ABSTRACT

Background
People with complex neurological conditions require co-ordinated care provided by nurses educated in meeting service needs, understanding the pathophysiological processes of disease and the preparation to care for those with complex needs. However, evidence suggests that neuroscience specific education provision is largely unregulated and set outside of a cohesive professional development context. Furthermore, it largely seems to only address the induction phase into working within neurosciences.

Objectives
To evaluate the nature of post-registration neuroscience focused education across Europe and neuroscience nurses' perceived educational needs.

Methods
Post qualifying nurses working in the field of neurosciences were invited to complete a self-reported 29-item on-line questionnaire that contained closed and open-ended questions exploring professional background, clinical and educational experience, educational opportunities available to them and their perspectives on their educational needs.

Results
154 participants from fourteen countries across Europe completed the survey. 75% (n=110) of respondents had undertaken neuroscience focused education with the most accessible education opportunities found to be conferences 77% (n=96) and study days 69% (n=86). Overall, 52.6% of courses were multidisciplinary in nature, and 47.4% were exclusively nursing. Most identified that their courses were funded by their employer (57%, n=63) or partly funded by their employer. Results illustrate a significant variance across Europe, highlighting the need for more effective communication between neuroscience nurses across Europe. Implications for future education provision, recruitment/retention, and funding are discussed, resulting in recommendations for the future of neuroscience nursing.

Conclusions
This study, the largest of its kind to survey neuroscience nurses, illustrates the absence of a cohesive career development pathway for neuroscience nurses in Europe. Nurses need quality assured specialist education to deliver high quality appropriate healthcare.

HIGHLIGHTS

- We examine educational experiences of neuroscience nurses within Europe
- Significant variance exists in education standards across Europe
- European standards of neuroscience nursing education need to be established
- Addressing neuroscience nursing education is paramount

KEY WORDS

- Nurses
- Neuroscience
- Experiences
- Post-qualifying Education

INTRODUCTION

Neurological disorders 'constitute a large and increasing share of the global burden of disease (WHO, 2004), occupying the highest number of conditions identified in the International Classification of Diseases (ICD -10) (WHO 2015). Furthermore, neurological conditions are the most common cause of serious disabilities and have a major, but often unrecognised, impact on healthcare, representing the prime contributor to morbidity burden in Europe (Wittchen et al. 2011). According to the European Commission (2014) more than 600 disorders afflict the nervous system, supported by data identifying that neurological disorders represent 35% of the burden of all diseases in Europe in 2005 (Andlin-Sobocki et al. 2005). In 2010, this was calculated to cost €798 billion, averaging at €1550 cost per capita (Gustavsson et al. 2011, Olesen et al. 2012). However, accurate prevalence of neurological disorders within Europe is difficult to confirm as a result of the absence of robust recording and reporting systems across all countries (Gustavsson et al. 2011). This renders the scale of the neurological conditions likely to be greater than anticipated.

Isolating some neurological conditions, stroke is the most important cause of mortality, morbidity and long-term disability in Europe (The European Stroke Initiative Executive Committee and EUSI Writing Committee, 2003), resulting in 1.1 million deaths annually (Vasiliadis 2013). Acute stroke is the one of the leading causes of morbidity and mortality worldwide (Vasiliadis 2013). After ischaemic heart disease, stroke ranks as second most common cause of death globally (WHO 2012). Considering the scale of stroke's association with morbidity and long-term disability, the anticipated increased prevalence of this condition within certain European countries over the next few decades will heighten the need for expert nursing care, particularly those with the lowest economic standard of living (Redon et al. 2011). This is within the context of a growth in the elderly population and technological advances increasing the number of people living longer with complex conditions, which will lead to an increase in the health burden of neurological diseases and a consequential increase in economic burden.

Within the northern hemisphere, the prevalence of neurodegenerative conditions also merits consideration. Stovner et al. (2014), reporting on data from the Global Burden of Disease 2010 Study (GBD 2010), advocate that the economic burden of neurological disorders could be offset through implementation of evidence-informed, effective and efficient interventions that treat and prevent their occurrence. Education plays a central role in such a strategy. With the GBD 2010 explicitly demonstrating the extensive consequences of neurological disorders in Europe, the context of an aging society will see a rise in neurodegenerative disorders, notably Alzheimer's type dementias and Parkinson's disease (PD). Stovner et al. (2014) advocate this will necessitate a greater focus on education to deal with the associated needs of people affected. This is supported by Gustavsson et al. (2011) who, in reviewing the extensive cost and impact of neurological disorders in Europe, strongly advocate the need education to be quantitatively and qualitatively improved to address this global concern.

