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Team nursing: experiences of nurse managers in acute care settings

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KEY WORDS

team nursing, nurse managers, acute care, experiences, models of care, staffing

ABSTRACT

Objective

This study aimed to explore and describe nurse managers' experiences with a team-based approach to nursing care in hospital settings.

Design

A qualitative descriptive study using interviews to explore managers' experiences of team nursing.

Setting

Medical and surgical wards in an acute care setting

Participants

Five nurse managers (four female and one male) who volunteered to participate following calls for 'expressions of interest' in three acute care hospitals

Findings

The team nursing experiences of nurse managers are described using three main categories: adapting to team nursing, gains with team nursing and concerns with team nursing.

Conclusions

Nurse managers considered gains for staff and patients were made with the implementation of a team-based approach to nursing care. This team-based approach to care was regarded by managers to enable nursing staff of varying experience and skill to provide care more safely as direct supervision by more experienced staff was possible. However the role of team leader necessitated staff development and support to enhance clinical leadership skills involved in this new role.

INTRODUCTION

Clinical nurse managers are expected to oversee the delivery of patient care that is safe and meets quality standards within the available human, financial and material resources. Staffing, particularly the available skill mix, is often a challenge for nurse managers faced with this accountability in an environment where it is difficult to recruit and retain experienced nursing staff and to offer a supportive learning environment for inexperienced nurses. Evidence indicates that various forms of team nursing are being adopted in acute care settings to provide safe patient care using a more diverse skill mix (NSW Health 2007; Walker et al 2007; Walker 2002). Teamwork both within nursing teams and in collaboration with multidisciplinary teams is said to be crucial to producing better quality care and reducing risk to patients (Rathert and Fleming 2008). Despite the increasing diversity of the skill mix within the workplace and the importance of teamwork being advocated as an essential approach to practice, little is known about nurse managers' experiences with team nursing in acute care wards. This study explored with nurse managers their experience of a team-based approach to nursing care delivery in acute care settings.

LITERATURE REVIEW

Team nursing

Team nursing developed in the 1950s in response to changes in nursing skill mix. This approach requires strong leadership and excellent communication skills to bring together small groups of nurses, led by a team leader, to work collaboratively and cooperatively to deliver a better standard of care than possible with individual nurses working alone (Dobson and Tranter 2008; Shirley 2008; Tiedeman and Lookinland 2004; Sherman 1990). Recently Spitzer (2008, pp.6) drew attention to the importance of teams in "...maximising staff and providing environments for professionals..." to "...apply their education and skills while working with others who can provide caring services under the registered nurse's direction." According to Kalisch et al (2009), where teamwork is effective nurses

stay in nursing, they are more productive, errors are reduced, quality is improved and "patients are more satisfied" (pp.1).

Recently the implementation of team nursing approaches to address changing skill mix has been reported both internationally (Dobson et al 2007) and nationally (Walker et al 2007; O'Connell et al 2006). In Australia nursing care delivery is moving away from patient allocation towards team nursing models of care (Walker et al 2007; NSW Health 2006).

Experiences with team nursing

Experiences of nurses delivering care in teams have been explored from the perspective of nurses, team leaders and nurse managers. Nurses' perceptions of team nursing have identified benefits for patients as being continuity of care (Cioffi and Ferguson 2009; O'Connell et al 2006) and delivery of safer and better quality care (Cioffi and Ferguson 2009; Jupp 1994). For nurses the benefits have been identified as improved working relationships (Cioffi and Ferguson 2009; O'Connell et al 2006; Hyrkas and Appelqvist-Schmidlechner 2003); increased ability to share and work together (Cioffi and Ferguson 2009; O'Connell et al 2006; Jupp 1994) and availability of a shared network (Cioffi and Ferguson 2009). However, some issues identified with team nursing have been inadequate preparation for team nursing (Cioffi and Ferguson 2009; Jupp 1994); increased responsibility for registered nurses particularly when in the role of team leader (Cioffi and Ferguson 2009); unfair and uneven workloads leading to overburdening of staff (O'Connell et al 2006) and confusion around roles and responsibilities in the team (O'Connell et al 2006; Jupp 1994). Other challenges with communications and teamwork have been attributed to the varied skill mix; the lack of familiarity with ward routine and assigned patients; and busy, pressured work conditions (Cioffi and Ferguson 2009; O'Connell et al 2006). Team leaders reported that their job satisfaction improved particularly through enhanced relationships and seeing staff develop (Jupp 1994). These findings clearly indicate gains for both patients and staff can be made with team nursing.

From the perspective of nurse managers, findings show relationships for patients, relatives and staff improved, staff morale and motivation increased and communications improved (Jupp 1994). However managers who implemented team nursing identified retrospectively that more information and educational support was essential (Jupp 1994). As little is currently known about nurse managers' experiences with team nursing this study explored and described managers' experiences of team nursing in acute care settings.

METHOD

Design

A qualitative study to identify and describe nurse managers' experiences of team nursing in acute care wards was undertaken. A descriptive approach within the framework of naturalistic inquiry was selected as little is known about managers' experiences with team nursing in acute care wards (Erlandson et al. 1993; Lincoln and Guba 1985).

Setting

The study setting was three acute care hospitals, two metropolitan tertiary referral and one general teaching hospital in an area health service in NSW, Australia.

Sample

From 'calls for expressions of interest' sent to three hospitals, only five nurse managers volunteered to participate in the study. The inclusion criteria were: a nurse manager in an acute care adult ward with a team-based approach to nursing care delivery. The size of the purposive sample is small but appropriate for a qualitative study as Kuzel (1999) suggests a range between five to twenty persons. Ethics protocols were approved by the area health service and university Human Research Ethics Committees. The participants were registered nurses with a mean of four and half years' experience as a nurse manager in an acute care ward and a median of ten years' experience with team nursing. There were four female and one male participants; two held a masters degree, one a bachelor degree and two held postgraduate certificates.

Data collection procedures

Data were collected by the researchers using interviews with nurse managers to explore their experience with team nursing. The interviews were scheduled in each hospital to facilitate access; they were audiotaped and lasted about one hour. A topic guide was available and used only to raise areas if participants did not include them in their overall descriptions of their experiences. Participants completed consent and demographic forms prior to the interviews.

Data analysis procedures

The audiotapes were transcribed verbatim, checked and textual data coded and categorised using Liamputtong and Ezzy's (2005) inductive interpretative approach to qualitative analysis. Personal information about participants was summarised using descriptive statistics.

FINDINGS

Nurse managers' experiences of team nursing can be described using three main categories: adapting to team nursing, gains with team nursing and concerns with team nursing.

Adapting to team nursing

Managers described the change to team nursing as being influenced by skill mix, inadequate supervision of less experienced staff by senior staff, the altered role of the enrolled nurse and attrition of experienced staff. However skill mix was identified as the main factor for changing to team nursing as nursing staff were less experienced and less skilled, requiring an increased level of direct supervision. A typical comment was:

"... first year graduates, trainee enrolled nurses, enrolled nurses (EN), undergraduates ... need to team nurse with that group of skill mix ... they have to be led and guided by a registered nurse..."

From the managers' descriptions team nursing was commenced with minimal preparation on a trial and error basis, for example:

"... took it to a ward meeting for discussion ...we started with three weeks ... it was a bit of trial and error..."

On reflection managers identified areas they could have planned differently including the need for staff to be involved and have ownership of the change, to develop a shared understanding of team nursing and the critical nature of communication in teams, and the need to set a timeframe for the change, for example:

“... important to talk about what you think team nursing is and how you think it will run and really keep it open for feedback at the start ... I would say definitely some education on communication. I think that is a major issue.”

“...You’ve got to involve them, give them time to adjust, but then you have to put a timeframe on that...”

Managers indicated that senior staff were not as keen as the junior or less skilled staff about the team nursing approach to care. Being responsible for a greater number of patients and for supervising team members underlay this lack of enthusiasm as shown in extracts below:

“The senior staff took a little longer to come around to it ... they battled with the extra responsibility...”

“Instead of thinking about only... four patients,... has got to think for the other 10 or 15 or 18.”

The managers talked about the need for nurses to be well prepared for different roles within the team specifically the need for the team leader to accept accountability for team performance. Managers described using reassurance and positive reinforcement with teams; including the staff in decision making, building independence and providing the means for nurses to empower themselves to make practice decisions within the teams. Strategies they used were mentoring, learning packages, up-skilling of staff, setting and managing expectations and dealing with resistance to change. Typical comments were:

“...developed a team leader package and ... a mentorship program. So we focus on the work.... the people as a leader, but they need to be trained, so we give them feedback as well and say this is your weakness.”

“it’s happening more these days where your juniors are your seniors ... got to skill them up pretty quick and get them confident enough... when you do have a few of your seniors on, then you put your most junior person as team leader and then the other people are there as a resource”

“...team leader... accountable for patient care... in such a way the supervision is more effective and the patient care is more guaranteed... there are times when you have to be firmthere are times when you really need to discuss things and empower them and get their feedback.... important to keep them in the loop...”

“...positive reinforcement, praise where praise is due and dealing with the nitty gritty stuff ... be approachable ... have it clearly documented this is what is expected ...follow-up on the disciplinary process if you need to...”

The consequence of staff not being adequately supported was noted by managers. As one manager said:

“...if we don’t support them, then we lose them, and then we are working under even under more pressure, because you have got less skilled staff on the ward”

Gains with team nursing

Managers outlined the gains made with team nursing through a comparison with the patient allocation model that had been the predominant model of care delivery prior to the introduction of team nursing. This comparison identified team nursing as enabling nurses to have a more complete ‘picture’ of all the patients, facilitating better coverage over breaks, encouraging more independence in staff and positioning seniors in the team to accept greater responsibility for supervising junior and less skilled staff. For the patients it was considered to result in more contact with nurses, better quality care and a safer environment. Some typical comments were:

“...so if one is off on a break ... another person there who knows what is going on with that group of patients ...continue with care.”

“... this way everyone gets a senior and a junior (*staff looking after them*). The patients ... know there is always a senior around looking after them”

“... in a team ... a lot better quality of care ... a safer environment if you have RNs, ENs, first year grads working together...”

Further gains managers highlighted were the networks engendered by the team leader and nurses supporting each other and the increased learning opportunities that arose with more experienced nurses working with less experienced nurses. Typical comments were:

“... gain so much more as part of a team ... that support network ... it's everything because you are not on your own, you are not getting overwhelmed...”

“... work with a senior person maybe once or twice a week ... feel more comfortable around them ... learn with that rapport ... there are more learning opportunities”

Managers identified that team nursing had impacted on nurses' relationship with other health professionals engendering increased liaison, increased opportunity for education, greater potential to coordinate care and improved patient outcome orientation, for example:

“We have social worker, occupational therapist, physiotherapist, dietician meeting once a week... they are more ready to communicate with us. In the past, they tended to work alone... now they see us as a team ... always come looking for us and see how we improve the patients ... meet together to try to improve the patient flow.”

Concerns with team nursing

A key concern for effective team functioning identified by managers was the team's ability to communicate effectively. Managers were acutely aware poor communication within the team placed both team members and patients at risk. They described active management of this concern addressing communication at ward meetings, performance appraisals and with the use of shift communication sheets, handover sheets, and walk-around reports.

