NURSING STUDENTS' MISUNDERSTANDINGS WHEN LEARNING ABOUT STROKE CARE: A PHENOMENOGRAPHIC STUDY

ABSTRACT

Background: Considering the prevalence and complexity of a stroke, it is necessary to think about how undergraduate nursing students are developing knowledge for stroke care.

Aim: To obtain a vision of nursing students' learning, exploring difficulties concerning understanding stroke care delivery

Design: A phenomenographic research approach.

Locations and Participants: This research is based on written exam papers (n=126) from third-year nursing students enrolled in the 2015-16 academic year in two Nursing Schools in Spain.

Results: The analysis revealed four conceptions in which students demonstrated difficulties understanding stroke care delivery: 1) limitation of the neurological assessment to the level of consciousness and use of the Glasgow Coma Scale; 2) association of haemorrhagic stroke with hypovolaemia; 3) justification of the need for appropriate patient positioning and postural changes based solely on preventing pressure ulcers; and 4) assertion that strength exercises help improve spasticity.

Conclusions: Empirical identification of these conceptions among undergraduate nursing students, together with agreed definitions of learning outcomes, in the subject of stroke care delivery will allow educators to design evidence-based teaching-learning strategies.

Keywords: Stroke; Learning; Conceptions; Nursing student; Nursing education research; Phenomenography

INTRODUCTION

In 2015, cardiovascular diseases caused over 37% of all deaths in the European Union (EU). Out of these deaths, strokes were responsible for 23% (Statistical Office of the European Communities, 2018). A stroke can be defined as the loss of brain functions due to the interruption of blood flow to an area of the brain, with symptoms lasting longer than 24 hours, or of any duration if there is neuropathological and/or neuroimaging evidence of permanent injury (Sacco et al., 2013). Thanks to great efforts being made to improve stroke management and prevention, the mortality rates and stroke-related disability-adjusted life-years have declined in recent decades (Kjellström et al., 2007). Nevertheless, both the absolute number of people affected and the number of people who remain disabled from strokes is still growing (Feigin et al., 2017).

Nursing education has an essential role to play in tackling strokes and their consequences for individuals, families and society. There is emerging evidence showing that nurses' education and training can improve health outcomes in people who have had a stroke (Jones et al., 2017). In order to gain a comprehensive understanding of the impact of education on stroke patients' care, it is also necessary to focus on the available research evidence on teaching and learning among pre-registration nurses. This is a particularly important issue in countries such as Spain, where the care for stroke patients is provided by generalist nurses.

When assessing knowledge of stroke care, Mason-Whitehead et al. (2013) found that third-year nursing students had gained insufficient knowledge regarding the rehabilitative role of nurses, stroke diagnosis, complications and acute management of strokes. Other studies have focused on analysing the students' perception of their learning (Stephens et al., 2013; Stevens and Tait, 2006). Nevertheless, overall, we have found relatively few studies on this topic in the literature, and none exposing variation in students' understanding of complex concepts.

Identifying what students find difficult to understand is a necessary (and prior) condition for educators to develop instruction that allows students to create adequate knowledge structures required to improve clinical reasoning (Boshuizen and Schmidt, 2008). Phenomenography has long been recognised (Åkerlind et al., 2014) to investigate variations in how students might understand (or misunderstand) the same disciplinary concept.

AIM

The aim of this study was to look at nursing students' learning, exploring difficulties when understanding stroke care delivery. The specific objectives were to explore conceptions regarding the following areas (I) Nursing stroke assessment, (II) Aetiology, pathophysiology and characteristic clinical manifestations of strokes, and (III) Nursing care plans after a stroke.

METHOD

Context of the research

This study was carried out in two Nursing Schools of the University of the Basque Country (Spain). The two schools followed the same syllabus and nursing care for stroke patients was taught as part of the Clinical Nursing IV module. This module provided 10 European Credit Transfer and Accumulation System credits, of which 2.5 were related to care of patients with neurological disorders. In both schools, the topic in question was taught over a 2-week period during the first term of year 3. The time dedicated to teaching about strokes was 12 hours. The teaching method used in both groups was based on traditional lecturing and covered diagnosis and prevention of strokes, hospital-based treatment, nursing care for dysphagia, and motor, communication and behavioural abnormalities. Experienced teachers from the Department of Nursing gave the lectures. Both groups of students used the Spanish version of the 12th Edition of Brunner and Suddarth's Textbook of Medical-Surgical Nursing (Smeltzer et al., 2012).

