Equipping Stroke Nurses to Take on Extended Roles Within Acute Stroke Care Through an Advanced Practice Fellowship: An Evaluation Study

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Abstract

Background

Stroke nurses are adopting extended roles to improve patient care due to limited numbers of vascular neurologists, however, little is known of this experience. We evaluated the impact of an internationally implemented fellowship education program to equip experienced stroke nurses, nationally and internationally, to undertake extended acute stroke roles.

Methods

We conducted semi-structured interviews with the following groups of individuals associated with the NET SMART Advanced Practice fellowship program: 1) Stroke nurse program graduates; 2) currently enrolled stroke nurse fellows; 3) local physician mentors; 4) service managers of program graduates. Interviews took place between February-August 2018 and were analysed using the Theoretical Domains Framework.

Results

Interviews were held with stroke nurses (n=11), mentors (n=4) and a service manager (n=1). Four themes were identified: 1) 'The learning journey'- describing motivations for undertaking the training and course content; 2) 'Organizational and professional change'- experiencing professional resistance to the new role, or lack of a suitable role to move into after program completion; 3) 'What hindered the learning journey?'- small hospitals with low patient volume makes completion challenging; 4) 'What helped the learning journey?'- a supportive team facilitated completion.

Conclusion

We found overwhelming skill development and professional growth by nurses, and this was echoed by mentors and managers. However, despite expanding their stroke-specific knowledge and skills, non-U.S.A. nurses faced systemic challenges in implementing their skills including lack of acceptance of extended nurse roles from wider professions.

Key words: nurse roles, nurse education, advanced practice, stroke, qualitative approaches, workforce issues.

INTRODUCTION

Stroke is a leading global health problem. Despite increased knowledge of stroke diagnostics, treatments and prevention, it remains the second leading cause of death and the third leading cause of disability worldwide (1). Developments in care have led to major redesign of stroke services to ensure that stroke is now treated as a medical emergency. The rapid development of acute stroke treatments means that the health care workforce must have the relevant skills, knowledge, and experience to ensure patients have effective access to care. However, we currently face a significant shortage of staff to deliver specialist stroke services. In the UK there is a dearth of all healthcare staff (2), and globally there is a scarcity of highly specialized stroke staff including stroke physicians, general neurologists and vascular neurologists (3, 4). Therefore, to maintain and improve access to specialist stroke care within the context of increasing demand and staff shortages, the stroke workforce needs to innovate new ways of working. With a lack of stroke physicians, one solution is to advance the role of stroke specialist nurses through structured programs of training and development that will enable them to take on clinical roles traditionally performed by the physician workforce.

Background

Roles such as the United Kingdom's Advanced Clinical Practitioner (ACPs) are pivotal to the healthcare workforce (5) . To develop the capabilities of experienced stroke practitioners that will enable them to work at the ACP level within acute stroke care, the Neurovascular Education and Training in Stroke Management and Acute Reperfusion Therapy (NET SMART®) Advanced Practice (AP) program was developed as a post-graduate (Masters or Doctorate) fellowship and first implemented in the United States in 2008. The program combines standardized didactic content and clinical practice procedures, delivered through web-based training modules and face-to-face teaching, supported by a local clinical mentor. Successful completion of the course requires demonstration and integration of clinical competence and knowledge which is validated in an on-site clinical testing session by program faculty after all learning modules have been successfully completed. Additionally, the Association of Neurovascular Clinicians (www.anvc.org) offers a culminating certification credential, the Advanced Neurovascular Practitioner (ANVP) for those successfully completing the NET SMART®-AP program or a similar fellowship.