As the developed world's population ages the burden of neurodegenerative diseases will increase substantially in the coming years. This fact and the increasing number of people living with neurological condition and their associated complications indicates a continuing need for nurses to develop knowledge and understanding of the conditions and their care management (Gustavsson et al. 2011, Olesen et al. 2012). Therefore the education and training needs of neuroscience nurses are of particular importance, both in terms of pre-registration and post-registration education and training.

BACKGROUND LITERATURE

In May 2013, the European Association of Neuroscience Nurses (EANN) part-funded this project based on a research proposal submitted to the board (Cook and Braine 2013). This originated from identification of other healthcare professions taking forward innovative strategies within Europe to address educational needs in a cohesive and structured approach. This is against a background of recommendations whereby strategic principles have been developed for neuroscientists (Brann and Sloop 2006) (See Figure 1), and where organisations such as The Federation of European Neuroscience Societies (FENS) and the International Brain Research Organization (IBRO) identify

principles to underpin education for the Programme for European Neuroscience Schools (PENS) (Aguayo et al. 2005). These highlight the need to increase the quality of education across Europe, but highlight how this needs to be internationalised in a manner that permits local priorities to be central. The principles further advocate the need for inter-professional learning and the creation of a nexus of teachers and learners across countries

Against this background, a need for an educational strategy for Neuroscience Nursing within Europe was identified. This was based upon a needs analysis through engaging those at the centre of the learning i.e. neuroscience nurses (Kaufman 2003, Burke et al. 2012). Central to this needs analysis was clarifying current available education and how it is resourced (Rochmawati and Wiechula 2010).

The literature identifies that there is currently no such strategy for post-registration education within Europe. Generally, specialist and advanced training in neurological nursing is unavailable (WHO, 2004). Whilst European Directives exist that influence pre-registration education within Europe, these are not extended into post-registration education, despite nursing engaging the principles and values of life-wide learning. Additionally, practice settings have become increasingly specialised, requiring focused education to maximise the quality of care. Studies have identified that pre-registration education does not prepare nurse for working in specialised areas, and that further education and development is needed (Long et al. 2002; Ellenbecker 2010). This is confirmed to be the case in the field of neuroscience nursing by Baker (2012), who emphasised the need for such education to be creatively constructed in a manner that facilitates a range of learning styles.

The only identified study that attempted to undertake a needs analysis for neuroscience nursing within Europe was that by Forde-Johnson in 2007. This survey designed study was completed by 8 out of 15 board members of the EANN. While the results highlighted the fragmented and varied approach to post-registration education for neuroscience nurses within Europe, the results could not be considered as representative of current educational and resourcing within Europe. This study led to no cohesive strategy.

It is therefore clear that the first step forward is to conduct a learning needs analysis (Burke et al. 2012). This is supported by adult learning theory, where the importance of engaging learners in determining their needs is seen as fundamental to the success of effective learning (Kaufman 2003). Furthermore Rochmawati and Wiechula (2010) advocate the need for further research on a large scale to determine the variety of education being provided, and how it is resourced as part of developing such a strategy. The second step is to develop a cohesive educational strategy that addresses the contemporary European perspectives with due regard to adult learning principles.

Aims

The aim of this study was to determine the nature of neuroscience focused education received by neuroscience nurses in Europe and their perceived educational needs. The primary outcomes measures were:

- Undertake a review of the literature relating to continual professional development in Europe,
- To determine what, if any, neuroscience focused education is received by neuroscience nurses,
- To determine how neuroscience focused education is funded,
- To determine neuroscience nurses' perceived continuing professional development needs,
- To develop an education strategy for neuroscience nursing in Europe.

METHODS

Design

Research in post registration neuroscience education is limited, therefore, a combined method, which draws upon both quantitative and qualitative paradigms, was used. Data collection involved the use of a measurement tool in the form of a self-reported on-line questionnaire. The questionnaire was specifically designed for this particular evaluation, as no pre-existing questionnaire existed, drew upon relevant literature and guidance from an expert panel of senior neuroscience nurses from across Europe.