Typical comments were:

“If you don't communicate ... ultimately it's the patient who's comprised ... after the verbal handover then the teams ... go around ... visualise the patients ... Becoming standard practice ... talk about it at ward meetings and just on one on one performance appraisals...”

“... a handover sheet... checks happen... every shift”

Another concern was that related to communications between the nursing teams and medical staff, although there was acknowledgement that this had improved. For example:

“... probably our worst communicators at times are the medical staff ... they don't write it ... compared to ... just a couple of years ago, it's improved...”

A further concern for nurse managers was the perceived relationship of the nursing team to the multidisciplinary team. Though managers described a greater awareness by nursing teams of the whole team involvement in patient care they specifically identified a need for junior nursing staff to attend and participate in multidisciplinary team meetings.

“... morbidity and mortality meeting... look at any incidents or how we can do things better and junior staff should be attending those as well”

DISCUSSION

Main findings show nurse managers' experiences of team nursing focused on the adaptation to team nursing with its associated gains and concerns. Managers identified that similar factors had precipitated the change to team nursing within their ward areas and it was acknowledged the implementation process needed to be better planned to include collaboration with staff, clear protocols and roles for teams. Main gains achieved with team nursing for patients were more contact with nurses, better quality care in a safer environment and for less skilled and less experienced nurses, better support and direct supervision. This supports previous findings that team-based models can improve patient

safety, quality of care and the work environment (Cioffi and Ferguson 2009; Jupp 1994). However concerns were identified including the need to support and develop team leaders for their increased level of responsibility and to ensure effective communications within both the nursing and multidisciplinary teams.

Findings from this study support earlier findings (Dobson et al 2007; Walker et al 2007; NSW Health 2006; O'Connell et al 2006) that show team nursing can accommodate a workforce of varied skill mix with enrolled nurses, first year graduates and student nurses as they can be supported and supervised on shifts. Managers identified that inexperienced staff found the supportive environment of team nursing resulted in them feeling more comfortable, enabling supervised learning and reducing feelings of being overwhelmed and isolated. The more experienced nurses who had to assume the team leader role and take responsibility for team performance found team nursing more stressful and required support and development for the leadership role. As identified in previous studies (Cioffi and Ferguson 2009; O'Connell et al 2006; Jupp 1994) the nurse managers in this study considered benefits for patients were achieved with a team nursing approach to care including more direct contact with nurses and care that was delivered more safely with quality monitoring occurring. Overall managers were positive about team nursing recognising its 'goodness of fit' to the available staff mix.

In the early days of implementing team nursing managers described the change as predominantly one of 'trial and error', a finding also identified by Cioffi and Ferguson (2009) and Jupp (1994). The change process described suggests that a more structured and planned approach to the transition to team nursing was required with staff involvement in planning, more emphasis on the development of a common understanding of team nursing and of the roles and responsibilities of team members, specifically the role of team leader with its greater responsibilities. Further to this, managers were aware that communication was a critical component of

effective teamwork and recommended its inclusion in the preparation for team nursing with ongoing support during and after implementation.

LIMITATIONS

The main limitation of this study is the small number of nurse managers who volunteered to participate despite repeated attempts to recruit managers from three sites. Difficulty with recruiting may reflect their heavy managerial workloads with many competing demands and the underdeveloped research culture of the clinical settings. Findings therefore only reflect the experiences of a few managers. This small study can provide a guide to the development of further studies that are needed to more extensively describe team nursing experiences from a managerial perspective.

CONCLUSIONS

The findings of this study highlights managers' agreement that team nursing is a key strategy to be employed when the nursing skill mix consists predominantly of less experienced registered and enrolled nurses who require constant supervision and support. The positive effect of team nursing on working environments particularly for junior staff can contribute to improved quality and safety of patient care. However, senior staff require support to enhance their clinical leadership skills to enable them to manage the additional responsibilities of leading teams in acute care settings.

The findings also emphasise the importance of good planning, consultation with staff, clear definition of the team nursing model and the expected roles and responsibilities of all team members prior to the implementation of the team nursing model of care. There is evidence to suggest that relationships between the nursing and the multidisciplinary team were improved with team nursing, however opportunities remain for this relationship to be strengthened with further attention paid to communication between members of the various teams.

RECOMMENDATIONS

As team nursing is implemented in different forms in different settings nurses need to identify the critical factors within team nursing that result in effective performance and optimal patient and staff outcomes. Managers would then be in a position to implement effective, evidence-based approaches to team nursing that are well suited to a diverse nursing skill mix.

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Patient satisfaction with Nurse Practitioner care in primary care settings

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KEY WORDS

Nurse Practitioners, primary care, patient satisfaction

ABSTRACT

Objective

To determine the level of satisfaction with care and acceptance of the role of Nurse Practitioner in New Zealand.

Design

A descriptive correlational study was conducted using a 15 item satisfaction survey distributed to participants by the clinic receptionist after a clinic visit to the NP. Demographic data, reason for visit and waiting times were also collected.

Setting

Two clinical sites in the same medium sized city were used for data collection. The first site was a university campus health clinic and the second a primary health care clinic in an industrial area.

Subjects

Convenience sample of the first 100 patients to complete and return the self-administered survey from each practice site were to be included in the study. In fact 193 useable surveys were included.

Outcome measures

Patient satisfaction and acceptance was measured using modified 15 item version of the Thrasher and Purc-Stephenson (2008) satisfaction survey.

Results

Patients were satisfied with the care they received and had accepted the role. Mean satisfaction score was 15.59; SD 4.71, range 12-25. The lower the score the more satisfied the patient. Satisfaction was significantly correlated by only two variables, age ($r=.221$, $p=.003$) and role clarity ($r=.355$, $p=.000$).

Conclusions

While this study contained limitations, the overall positive findings are similar to previous study findings on patient satisfaction with Nurse Practitioners care. The instrument, methodology, and findings of this study can be used as initial data on the evaluation and continued monitoring of the role in New Zealand (NZ).

INTRODUCTION

New Zealand like many western countries is currently experiencing a critical health care workforce shortage. Over ten years ago the role of the Nurse Practitioner (NP) was identified and supported by the New Zealand Ministry of Health (Ministerial Taskforce on Nursing 1998) as one approach to relieving this shortage and providing a career ladder to expert clinical nurses. Seven years ago the Nursing Council of New Zealand began to register individuals as Nurse Practitioners (NP). Today there are approximately 70 recognised NPs in New Zealand, a country of over four million people (NPNZ listserve April 2010). To date little research has been published in New Zealand on the outcomes these providers are achieving. However data have been presented at symposiums and conferences addressing NP experiences and outcomes in a variety of settings (Boyd 2009; Gilmer 2009; Langer 2009). This article presents data on patient satisfaction and acceptance of the NP role in a sample of patients in NZ.

Literature Review

Nurse Practitioners in outside of NZ have been shown to positively impact the quality and quantity of life experienced by the individuals, families, and communities they serve (Brown and Grimes 1995; Cooper et al 2000; Shumm et al 2000; Cooper et al 2002; Larkin 2003). NPs have also been shown to practice in a cost effective manner (Jenkins and Torrisi 1995; Spitzer 1997; Hunter et al 1999; Paez and Allen 2006; Bauer 2010). In addition NP care has been associated with increased patient satisfaction over other models of care delivery (Brown and Grimes 1995; Byrne, Richardson, Brunsdon, & Patel (2000)); Brooten et al 2002 .

Researchers addressing the implementation and evaluation of the NP role advocate for initial studies to address outcomes related to safety and efficacy, acceptance and satisfaction, costs and role transfer (Mitchell-DiCenso et al 1996; Bryant-Lukosius, & Dicenso, (2004). Unpublished works in New Zealand by Boyd (2009) speak to the safety, efficacy and financial impact of the NP role in gerontology

practice, while Langer's (2009) work addressed safety and role transfer in a mental health setting and Gilmer's (2009) work looked at acceptance of the role in a primary care setting. No data have yet been published on acceptance and satisfaction of the NP role in New Zealand.

As stated above, satisfaction is one of the key outcomes associated with the introduction of a new role in health care delivery. Some researchers have linked satisfaction with outcomes of improved health status (Lashinger et al 2003), decreased use of healthcare resources (Thompson et al 1996), and increased adherence to plans of care (Moore et al 2002).

Measuring outcomes requires the use of validated instruments to accurately capture the concepts under study. Measuring satisfaction can be difficult as many factors may influence a patient's satisfaction with care on any given day. Thrasher and Purc-Stephenson (2008) developed and tested an instrument to measure satisfaction with NP care provided in an emergency department in Canada. This instrument, adapted and used in this study, is discussed further in the sections to follow.

METHODS

This descriptive study presents initial data on two outcomes of NP practice, satisfaction and acceptance. Satisfaction was selected as one variable where quality measures have been developed and tested, Satisfaction with Care Survey (Thrasher and Purc-Stephenson 2008). The Satisfaction with Care instrument contained 21 items that loaded into three factors labelled attentiveness, comprehensive care and role clarity. Of the 21 original items in this instrument 13 items accounted for 70.8% of the variance in the measure. These 13 items were included in the current study along with two additional items. One additional item was included to capture the overall satisfaction level of the respondent (item # 11,) and the other additional item was included to address acceptance of the NP role (item#15). Table 1 includes all the items used in the survey.

Table 1: Items of the Satisfaction Survey

Satisfaction	
1.	The Nurse Practitioner gave me a chance to say what was on my mind.
2.	The Nurse Practitioner was friendly to me.
3.	I felt free to talk to the Nurse Practitioner about private thoughts.
4.	I feel the Nurse Practitioner spent enough time with me.
5.	The Nurse Practitioner took my problems very seriously.
6.	I would trust the Nurse Practitioner with my health.
7.	The Nurse Practitioner provided information about how to look after my health/problem.
8.	The Nurse Practitioner took time to answer my questions or address my concerns.
9.	The Nurse Practitioner provided excellent care.
10.	The Nurse Practitioner was successful in dealing with my problem
*11.	Over all I was very satisfied with the care I received from the Nurse Practitioner.
**15.	I am likely to refer a friend or family member to the Nurse Practitioner
Role Clarity	
12.	I am clear on how a Nurse Practitioner's role is different from a nurse's role.
13.	I am clear on how a Nurse Practitioner's role is different from a doctor's role.
14.	I am clear on how a Nurse Practitioner is trained.

* Added in this project overall satisfaction

** Included in satisfaction score but also represented acceptance.

Two practice sites were used for data collection. The first site was a primary care clinic in a mixed industrial residential area of a medium sized city where one Primary Health Care NP worked two days per week. The second site was a university campus health setting where a Primary Health Care Nurse Practitioner Intern was employed one day per week.

A convenience sample of 200 patients was the goal. The first 100 from each of the two practices to complete and return the questionnaire were included in the study. However upon data entry and cleaning it was determined that seven subjects actually returned blank surveys and several others left some responses blank.

