A Systematic Scoping Review of Undergraduate Nursing Hub and Spoke Placement Models

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Abstract

Background: While nursing education has been forecast to continue to grow, placement capacity is now the key factor which precludes growth in supply.

Aims: This paper sought to provide a comprehensive understanding of hub and spoke placements and their ability to increase placement capacity.

Methods: A systematic scoping review and narrative synthesis were utilised (Arksey and O'Malley 2005). PRISMA checklist and ENTREQ reporting guidelines were followed.

Findings: The search returned 418 results. After a first and second screen, 11 papers were included. Results suggest that hub and spoke models were generally evaluated favourably by nursing students, with a range of benefits reported. However, many of the studies included in this review were small and of low quality.

Conclusion: Given the exponential increase in applications to study nursing, hub and spoke placements appear to have the potential to better meet these increased demands while also providing a number of benefits.

Keywords: clinical placement, nurse placement, nurse training, hub and spoke

Introduction

Clinical placements are an essential element of all pre-qualifying health care programmes. In the UK, nursing and midwifery placements currently account for 50% of programme hours, equating to 2300 hours of clinical placement whilst training (Nursing and Midwifery Council 2019). Internationally variation in the number of hours allotted to practice learning is evident. Nursing students in Australia and Canada undertake 800 hours, (Australian Nursing and Midwifery Accreditation Council 2012; Canadian Association of Schools of Nursing 2015), South African students 2800 hours, while New Zealand students undertake between 1100 and 1500 hours (Miller and Cooper 2016); many countries (Australia, Canada, Finland, United States of America and the United Kingdom) have embedded the hours requirements within national, achievement of hours a requirement for registration (American Nurses Association 2015; Canadian Nurses Association 2015; Nursing and Midwifery Board of Australia 2016; Anderson, Moxham and Broadbent 2018; Nursing and Midwifery Council 2018).

Nursing courses in the UK have witnessed an exponential (32%) rise in applications (UCAS 2021). An analysis by Data Bridge Market Research (2021) has forecasted that the global nursing education market will grow 5.6% between 2020 – 2027. This increase in interest and future nursing supply should be welcomed, but placement capacity is now the key factor which precludes growth in supply, with universities having to limit student numbers entering nursing due to insufficient placement availability.

In order to achieve required hours, placement allocation in nursing has historically adopted a rotational approach, students rotated around a range of clinical learning environments, each placement having a particular clinical focus or specialty. However, evidence has suggested that using rotating placements limits students' understanding of the whole patient journey,

including the range of services patients access available, as placements are compartmentalised, and frequently unrelated to student learning (Campbell 2008). Additionally, although a rotational approach to placement allocation can expose students to a wide range of clinical experiences, the constant new starts in unfamiliar new clinical settings lead to poor student confidence, anxiety and insecurity (Campbell 2008).

An alternative to rotational placements increasingly being adopted is a hub and spoke approach, whereby students are allocated to a home based or 'hub' placement, from which they 'spoke' out to short bite size placement experiences, adding breadth to the overall placement experience. The hub and spoke model has its origins in the transportation industry, most notable in the aviation industry, where the use of resources (flights, fuel and personnel) was substantially improved by introducing a main base and satellite points for travel (Lin and Kawaski 2012; Elrod and Fortenberry 2017). The health care sector adopted this model of organisation over the last 25 years in a number of places. These include health service provision in parts of the USA (Elrod and Fortenberry 2017), hub and spoke dispensing for European community pharmacies (Rechel 2018) and the hub and spoke model for practice learning for nursing students (Roxburgh et al. 2012). Roxburgh et al. (2011:18) describe the hub and spoke model process as follows:

The student is allocated to their Mentor (Hub) and allocated by that mentor to other areas / mentors (Spoke) to ensure the student achieves a variety of experiences and skills that allows them to achieve the NMC Standards of Proficiency. The (Spoke) mentors provide feedback and assessments to the main Mentor (Hub).