Recruitment and sampling

A non-probability, convenience method of sampling was used with all qualified nurses working in neuroscience speciality. The target population was neuroscience nurses identified as members of

Members of the European association of Neuroscience Nurses (EANN) accessible via EANN member country organisations (*n* = 1100). Inclusion Criteria included Registered Nurse in a European country and practicing within a neuroscience nursing setting. All potential respondents received an electronic invitation to participate in the survey, along with information about the study. Online consent was obtained for each participant. The questionnaire contained no identifying data to ensure anonymity.

Ethical Considerations

Ethical approval was sought from the Research and Governance Ethics Committee in two Higher Education Institutes at which the researchers are employed. In addition, as both researchers are registered nurses they adhered to the UK Nursing and Midwifery Council Standards of conduct, performance and ethics for nurses and midwives (2008). All participants were provided with participant information to support making an informed decision to give or withhold consent.

The questionnaires were completed anonymously, with respondents asked for personal details of age and gender only. Data collected and stored was in accordance with the Data Protection Act (1998). Digital data was stored on a computer protected by a password and accessible only by the researchers. Participants were informed that they could withdraw at any time and were under no obligation to complete the questionnaire. Privacy was ensured for participants through ensuring that personal information, views and attitudes are not made public in a way that would allow identification of individual participants.

Data collection

A 29-item, anonymised questionnaire was developed, comprising of 26 closed statements and 3 open-ended questions enabling the entry of free text in recognition of the restrictive nature of closed questions. Closed question were measured on a five-point Likert-type scale, ranging from Strongly Agree to Strongly Disagree. The questions were primarily in three sections: demographics, nurses' neuroscience educational background and finally the nurses' preferences for developing your neuroscience nursing knowledge and skills and suggested areas for improvement. The questionnaire was administered through the Qualtrics® software package, a web-based survey tool, for convenience and ease of data collection, which will enable data collection and analysis from several countries. The questionnaire was written in English. To increase the response rate, follow-up reminders were sent, and the online questionnaire was kept open until December 2013**.**

Data analysis

Descriptive statistics were obtained using IBM SPSS Statistics 21.0 statistical software. Inferential statistics were not deployed as there were insufficient responses across countries to provide significant results. Qualitative data was analysed using content analysis using Newell and Burnard's (2006) 6 stage approach.

DATA RESULTS

A total of 154 questionnaires were returned, which represents a response rate of 14% from a sample of 1100. This response rate reflects questionnaires with complete responses (after data cleansing), prior to which responses were n=168. The response rates varied across country with the UK generating the largest response rate 56% (n=80) (Figure 2). Responses from many countries were in single figures, which limit how representative the data can be considered.

Sample characteristics

The respondents were mostly female 86% (n= 126) and predominantly aged between the age 35-54, 65% (n= 95). The majority of nurses were working with adult patients 91% (n= 131) and 2% (n=3) were working with children (paediatrics), and 5% (n=7) identified that they worked in other areas such as education, rehabilitation and research. Most respondents were practicing in the area of neurosurgery, followed by neurology and critical care, and the majority had been working in neuroscience practice for over 10 years 62% (n=86) and only 7% (n=9) had less than 2 years neuroscience experience. When asked what professional qualification was held against their registration most identified registered nurse 73% (n=113) and specialist nurse 29% (n=45). One respondent identified that they did not have a professional register in their country the Former Yugoslav Republic of Macedonia.

Of those respondents who held an academic qualification a Bachelor's degree was the most prevalent undergraduate qualification) 55% (n=77) followed by an undergraduate diploma 33% (n= 46) (Figure 3) of these 78.3% (n=36) were from the UK. The most common postgraduate academic qualification was a Master's degree 32% (n=45), most dominantly found within the UK, Denmark, and Poland. Doctoral Degrees, which comprised 7% (n=10) were from Denmark, UK, Sweden, Poland and Norway respectively.

Neuroscience Education

71% (n=110) of respondents had undertaken neuroscience focused education, with 51% of those having taken 5 or more courses and 41% of all courses had academic credits associated with them, 59% did not. 90.9% of UK respondents (68% of all respondents) had undertaken neuroscience focused education/training. Of these courses 35.8% were professionally accredited, 47% were not professional accredited and respondents indicated that 17% of courses were undertaken in countries that had no professional regulatory body.