This study is part of a larger research project which seeks to design and evaluate a teaching-learning sequence on the topic of stroke patient care.

Research design

In order to generate further data on how students learn about stroke care, this study was based on a phenomenographic research methodology. Phenomenography has been proposed and used to describe and explain the qualitatively different ways in which people perceive and understand reality (Marton, 1981). This research approach has proven to be valuable when identifying variations in understanding complex concepts in a cohort of participants in a

specified field. Likewise, it has proven to be valuable for assessing teaching methods and improving nursing students' learning of such concepts (Barry et al., 2017). Commonly, phenomenographic research uses interviews as a source of data (Akerlind et al., 2005; Sjöström and Dahlgren, 2002). However, when a large number of students take part in a course, the researchers use student products, such as the answers to the questions in a test or a piece of work, and they analyse its contents phenomenographically (Marton and Pang, 2006; Skär and Söderberg, 2016).

To address the study objective, students' written responses were analysed regarding two problem questions on stroke care (Table 1) that were part of their final exam. These problems covered part of the module content and measured certain learning outcomes that were described in the course syllabus (Table 2). Problem 1 explored the students' knowledge and understanding concerning the initial hours after a stroke. Question 1 aimed to assess their understanding when selecting a neurological assessment scale for strokes, while question 2 explored difficulties they might encounter in relating the aetiology of strokes to managing the condition. Problem 2 assessed students' awareness and understanding of mobility impairment in stroke patients. Question 3 aimed to ascertain whether they were aware of arguments to justify patient positioning and the need for postural changes after a stroke. Finally, question 4 aimed to assess the link they made between patients' loss of strength and muscle tone abnormalities that may develop after a stroke. Table 2 shows how the questions match the course learning outcomes.

Insert Table 1

Insert Table 2

Participants

This study was based on the third-year nursing degree exams in the 2015-16 academic year. To minimise potential sources of bias, we excluded any papers from students re-sitting the

module or any with previous professional experience in healthcare. All the students had previously passed the same modules. Furthermore, students were allocated to groups randomly, using university academic management software.

Out of 128 written exam papers, 2 were excluded from the analysis for not meeting the selection criteria, and hence, the final number of papers analysed was 126. The mean age of students whose papers were analysed was 20.7 years (SD 1.7); 84.9% women and 15.1% men.

Validity

Once the problems had been drafted, they were validated in terms of content and aims. Regarding the validity of the scenarios and their relevance to the study goals, two faculty members from the University of the Basque Country Nursing School and two nurses with over 10 years' experience in the neurological field confirmed that the content of the problems and questions themselves were appropriate for all nursing students. Additionally, a pilot study was conducted with a sample of 25 final-year students to assess feasibility and content validity. This confirmed that the students had no time-related problems to answer the questions and the problems covered the learning outcomes to be evaluated.

Data collection

Data was collected from the written exam papers. Students had 30 minutes to answer the two problems. The assessments were carried out 10 weeks after the content had been taught in lectures, as part of the written paper for the final assessment of the module.

To avoid any type of interference between research and teaching, the research team did not receive copies of the student's exam papers until all assessment and marking, as well as all teaching of the module, had been completed. Furthermore, any means of identifying the students were removed to preserve their anonymity. After this initial processing, data was aggregated for subsequent analysis.

Data analysis

The students' answers to the questions were subjected to rigorous phenomenographic analysis (Akerlind et al., 2005). First, one of the authors (JZ) performed a preliminary analysis in which the answers in a subsample of 10% of the papers were grouped according to the explanations

given by the students. Then, each member of the research team (JZ, MA and IHC), independently and repeatedly read students´ answers and, drafted a list of conceptions based on this grouping of ideas.

In order to achieve trustworthiness in the study, once the answers had been classified, the authors compared and discussed answer allocations. The degree of agreement reached (Cohen's Kappa reliability coefficient average of 0.85) fell within the suggested range for phenomenographic studies (Skär and Söderberg, 2016). An iterative process was used to produce the final conceptions. When there was no agreement, a discussion was held among the researchers and the original conceptions were redefined until a consensus was reached.