Pilots of this model were implemented as early as 2009 in Scotland (Roxburgh et al. 2012), followed shortly with pilot projects at Universities in England. For example, the University of

Wolverhampton adopted hub and spoke by allocating students to one hub placement per year, students returning for three separate blocks of placement during the academic year, throughout which they were supported by the same mentor (Thomas and Westwood 2016). Students were allocated to "spoke" placements, lasting between one to four weeks, the aim of the spoke placements being to reflect the patients' journey across healthcare settings (Thomas and Westwood 2016).

Notwithstanding this, the hub and spoke approach to student placements has not been universally adopted in the UK. Establishing the model requires additional organisation, placement providers mapping the students to spoke placements according to their specific learning needs, whilst ensuring that a quality learning experience is achieved (Millar et al. 2017; Heath et al. 2021), students having an enriching experience rather than being used as an additional "pair of hands" (Thomas and Westwood 2016:26) Evaluation of the hub and spoke model suggests the student experience is enhanced (Thomas and Westwood 2016; White and King 2015). There is also evidence to suggest that 'hub and spoke models' increase placement capacity (Roxburgh et al. 2012; Royal College of Nursing 2021).

It is therefore timely to explore the evidence base for hub and spoke placement allocation models to determine whether this approach has the capability to increase placement capacity, while concomitantly enhancing the students' learning experience.

This paper reports on a systematic scoping review which aims to summarize and synthesize the empirical literature in order to provide a comprehensive understanding of hub and spoke placement allocation models and their impact on student experience and capacity.

Research question/aims

The aim of this systematic scoping review is to summarize and synthesize the empirical literature in order to provide a comprehensive understanding of hub and spoke placements used to train undergraduate nurses and whether they increased placement capacity. A secondary aim was to evaluate the strengths and drawbacks of hub and spoke placement models. Therefore, our research questions are:

1. What is the currently published evidence of hub and spoke placement models used to train undergraduate nurses and whether these models increase placement capacity?

2. What are the strength and drawbacks of hub and spoke placement models?

Methods

Design

A systematic scoping review was utilised as the overarching aim of this review was to identify and summarise the research conducted in this area, along with the strengths and weaknesses of the hub and spoke approach, rather than answer a single, specific research question. Such a review can be an important step in understanding an area of interest when it is complex and has not been previously reviewed (Arksey and O'Malley 2005). This review therefore was undertaken with the following steps: identification of area of interest, systematic literature search, data extraction, quality appraisal, data synthesis and presentation. In addition, the PRISMA checklist (Page et al. 2021) and ENTREQ reporting guidelines have been followed (Tong et al. 2012).

Search strategy

A systematic search was undertaken on 27th January 2021 using Scopus, CINAHL, OpenGrey, Medline and Health Management Information Consortium (HMIC). In addition, the resulting papers were hand searched for specific references, which may have been missed. Search terms were developed to reflect the concept in question. The final terms were: “hub and spoke" OR "home base" OR home-base AND student OR nurs* OR pre-reg*.

Inclusion and exclusion criteria

The search returned 418 results, which was reduced to 281 after duplicates were removed. Two authors <redacted for peer review> conducted an initial title and abstract screen; papers were included if they reported on primary research pertaining to placement allocation models, which included a hub and spoke approach. Twenty-nine papers were identified (see figure 1 – Prisma flow diagram). The reference lists of these articles were searched, with one further paper included, resulting in 30 papers. These were assessed against the following inclusion/exclusion criteria:

Inclusion:

- Papers that reported on primary research
- Studies that included pre-registration/student nurses in the sample
- The placement model(s) include a hub and spoke approach

Exclusion

- Studies from the US
- Studies that reported on clinical (i.e. healthcare delivery) hub and spoke approach

After a full text review against the above criteria by two authors <redacted for peer review>, 11 articles remained.

Rationale for exclusions

We have excluded papers from the US because of the considerably different healthcare system and training model. This only resulted in the exclusion of one paper (Kruger et al. 2010).