The most accessible education opportunities were found to be conferences 77% (n=96), study days 69% (n=86) and in-service/employer provided 46% (n=57), and a small percentage identified having no access or training or education 7% (n=9) (Figure 4). Five countries did not have access to any academic courses or training specific to neuroscience nursing; Austria, Belgium, Macedonia, Greece and Malta. Respondents from two countries identified that they had no access to any training or education these were Macedonia, and Malta.

When questioned further as to the nature of this education as to whether it was multi-disciplinary there was a mixed response. Overall, 52.6% of courses were multidisciplinary in nature, and 47.4% were exclusively nursing. Multidisciplinary neuroscience education was most prevalent in Poland (72.2% of courses). Most identified that their courses were funded by their employer (57%, n=63) or partly funding by their employer (25%, n=28). Self-funding was the most common source in Macedonia (100%), Austria (50%) and Poland (25%). Norway and the UK were the only two countries to have grant/scholarship funding.

Respondents identified a variety of ways that they updated themselves, ranging from study days to reading journal articles (Figure 5). When asked further how often they keep up-to-date the majority did so weekly or monthly. The majority had undertaken five or more education opportunities and overall 52.6% of courses were multidisciplinary in nature, and 47.4% were exclusively nursing. Poland respondents identified their neuroscience education as being largely multidisciplinary in nature (72.2%) in contrast to Austrian respondents, whom largely undertook uniprofessional (nursing) neuroscience education.

When asked what education /training should be available there was unanimous agreement from those that responded that this should be in the form of a neuroscience specific course either short or long-term and accredited at either at degree or masters level. Some respondents also identified the need for more conferences and study days. The majority of respondents felt that the educational/training should be delivered with other healthcare professionals working in the speciality of neurosciences 78% (n= 87) and that this should be accredited 95% (n=106), with the majority stating that this should be accreditation both professionally and academically 81% (n=86). However, when asked what level this accreditation the response was mixed; 55% (n=57) stating that this should be at undergraduate level whilst 45% (n=46) stated at post graduate level (Figure 6).

DISCUSSION

The objectives of this study were to evaluate post-registration neuroscience focused education across Europe and neuroscience nurses' perceived educational needs. This study has shown that neuroscience nurse provision across Europe would appear to be made up of experienced nurses, with 62% of respondents having over 10 years' experience and an additional 20% having 5-10 years' experience. This indicates a dedication to the field of neuroscience, but may also indicate difficulty in recruiting and maintaining numbers of newly qualified nurses.

25% of the respondents had never had any neuroscience focused education and considering 93% had been practicing in the field of neurosciences for over two years, then these respondents are

providing care without having had formal, quality assured preparation. While the results illustrate the countries where the lack of neuroscience education exists, from a European perspective, there is no standardised level of preparation. Additionally, 47% of courses were not academically accredited. While every educational experience cannot be realistically accredited through an academic institution, academic accreditation enhances the ability of those undertaking education to develop their academic profile, and that of the neuroscience nursing profession. Furthermore, academic accreditation ensures a degree of quality assurance. This ensures courses are underpinned by sound educational principles and subject to review and monitoring to ensure they are fit for purpose. The quality of courses outside of quality assurance frameworks provides no assurance of their effectiveness. Variation in accessibility and availability of dedicated neuroscience courses may also be a reflection of the cultural and/or economic diversity across Europe.

Career development merits focus within Europe. A recent study illustrates that an increase in the number of nurses with baccalaureate degrees is associated with a reduced incidence of post-surgery mortality (Kutney-Lee et al. 2013). This is one example of the need for nurses to have graduate qualities. Russell (2013) highlights that it is insufficient to provide education that only delivers on skills and content, practitioners require the ability think critically, reason and question practice. Providing education to Baccalaureate Degree level is therefore associated with better care. This study illustrates that over half of neuroscience nurses had a Baccalaureate Degree (55%), over a third (42%) had academic credits below that of a Degree, and 5% had no academic accreditation for their professional qualifications. Neuroscience Nursing within Europe needs to strive towards Baccalaureate Degree as a minimum in order to mirror global developing standards and to provide neuroscience nurses with the graduate qualities and skills of lifelong learning necessary to engage with and utilise post-registration education in the area of neurosciences. In this respect we refer to promoting education to the level of baccalaureate degree, but not necessarily focused on neurosciences. Neuroscience nurses, as with nurses in other specialities, need the ability to think critically, make decisions and use evidence. Blegen et al.'s (2013) evidence that increasing education levels improves mortality statistic across a number of aspects of practice, supports this recommendation. This will require investment in the education of neuroscience nurses and also within the field of education to provide the necessary educational experiences. Such education may be dovetailed with neuroscience specific content or enable neuroscience nurses to progress to such education following degree preparation.