Verbal permission was obtained from clinic administrators in both sites for the study. Approval from both sites was obtained after the research protocol, patient information sheet, and questionnaire were presented along with assurance to the clinic administrators that appropriate ethics approval would be obtained prior to data collection. Ethical approval was received from the ethics committee affiliated with the researchers employing university.

An administrative assistant or clinic receptionist in each site distributed the participant explanation letter and the questionnaires to patients at the completion of their visit with the NP. The assistant asked each patient to complete and place the completed questionnaire in a sealed box in the waiting room on the patient's way out of the clinic. The assistant was oriented to the study so that she could answer any questions. The NP, also the researcher was available to answer any questions. Data collection was hypothesised to take approximately ten weeks. In reality data collection required six months. Issues around the assistant remembering to distribute the questionnaires and holiday breaks at the university influenced the data collection process.

Analysis

One hundred and ninety three surveys with enough data to enter into the study were returned for analysis, seven were returned blank. Several had data missing and were included in analysis only in the areas where item responses were not required for that analysis. Responses were entered, cleaned, and analysed using SPSS version 17. Demographics are presented as a simple frequency table (table 2).

Satisfaction survey results were based on likert scales (1= strongly agree to 4 strongly disagree). A Total Satisfaction score for each individual was calculated by adding responses to the 12 items inquiring about satisfaction with care (first 10 questions from original form plus items 11 and 15 new). The role clarity score was calculated for each individual by adding the responses to the 3 questions about patient ability to describe differences between the NP and a GP or a practice nurse in the same clinic.

Table 2: Description of participants

Variable	N	Range	Mean	Std Deviation
Age	190	9-86yrs	34.59	16.91
Missing	3			
Waiting Time	182	0-30min	7.75	6.20
Missing	11			
Variable	Frequency		Percent	
Gender				
Female	101		50.5	
Male	92		46.0	
Ethnicity*				
NZ European	138		71.5	
Maori	12		6.2	
Samoan	2		1.0	
Tongan	1		0.5	
Chinese	6		3.1	
Indian	3		1.6	
Other	26		13.5	
Both NZ European and Maori	5		2.6	
Education (3.1% Missing)				
Primary	3		1.6	
Some secondary	33		17.1	
Completed secondary	29		15.0	
Some tertiary	73		37.8	
Bachelor's	21		10.9	
Some Postgraduate	13		6.7	
Master's	3		1.6	
In Doctoral study	6		3.1	
Doctorate	2		1.0	
Other	4		2.1	
Missing	6		3.1	
Reason for Visit (8.8% missing)				
Med refill	31		16.1	
Injury	23		11.9	
Skin complaint	18		9.3	
Ill	46		23.8	
STI check	3		1.6	
MAP/Preg	8		4.1	
Health Promotion	14		7.3	
Eye/Ear complaint	4		2.1	
Blood test results	4		2.1	
Forms/letters/referral	18		9.3	
Chest pain	1		0.5	
Check up	4		2.1	
Accompanied child	2		1.0	
Missing	17		8.8	

*No one reported being Cook Island Maori or Niuean in this study.

The above grouping was slightly different from the original work of Thrasher and Purc-Stephenson (2008). This study was primarily interested in patient satisfaction with and acceptance of the role of the NP, therefore the grouping of items into one total satisfaction variable was used to capture satisfaction rather than looking at three components of satisfaction.

The role of the NP is new in New Zealand so role clarity was of a secondary interest to the researchers. The original three items defining role clarity were grouped as done in the study by Thrasher and Purc-Stephenson (2008).

Finally one item, #15 was used to address acceptance of the role. While it is recognised that one item scales are not usually robust, this item was deemed representative of the concept acceptance by the research team.

Patient satisfaction was compared across individual characteristics of the sample including age, gender, reason for the visit, educational level, ethnicity, time waiting for service, and role clarity. The dependent variable was Total Satisfaction, a continuous variable and the independent variables were at various levels of data. Analysis was guided by the level of data and statistics used included the Man Whitney U, the Pearson's R for correlation, Analysis of Variance and the Kruskal-Wallis test. The two sites were combined as there was no significant difference on the total satisfaction scores between the NP practices using the t-test for independent samples ($t=1.43$, $p=.159$).

RESULTS

The number of missing responses varied across the independent variables (three for age; six for education; 11 for waiting time and 17 for reason for the visit). One hundred and ninety three completed satisfaction surveys were received with individual items missing data on the satisfaction survey varying from one to seven. Question 15 "I would refer friends or family to the NP had seven missing responses.

No attempt was made to statistically replace missing items. Rather data were analysed using exclude cases pairwise, meaning individuals were only excluded from analysis if data were missing for the item under analysis.

Satisfaction

The dependent variable in this study was satisfaction. The satisfaction items, as previously stated were drawn from the work of Thrasher and Purc-Stephenson (2008). Total Satisfaction was calculated by adding the responses for the first 10 questions plus item 11 and 15 of the survey. Patients responded to the question by ticking a box that corresponded to a 4 point likert scale; strongly agree=1, agree =2, disagree=3, and strongly disagree=4.

Total satisfaction mean score for 179 usable responses was 15.598 with SD of 4.71 and a range of 12-25. The lower the score the more satisfied the patient. Overall respondent strongly agreed or agreed that they were satisfied with the care provided by the NP.

Role clarity

Role clarity scores were calculated based on the three items 12-14 of the survey. The same likert scale was used for these items. The mean Role Clarity score for 191 responses was 6.23 with SD of 2.59 and a range of 3-12. Again, the lower the score the more the patient agreed that they could differentiate between the Nurse Practitioner, the practice nurse and the physicians in the clinic. In this study patients were likely to respond that they agreed or disagreed (the middle scores) that they were clear about role differences and educational differences between the NP, GP and practice nurse.

Acceptance

Item 15 was included both as an item in total satisfaction and as an indicator of acceptance of the role. Item 15 used the same likert scale to determine how likely the patient was to refer a friend or family member to the NP. The mean score on this item from the 186 responses was 1.45 with a SD of .578 and a range of 1-3, meaning that most patients agreed or strongly agreed that they were likely to refer a friend or family member to the NP.

Satisfaction determinates

The total satisfaction score was analysed to determine if the characteristics of the respondents or clinical visit were related to satisfaction. To determine this satisfaction was compared across ages, waiting times, and role clarity using the Pearson's correlation r , gender using the Mann Whitney U, and education, using the Kruskal-Wallis H test and ethnicity and reason for visit using ANOVA. The results are presented in tables 3-7.

Table 3a: Satisfaction and age or waiting times or role clarity

Variable	N	r	Sig.
Age	174	.221	.003*
Waiting time	178	.122	.113
Role clarity	178	.355	.000*

There was a small positive correlation between age and satisfaction, (lower satisfaction scores meant better satisfied, therefore the younger the patient the better satisfied) and a medium positive correlation between role clarity and satisfaction (the clearer on the differences the better satisfied with care). There was no significant correlation between waiting times and satisfaction. Shorter waits were not correlated with higher satisfaction nor were longer waits correlated with lower levels of patient satisfaction with the care provided.

Table 3b: Satisfaction and gender

Variable	N	Score	Z	Sig.
Gender				Two tailed
Female	93	3427	-1.50	.132
Male	84			

There was no significant difference between genders on levels of satisfaction. Males and females reported similar levels of satisfaction with the care the NP provided.

Table 4: Satisfaction and education

	Satisfaction Score
N=172	
Chi-square	12.295
df	9
Significance	.197

Satisfaction was not significantly related to levels of education. Satisfaction levels across the ten different levels of education identified in the NZ census data and included in the study were similar.

Table 5: Satisfaction and ethnicity

	Sum of Squares	df	Mean square	F	Significance
Between groups	60.431	7	8.633	.384	.911
Within groups	3799.072	169	22.480		
Total	3859.503	176			

Satisfaction was not significantly related to ethnic background. Satisfaction levels were similar across the eight ethnicities included in the study. It was noted two categories from the nine NZ census data categories were not selected by respondents, while a new category, Maori and NZ European was added by respondents.

Table 6: Satisfaction and reason for visit

	Sum of squares	df	Mean square	F	Significance
Between groups	341.750	12	28.479	1.391	.176
Within groups	3070.668	150	20.471		
Total	3412.417	162			

Satisfaction was not significantly related to reason for visit. Levels of satisfaction with care were similar no matter the reported reason for the patient visit.

DISCUSSION

The initial evaluation of new health care roles or models of care should include outcomes of safety, acceptance, satisfaction, costs, and role transfers (Mitchell-DiCenso et al 1996). This study set out to address the satisfaction and acceptance of a new health care role in the primary care setting. Using a previously validated instrument with two additional items added by the authors, the present study findings reflect those of other researchers around the world who have looked at satisfaction with care provided by NPs (Benkert et al 2007; Knudtson 2000; Pinkerton and Bush 2000; Cipher et al 2006; Thrasher and

Purc-Stephenson 2008). Overall patients were satisfied with the care they received and had generally accepted the role.

Interestingly and different from findings by Thrasher and Purc-Stephenson (2008) patients in this study had a moderate level of understanding of the role and understanding did relate to satisfaction. This finding may reflect an anomaly in the study population or it may be related to the fact that half of the study group was from a university setting where it is assumed that critical thinking and curiosity is encouraged leading to participants requiring clarity around the roles of their health care providers. Satisfaction levels may also reflect the expectations by participants around who provides primary care. Finally satisfaction may reflect the information given to participants by the clinical assistants who may themselves not clearly understand the new role leading to dissatisfaction with explanations given by assistants.

Another interesting finding that younger patients were more satisfied with care than the older members of the sample. This is supported by earlier findings (Berkert et al 2002) but is different from Thrasher and Purc-Stephenson (2008). This finding may again reflect expectations about providers across generations in New Zealand.

Another difference between this study and the original using the survey (Thrasher and Purc-Stephenson, 2008) was in the analysis. The study did not analyse satisfaction, as it's separate components attentiveness, comprehensiveness of care, and role clarity. Rather this satisfaction study combined all the items into one satisfaction measure for analysis. The individual components of satisfaction were not the focus of this study. This study set out to address levels of patient satisfaction and acceptance of the NP role.

One final interesting finding relates to the one item acceptance scale which indicated patients were accepting of the role. This finding is interesting considering the role clarity scores. That is, respondents were not entirely clear on the role but were willing to refer friends or family members to the provider for health care. This may reflect the characteristics of the providers rather than the role.

Limitations of this study

Two definite problems arose in this study that could impact results. The first issue was the failure to use fully trained research assistants to distribute and collect questionnaires or answer participant's questions. This failure impacted the amount of time it took to collect data (nearly six months instead of ten weeks). This failure may also have impacted information given to participants at the time of data collection. Even though efforts were made to educate the clinic assistant as to the nature of the study, how to approach the participants, and how to answer questions, there was no control over the assistant's approach to data collection within the structure of their work day. The inconsistency may have impacted what the participants knew about the NP role and consequently levels of satisfaction and role clarity.

The next problem concerns the instrument itself. The first being the failure to use reverse statements in the questionnaire to avoid the column tick phenomena. Participants had the potential to select the same column response for each item of the questionnaire, potentially impacting on results. However, this format was consistent with the instrument originally designed by Thrasher and Pruc-Stephenson (2008). The other issue concerning the instrument was the use of a one item acceptance scale. Since this is preliminary study of the role, a simple survey of acceptance using one item provided useful information for future studies to build upon.