Ethical considerations

This study did not affect the students whose papers were analysed in any way. Identities were kept strictly confidential and all written answers were analysed anonymously. Approval for this study was obtained from the Institutional Research Ethics Review Board (CEISH UPV-EHU, Report M10/2017/025).

RESULTS

In this section, we present the results of the phenomenographic analysis and interpretation of the responses given to problems presented in Table 1. The objective of this study was not to determine how many students responded appropriately to the questions, but rather to analyse students' conceptions when explaining care for stroke patients.

The results of the students' conceptions in each of the four questions are presented below (Table 3). From the phenomenographic data analysis, four misunderstandings emerged concerning stroke care delivery: 1) limitation of the neurological assessment to the level of consciousness and use of the Glasgow Coma Scale (GCS); 2) association of haemorrhagic stroke with hypovolaemia; 3) justification of the need for appropriate patient positioning and postural changes based solely on preventing pressure ulcers; and 4) assertion that strength exercises help to improve spasticity.

Insert Table 3

Misunderstanding 1: Limitation of neurological assessment to the level of consciousness and use of the Glasgow Comma Scale

In relation to question 1, students were expected to identify and explain the National Institute of Health Stroke Scale (NIHSS) and/or the Canadian Neurological Scale (CNS) as tools for monitoring neurological deficits of patients through the continuum of care.

Notably, nearly two-thirds (62.7%) of students opted for using the Glasgow Comma Scale (GCS) rather than stroke-specific scales for neurological assessment and monitoring (NIHSS or CNS).

> "I would use the Glasgow scale, because it is the best for assessing neurological functioning." (SD1)

Among the arguments stated for making this choice was that the scale was easy to perform.

> “This is a scale that does not take a lot of time to administer”. (SD6)

According to our study, the speed at which the score was obtained was a characteristic that students understood to be important in the context of the problem (the first hours after a stroke).

> ”There is more than one scale for monitoring neurological functioning: the Glasgow scale, the Canadian scale and the NIHSS, among others. I would not use the NIHSS since it takes too much time. The Canadian scale is good, since it allows a broad assessment, but I would not do it on admission. As we are dealing with an acute stage, I would use the Glasgow scale.” (SD18).

From the students’ answers, we can see that assessment of the level of consciousness is believed to be the key factor, rather than gathering other neurologically-related information.

> "I have opted for this scale because it is fast, easy and effective (…) It only assesses the level of consciousness; in other words, it does not cover other aspects of neurological assessment (SD45)

> “(…). Although the NIHSS and the Canadian Neurological Scale are more appropriate for strokes, the Glasgow scale provides information rapidly about the level of consciousness.” (SD70)

The main reason other students seemed to have chosen the GCS was familiarity with the scale.

> "It is the most commonly-used scale for monitoring brain functioning.” (SD10)

According to the arguments set out by some students, in their opinion, the NIHSS scale was the scale of choice for neurological assessment from a theoretical perspective. Nevertheless, in response to the problem, they finally opted for the GCS since they considered that nurses did not use the NIHSS.

> “The appropriate neurological assessment scale is the NIH. This scale is administered by neurologists, not by nurses.” (SD59)

> “I know of different scales for assessing neurological function: the NIHSS; the Canadian one and the GCS. In my opinion, the GCS is the most appropriate for the case presented; the one that can be administered by nurses.” (SD127)

Misunderstanding 2: Association of haemorrhagic stroke with hypovolaemia

Blood pressure is a sign that requires special consideration, since it is generally high in stroke patients. The argumentative knowledge expected in relation to question 2 was that students would explain how the objective varies between patients as a function of the treatment being administered, extent of the lesion, and vascular permeability. Furthermore, students were also expected to consider that in the case of a haemorrhagic stroke, we should balance the benefits of treatment, such as reducing bleeding, against the risk of cerebral hypoperfusion. Fewer than 20% of the students made this connection.

The students’ answers generally focused on complications that can emerge in the event of a stroke being ischaemic or haemorrhagic, such as a greater risk of intracranial pressure. These arguments follow simple causal reasoning, not supported by evidence.