Such an approach will require a career development strategy for neuroscience nurses across Europe, whereby those in practice are facilitated to develop to Baccalaureate Degree level as a minimum standard. Alongside recruiting at this level, neuroscience nursing will be enabled to maximise the quality of care in such a specialised field. This will provide the graduate qualities needed for a profession built upon life-wide learning, which can be complemented by quality assured neuroscience education through academic and/or professionally accreditation. Dovetailing these ensures nurses have the core skills to engage in continuing professional development whilst also have the field specific knowledge for specialist care. While there is limited evidence on accreditation of programmes and its direct link with quality of care, accreditation sets expectations for quality by which education providers are held to account (Hickey et al. 2014). This is reported to positively motivate and standardise practice. Awa et al. (2010) support this view, evidencing that accreditation is statistically associated with highly significant perceived improvement in the quality of patient care and safety ($p<0.001$).

The results of the survey indicate that there is a high level of commitment from employers to fund neuroscience nursing education, with 84.3% of education/training being either fully (59.3%) or part funded (25%). 10.2% were self-funded and a low level of grants/scholarships were funded (3.7%). In order that evidence-informed neuroscience practice is developed within Europe, there needs to be greater investment in grant and scholarship funding. The goal of education is to enhance care provision through advancing skills, knowledge, and the ability to inquire, analyse, investigate and use innovation. This requires quality improvement, evidence-informed practice, and research to be interwoven and synergistic with each other (Cepero 2011). This necessitates a balance in the development of neuroscience nurses whereby the skills of inquiry are enhanced through programmes of research investigation and evidence-informed practice is disseminated and is accessible**.**

Limitations

A significant limiting factor in this study was the low response rate of 14%. A previous inquiry in May 2006 surveyed 8 (out of 15) members of EANN, each representing their country in an attempt to evaluate post-registration specialist education for neuroscience nurses in Europe (Forde-Johnson 2008). This study represents views of over 19 times more neuroscience nurses and so gives us a wider view of experiences and perspectives. Regardless, some countries yielded no responses and others were significantly limited by very few responses. The UK represents the highest response rate, which may adversely influence results to be more representative of the UK. The low response rate could be explained by a number of contributing factors:

1. Apart from the UK, there appears to be no electronic database for member countries to contact their members by email.
2. Only 2.1% of EANN members have registered in the EANN database.
3. While English is the official language of EANN, the English language may have been a barrier to completion. However, each member country was offered the ability to obtain a translated version of the questionnaire. One country (Germany) took up this option, but no responses were received using it.

CONCLUSION

This study provides an insight into the educational and professional development experiences of neuroscience nurses within Europe. While the response rate across countries does not provide concrete findings to provide saturation of data, the findings build upon previous research and provide a greater, if incomplete, picture. The findings illustrate neuroscience nurses dedication in terms of longevity in the career and taking opportunities to access available education and professional development activities. Future pursuits should enable this to continue as well as to maximise access and funding to education and development to a baseline standard across Europe.

A career development strategy is necessary for neuroscience nurses across Europe and all nurses new to the field of neurosciences should be provided with quality assured education. Research into the value of specialist neurological nurse education is warranted. The findings from this study will contribute to the development of the EANN strategy for neuroscience nursing in Europe. Moreover, the findings provide an impetus for future multilateral cooperation between education providers across Europe to share and provide accessible and focused neuroscience education. Although further research is necessary to gain a more conclusive picture of neuroscience nursing in Europe. Indeed, further research on the global perspective would further illuminate the international position on education for those working within neurosciences. However, the success of this hinges on neuroscience nurses being accessible through their respective country organisations. With advances in educational technology, an enhanced European perspective, coupled with an international view, enables collaborative alliances with the potential for innovative methods to support the development and implementation of neuroscience nursing education.

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