Finally, this study addressed patient satisfaction with care provided by two primary health care NPs. Given the variation in scope, education, and practice settings of NPs in New Zealand the results of this study may not be generalisable to all NZ practicing NPs.

Future Research

Given the limitations of this study, a larger study including the reverse statements and trained assistants may improve the quality of findings. It would be especially interesting to determine if a larger sample and a trained assistant would have similar findings around role clarity and satisfaction. It would

also be interesting to address the components of satisfaction using a larger sample as this would allow for additional statistical analysis of findings.

Future work might address the relationships between role clarity and acceptance. Expanding the acceptance component with more items could provide more robust scale for measuring acceptance.

If it is accepted that participants were satisfied with the care they received from NPs and had accepted the role, then future studies could be designed to address the other variables recommended for initial evaluation of new roles, i.e. safety, efficacy, costs and role transfer. These studies would complete the initial evaluations of the role and set the ground work for long-term monitoring of the role of the NP in NZ.

CONCLUSION

The impact of the relatively new role of the NP in New Zealand has not been fully evaluated. This study addressed two aspects of new roles recommended for evaluation, satisfaction and acceptance. Despite its flaws, this study further demonstrates that patients world wide are satisfied with the care they receive from NPs and that the role is accepted by individuals with varying educational levels, ethnicity, or reasons for their health care visit.

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“I don’t want to become a scientist”: undergraduate nursing students’ perceived value of course content

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KEY WORDS

Alternative entry pathways; Double degree programs;
Pre-registration nursing education; Rural nursing
education; Student experience

ABSTRACT

Background

In the development and delivery of pre-registration baccalaureate nursing programs, universities must address both the needs of industry and the registering authorities that regulate health professional practice. Balanced with this, providers of education at this level also wish to deliver an experience to students that they both value and enjoy.

Objective

This paper describes the findings of a study examining these factors in the first year of four pre-registration programs at a rural campus and outreach centre of one Australian university.

Design

A descriptive, exploratory survey was employed in this research, which is drawn from a larger study into entry pathway, success and academic experience.

Results

Results indicate that students found units such as fundamental nursing subjects and law most enjoyable and valuable. Units with a sociological foundation were considered less enjoyable and valuable. Overall, students recognised the value of the bioscience units while contrarily not expressing enjoyment of this aspect of their studies.

Conclusions

These findings have implications for nurse educators in respect of the content and delivery of pre-registration nursing programs. As first year students, the participants may have been focused on learning fundamental nursing tasks, lacking an understanding of the breadth of knowledge required for their professional role. Future research into aspects of nursing studies found to be most valuable may provide a different perspective if conducted in the period post graduation.

INTRODUCTION

Universities constantly strive to develop programs that are relevant and significant. Where courses lead to a vocational qualification, such as occurs in the health care professions, there exists an additional need to ensure adequate preparation of professionals that meet both industry needs and the requirements of registration and other professional bodies. In addition, tertiary education providers seek to ensure that the experience of education for the student is both enjoyable and valuable. This paper presents findings of research involving nursing students undertaking pre-service studies at one rural Australian university. Participants were asked to rank the perceived enjoyment and value of units completed in both first and second semester of their first year of study. An understanding of these factors can guide nursing faculty in the delivery of course content to ensure students' appreciation of units of significance to their future professional role.

BACKGROUND

The literature shows that integration of knowledge into practice is a difficult transition for many nursing students (Baxter and Boblin 2008). Learning most often takes place by a 'reception learning' process of factual presentations allowing new concepts and propositions to be developed (Novak 2006). This process is assisted when concrete experience or activities are provided as these can help develop depth of understanding. However, it is well recognized that the ways in which students learn consists of various cognitive styles and these individual preferences influence a learner's approach to perception, acquisition and processing of information (Noble et al 2008). Thus, it is a challenge to always meet the learning needs of every student.

Modern curricula are delivered by various modes of study to assist students to achieve their learning objectives. While there is no doubt that institutions of higher learning evaluate programs regularly as a quality assurance measure, few studies have been published in the accessible body of evidence. Little in particular is known about Australian conditions.

Salamonson and Lantz (2005) found high nursing student satisfaction in New South Wales with a hybrid learning model for delivery of a pathophysiology unit which included classroom tutorial and prescribed web-based learning activities. Jordan (1994) considered the importance of bioscience in nursing curricula specifically. Her subsequent research (Jordan et al 1999) would further examine this aspect of nursing studies, finding that students, while describing this component as the "hardest of all" (p. 217) ultimately considered bioscience more valuable than did their lecturers. Hughes (2005) explored nursing students' attendance at college-based lectures in North America and noted lower attendance for less popular subjects such as ethics, law and social policy. This paper aims to redress the lack of literature on this topic by examining undergraduate nursing students' perceptions of the value and enjoyment of units of study in the first year of their course.

METHODS

Data presented in this paper are drawn from a larger study conducted over the academic year in four undergraduate courses (Bachelor of Nursing; Bachelor of Nursing/Bachelor of Midwifery; Bachelor of Nursing Rural Health Practice and the alternative entry Diploma of Tertiary Studies) in two locations (the main campus and an outreach satellite centre). These programs share a number of common units, particularly in the first year of study.

The aim of the broader study was to compare student career trajectory and success relative to entry pathway and other demographic data. Three surveys were administered over the course of the first year of study, with students completing the brief survey on the first day of each semester and in the final week of the academic year. Data from the first round survey has been reported elsewhere (Birks et al 2010). The data presented and discussed in this paper were collected during the second and final rounds of the study. Students were asked to rank the units they found most and least enjoyable and those they considered to be the most and least valuable in

the semester they had just completed. Opportunity was also provided for additional comments to be made should the students wish to justify or explain their choices.

RESULTS

Total enrolments in first semester for all courses combined were 163. One hundred and five students responded to the survey following the completion of first semester, with 69 returning surveys administered at the end of second semester. Tallied responses with illustrative comments are presented in the following section. Numerous comments were made by respondents, with those presented in the following discussion selected to represent issues relating to enjoyment and value of unit content. Comments made by respondents that relate to process of delivery are not relevant to this discussion and will be incorporated into course revision and quality assurance processes.

Semester 1

Table 1 summarises the students' responses to questions about which unit of study they found most enjoyable and which they found least enjoyable in their first semester of study. The introductory nursing unit *Perspectives of Health and Wellness* was overwhelmingly reported as the most enjoyable unit. No students indicated that this was the least enjoyable unit.

It was easy to understand and it was very enjoyable because it was hands on.

It was involved, fun and interesting. I was learning things [that] interested me.

It had practicals that I enjoyed and I feel by doing this unit I'm working towards my goal.

As the first practical subject, this unit exposes students to introductory concepts of health assessment and fundamental nursing skills such as assessment of vital signs and maintenance of hygiene. This factor is reflected in figures indicating that only a small percentage of students found it the least valuable, with half the responding students finding it to be the most valuable unit.

...because it's what I want to do!!

I felt I learnt a lot in the labs, which then helped me to understand other elements in other units.

It was probably the essence of doing a nursing course.

In spite of often being a challenging unit for students, the bioscience subject *Human Structure and Function* was found by around a quarter of the responding students to be the most enjoyable unit.

LOVE anatomy and physiology: fascinating, challenging, detailed, intricate.

Challenging but rewarding.

I can find out and know clearly the structure and function of the human body. It attracts me and motivated me to study more and put more effort into future work.

Conversely, 17% of respondents reported finding the bioscience unit least enjoyable:

It was so hard!

Very hard material to learn and understand.

So much content... so little time.

This unit provides fundamental knowledge of anatomy and physiology, supporting the basic skills introduced in the nursing unit, with 29% of respondents acknowledging its significance to nursing practice by recognising it as most valuable:

...because it is important. Knowledge is needed.

It tied most subjects together.

Despite the relatively high appreciation of the importance of foundational scientific knowledge, a minimal number of respondents considered this unit to be least valuable.

Information was too in-depth and would be irrelevant in the workforce.

The sociological subject *Nursing, Society and Culture* received no positive responses from students who participated in the survey. This unit introduces the nurse's role in the broader healthcare context and provides an overview of social determinants of health

including the influence of culture. Ethical concepts are also introduced. No students found it most enjoyable, with more than half identifying it as their least enjoyable unit.

[The] content of material wasn't very engaging.

It is just the nature of the unit, however, it is still a good unit and have learned lots; probably can include a more practical aspect of this knowledge to make the unit more interesting.

More than a third of respondents also found this unit of study to be least valuable.

I don't feel as though I could use a lot of the content covered.

A lot of the course was generally common sense.

I just couldn't see the relevance.

While a few of the responding students found *Professional Communication* enjoyable and valuable, a relatively large proportion (20%) found it least valuable. This subject introduces concepts of communication within a developmental psychology framework.

[I] just didn't find the point in the subject.

Mostly common knowledge. Already knew most of it.

This subject seemed irrelevant to nursing.

Most students enrolled in the first year of their course undertook the units discussed above during this semester of study. A small number of students indicated other units in their responses that were not core or recognised units, shown in table 1 by the category "Other".

Table 1: Students' ratings of units of study at the end of Semester 1 (frequency and valid percentage, n=105)

Unit of study	Most enjoyable n(%)	Most valuable n(%)	Least enjoyable n(%)	Least valuable n(%)
Perspectives of health and wellness	72 (69.9)	50 (54.3)	0.0	3 (4.4)
Human structure and function	26 (25.2)	29 (31.5)	17 (20.0)	2 (2.9)
Professional communication	2 (1.9)	4 (4.3)	8 (9.4)	20 (29.4)
Nursing, society and culture	0.0	0.0	54 (63.5)	37 (54.4)
Other	3 (2.9)	9 (9.7)	6 (7.1)	6 (8.9)
Total	103	92	85	68

Students' choice of *Perspectives of Health and Wellness* as the *most enjoyable* and *most valuable* unit was confirmed statistically when crosstabulated (using the Chi-square test for independence) with other unit results ($\chi^2=14.2$; $p<0.0001$). *Nursing Society and Culture* was the least enjoyable and least valuable unit ($\chi^2=8.74$; $p<0.005$) with significant positive correlations between both value and enjoyment). Thus, both value and enjoyment of units were positively associated in the minds of students.

Semester 2

Students' perceptions of value and enjoyment of units in the second semester of study are summarised in table 2. In this study period, more than half the participating students identified the law unit

Legal Issues and Concepts as most enjoyable. The popularity of this unit was reflected in the respondents' comments:

It was different to anything else I have studied before and I know little about it.

Very interesting – enjoyable to learn and study.

I found it great and practical to what we are studying.

The timing of this unit in the second semester of the course ensures an introduction to legal concepts prior to the first clinical placement. This unit of study introduces students to basic concepts of law relevant to their practice seeing the majority of students also indicating that it was most valuable.

It was good to learn early on in the course what our legal responsibilities, etc., are. I think this will benefit us in placements next year.