> "If the stroke were haemorrhagic, this would mean that blood vessels in the brain had ruptured, in turn, resulting in an increase in intracranial pressure. Hence, it would be

important to manage hypertension, so that it does not also increase the intracranial pressure.” (SD27)

“In haemorrhagic strokes, we must control blood pressure strictly. If it is accompanied by an episode of hypertension, this can encourage bleeding (…) facilitating the development of herniation and death of tissue (SD72).

Some students even mention development of complications related to a rise in blood pressure, although they do not explain these complications

“In a haemorrhagic stroke (…) there is a risk of higher intracranial pressure, causing serious complications." (SD55)

A total of 38 students (30.2%) linked haemorrhagic stroke to blood loss and systemic blood volume.

"Hypovolemia caused by bleeding can lead to hypotension.” (SD16)

“(…) in this type of stroke, there is a risk of hypovolemic shock.” (SD80)

Misunderstanding 3: Justification of the need for appropriate patient positioning and postural changes based solely on preventing pressure ulcers

Positioning of an individual after a stroke is a key factor that determines cerebral perfusion and oxygenation. Further, it is important to maintain therapeutic positioning, mainly to maximise motor function, improve communication, promote socialisation and limit development of complications such as contractures, compression neuropathy and pulmonary aspiration, as well as pressure ulcers.

In response to question 3, nearly half (46.8%) the students associated patient positioning with more than two of the aforementioned factors. The most common combination was the prevention of pressure ulcers and contractures.

“I would change the patient’s position every 3-4 hours, on the one hand, to maintain skin integrity, and on the other, to improve motor function, for example, to prevent shoulder dislocation, etc.” (SD6)

The students who used this argument did not generally include post-stroke cerebral perfusion as an argument to justify patient positioning or the need for frequent postural changes.

Furthermore, 43.7% of students used simple arguments based on a single factor to justify the need for frequent postural changes. As many as 40.5% of students in the sample gave prevention of pressure ulcers as the sole explanation for maintaining appropriate postures and justifying postural changes.

> "There is a decline in sensitivity and mobility, and hence, a high risk of pressure ulcers." (SD45)

> "I would change the patient's position every other hour, as usually specified in protocols in all units, given the risk of pressure ulcers." (SD42)

Misunderstanding 4: Assertion that strength exercises help to improve spasticity

When there is loss of control of voluntary muscles, the action of the strong flexor muscles dominates extensor muscles. Regarding the upper limbs, we tend to observe adduction and internal rotation of the shoulder, together with flexion of the elbow, wrist and fingers. Question 4 explored student arguments regarding the use of an anti-stress ball in patients with post-stroke hemiparesis. The expected reasoning in this question was that the use of this type of device would facilitate activation of flexor muscles, when the opposite is required, namely, to encourage activation of extensor muscles.

> "Research suggests that under hypertonic conditions patients should not use the ball. In such cases, we should facilitate muscle extension, and use of a ball might lead to claw hand." (SD 69)

Just over a quarter (27.7%) of students provided coherent arguments referring to the concept of spasticity.

On the other hand, almost 60% of students responded that strength training was positively associated with rehabilitation.

> "Movement and strength are good for rehabilitation; for this reason, the ball is helpful in that it may maintain patient strength and achieve greater mobility (…) It should not always be used all the time, as it might strain the joints and cause damage." (SD 4)

> “As it involves movement, it enables early rehabilitation.” (SD125)

Among these cases, students presented contradictory arguments, reflecting problems or difficulties in understanding concepts such as hypertonicity and spasticity.

> “It helps to strengthen muscles in the hand and forearm as well as preventing the appearance of spasticity and helps enable early recovery of motor function.” (SD93)

> “Playing with the ball exercises the muscles and prevents hypertrophy; furthermore, as he has hemiparesis, it can be used to work on strength.” (SD111)

DISCUSSION

This study applied a phenomenographic methodology to reveal nursing students' variation and understanding difficulties of stroke care. Contrary to recommendations in the scientific literature, the results of this study indicate that students perceive that the neurological assessment of a stroke is limited to assessing the level of consciousness using the GCS. Regular assessment and recording of the patient’s neurological status by nurses are necessary, even essential, to detect changes in the patient, and must go beyond assessing consciousness (Goldstein, 2018; Iacono et al., 2014; Kelloway et al., 2011). The NIHSS is the most complete tool for assessing neurological function, in that it explores neurological deficits that other scales overlook. Internationally, it has become the gold standard (Powers et al., 2018). Together with the GCS, it is considered a useful and valid tool for defining patient status after a stroke and, additionally, it allows us to assess changes in patient status after initiating treatment (Powers et al., 2018).