NET SMART®-AP was conceived in the U.S.A. to develop advanced practice providers (APPs) capable of working alongside stroke physicians in expanded roles at the point of stroke diagnosis and decision-making for time-critical reperfusion therapy. Use of APPs in these roles have demonstrated improved thrombolysis treatment rates at enrolling hospital stroke centers in the U.S.A (6). The NET SMART®-AP program content has been expanded to ensure applicability to stroke services beyond the U.S.A. and has been successfully implemented in Canada, the UK, Australia, and New Zealand. The NET SMART®-AP course and training were implemented for the first time in the UK in 2012, and to date the program has graduated over 140 APPs worldwide. However, despite successful uptake internationally, the experience and impact of completing the NET SMART®-AP program has not been formally evaluated across countries. This study aimed to understand the experience of stroke nurses and their mentors undertaking NET SMART®-AP and explore the impact at an individual, team and organizational level, nationally and internationally. The purpose of this study is to inform implementation of advanced stroke nursing knowledge and skills into clinical practice.

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METHODS

Design

The study used a qualitative exploratory approach and semi-structured interviews for data collection. Ethical approval was obtained in June 2017 [REC Reference 18/HRA/0119]. We used the consolidated criteria framework for reporting qualitative studies (COREQ) (7).

Participant recruitment

Criteria for participating in the study were: (i) stroke nurses who had completed NET SMART®-AP; (ii) stroke nurses who had registered, but not completed, the NET SMART®-AP course; (iii) local course mentors; (iv) managers of staff completing NET SMART®-AP. To maintain confidentiality and blinding, NET SMART®-AP students were approached and invited to participate via an email invitation, which included a participant information sheet from the NET SMART®-AP program director. Those interested in taking part contacted the research team directly. Mentors and managers were approached and invited to take part by the research team. Verbal and written informed consent were obtained from each participant ahead of interviews.

Data collection

Interview schedules were developed based on the Theoretical Domains Framework (TDF (8)). The TDF is used to understand health professional behavior by providing a theoretical lens through which to view the cognitive, affective, social and environmental influences on behavior and implementing healthcare interventions. The TDF encompasses 14 domains: knowledge; skills; social/professional role and identity; beliefs about capabilities; beliefs about consequences; goals; intentions; memory, attention and decision processes; optimism; reinforcement; environmental context and resources; social influences; emotion; and behavioral regulation.

Data collection occurred between February to August 2018. One-to-one, semi-structured interviews were conducted by two Research Assistants independent from the training course (EJH, female, PhD, background in Psychology; SL, male, MSc in Psychology) both with training and experience in conducting qualitative research interviews. Interviews lasted between 20-55 minutes were held via video-call or telephone and were audio-recorded and transcribed. Interviewees reviewed their transcript ahead of analysis to ensure accuracy.

Data analysis

Data were analysed using the TDF in NVivo 12.0 and interpreted thematically (9). Two researchers independently coded anonymized transcripts (EJH, SL), double coding approximately a third. Coding and interpretation were independently assessed by two further researchers (CEL, RG; both health researchers and registered nurses). Relevant themes were identified, and discussions were held if there were disagreements to agree on appropriate themes. Authenticity was maintained through use of participant quotes to support readers in understanding participants' experiences.

RESULTS

A total of 19 individuals who had completed, mentored or managed others through NET SMART®-AP participated in an interview. Eleven APP interviews were conducted with nurses working in U.S.A. (n=6), U.K. (n=4) and Australia (n=1). All had fully completed the program. No staff were recruited that had partly-completed the program. Four NET SMART mentors and one service manager were interviewed, all of whom held UK-based physician roles.

The TDF domains that were relevant in the data were: goals, skills, knowledge, beliefs about capabilities, environmental context and resources, social and professional role

and identity, social influences, behavioral regulation, and beliefs about consequences. Four key themes emerged from these domains including 1) The learning journey; 2) Organizational and professional change, 3) What hindered the learning journey? and, 4) What helped the learning journey?