Gave me a greater understanding of what legal responsibility I will have as a nurse.

You never want to be sued or lose the ability to practice as a nurse if you are found negligent. Waste of four years study otherwise.

Once again the nursing unit was relatively popular with the responding students, with more than a quarter indicating that it was the most enjoyable for them. *Health Assessment and Clinical Practice* extends knowledge of physical assessment and prepares students for extended clinical practicum through the introduction of more advanced clinical skills. In this unit students are also exposed to their first clinical block.

It was the most practical unit, which reminds you why you're doing all the theory involved in this course.

Practical and relevant – greatly enjoyed clinical placement.

Only a third of the responding students also identified this unit as being most valuable; a lower percentage than for the nursing unit in first semester. Nonetheless, it was clear that these students appreciated the practical value of this unit:

It is the most relevant, and it's where we learn all our skills.

We are actually putting in practice what we have come to unit to do.

Gave me a chance to feel like a real nurse with clinical placement.

The second bioscience unit *Human Structure and Function 2* proved less popular with participating students in the second semester of their course. This subject continues the study of anatomy and physiology commenced in the previous semester. Nearly one third found the unit least enjoyable.

Too much information (overload) for me.

Sheer volume of information needed to be absorbed in such a short time.

I don't want to become a scientist.

While the percentage of students who found this science unit 'most valuable' was reduced compared to the previous semester, there were nonetheless those that identified it as important.

...challenging, but vital.

[We] need to know A & P to understand how disease processes work and what to expect [and the] nursing care needed.

More than half the responding students found the Indigenous unit, *Indigenous Health and Wellbeing* least enjoyable. Many students also felt that this unit was least valuable, perhaps due to the historical and political context within which Indigenous health issues are explored. As with other units not perceived to be directly related to nursing, students were more likely to question its relevance.

Learned a lot of stats that will not have a huge bearing on my work. Would have preferred to learn more about traditional Aboriginal culture.

Although it was interesting I didn't see its value in helping me to be a better nurse.

I have no desire to be a remote [or] regional nurse.

Table 2: Students ratings of units of study at the end of semester 2 (frequency and valid percentage, n=69)

Unit of study	Most enjoyable n (%)	Most valuable n (%)	Least enjoyable n (%)	Least valuable n (%)
Legal issues and concepts	37 (53.6)	29 (42.0)	0.0	2 (2.9)
Health assessment and clinical practice	18 (26.1)	21 (30.4)	0.0	0.0
Human structure and function 2	6 (8.7)	11 (15.9)	22 (31.9)	8 (11.6)
Indigenous health and wellbeing	3 (4.3)	1 (1.4)	36 (52.2)	36 (52.2)
Other	5 (7.2)	7 (10.1)	7 (10.1)	6 (8.7)
None	0.0	0.0	4 (5.8)	17 (24.6)
Total	69	69	69	69

The category “Other” in table 2 once again includes units not core or recognised in this period of study. In addition to the definitive responses, four students (5.8%) wrote “none” when asked which units were least enjoyed, while 17 students (24.6%) also wrote “none” when asked which units were least valuable; a situation that had not occurred in the previous semester.

Legal Issues and Concepts was confirmed as both the most enjoyable and most valuable unit when crosstabulated with other unit results ($\chi^2=24.2$; $p<0.0001$). Alternatively, *Indigenous Health and Wellbeing* was the least valuable and least enjoyable ($\chi^2=35.8$; $p<0.0001$) with significant positive correlations between both value and enjoyment. Units perceived as valuable were also perceived as enjoyable, and vice versa; the least valuable being associated with being least enjoyable. These associations held true for both semester 1 and semester 2 units of study.

DISCUSSION

There is a lack of published information available related to nursing students perceptions of the most enjoyed or valued units of study in their pre-service programs. It may be that many universities have evaluated course curricula and these results remain unpublished. While it would appear logical that strong relationships would exist between subjects considered most enjoyable and most valuable, as was evidenced in the results, this is not always the case. We found, similar to the findings of Jordan et al (1999), that while science was considered difficult, heavy and hard to understand by a number of students, it was also rated as the most valuable by many. This indicated an appreciation of the relevance and merit of the information even though it wasn't their most enjoyable unit of study. Those students who enjoyed the science subject may have done so because the information was an expansion of what they already knew. Those who enjoyed this unit least may have entered the course straight from school or may have lost interest in the sciences, or else lacked the foundational knowledge to make sense of new material (Novak 2006).

Gallagher (2007) believes that students' preconceptions about what they think is the nature of nursing determines the value they see in the theories presented to them. The most popular unit in first semester was that related to nursing work where the content was more closely linked to what could be seen as the work of nurses. Students were more able to visualise themselves in the role of the nurse as evidenced by their comments about “doing things” and being “hands on”. The second nursing subject was also one of the most valued and enjoyed units in the following semester, being the only one that included clinical practice where students assumed the role of the nurse in a visible way. Rush et al (2009) found a significant increase in the way the students saw themselves as belonging to the nursing profession following their clinical exposure. As one would expect, these students in the current study joined the course in order to be nurses and therefore appreciated and enjoyed the opportunity to experience the practical aspects of the profession. Students who had already been exposed to nursing may have expressed a preference for other subjects because they were not enrolled in the nursing unit or because they were already familiar with the content and were looking for new territory to master.

Research by Hughes (2005) found that students tend to dislike certain subjects such as ethics and social policy, a fact reflected in this research where respondents felt that units related to sociology and communication were common sense and did not add to their knowledge base in a meaningful way. It may be that at this early stage in their education students don't see the significance of sociology to nursing practice. Furthermore, the Indigenous unit was rated the least enjoyable and least valuable subject in second semester. The highly focused area of this unit may have resulted in this unit being seen as particularly complex and might require a more advanced degree of sociological understanding than can be expected of first year students. As a result of similar feedback in standard university evaluations, this unit has since been moved to the second year of study.

Hughes (2005) also identified law as another unpopular subject however it was rated as the most enjoyable in second semester in our study, displacing the nursing unit. As a different area of enquiry, yet still presented in the context of nursing, it may be that law is seen by students to be both interesting and relevant. Leners et al (2006) found that as their professional values developed, students' focus became centred on the hidden, broader aspects of nursing practice such as team participation and interaction. This may explain why students indicated 'none' for the least enjoyable/valuable unit in second semester and thus the results indicate they had an increasing appreciation of the value of curriculum content.

Limitations and recommendations

The relatively small number of students available in the enrolled cohorts reduced the number of participants available for inclusion in this study: a factor aggravated by the reducing number of respondents in each round reported here. It was difficult to apply some statistical tests due to the small numbers in some categories, for example tests of correlations between ratings of units and students final scores on these. Although a longitudinal, prospective research design is the best way to ensure access to sequential groups, future research should utilise a larger sample in order to enable more accurate analysis of various subgroups and allow more precise calculations of correlations. The educational impetus to continuously improve curricula is likely, however, to result in changes within units of study that would permit only trends to be tracked in relation to the various versions of units over time. An additional limitation of this study relates to the fact that, while most students followed a common enrolment pathway, not all students were enrolled in all units.

Perceived or actual poor performance or difficulty in completing academic requirements may have coloured students' enjoyment and valuing of units. Future research with an increased qualitative component would enable evaluation of this aspect of students' experience. Given the relationship

established between value and enjoyment in this research, it may also be interesting to explore what significance this association has for educators. To what extent does enjoyment influence perceptions of value? Does perceived value, as was indicated in the nursing skills units, ensure an enjoyable experience for students? How can educators capitalise on this relationship to enhance the educational experience and student outcomes?

Most students of nursing courses have little true understanding of the qualified professional role. Research may thus be warranted with graduates 1-2 years post course completion as such a study may give a different picture of units considered most valuable to nursing and midwifery practice.

CONCLUSION

This study has provided a picture of pre-registration nursing students' perceptions of the value and enjoyment of various units studied in the first year of their education. Findings indicate a clear association between subjects they perceived as focusing on improving their skills towards achieving their professional nursing role and those units being both valued and enjoyed. By second semester of their first year of study, more mature opinions were apparent as they ascribed greater appreciation of other units of study allied to nursing. Further research is warranted with pre-service nursing students to more fully explore perceptions of the value of course content necessary for competency development. Such research could also identify students' understandings of how studies are related to their future professional nursing role. Increasing an appreciation of the significance of course content will ultimately enhance the experience of students in this important stage of their undergraduate education.

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Nurses make a difference in immunisation service delivery

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KEY WORDS

Vaccination; immunisation; family practice; primary health care; primary health care nurse

ABSTRACT

Objective

The study aimed to determine nurse characteristics associated with childhood immunisation coverage and timeliness in the New Zealand primary care setting.

Design

In 2005-2006 a survey of randomly selected practices and health providers was conducted, with multiple regression analysis to establish significant determinants of coverage and timeliness. The multivariate analysis adjusted for social deprivation, region, practice governance and the age of the children registered at each enrolled practice.

Setting

The study was conducted in family practices in two regions in New Zealand, where approximately 66% of the national population reside.

Subjects

One hundred and fifteen practice nurses employed in the primary care setting.

Main Outcome Measures

Nurse characteristics, knowledge and attitudes associated with immunisation.

Results

Immunisations were delivered by 95% of practice nurses. Factors associated with higher practice immunisation coverage and less delay were a lower ratio of nurses to children - in the practice (1:1 to 1:74 (85)1:75 to 1:1290 (30) coverage $P=0.04$, timeliness $P=0.03$), nurse comfort with their own immunisation knowledge (Yes (105), No (4) coverage $P<0.001$, timeliness $P=0.01$) and their perception of parental apathy (Yes (56) No (53) coverage $P=0.01$, timeliness $P=0.02$), or fear (Yes (66) No (43) coverage $P=0.01$), as a barrier to immunisation.

Conclusion

Higher coverage and more timely immunisation delivery is achieved at practices where the nurse to child ratio is lower, where nurses are confident in their immunisation knowledge and are perceptive of parental attitudes which can be barriers to immunisation.

INTRODUCTION

New Zealand (NZ) experiences outbreaks of vaccine preventable diseases as a result of mediocre immunisation coverage (Ministry of Health 2007). Infant pertussis hospital admissions in NZ are 3-6 times those in the United Kingdom (UK), United States (USA) and Australia (Grant et al 2003).

Improving the uptake and timeliness of immunisations are necessary to make gains in disease prevention. There is strong evidence for the use of provider level strategies to improve immunisation coverage (Briss et al 2000, Shefer et al 2001).

Contraindications to vaccinations are well documented (Ministry of Health 2006). However, there are significant grey areas and myths that influence a provider's recommendations. It has been shown that in 34-80% of cases where children attend a clinic and do not receive appropriate vaccines it was due to professionals misapplying contraindications, or missed opportunities (Gamertsfelder DA et al 1994, Mafi et al 2002).

Health professional recommendation has been closely related to vaccine uptake (Gustafson and Skowronski 2005). Trusted professionals can regain parental confidence after exposure to anti-immunisation rhetoric (Leask et al 2006).