Nevertheless, after teaching on the topic of strokes based on traditional lecturing, students held the view that GCS was the scale of choice, despite the fact it is not a stroke-specific tool. This perception could be attributed to the GCS being the most widely-used neurological assessment tool (Iacono et al., 2014). It should be underlined that students also failed to identify the limitations in its application and specificity to patients who have had a stroke, as most such patients do not present an altered level of consciousness (Kelloway et al., 2011). Furthermore, they did not take into account that the CNS and NIHSS also assess level of consciousness (Côté et al., 1989; National Institute of Neurological Disorders and Stroke, 2018).

No reports of research into teaching these scales to nursing students were found. In the literature on nursing education, there is no definition of what should be expected as part of training for generalist versus specialist nurses. Studies concerning adoption of these scales only consider registered nurses' education in neurological units. These studies reported that skills in NIHSS or CNS scoring are acquired through frequent use or additional training (Gocan and Fisher, 2008; Iacono et al., 2014; O'Farrell and Zou, 2008). Notably, in our study, some students believed that the NIHSS was a scale used by neurologists and not by nurses. It appears that the teacher's belief concerning the scope of nursing practice might have influenced how the teacher taught about neurological assessment. There is no additional data on what the teacher specifically highlighted during lectures. Anyhow, this seems to be a serious concern and, in consequence, it would be interesting to investigate which factors may influence such views among student nurses.

On the other hand, the results suggest that traditional lecture-based teaching had a limited impact on students' learning. More than 30% of the students linked haemorrhagic stroke to hypovolaemia and almost twice as many related grip strength exercises (flexion) to improvements in spasticity. These views reflect that, as indicated by Halloun and Hestenes (1985) in their research into the teaching of physics, students start university-level courses with alternative knowledge and beliefs acquired through earlier education and/or their social environment; furthermore, such knowledge and beliefs often remain very stable despite being challenged by the content of university courses. Another explanation of the phenomenon observed might lie in the fact that these are problematic aspects of knowledge of this discipline or what Meyer and Land (2005) have called threshold concepts. These are generally different or counter-intuitive ideas that can restrict the learning process.

Lastly, the answers analysed indicated that students explained the need to change a patient's position after a stroke to prevent the development of pressure ulcers. According to Halbwachs (1977), this argument is simple causal reasoning (based on a single factor), students are only relating the need for mobility to maintaining skin integrity. To ensure quality in the stroke care delivery, it is essential to develop more complex reasoning skills that integrate different levels of analysis (such as respiratory or cardiovascular function, and cerebral perfusion). This will allow future nurses to diagnose patient problems better and select relevant nursing care.

Crucial to what is made possible to learn in a lesson is what aspects are made possible to discern (Marton, 2015). This research investigated variations in students' understandings/misunderstandings of stroke care concepts. This is a necessary prior stage for future design of learning activities. In the light of this evidence, nurse educators will decide whether to include PBL, simulation, lectures or other teaching methods to help students grasp these aspects of the curriculum.

LIMITATIONS

This study has analysed written exam papers following teaching of a module using traditional lecture-based methods in a public university. When interpreting the results, it should be acknowledged that the time-pressure associated with completing exams might have influenced students' answers. Furthermore, in order to gain in-depth understanding of students' answers, it would have been beneficial to interview students. Despite these limitations, the results of this study provide important new information on which concepts of stroke-care nursing students find difficult to understand.

CONCLUSIONS

This research sheds light on issues that have not previously been mentioned in nursing education research, making it possible to identify difficulties that students encounter in relation to learning about care for patients who have had a stroke. A substantial proportion of the students in the study demonstrated misunderstandings in at least one of the following areas:

- Limiting neurological assessment to the level of consciousness (use of the GCS)
- Associating haemorrhagic stroke with hypovolaemia
- Justifying the need for appropriate patient positioning and postural changes based solely on preventing pressure ulcers
- Asserting that strength exercises help improve spasticity.