Data extraction and synthesis

Data from the included studies was extracted by two authors <blinded for peer review> and categorised according to the source, country of where the research took place, study aims and objectives, research methods/design and sample information, main outcomes and quality appraisal scores (see Table 1). Categories were kept broad due to methodological differences within and between studies and therefore summary measures were not possible.

Quality appraisal

Due to the variety of papers included, the MMAT critical appraisal tool was utilised to give a sense of the quality of the included empirical studies (Hong et al. 2018). This is a multifunctional tool that can be used to appraise quantitative, qualitative and mixed-methods studies. Studies are scored on five criteria and results can be aggregated to provide an overall score for each study and for each methodological category, with higher scores indicating generally higher quality studies. In this review the scoring is indicative only to give a sense of the quality of the research being produced in this field. Many studies included were descriptive in nature and therefore have been given a 0 for quality, however it should be noted that this is only in relation to the research quality and not the output quality per se.

Data summary and synthesis

Due to the small number of studies found and the heterogeneity of the above results, studies were combined to summarise descriptive statistics of the study characteristics, followed by a narrative synthesis. A narrative synthesis is a more informal process used to synthesise literature that can integrate qualitative and quantitative evidence through narrative juxtaposition. This approach provided a degree of flexibility and was well suited to answer our research questions (Dixon-Woods et al. 2005).

Results

Quality appraisal results

Overall, the quality of studies varied substantially with six studies scoring 75% (Roxburgh et al. 2012; Craig et al.2014; Roxburgh 2014; McCallum et al.2016; Thomas and Westwood 2016; Millar et al.2017;) and five studies scoring 0% (Arnott 2010; Millar 2014; Harrison-White and King 2015; Humphries et al.2020; Heath, et al. 2021). This means that while a little over half of the studies included in this review were of acceptable quality others were not and did not meet any of the criteria set forth in the MMAT. There was no discernible differences in scores by methodology; quantitative and qualitative studies scored 75% while a number of mixed methods and qualitative studies scored 0%. Results are recorded in table 1 below.

Descriptive study results

Almost all studies included in this review were from the UK (n = 10), one study was conducted in Australia; all studies were conducted over the past decade. Eight studies used qualitative methods, two used mixed methods and one study used quantitative methods. The majority of studies recruited nursing students (n = 727), while two studies also included mentors (n = 39;

one study did not report mentor sample size). One study recruited an interdisciplinary sample of medical/health students (n = 79).

The majority of studies focused on research questions related to the hub and spoke placements themselves, that is, student and mentor perceptions about the placement, their implementation and establishment and the evaluations of students who had experience with the model. A number of studies suggested that hub and spoke placements had indirect clinical benefits, however only one study focused specifically on this question. These results will be discussed below.

Implementation, establishment and exploration of hub and spoke models

While there was overlap, studies that examined hub and spoke models were generally designed one of three ways. Two studies reported on the implementation of hub and spoke models, what was learnt in the implementations and challenges they faced. Four studies offered a more general evaluation of hub and spoke models, while three studies compared different hub and spoke and/or placement types. The study by Millar et al. (2017) was somewhat distinct giving insight into both the benefits of hub and spoke placements and the elements of these placements that enhanced student learning. Unlike most studies, Craig et al. (2014) evaluated the impact that hub and spoke placements had on more applied clinical skills, such as communication and interdisciplinary working.

Two studies provided accounts of how hub and spoke placements were implemented. Millar (2014) reported on a hub and spoke implementation project at a UK university, discussing the steps taken in scoping the model and in implementing the model. This study explains how the first phase of the project scoped elements of the hub and spoke approach that were present in