It has been estimated that NZ nurses administer 93% of all immunisations given in the practice setting (Petousis-Harris et al 2004) and 80% of practice nurses administer immunisations independently without doctor referral (Kent et al 2005). Considering this level of responsibility, there is a surprising paucity of published, critical assessment of the nurse contribution to immunisation uptake.

Evolution of the practice nurse role has been described as 'changed from that of an administrator needing a few nursing skills, to a nurse needing a few administrative skills' (Halcomb et al 2004). NZ, the UK and Australia are implementing policies to strengthen service delivery in primary care including enhancing the practice nurse role (Halcomb et al 2004, Ross et al 1994).

The aim of this study was to explore characteristics, behaviours, attitudes and knowledge of nurses working in the general practice setting that may influence the completeness and timeliness of childhood immunisations.

METHOD

This study was part of a broader project that sought to determine the relative contribution that health care system factors make to immunisation coverage and timeliness, including practice characteristics (Grant et al 2009), knowledge and attitudes of medical (Goodyear-Smith et al 2009) and nursing staff and parental perceptions of the quality of care received by children less than two years of age and missed opportunities for immunisation (Turner et al 2009). The design was a survey of randomly selected practices and health providers, with multiple regression analysis to establish significant determinants of coverage and timeliness. This paper reports on the contribution of nursing to these determinants.

The study was conducted 2005 to 2006 in family practices in two regions in NZ, in which approximately 66% of the national population reside.

Participants

The sample involved 124 randomly selected practices, 72 from the Auckland region and 52 from the Midlands region. A random sample of practices with stratification by region and over-sampling of Māori governance practices (independent Māori health providers which target services primarily towards Māori and have a Māori management and governance structure) were recruited (Ministry of Health 2004a). Māori governance practices are focussed on improving health care delivery to NZ's indigenous Māori population. Māori children have lower immunisation coverage and higher rates of vaccine preventable diseases (Ministry of Health 2006, Somerville et al 2007).

The sample size calculations estimated that a sample of 125 practices was sufficient to yield 80% power to show statistical significance at the 5% level for a health professional characteristic associated

with higher immunisation coverage or more timely immunisation if this characteristic was present in 20 to 25% more of the practices with higher coverage.

Data collection

Practice coverage was measured by electronic audit of each practice's primary care management system. The measure of immunisation coverage used, was the proportion of the registered children at each practice who had received all of their scheduled immunisations. The measure of timeliness, was the proportion of children who were not delayed for any of their immunisations. An immunisation was defined as delayed if it had not been received within four weeks of the first due date for the six week immunisations and within six weeks for the three, five and 15 month immunisations (Ministry of Health 2004b).

Coverage estimate was based on the third dose assumption where if the third dose in a series of vaccine doses has been recorded as being given, then the previous two doses are assumed to have been received, whether or not they are recorded. Such an assumption results in a small overestimate of coverage but this is of a smaller magnitude than the underestimation of coverage that results if this assumption is not use (Hull et al 2003).

Knowledge and attitudes of nurses were elicited using a computer assisted telephone interview (CATI) with one randomly selected nurse from each practice. Nurse knowledge and attitudes were measured using a questionnaire previously used in NZ (Petousis-Harris et al 2005) adapted from a UK questionnaire (Peckham et al 1989).

The nurse survey measured practice nurse characteristics, immunisation practices, knowledge and attitude towards immunisation, the barriers practice nurses perceived to improving immunisation, their attendance at professional immunisation education courses, their sources of immunisation information and areas about which they would like more information or support.

Ethical considerations

Ethics approval was obtained from the Regional Ethics Committee. Participants were provided with information sheets which guaranteed their confidentiality and written consent was obtained.

Analysis

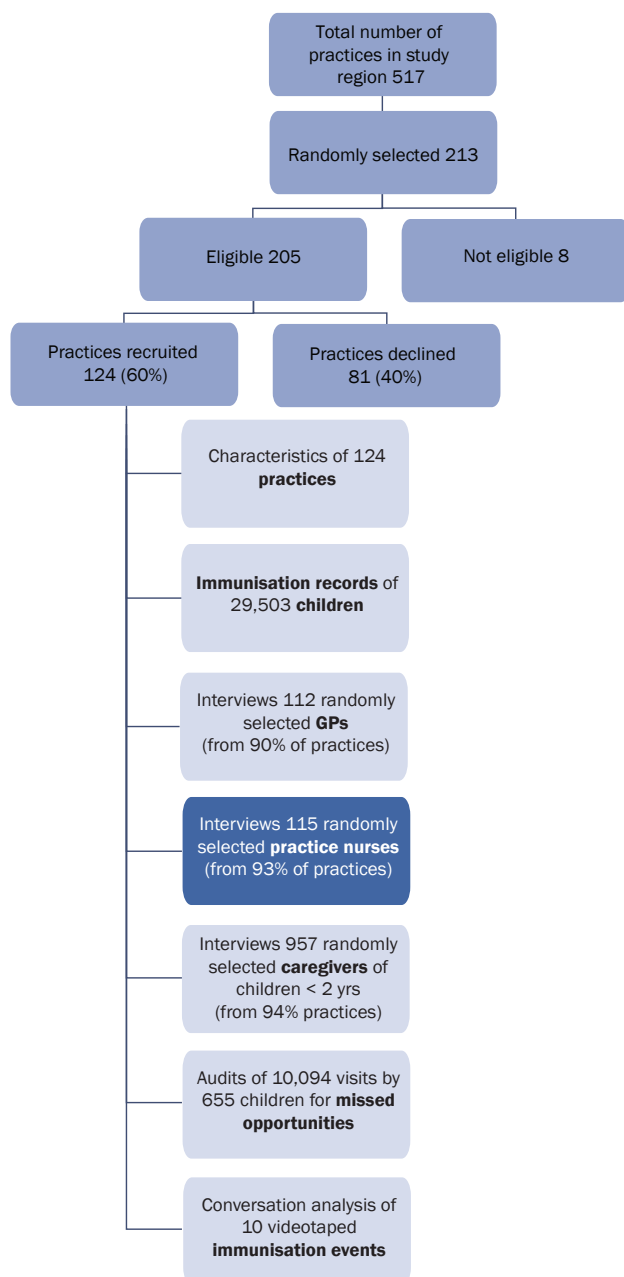
The distribution of variables across practices was determined and where necessary summarised to enable statistical analysis. Nurse characteristics, knowledge and attitudes were defined at the practice level. Descriptive analyses were performed, of immunisation coverage and timeliness, and of the variables describing nurse characteristics, knowledge and attitudes. Regression analysis was used to determine associations of each of the nurse variables with practice immunisation coverage and timeliness. These associations were adjusted for region (Midland and Auckland), practice governance (Māori and non-Māori governance) and for the social deprivation of population registered at each practice. Social deprivation was measured using the 2001 NZ index of social deprivation which divides households in New Zealand into 10 socioeconomic deprivation deciles (Salmond and Crampton 2002). For the multivariate models of nurse determinants of immunisation coverage and timeliness a base model was created that included region, practice governance, socioeconomic deprivation, and the median age of the children registered at each practice. To this base model were added the variables describing nurse characteristics that were identified as potentially important based upon previous published research and upon the results of the univariate analyses. The regression analyses were performed in SAS-PC 9.1 using proc GLM (General Linear modelling) (SAS Institute, Cary, NC, USA).

FINDINGS

Participant characteristics

There were 517 practices in the study region. Two hundred and thirteen (41%) were randomly selected, 108 (31%) in Auckland and 105 (61%) in Midland. A small number of practices were ineligible; mainly because they did not provide well-child care and 39% of selected practices declined to participate. The percentage of practices that declined was higher in Midland than Auckland (45% versus 30%, $P=0.015$).

One nurse from each of 115 of the 124 enrolled practices was interviewed (figure 1). From the full practice sample, four practices did not have nurses and two nurses covered two practices each. Nurses from three practices declined to participate.

Figure 1: Summary of data sets in overall study

Sixty-seven nurses were from practices in Auckland and 48 from the Midland region. All were female. The majority of the nurses were aged 40 and over ($n=79/115$, 69%) and 47/115 (41%) had been working as practice nurses for 10 to 19 years. This is representative of NZ primary health care nurses (Ministry of Health 2003b).

The number of registered children under the age of two per nurse full time equivalent (FTE) varied widely across the 124 practices ranging from 0 to 290

children (mean=60) per nurse FTE. Seventy-two (63%) of the nurses had dedicated time for immunisation follow-up and most (109/115; 95%) were exclusively responsible for delivery of immunisations.

Nurses' preferred source of information ($n=111/115$; 97%) was the Ministry of Health Immunisation Handbook. Most nurses ($n=100/115$; 87%) sought further information from practice nurse colleagues and 89/115 (77%) would go to GP colleagues for information. The most frequently requested information was that relevant to current issues in the media ($n=89/115$; 77%).

The majority of nurses (100/109; 96%) felt comfortable with their immunisation knowledge. Despite this, significant gaps were shown. With respect to contraindications to measles, mumps, rubella (MMR) vaccine, 61/115 (53%) correctly identified that a rash after eating eggs was not a contraindication to MMR immunisation, 23/115 (20%) stated they would delay MMR if the child had rhinorrhoea and low grade fever.

Nurses' opinions varied considerably on barriers to patients accessing services. Parental apathy or ambivalence was considered a barrier by 58 (47%) and parental fear by 68/109 (59%). The following factors were not identified as significant barriers: poor Ministry of Health direction ($n=72/115$; 62%) lack of provider funding ($n=87/115$; 76%), time ($n=83/115$; 72%) or provider knowledge ($n=92/115$; 80%). Of the 77 nurses who offered other suggestions, 22 (30%) considered anti-immunisation misinformation to be a significant barrier for parents.

Nurse characteristics associated with coverage and timeliness

After adjustment for region, Māori governance, social deprivation of the practice population and median age of the children registered at each practice, higher practice immunisation coverage was associated with: a lower ratio of nurses to children registered with the practice ($P=0.03$), nurse perception of increased parental apathy ($P=0.005$) or fear ($P=0.008$) as a barrier and her comfort in her knowledge about immunisation ($P=0.0004$) (table 1).