The empirical identification of these conceptions among undergraduate nursing students, plus agreed definitions of learning outcomes, in the subject of stroke care delivery, will allow educators to design evidence-based teaching-learning strategies. It should be underlined that

merely including the topic of stroke patient care in the syllabus does not guarantee that students learn or integrate theoretical and practical concepts needed for their professional activities and for making care-related decisions. Nurse educators need to investigate how different teaching strategies allow students to achieve learning outcomes. Further education and research on nursing education regarding stroke care would be essential in the clinical setting.

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Table 1: Problems completed by students as part of their final exam

PROBLEM 1

You are a nursing student on placement in the neurological unit of an acute hospital. You have just undertaken the admission assessment of a 78-year-old woman with ischemic stroke

Q1: You know that monitoring of neurological function is important to observe the status of the patient and track changes. Among the different scales you know for assessing neurological function, choose the one that, in your opinion, is the most appropriate for this situation, specifying its main characteristics, and its pros and cons.

Q2: If the stroke had been haemorrhagic rather than ischemic, how might that have changed the management of the patient's blood pressure?

PROBLEM 2

You have just arrived at the unit to do the afternoon shift after 2 days off. After the handover of your group of patients, you decide to do a round of the rooms to introduce yourself and carry out a general assessment. You start with 615-A, the room of Martín García who was admitted 6 hours earlier following a stroke presenting with Broca's aphasia, right hemianopsia and right hemiparesis. When you go into the room, you find the patient supine, with his head in a neutral position.

Q3: How often, during your shift, would you change the patient's position and why?

Q4: Martín has an anti-stress ball in his hand. What impact may this type of device have on rehabilitation? Outline its pros and cons.

Table 2: Mapping between learning outcomes and the exam questions

Learning Outcomes		Questions
LO1	Define the aetiology, pathophysiology and characteristic clinical manifestations in individuals with stroke	Q2
LO2	Specify in detail nursing assessment of individuals with stroke.	Q1
LO3	Develop coherent care plans based on nursing diagnoses identified in individuals with stroke.	Q2, Q3, Q4

Abbreviations: LO (Learning Outcome) and Q (Question)

Table 3: Distribution of conceptions across different questions

Conceptions	Total sample (n=126)	Misunderstandings
Question Q1		
• Monitoring of neurological status of patients with stroke Scale (NIHSS/Canadian Neurological Scale)	42 (33.3%)	Limitation of neurological assessment to the level of consciousness
• Assessment of level of consciousness (Glasgow Coma Scale)	79 (62.7%)	
• Incoherent response/Did not answer the question	1 (0.8%)	
• No response	4 (3.2%)	
Question Q2		
• Relation drawn between blood pressure and cerebral perfusion post-stroke	22 (17.5%)	Association of haemorrhagic stroke with hypovolaemia
• Recommendations outlined but no relation drawn between blood pressure and cerebral perfusion post-stroke	37 (29.3%)	
• Relation drawn between haemorrhagic stroke and hypovolaemia	38 (30.2%)	
• Incoherent response/Did not answer the question	17 (13.5%)	
• No response	12 (9.5%)	
Question Q3		
• Relation drawn between positioning/posture and at least two factors including cerebral perfusion post-stroke	2 (1.6%)	Justification of need for patient positioning and postural changes based solely on preventing pressure ulcers
• Relation drawn between positioning/posture and at least two factors not including cerebral perfusion post-stroke	59 (46.8%)	
• Simple causal reasoning (only one factor)	55 (43.7%)	
○ *Pressure ulcers*	51 (40.5%)	
○ *Others: contractures, deep vein thrombosis*	4 (3.2%)	
• Incoherent response/Did not answer the question	5 (4%)	
• No response	5 (4%)	
Question Q4		
• Development of the concept of spasticity	25 (19.8%)	Assertion that strength exercises help improve spasticity
• Mention made of the concept of spasticity with limited reasoning	10 (7.9%)	
• Relation drawn between strength exercises and rehabilitation under hypertonic conditions	75 (59.5%)	
• Other reasoning: motivation/anxiety reduction	3 (2.4%)	
• Incoherent response/Did not answer the question	7 (5.6%)	
• No response	6 (4.8%)	