halter, M., Tye, C. (2011) Physician assistants in English general practice: A qualitative study of employers' viewpoints. *J. Health Serv. Res. Policy*. [Online] 16 (2), 75–80.

Drennan, V.M., Halter, M., Brearley, S. et al. (2014) *Investigating the contribution of physician assistants to primary care in England: a mixed-methods study*. Health Services and Delivery Research. Southampton (UK): NIHR Journals Library. [online]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK259802/ (Accessed 21 April 2018).

Drennan, V.M., Halter, M., Joly, L. et al. (2015) Physician associates and GPs in primary care: a comparison. *Br. J. Gen. Pract*. [Online] 65 (634), e344-50.

Edward, L., Till, A., McKimm. (Under Review) The positive leadership response needed to facilitate the introduction of physician associates. *Br J Hosp Med*

Faculty of Physician Associates (2017a) *Who are physician associates?* [online]. Available from: http://www.fparcp.co.uk/about-fpa/Who-are-physician-associates (Accessed 27 May 2018).

Faculty of Physician Associates (2017b) *Code of Conduct for Physician Associates*.

Faculty of Physician Associates (2017c) *PAMVR* [online]. Available from: http://www.fparcp.co.uk/employers/pamvr (Accessed 28 May 2018).

Faculty of Physician Associates (2018) *News* [online]. Available from: http://www.fparcp.co.uk/about-fpa/news (Accessed 6 June 2018).

Farmer, J., Currie, M., Hyman, J., West, C., Arnott, N. (2011) Evaluation of physician assistants in National Health Service Scotland. *Scott. Med. J*. [Online] 56 (3), 130–134.

General Medical Council (2017) *GMC response to the Department of Health (England) consultation on the regulation of medical associate professions in the UK*.

Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., Kyriakidou, O. (2004) Diffusion of Innovations in Service Organizations: Systematic Review and Recommendations. *Milbank Q*. [Online] 82 (4), 581–629.

Halter, M., Wheeler, C., Drennan, V.M. et al. (2017a) Physician associates in England's hospitals: a survey of medical directors exploring current usage and factors affecting recruitment. *Clin. Med. (London, England)*. [Online] 17 (2), 126–131.

Halter, M., Drennan, V.M., Joly, L.M., Gabe, J., Gage, H., Lusignan, S. (2017b) Patients' experiences of consultations with physician associates in primary care in England: A qualitative study. *Health Expect*. [Online] 20 (5), 1011–1019.

Hooker, R. S. & Kuilma, L. (2011) Physician Assistant Education: Five Countries. *J. Physician Assist. Educ*. 22 (1), 53–58.

Howie, N. (2015) A new kid on the block: the role of physician associates. *Clin. Med. (London, England)*. [Online] 15 (3), 309–310.

Hunt, J. (2015) *New deal for general practice* [online]. Available from: https://www.gov.uk/government/speeches/new-deal-for-general-practice (Accessed 27 May 2018).

Imison, C. & Bohmer, R. (2013) *NHS and social care workforce: meeting our needs now and in the future?. The King's Fund.*

Jackson, B., Marshall, M., Schofield, S. (2017) Barriers and facilitators to integration of physician associates into the general practice workforce: a grounded theory approach. *Br J Gen Pr*. [Online] 67 (664), e785–e791.

de Lusignan, S., McGovern, A.P., Tahir, M.A. et al. (2016) Physician Associate and General Practitioner Consultations: A Comparative Observational Video Study. *PloS One*. [Online] 11 (8), e0160902.

McCartney, M. (2017) Margaret McCartney: Are physician associates just “doctors on the cheap”? *BMJ*. [Online] 359j5022.

Merkle, F. et Merkle, F., Ritsema, T.S., Bauer, S., Kuilman, L. (2011) The physician assistant: Shifting the Paradigm of European medical practice? *HSR Proc. Intensive Care Cardiovasc. Anesth*. 3 (4), 255–262.

Nasir, J., Goldie, J., Little, A., Banerjee, D., Reeves, S.(2017) Case-based interprofessional learning for undergraduate healthcare professionals in the clinical setting. *J. Interprof. Care*. [Online] 31 (1), 125–128.

NHS Employers (2017) *Agenda for Change pay scales - Annual* [online]. Available from: http://www.nhsemployers.org/sitecore/content/nhs confederation/home/confed18 (Accessed 2 June 2018).

NHS England (2017) *Next steps on the NHS Five Year Forward View*.

NHS England (2014) *NHS Five Year Forward View*.

Nuffield Trust (2017) *The NHS workforce in numbers* [online]. Available from: https://www.nuffieldtrust.org.uk/resource/the-nhs-workforce-in-numbers (Accessed 3 June 2018).

Pope, C., Ziebland, S., Mays, N. (2006) ‘Analysing qualitative data’, in Pope, C. & Mays, N. (eds.) *Qualitative Research in Health Care*. Oxford: Blackwell Publishing. pp. 63–81.

Review Body on Doctors’ and Dentists’ Remuneration (2015) *Review Body on Doctors’ and Dentists’ Remuneration. Contract reform for consultants and doctors & dentists in training – supporting healthcare services seven days a week*.

Ritsema, T. (2017) *Faculty of Physician Associates Census results 2017*.

Ritsema, T. S. & Paterson, K. E. (2011) Physician assistants in the United Kingdom: An initial profile of the profession. *J. Am. Acad. Physician Assist*. 24 (10), 60–60.

Ritsema, T. S. & Roberts, K. A. (2016) Job satisfaction among British physician associates. *Clin. Med. (London, England)*. 16 (6), 511–513.

Rizzolo, D., Leonard, D.R., Massey, S.L. (2017) Factors that Influence a Physician Assistant/Associate Student Career Choice: An Exploratory Study of Students from the United States and United Kingdom. J. Physician Assist. Educ. *(Lippincott Williams & Wilkins)*. [Online] 28 (3), 149–152.

Wheeler, C., Halter, M., Drennan, V.M. et al. (2017) Physician associates working in secondary care teams in England: Interprofessional implications from a national survey. *J. Interprof. Care*. [Online] 31 (6), 774–776.

White, H. & Round, J. E. C. (2013) Introducing physician assistants into an intensive care unit: process, problems, impact and recommendations. *Clin. Med. (London, England)*. 13 (1), 15–18.

Williams, L. E. & Ritsema, T. S. (2014) Satisfaction of doctors with the role of physician associates. *Clin. Med*. *(London, England)* [Online] 14 (2), 113–116.