Theme 1: The Learning Journey

Subtheme 1: Motivations for Completing the Course; TDF Domain: Goals

All APPs expressed their desire to further develop stroke-specific knowledge and skills, and to increase their role confidence, and they felt NET SMART®-AP would help them achieve that. When asked their reasons for undertaking the training, one explained,

"*To enhance my skills, increase my knowledge, but to gain a bit of credibility, that yes, I'm specifically stroke trained, we've got those skills."* **UK APP 01.01.003**

Mentors and the manager wanted APPs to increase their knowledge and skills through completion of the training. The manager hoped the training would lead to upskilling nursing staff and aid leadership skills development.

"To promote their independence in working, to promote their leadership skills, to redevelop them as trainers themselves, to give them the skills that they then can pass down to train other people." **UK Manager 03.01.001**

Subtheme 2: Course Content

TDF Domain: Knowledge

APPs found the course content was more advanced than anticipated. Some described that before starting the training they felt they had a good knowledge of stroke, however seeing the content of the course raised their awareness of their knowledge gaps. Despite initially feeling overwhelmed, after completing the training they felt the higher level of learning was beneficial. APPs suggested the learning provided a structure: both for their learning and their clinical practice, which they described as not usually provided in nursing courses.

"*Doing the training is the difference between learning somebody else's practice habits, because you are partnering with somebody and learning the ropes through that partner, versus having an academic-based understanding that's organized and structured to give you a workflow understanding of what it is you are doing and why you are doing it."* **US APP 01.02.001**

Mentors were similarly surprised at the advanced nature of course materials. Some mentors felt in the future that it may be worthwhile to divide the course content into different levels to allow staff to recap on basic nursing skills, as well as covering higher-level skills and knowledge. This may be helpful to staff who wish to achieve different levels of qualifications in a manageable format.

"I think some of the content, I actually thought was quite advanced for the nursing. I think they managed it, but some of the feedback and some of the comments were that it was fairly advanced." **UK Mentor 03.01.001**

Theme 2: Organizational and Professional Change; TDF Domains: Social and Professional Role Identity, Social Influences, Behavioral Regulation, Beliefs About Consequences

While all APPs felt they had increased their stroke-specific knowledge and skills, there were differences in the nurses' ability to implement these skills in clinical practice. U.S.A.-based APPs described their ability to work independently to assess and administer emergency stroke care following NET SMART®-AP completion. Conversely, all APPs, mentors and

managers from the UK or Australia described themselves, or their students, as not as independent as anticipated. They felt professional resistance may account for this difference, with wider clinical staff unable to accept the advanced role of nurses or their capability for new nursing roles with greater responsibility. One APP described,

"*There is a lack of understanding of what you are capable of. Or people expect you to be able to do stuff but actually they are not really that interested because you're not a doctor, you're a nurse, so we'll ask a doctor, and that can be a bit insulting."* **UK APP 01.01.004**

"I think obviously there are a lot of different service barriers and acuity barriers and role barriers that prevent us taking that leadership that one step further." **UK Mentor 03.01.001**

This was further compounded when team members with the same job role had completed NET SMART®-AP yet were not allowed to work at a higher level than their colleagues who had not; new advanced practice roles had to be created. APPs highlighted that the lack of recognized accreditation of the course within their country exacerbated these issues, and some clinical coworkers failing to value their new knowledge and skills.

All mentors felt their NET SMART role fitted within their responsibility to supervise and educate staff and reported satisfaction in carrying out the role.

Across all groups, the role of peer-support was discussed. UK-based APPs described the value of having contact with peers for ongoing support and motivation. They felt this was particularly relevant as training was often online leaving little opportunity for contact with others as compared to classroom-based learning. A network of support was not established for mentors; however, mentors suggested this as desirable going forwards.

Managers and mentors described secondary and unexpected outcomes. One mentor described the consequence of promoting interactions with clinicians beyond enabling thrombolysis, which led to an increased sense of trust and confidence in the APP's capacity following completing NET SMART®-AP. They felt that empowering nurses through NET SMART®-AP led to the development of leadership skills, creating a 'ripple effect' whereby the APP nurse was able to pass on their new skills and knowledge to the wider team.