existing placement models, in the different nursing fields taught at the Edinburgh Napier university. For example, Learning Disability nursing previously integrated a 'base and associate' approach to practice learning and Midwifery already included elements of the Hub and spoke model by providing students with the experience following 'a pregnancy to birth journey'. After establishing the current placement practices and implementations, Millar (2014) described general aims and outcomes, but also nursing field-specific aims for the practice placements were developed. In contrast to more traditional placement models, the hub and spoke approach implemented with the different nursing disciplines required a change in recording practices, both of placement experiences by the students and within the relevant hubs and spokes. This involved changes in how placements were planned, and it included the creation of a database of community services available and the geographical locations as well as the production of a one-page information leaflet to inform all students, staff and stakeholders of the hub and spoke model. The overall hub and spoke model was not only implemented field specific, and also considered the year group of students to support their practice learning, such as the repeat of a community or hospital older people's area in year one and year three for mental health nursing students. An interdisciplinary action group led in implementing this project and communicating to all staff (Millar 2014). Heath et al. (2021) also described their experiences of engaging with and selecting primary care networks (PCNs) to be part of the hub and spoke placement rather than individual GP practices. Partner universities facilitated these placements and worked together with PCNs to have students engage in the hub and spoke placements. The authors also noted a number of 'stumbling blocks', including issues related to payment for placements, along with inadequate time to fully develop the programme and a lack of funding, meaning that longer term this programmes future remained uncertain. Heath et al. (2021) further reported briefly on the experiences of those involved in the model, students, universities and supervisors and suggest that each saw benefits from participating in the model.

Furthermore, this study suggested that this model could be used as a means to develop leadership in the primary care workforce. In particular and in relation to student experience Heath et al. (2021) concluded that students benefitted from obtaining different patterns of work, differing methods of delivering care and exploration of all the varied work that the general practice nurse workforce has to offer.

Four further studies offered a general evaluation of hub and spoke placement models. Humphries et al. (2020) explored perceptions and satisfaction related to a hub and spoke model implemented at a UK university. Amongst 30 nursing students, the hub and spoke model was generally evaluated positively, the approach found to be a valuable informative experience which encouraged autonomous practice. The model was also endorsed by the organisations involved, the staff felt valued, and welcomed the opportunity to share and promote the valuable work occurring in their services. Some challenges with this model were encountered, for example, using an online practice assessment tool was beneficial for practice assessors and students alike to keep track of the learning activities. However, a number of students were challenged by the self-directed elements in this practice learning approach and perceived it as stressful as they had to reflect on their learning using the online tool as well as be pro-active in managing the learning opportunities. Overall, the study concluded that a hub and spoke approach provided a valuable experience and, generated an increase in placement capacity.

Similarly, Thomas and Westwood's (2016) study found that the hub and spoke model was beneficial and contributed to the development of a number of clinical skills (see below), alongside other positives such as enhanced student understanding of the whole patient
Journey, a great variety of learning experiences and development of transferable skills such as communication and adaptability (Humphries et al. 2020; Heath et al. 2021; Millar 2014; Millar

2017). Students reported a sense of belongingness in their placements, and many reported an overall positive learning experience. However, some challenges were apparent, including issues related to "personality difficulties" and organisations' problems, particularly in spoke placements. Regarding the latter, it was found that the purpose of spoke placements was not always apparent and in some instances, there was a lack of appropriate student learning opportunities facilitated by spoke mentors.

Harrison-White and King (2015) reported on their experience of implementing and evaluating a hub and spoke model with 25 nursing students. They concluded that this approach had several benefits, including offering a richer learning experience; a heightened sense of belonging; enhanced understanding of the patient journey; greater insight into the roles and responsibilities of an interdisciplinary team; and increased awareness of possible career choices. The students were able to work more confidently with different clinicians and teams. It was also noted that this model increased placement capacity.

A final study presented a brief summary of their pilot results (Arnott, 2010), with a number of themes emerging from their data that suggests hub and spoke placements linked well with the NMC's modernising agenda and the [then] standards for pre-registration nursing (Nursing and Midwifery Council 2004)[1].