Table 1: Significant associations of practice nurse characteristics with immunisation coverage at the practice

Variable (number of practices)	Median practice immunisation coverage % (25 th , 75 th centile)				
Region	Auckland		Midland		
Governance	Māori n=7	Non-Māori n=61	Māori n=14	Non-Māori n=36	<i>p</i> value*
Practice infrastructure relevant to delivery by nurses					
Ratio of practice nurses to children (115)					
1:1 to 1:74 (85)	51% (36,64)	73% (64, 77)	58% (46, 63)	75% (71, 82)	<i>p</i> =0.03
1:75 to 1:1290 (30)	24% (24, 24)	67% (52, 71)	49% (47, 52)	75% (73,79)	
Nurse has dedicated time for immunisations (108)					
Yes (67)	47% (36, 58)	70% (62, 77)	62% (56, 65)	78% (67, 81)	<i>p</i> =0.07
No (41)	22%(20,24)	70% (45, 74)	52% (46, 59)	74% (70, 77)	
Nurse professional experience as practice nurse					
Five or more years of experience (107)					
Yes (81)	36% (20,58)	70% (63, 77)	59% (46, 65)	75% (73,80)	<i>p</i> =0.50
No (26)	24% (24, 24)	68%(45, 74)	59% (58, 62)	65% (55, 78)	
Nurse attitudes					
Perceives parental apathy as a barrier to immunisation (109)					
Yes (56)	58% (58,58)	70% (63, 75)	62% (43, 63)	78% (73, 82)	<i>p</i> =0.005
No (53)	24% (20, 36)	68% (52, 77)	57% (49, 67)	72% (62, 75)	
Perceives parental fear as a barrier to immunisation (109)					
Yes (66)	36% (20, 58)	71% (57, 79)	58% (46, 62)	75% (71, 81)	<i>p</i> =0.008
No (43)	24% (24, 24)	67% (62 ,74)	62% (56, 76)	74% (55, 78)	
Nurse knowledge					
Comfortable with own level of knowledge (109)					
Yes (105)	30% (22, 47)	70% (61, 77)	58% (40, 63)	75% (71, 80)	<i>p</i> =0.0004
No (4)	(-) [†]	75% (5,82)	(-) [†]	70% (70, 70)	

* Adjusted for region, practice governance and socioeconomic deprivation of the registered population and age of children <2 years old

[†] No practices in this category

After adjustment for these same four variables more timely practice immunisation delivery was associated with; a lower ratio of nurses to children registered with the practice ($P=0.007$), nurse perception of increased parental apathy as a barrier ($P=0.003$) and her comfort in her knowledge about immunisation ($P=0.049$), (table 2).

In the multivariate analysis of nurse determinants of practice immunisation coverage, four factors were independently associated with higher practice immunisation coverage (table 3). The factors positively associated with higher coverage were lower ratio of nurse to children ($P=0.04$), nurse's increased perception of parental apathy ($P=0.01$) or fear ($P=0.01$) as a barrier to immunisation and the nurse's

comfort in her immunisation knowledge ($P<0.001$). Three factors were independently associated with more timely practice immunisation delivery (table 3). These were lower ratio of nurses to children ($P=0.03$), nurse's increased perception of parental apathy ($P=0.02$) as a barrier to immunisation and the nurse's comfort in her immunisation knowledge ($P=0.01$).

In the multivariate models of coverage and timeliness the nurse variables accounted for an additional 12% of the variance in the coverage model and 11% of the variance in the timeliness model over and above that explained by region, practice governance, social deprivation and age of the children.

Table 2: Significant associations of practice nurse characteristics with immunisation timeliness at the practice

Variable (number of practices)	Median practice immunisation coverage (%) (25 th , 75 th centile)				
Region	Auckland		Midland		
Governance	Māori n=7	Non-Māori n=61	Māori n=14	Non-Māori n=36	<i>p</i> value*
Practice infrastructure relevant to delivery by nurses					
Ratio of practice nurses to children (115)					
1:1 to 1:74 (85)	37% (30, 46)	60% (47, 68)	44% (25, 57)	59% (47, 63)	<i>p</i> =0.007
1:75 to 1:1290 (30)	17% (17, 17)	52% (44, 66)	36% (31, 40)	61% (56, 64)	
Nurse attitudes					
Perceives parental apathy as a barrier to immunisation (109)					
Yes (56)	47% (47, 47)	60% (49, 68)	50% (36, 60)	60% (49, 63)	<i>p</i> =0.003
No (53)	23% (17, 32)	55% (40, 66)	42% (28, 54)	58% (36, 66)	
Nurse knowledge					
Comfortable with own level of knowledge (109)					
Yes (105)	28% (20, 40)	59% (44, 66)	44% (28, 57)	59% (47, 63)	<i>p</i> =0.05
No (4)	-†	76% (11, 78)	±	47% (47, 47)	
A cold is not a contraindication (107)					
Yes (83)	23% (17, 32)	58% (43, 66)	44% (28, 50)	60% (47, 64)	<i>p</i> =0.10
No (24)	47% (47, 47)	65% (49, 75)	62% (40, 67)	58% (35, 61)	
Completed a vaccination training course (109)					
Yes (102)	23% (17, 47)	58% (44, 66)	43% (25,52)	59% (47,63)	<i>p</i> =0.09
No (7)	32% (32, 32)	69% (58, 75)	64% (64, 64)	58% (58, 58)	

* Adjusted for region, practice governance and socioeconomic deprivation of the registered population and age of children <2 years old

† No practices in this category

Table 3: Multivariate analysis of practice nurse association with practice immunisation coverage and timeliness

	Association with coverage	Association with timeliness
R-squared for model	0.54	0.39
Number of practices in model	98	100
Region	<.0001	0.102
Social deprivation	<.0001	<.001
Median age of children registered at the practice	<.0001	NS
Māori practice governance	0.039	0.056
Ratio of nurse to children in the practice	0.04	0.03
Nurse perceives parental apathy as a barrier to immunisation	0.01	0.02
Nurse perceives parental fear as a barrier to immunisation	0.01	–*
Nurse comfortable with own level of knowledge	<0.001	0.01

* This variable not included in multivariate model of practice immunisation timeliness

Study limitations

One nurse from each practice was interviewed and their responses may not reflect those of all the nurses in the practice. Immunisation coverage and timeliness was assessed as a ‘one-off’ measure and the precision would be lower for practices with fewer children under two years of age. Coverage and

timeliness were assessed based on data obtained at the practice via the computerised query, thus they are dependent on the quality of data entry at the practice level. Data quality has been shown to vary depending on the practice management system used and the manner in which data is entered (Goodyear-Smith et al 2008).

Study strengths

The authors obtained a random sample of nurses with a high level of participation (93%). Data were collected and analysed maintaining the nurse data set as a distinct entity within the primary care variables. An independent, standardised and rigorous assessment of coverage and immunisation timeliness was used.

DISCUSSION

Practice nurses fulfil the principal role in immunisation delivery within primary care in NZ.

Nurse to child ratios

Nurses were responsible for immunisations in 95% of practices and are critical for successful program delivery. The nursing workforce is relatively mobile and NZ is affected by global nursing shortages (Kent et al 2005). Nurse to patient ratios have been associated with mortality rates in the hospital setting (Aiken et al 2003). It was found that practices with relatively more nurses, particularly experienced ones, were able to immunise their population more completely and in a timelier manner.

Nurse knowledge

Nurses were more likely to seek information from practice nurse colleagues than GPs suggesting a high level of expertise. Most nurses were confident in their knowledge despite significant gaps being shown. Lacking confidence was associated with lower practice coverage and more delay.

The wide variance in correct answers in this study is concerning. Knowledge gaps create the opportunity for conflicting advice that in turn leads to parental confusion delayed decision-making and delayed immunisations.

An often cited barrier to role expansion of the practice nurse includes inadequate education programs (Patterson et al 1999, Minto 2006, Ministry of Health 1998). A previous NZ study has shown that vaccinator training is associated with higher immunisation coverage (Petousis-Harris et al 2005). The finding that nurse comfort in immunisation knowledge

is a predictor of better practice immunisation delivery, emphasises the importance of continued education.

Nurse Attitudes

It was found that nurse attitudes and increased perceptiveness around the parental barriers of apathy to, and fear of, immunisation were associated with higher uptake and timeliness. As attitudes are related to decision-making and depend on situational context (Prislin et al 2002), these perceptions may prompt the nurse to recommend immunisations more frequently and with greater empathy.

CONCLUSIONS

Nurses may be considered the immunisation leader in many practices, where their knowledge is sought after; they administer almost all childhood immunisations and invest a substantial amount of time with caregivers. Higher immunisation coverage is due, in part, to having an adequate number of nurses who are experienced, knowledgeable and can communicate well with caregivers. Improving nursing performance in general practice may contribute to further improvement in NZ immunisation coverage.

Investing in and retaining nursing staff needs to be considered in strategies to achieve and maintain high immunisation coverage. The nurse/child ratio could be explored as a useful practice management measure.

Further research could incorporate assessment of nurse understanding and communications on vaccine safety and efficacy.

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CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

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Occupational stress in the Australian nursing workforce: a comparison between hospital-based nurses and nurses working in very remote communities

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KEY WORDS

Hospital-based Nursing, Remote Area Nursing, Occupational Stress, Job Demands-Resources Model, Psychological Distress, Emotional Exhaustion, Work Engagement, Job Satisfaction.

ABSTRACT

Objective

To compare workplace conditions and levels of occupational stress in two samples of Australian nurses.

Design

The research adopted a cross-sectional design, using a structured questionnaire.

Setting

Health centres in very remote Australia and three major Australian hospitals.

Subjects

349 nurses working in very remote Australia and 277 nurses working in three major hospitals in South Australia and the Northern Territory.

Main Outcome Measures

The main outcome measures were psychological distress (assessed using the General Health Questionnaire-12), emotional exhaustion (assessed using the Maslach Burnout Inventory), work engagement (assessed using the Utrecht Work Engagement Scale-9) and job satisfaction (assessed using a single item measure based on previous relevant research).

Results

Results revealed that nurses working in major Australian hospitals reported higher levels of psychological distress and emotional exhaustion than nurses working very remotely. However, both groups report relatively high levels of stress. Nurses working very remotely demonstrated higher levels of work engagement and job satisfaction. There are common job demands and resources associated with outcome measures for both nurses working very remotely and nurses working in major hospitals.

Conclusion

This research has implications for workplace interventions and the retention of staff in both hospitals and remote area health care facilities.

INTRODUCTION

International reviews have demonstrated high levels of occupational stress in various health and community service professions, including nursing (Dollard et al 2007; Michie and Williams 2003; Bakker et al 2000). Indeed, stress in nursing has been an area of considerable interest and research for almost half a century (Menzies 1960). Decades of research documents a multitude of workplace stressors and their impact on various outcome measures, such as productivity, quality of patient care and worker health and well-being. Some studies cite a significantly higher incidence of suicide for female nurses than the national average (Munro et al 1998), while other studies have highlighted a reduced life expectancy for those working in the profession (Morton-Cooper 1984).

Whilst there is some degree of consistency in the literature about common nursing stressors, the occupational stress experience can vary for nurses depending on the ward or unit in which he/she works. This concept has been accepted by a number of researchers, and accordingly, nursing research has investigated occupational stress across a variety of nursing specialty areas. Psychiatric nursing (Brown et al 1995), critical care nursing (Sawatzky 1996), geriatric nursing (Hallberg and Norberg 1993) and neonatal nursing (Gribbins and Marshall 1982) are some areas receiving more focused attention. Findings reveal that perceptions of stressors, as well as the experiences of occupational stress, vary considerably between these different nursing specialities.

In line with the general nursing stress research, there is little dispute that nurses working in remote regions also suffer from high levels of occupational stress (Lenthall et al 2009). Remote communities in Australia suffer the poorest health outcomes (Australian Institute of Health and Welfare 2008) with fewer health care professionals per capita to provide the necessary health services (Productivity Commission 2006). Nurses working remotely are required to attend to wide-ranging client needs that often lie beyond the scope of metropolitan nursing practice. Extended professional responsibilities

include the provision of services such as primary health care, trauma, health promotion and disease prevention, accident and emergency, acute care and chronic disease management, as well as the provision of care for mental health issues, substance misuse, domestic violence and child abuse (Kelly 1998).