"*Whatever was said earlier, he managed to get it infused into his colleagues afterwards, not exactly from the course but actual knowledge-based part of it. But the way he learned, he managed to pass it on to others.*" **Mentor M3.01.002**

Theme 3: What Hindered the Learning Journey? TDF Domain: Environmental Context and Resources

Graduates identified several barriers to completing NET SMART®-AP and implementing their learning. The time commitment meant that APPs often had to study at home, but this was offset by the flexibility to work at their own pace. APPs commented that individuals required self-discipline and motivation to ensure timely completion of the course. Time was also a limiting factor for managers and mentors, affecting their ability to provide support and guidance, particularly for fellows who were completing out-of-hours shifts.

The hospital environment also impacted course completion. APPs based in hospitals with fewer patients described having less opportunity to be involved in procedures, for example reviewing imaging.

"*There was quite a lot on imaging and localization you learn but looking at images you do have to absorb yourself in it and I wasn't getting that kind of exposure*

in the same way that [others in the course] were. Because they were seeing patients on a day-to-day basis, reviewing scans of everyone on ward rounds. I did find it hard." **UK APP 01.01.001**

One manager described that the significant increase in demand for healthcare services over the winter months meant that APPs were regularly required to provide support on the ward which reduced their learning opportunities.

Theme 4: What Helped the Learning Journey? TDF Domains: Social and Professional Role Identity, Social Influences, Environmental Context and Resources

Several factors were identified as facilitating completion of the course or implementing learning. Firstly, APPs described the importance of a supportive team. One APP described,

"*I think that it's key to have some sort of supportive environment that has the capability of supporting the learner in the areas that they need more help with."* **US APP 01.02.001**

APPs reported that completing an external placement, where they could demonstrate their clinical skills and competencies was a fantastic opportunity. They felt that working alongside teams with qualified APP nurses allowed them to observe their work in practice, allowing comparison of clinical practice and healthcare systems. This gave them the confidence to change how they worked within their own team. UK APPs described that completing a U.S.A. clinical placement allowed them to apply the theoretical skills they had learned, which they could then implement in clinical practice on return to their institution.

Staff who received funding to complete NET SMART®-AP reported this as a facilitator. They felt that without financial support, it may not have been possible to participate.

Finally, staff reported wider and perhaps unanticipated benefits to completing NET SMART®-AP. APPs had developed professional networks with individuals from clinical and academic settings nationally and internationally. They felt that the training instigated networking opportunities and built their confidence to establish these relationships. Others described that following completion of NET SMART®-AP, they had progressed within their careers and were able to take opportunities that otherwise would not have been available.

"*It has given me opportunities that I wouldn't have had otherwise. It has made a huge impact on my professional life with presenting, writing and publishing. Being able to be a part of a ground-breaking research project such as the mobile stroke unit that we have going on because I actually was recruited for that position. So, it was just an honor and it never would have happened had I not had that education."* **US APP 01.02.005**

Managers expressed that a shared agreement across team managers to support the nurses undertaking NET SMART®-AP acted as a facilitator. This mutual agreement made practical changes possible, such as allowing staff to alter shifts, or for extra staff to work in clinics enabling APP nurses to engage in specific aspects of training, while minimizing disruption.

DISCUSSION

The primary aim of NET SMART®-AP was to build confidence and capabilities in nurses to provide emergency stroke assessment and interventions. Our study found that experienced senior nurses participating in NET SMART®-AP reported overwhelming skill development and professional growth. This was confirmed by their mentors and managers. Managers felt the program was worthwhile given the time and level of support

required, and the overall improvement in services and benefit to patients. NET SMART®-AP served to standardize the required knowledge level expected of an APP working in acute stroke. However, our findings indicate that despite expanding their stroke-specific knowledge and skills and increasing their confidence, nurses faced systemic challenges in implementing their learning, particularly outside the U.S.A.