Three further studies also explored the benefits and drawback of a hub and spoke approach and compared differences between different placement environments and difference placement models. McCallum et al. (2016) sought to explore whether the type of hub and spoke model

[1] Hub and spoke placements linked well with the UK's Nursing and Midwifery Council's modernising agenda and standards for pre-registration nursing, standards for pre-registration nursing which while subsequently revised (NMC 2018) remain applicable to these findings

influenced perceptions of students and mentors. This study evaluated nursing students (n = 216) and their mentors (n = 29) experience of specialist versus traditional general areas as their hub practice learning environment. The quantitative results from this mixed-methods survey suggest that overall, students found both the general and specialist placements valuable, with feedback generally positive for those who completed general and specialist placements. Findings from the qualitative element of this survey suggest that while almost all students felt adequately supported in the specialist placements as their hub, yet a small number of students would have liked more time with their mentor. Similarly, while most students and mentors indicated the specialist placements offered ample learning opportunities, some participants felt their learning opportunities were limited. Students and mentors also reported a sense of belonging related to this model, that is, the familiarity of environment, staff and client group helped their confidence and sense of belonging when they returned to their hub. The two final themes that emerged related to person centredness and preparedness, with the majority of participants indicating the hub and spoke model exposed them to the realities of nursing, yet two students and some mentors reported that some of the learning environments were not prepared for the hub and spoke model.

Roxburgh et al. (2012) explored the impact of three different hub and spoke models. Findings revealed a generally positive picture, however some tensions were found relating to the breadth versus depth of learning provided. Several more specific benefits were found across each of the models. First, there was a continuum of student led learning, which supports the process with opportunities for individual students to be positively innovative and creative in their learning approaches. Second, placement capacity was increased.

In a later study, Roxburgh (2014) sought to explore undergraduate nurses' perceptions of the hub and spoke, and rotational model of placement allocation. The results suggest that participants felt the experiences of year 1 had raised their confidence in their ability to cope with the practice learning and educational demands of nursing, students generally seeing themselves as being better prepared for their second year as a result of participating in the hub and spoke model. Conducted over two phases, findings from the focus group illustrate how students experienced a greater sense of belongingness when undertaking hub and spoke placements when compared to a rotational approach. After participating in the rotational model, students reported higher levels of anxiety, and despite generally feeling better prepared because of the hub and spoke model, many reported doubts in their knowledge and progress after moving into the rotational placement model. Students also reported developing confidence and resilience as a result of the hub and spoke model and having more confidence in their achievements in the hub and spoke model as feedback was consistent and constant. Finally, while some students benefited from transitioning from a hub and spoke placement model, for some, by their second year these benefits had dissipated. One final theme that emerged after the students had completed their rotational placement related to their preferred placement model. Most students suggested a preference for a hybrid model, that is, a hub and spoke approach in years 1 and 3 and a model akin to a rotational model in year 2. Employing a multiple case study design,

Whereas the above studies found some small differences between hub and spoke and more traditional placements, Millar et al’s. (2017) study gave insight into both the benefits of hub and spoke placements, while also identifying key elements of these placements that enhance student learning. Rather than focusing on the benefits of the model, this study explores the characteristics of the Hub and Spoke model that supports students learning, to develop a deep

understanding of a person centred approach to care. Amongst student nurses (n = 24 completing a survey and n = 27 completing focus groups) results suggest that all participants felt that their experiences enabled them to form a better understanding of issues relating to the patient's communities. Additionally, all participants felt the hub and spoke placement complemented the knowledge that they gained in university and that in contrast to the rotational model of practice learning, connecting the Hubs to the Spokes meant that movements between placement areas were reduced and were then driven by student learning objectives, not by regulations or limitations in mentor capacity.

The impact of hub and spoke placement on clinical practice and learning

In the only study that was not from the UK, Craig et al. (2014) explored the benefits of a hub and spoke model in an Australian, interdisciplinary setting amongst. This study reported some short-term positive outcomes including improvements in students' attitudes and elements of cooperation and interdisciplinary 'collaboration'. Students were clearer on their professional roles and were able to engage in interdisciplinary conversations that potentially improved patient care prior to their placement. Similarly, Thomas and Westwood (2016) found that the hub and spoke model enhanced students understanding of the 'whole patient journey', offering a breadth of experience and the development of transferable skills, such as improved communication and adaptability.