We found that U.S.A.-based nurses were more likely to have applied their new skills within their role or had advanced to a position where they could implement their skills following program completion. However, while U.S.A.-based APPs watched their careers flourish, UK and Australia-based staff experienced barriers including professional resistance, where nurses were reluctant to accept their advanced preparation, while other disciplines were reluctant to allow role expansion. In particular, course graduates based outside of the U.S.A. felt that other professions did not appreciate the value of APPs regardless of their knowledge and skills. This suggests an ethical dilemma, whereby upskilling as acute stroke nursing experts is not valued, or perhaps respected. This problem is seen across various countries for APPs (10), and raises the question of why professional roles should be limited, and who should set those limits. While there may be obvious concerns for patient care, when staff who are shown to be capable and safe to practice "who" should decide the limit of knowledge and learning? Ironically, it is arguably true that when all professions are optimally educated and trained, bringing this higher skill to the bedside is likely to improve patient outcomes.

Additional barriers to implementing NET SMART®-AP skills included the lack of appropriate role and context to work within, particularly for those outside the U.S.A. We found that one UK-based APP was able to progress in the APP role, being added to the on-call rotation for telestroke assessments, while another, based within a neighboring NHS Trust, struggled to find a role on the same level and in effect required a position to be created. This finding is perhaps reflective of an organizational limitation. Similar findings occurred in another NHS healthcare leadership program, which found 61% of staff had changed roles following program completion, with three quarters of these stating this was to take on a more senior role (11).

Placement difficulty may in part be explained by variations in how APPs are defined, increasing recruitment challenges and limiting support and professional development (12). One explanation for these variations may be the way in which the role has been developed historically. APP roles were established in the U.S.A. and Canada in the 1960s, and are now well-established and regulated, with a requirement of a Master's degree to begin training and a protected role title on completion. However, in the UK, APP roles have existed since the 1980s and there are inconsistencies in APP educational requirements, competencies, (10) and role title (13). While some clarity is provided through a framework published by Health Education England (5), prior to this, the development of APP roles has often lacked standardization and has instead been locally driven. To date, although work has been undertaken to establish credentialing for APPs in emergency care (14), there is no national regulatory body for UK-based APPs which may exacerbate the lack of standardization. One solution is to require APPs working in stroke care to sit a certified examination, such as ANVC's internationally recognized, ANVP certification. The ANVP certificate ensures graduates are capable of working safely within their advanced expanded role, holding expert clinical practice skills.

One unanticipated benefit of those completing the UK-based NET SMART is the ongoing support networks which have

been maintained. Although initiated as part of peer-support for course participants, we found that even years after completing the course, APPs remained in contact for support and advice.

Limitations

This study has limitations. Firstly, those staff who were interviewed who had completed NET SMART®-AP were all nurses; therefore, we cannot account for the experience of other health professionals such as physician assistants, which may have been quite different. Secondly, only a small number of interviews were conducted with staff who had completed NET SMART®-AP. Although all known staff were invited to take part, including those who failed to complete the course, some had changed jobs and their contact details were invalid. Without hearing the experiences of nurses who did not complete the course, we cannot understand the full extent of the barriers faced. Another weakness of the study relates to the time between completion of NET SMART®-AP and interview participation; there was a lag between completing the training, or mentors'/managers' students completing the training and the interview. Interviews were relying on staff recollections that may be less accurate.

CONCLUSION

We found that NET SMART®-AP improved nursing knowledge and skill in acute stroke care and increased confidence in extending their role. The training had the potential to allow experienced nursing staff to take on higher-level roles in acute stroke care. However, there are stark differences in the application of APP roles. APPs in the U.S.A. were able to flourish in their career and accessed opportunities not otherwise available. UK or Australia-based nurses at times met organizational barriers. In the UK this experience varied across NHS Trusts. Some nurses experienced resistance to the role from other professions, which limited their ability to incorporate their APP role in clinical practice. Standardization of UK APP roles may be facilitated through agreed regulatory and educational requirements, which may in turn increase acceptance from wider professions. It remains unclear why some physicians or nurses would want to restrict the knowledge of nurses seeking role advancement and improving patient care.

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Conflict of interest statement

The authors report no conflicts.

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Resource Sharing

The data used and analysed during this study are available from the corresponding author on reasonable request and ethics board approval.

References

1. Johnson CO, Nguyen M, Roth GA, Nichols E, Alam T, Abate D, et al. Global, regional, and national burden of stroke, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet Neurology*. 2019;18(5):439-58. 10.1016/S1474-4422(19)30034-1
2. The Health Foundation, The King's Fund, Nuffield Trust. The health care workforce in England: Make or break? Nuffield Trust; 2018. 1-14. Accesed May 2, 2023. https://www.nuffieldtrust.org.uk/sites/default/files/2018-11/health-foundation-king-s-fund-and-nuffield-trust-the-health-care-workforce-in-england.pdf.
3. Burton A. How do we fix the shortage of neurologists? *The Lancet Neurology*. 2018;17(6):502-3. 10.1016/S1474-4422(18)30143-1
4. Adams HP, Biller J. Future of Subspecialty Training in Vascular Neurology. *Stroke*. 2014;45(12):3730-3. 10.1161/STROKEAHA.114.006318
5. Health Education England. Multi-professional framework for advanced clinical practice in England. Health Education England; 2017. 1-23. Accesed May 2, 2023. http://allcatsrgrey.org.uk/wp/download/education/medical_education/continuing_professional_development/HEE-ACP-Framework.pdf.
6. Alexandrov AW, Baca T, Albright KC, DiBiase S, Alexandrov AV, for the NET SMART Faculty and Fellows. Post-graduate academic neurovascular fellowship for advanced practice nurses and physician assistants significantly increases tPA treatment rates: Results from the first graduating class of the NET SMART program. *Stroke*. 2011;42(1):e206.
7. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007;19(6):349-57. https://doi.org/10.1093/intqhc/mzm042
8. Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation Science*. 2012;7(1):37. 10.1186/1748-5908-7-37
9. Braun V, Clarke V, Hayfield N, Terry G. Thematic Analysis. In: Liamputtong P, editor. *Handbook of Research Methods in Health Social Sciences*. Springer Singapore; 2019: 843-60. Accessed May 2, 2023. https://doi.org/10.1007/978-981-10-5251-4_103.
10. Delamaire M-L, Lafortune G. Nurses in Advanced Roles: A Description and Evaluation of Experiences in 12 Developed Countries. *OECD Health Working Papers*. 2010;54(1):1-107. https://doi.org/10.1787/5kmbrcfms5g7-en
11. Ipsos MORI Social Resarch Institute prepared for the NHS Leadership

Academy. Elizabeth Garrett Anderson Programme: Evaluation of Intake One and Two - Final Report. NHS Leadership Academy; 2017. 1-110. Accesed May 2, 2023. https://www.leadershipacademy.nhs.uk/wp-content/uploads/dlm_uploads/2019/08/A78-EGA-Evaluation-%E2%80%93-Ipsos-Mori.pdf.

12. Evans C, Pearce R, Greaves S, Blake H. Advanced Clinical Practitioners in Primary Care in the UK: A Qualitative Study of Workforce Transformation. *Int J Environ Res Public Health.* 2020;17(12):4500. 10.3390/ijerph17124500

13. Leary A, Maclaine K, Trevatt P, Radford M, Punshon G. Variation in job titles within the nursing workforce. *Journal of clinical nursing*. 2017;26(23-24):4945-50. 10.1111/jocn.13985

14. Crouch R, Brown R. Advanced clinical practitioners in emergency care: past, present and future. *British Journal of Hospital Medicine*. 2018;79(9):511-5. 10.12968/hmed.2018.79.9.511