Discussion

The aim of this systematic scoping review was to summarize and synthesize the literature related to hub and spoke placements used to train undergraduate nurses and increased placement capacity. A secondary aim was to evaluate the strengths and drawbacks of hub and

spoke placement models. The above results suggest that hub and spoke models were generally evaluated favourably by nursing students, with students and mentors reporting a range of benefits, including fostering resilience and independence in regard to their placements as well as a sense of belonging while on placement. A number of studies identified that hub and spoke models allowed them to increase their placement capacity (Roxburgh et al. 2012; Harris-White and King 2015; Humphries et al 2020). Studies that compared hub and spoke placements against more traditional placements suggest that elements of the hub and spoke model had advantages over more traditional, i.e. rotational placements models. Participants reported a greater sense of belonging in hub and spoke placement compared to rotational models and also reported that such placements complemented what they had learnt in university. Authors also concluded that in using the hub and spoke placement model, movements between placement areas were reduced and were instead driven by student learning objectives, not by regulations or limitations in mentor capacity. There was however a number of limitations noted. Some studies reported difficulties in implementing a hub and spoke approach. Most studies also reported that some students had difficulty with this approach, predominately in the stokes placements and with the more self-directed nature of this model. Other studies noted organisational problems in spoke organisations and that in some cases, students did not feel there were enough appropriate learning opportunities. As a whole the literature also suggests that a one size fits all approach may not be appropriate, with the need for hub and spoke placements to be designed to meet student needs, and these might vary according to field of practice.

The UK Parliament is currently progressing new legislation (Health and Care Bill 2021) which brings together recommendations from the NHS Long Term Plan (NHS England 2019) and the Government's White Paper Integration and Innovation: working together to improve health

and social care for all (Department of Health and Social Care 2021). The Bill is in part a response to the changes that were necessitated in the delivery of health care due to the Covid pandemic as well as a response to the increasing complexity of patient care arising from an increasing level of co-morbidities. Underpinning the Bill is therefore the need for greater collaboration to enable an integrated approach to care. In the UK student nurse placement are predominantly within secondary care, i.e. acute NHS trusts, with occasional rotation to community based placements. A rotational allocation approach focuses therefore on a specific point in time of a patient journey, often arising from either planned or unplanned admission to hospital. An integrated approach to care requires nurses to understand and witness a full patient journey and how services need to collaborate to ensure the best outcome for patients. A hub and spoke approach to placement allocation aligns with an integrated care approach and has the potential to better prepare nurses of the future for the complexities of healthcare delivery, nurses being at the centre of coordination and collaboration across services. In saying this, more research is needed to develop a body of knowledge around the implementations and variations in the hub and spoke model. This is particularly relevant now considering the amount of pre-registration nursing programmes offered and funded through the apprenticeship route. Students, who choose to carry out the apprenticeship route will need to negotiate with their current (health care) employer to secure a position as a ‘registered nurse degree apprentice’ and to be released to study at a university part time and to work in a range of practice placements (NHS healthcareers 2021). Considering this development, it can be argued that there is a shift in the hub and spoke model to form of employer "controlled" practice placements and this is likely to bring further challenges but also opportunities for the students’ learning experience and being ready for practice.

In summary, further research is needed to evaluate hub and spoke placements in the different nursing fields and around the types of collaboration of placement providers and HEIs.

This systematic scoping review has several limitations, which includes that the search was carried out in English only and the search terms were selective not to include other forms of placement models, which in comparison could also increase capacity (see for a list of potential models Markowski et al 2020). Indeed, there is a need overall for further research as most studies reviewed were small, many of which were low quality. Future research should explore the impact of hub and spoke models, beyond their perceptions of the model itself and look toward how hub and spoke places impact clinical skills development for example. Further research is also needed into what makes hub and spoke placements successful and cater for the needs of all students, that is, the literature suggests that while generally positive, some students did struggle with these placements. In saying this, the literature that exists suggests that hub and spoke placements are a promising placement model that could offer a range of benefits over more traditional placements.

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none

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