The remote context is very demanding (Wakeman 2004) and these conditions have been associated with elevated levels of occupational stress (Willis 1991) and high workforce turnover (Kennedy et al 2003). Compared to nursing research conducted in hospital-based health care administrations, scant research has examined occupational stress in the remote area nursing workforce (Eley and Baker 2007; Yuginovich and Hinspeter 2007; Albion et al 2005; Lea and Cruickshank 2005; Hegney et al 2002a; Hegney et al 2002b; Hanna 2001; Fisher et al 1996). Reasons for resignation have been explored through qualitative methodologies, identifying issues such as lack of staff, lack of management support, lack of time off, limited financial resources, limited opportunities for professional development, professional isolation, on-call demands, unavailability of locum relief, family and schooling matters, and concerns for personal safety (Eley and Baker 2007; Dade-Smith 2004; Kennedy et al 2003). In relation to the issues of personal safety, workplace violence has also been identified as a contributing factor in remote nursing turnover (Morrell 2005; Fisher et al 1995), with further research highlighting that increased exposure to violent or traumatic incidents in the workplace places nurses working remotely at a greater risk of developing conditions such as Posttraumatic Stress Disorder (Kelly 1999). In a sample of Queensland rural health professionals, Albion et al (2005) found elevated distress levels for nurses specifically, and lower levels of job satisfaction.

Evidently, occupational stress is an issue for nurses working in both hospital-based settings and remote health care facilities. The present study aimed to assess and compare job conditions (i.e. job demands and resources) and psychological well-being (i.e. psychological distress, emotional exhaustion, work engagement and job satisfaction) in these two nursing populations.

METHOD

The research was cross-sectional in design. A structured questionnaire was distributed to 1,007 nurses working in very remote regions across Australia. Remoteness was identified using the ARIA+ categorisation of 'very remote' (score of 10.53–15) (Australian Institute of Health and Welfare 2004). Various recognised methods were adopted to maximise survey return, including personalised cover letters and non-monetary rewards (Nakash et al 2006; Gore-Felton et al 2002). A database of remote nurse workplaces belonging to the Council of Remote Area Nurses of Australia (CRANA) was accessed for the study. This database was subsequently updated and refined. The questionnaire was also distributed to 1,600 nurses working in three major hospitals in South Australia and the Northern Territory. Three hospitals agreed to participate in the study and consequently promoted survey distribution through their respective administrative systems.

Ethics approval was granted by the Central Australian Human Research Ethics Committee, the Human Research Ethics Committee of the Northern Territory Department of Health and Community Services, and two university-based human research ethics committees.

The questionnaire yielded self-report data assessing the various workplace demands and resources, work outcomes and demographic information. The data were analysed using the Statistical Package for the Social Sciences (SPSS) for Windows, version 16.

Job Demands

Job demands were assessed using the Nursing Stress Scale (NSS) (Gray-Toft and Anderson 1981). The 34-item instrument consists of seven factors, or seven major sources of stress, including workload, conflict with physicians, conflict with other nurses and supervisor, death and dying, inadequate preparation to deal with the emotional needs of patients and their families, lack of staff support and uncertainty concerning treatment. The scale provides a list of nursing situations commonly perceived as stressful (e.g. "the death of a patient") and asks respondents "How often in your present workplace or unit have

you found the situation to be stressful?". Responses correspond with a 4-point scale, ranging from 0 (*never*) to 3 (*very frequently*). The scale has sound internal reliability ($\alpha=.90$).

Job Resources

Supervision and Social Support were measured using their respective subscales from the Job Content Questionnaire (JCQ) (Karasek et al 1998). Each subscale includes 4 items, with statements such as "My supervisor is concerned about the welfare of those under him/her" (Supervision) and "People I work with are competent in doing their job" (Social Support). Responses correspond with a 5-point scale, ranging from 0 (*strongly disagree*) to 4 (*strongly agree*). The Supervision sub-scale has a Cronbach's alpha of .92. The Social Support sub-scale has a Cronbach's alpha of .83.

Possibilities for Development and Job Control were assessed using their respective sub-scales from the Copenhagen Psychosocial Questionnaire (COPSOQ) (Kristensen 2000). The Job Control sub-scale is comprised of 14 items, such as "I can decide when to take a break". Responses correspond with a 5-point scale, ranging from 0 (*always*) to 4 (*never*). The scale yields a Cronbach's alpha of .87. The Possibilities for Development sub-scale has 3 items. Items ask respondents questions such as, "Does your work require you to take initiative?". Responses, once again, correspond with a 5-point scale, ranging from 0 (*to a large extent*) to 4 (*to a very small extent*). The scale has a Cronbach's alpha of .74.

The final job resource of measurement in this study was Opportunity for Professional Development. This was a purpose-designed scale based on the work of Aiken and Patrician (2000). In consideration of their research surrounding organisational traits of hospitals, it was decided to take a measure of continuing education and career development opportunities. The scale is four items and yields a Cronbach's alpha of .84. Respondents are presented with statements such as "There are active in-service/continuing education programs for me". Responses range from 0 (*strongly disagree*) to 4 (*strongly agree*).

Psychological Distress and Emotional Exhaustion

Measurement of psychological distress and emotional exhaustion was achieved using the General Health Questionnaire-12 (GHQ-12) (Goldberg and Williams 1991) and the Maslach Burnout Inventory (MBI) (Maslach et al 1996), respectively. The GHQ-12 includes 12 questions such as, "Have you recently lost much sleep over worry?". Participants are required to respond on a 4-point scale ranging from 1 (*not at all*) to 4 (*much more than usual*). The GHQ is a well-established scale with high internal consistency ($\alpha=0.91$). The emotional exhaustion subscale from the MBI includes 5 items such as "I feel emotionally drained from my work", with responses corresponding with a 7-point scale ranging from 0 (*never*) to 6 (*everyday*). This scale also demonstrates high internal consistency ($\alpha=0.93$).

Work Engagement and Job Satisfaction

Work engagement was assessed using the Utrecht Work Engagement Scale-9 (Schaufeli and Bakker 2003). This scale presents 9 items such as "I am enthusiastic about my job", and asks respondents to indicate the frequency with which they experience such feelings, on a 7-point scale ranging from 0 (*never*) to 6 (*everyday*). The Utrecht Work Engagement Scale demonstrates sound internal consistency ($\alpha=0.91$). Finally, job satisfaction was measured with a single item asking participants, "Taking everything into consideration, how do you feel about your job?" (Warr et al 1979). Again, responses correspond with a 7-point scale, ranging from 0 (*extremely dissatisfied*) to 6 (*extremely satisfied*).

FINDINGS

Descriptive Statistics

Three hundred and forty-nine (349) nurses working in very remote Australia participated in the study, generating an overall response rate of 34.6%. The majority of respondents from this sample were female (88.5%), with ages ranging from 20 to 68 years ($M=4$, $SD=11$). The response rate for nurses working in major hospitals was lower (17.6%). Two hundred and seventy-seven (277) nurses comprised this sample; 89.6% were female, ranging in age from 22 to 71 years ($M=42$, $SD=11$).

Psychological Distress and Emotional Exhaustion

Nurses working in major Australian hospitals reported higher levels of psychological distress than nurses working remotely (χ^2 (df=612)=1.42, *n.s.*), although the difference was not statistically significant. The sample of nurses working in major hospitals did however demonstrate significantly higher levels of emotional exhaustion than nurses working remotely (χ^2 (df=621)=3.07, $p<.01$).

Work Engagement and Job Satisfaction

A comparison of means also demonstrated a statistically significant differences for work engagement (χ^2 (df=597)=2.31, $p<.05$) and job satisfaction (χ^2 (df=624)=2.15, $p<.05$) with nurses working in remote Australia reporting higher levels for both of these variables than nurses working in selected Australian hospitals. The means and standard deviations for all outcome measures can be viewed in table 1.

Table 1: Means and standard deviations for all outcomes measures for nurses working in very remote Australia (n=349) and nurses working in major hospitals (n=277).

Outcome Measure	Hospital M (SD)	Remote M (SD)
1. Psychological Distress	13.7 (6.4)	13.0 (5.8)
2. Emotional Exhaustion	27.5 (15.2)	23.9 (14.0)**
3. Work Engagement	3.96 (1.27)	4.19 (1.16)*
4. Job Satisfaction	3.79 (1.34)	4.01 (1.22)*

**=difference significant at $p<.01$

*=difference significant at $p<.05$

Job Demands and Resources – Nurses working in Major Hospitals

All job demands were significantly positively correlated with psychological distress and emotional exhaustion ($p<.01$) for nurses working in major hospitals. Conflict with other nurses and supervisors ($r=.43$, $p<.01$) and lack of support ($r=.42$, $p<.01$) demonstrated the strongest relationships with psychological distress, while workload ($r=.55$, $p<.01$), uncertainty concerning treatment ($r=.45$, $p<.01$), and conflict with physicians ($r=.45$, $p<.01$) held the strongest relationships with emotional exhaustion (see table 2).

Furthermore, all job resources were significantly positively correlated with work engagement and job satisfaction ($p < .01$). Possibilities for development was the resource most strongly associated with work engagement ($r = .30$, $p < .01$), while supervision ($r = .46$, $p < .01$) and opportunity for professional development ($r = .41$, $p < .01$) demonstrated the strongest relationships with job satisfaction (see table 3).

Table 2: Means, Standard Deviations and Correlations for Nurses Working in Major Hospitals (N=277) and Nurses Working in Very Remote Australia (N=349) between Job Demands and Adverse Psychological Health Outcome

Job Demand	M (SD)	Psychological Distress	Emotional Exhaustion
1. Hospital nurses			
Death and dying	6.6 (3.3)	.19**	.28**
Conflict with physicians	4.8 (2.1)	.25**	.45**
Inadequate preparation	2.3 (1.4)	.25**	.38**
Lack of support	2.9 (1.9)	.42**	.44**
Conflict with nurses	5.0 (2.6)	.43**	.44**
Workload	9.3 (3.9)	.37**	.55**
Uncertainty re treatment	5.0 (2.4)	.34**	.45**
2. Remote nurses			
Death and dying	6.6 (3.1)	.20**	.23**
Conflict with physicians	4.9 (2.1)	.34**	.28**
Inadequate preparation	2.7 (1.3)	.21**	.17**
Lack of support	2.7 (1.9)	.31**	.30**
Conflict with nurses	4.0 (2.3)	.32**	.32**
Workload	9.0 (3.6)	.29**	.43**
Uncertainty re treatment	5.0 (2.3)	.22**	.20**

**= correlation significant at $p < .01$ (two-tailed)

re=concerning

Job Demands and Resources – Nurses working in Very Remote Australia

Analyses revealed statistically significant positive relationships between all job demands and psychological distress and emotional exhaustion

($p < .01$) for nurses working remotely. Conflict with physicians ($r = .34$, $p < .01$) and conflict with other nurses and supervisors ($r = .32$, $p < .01$) held the most significant relationships with psychological distress, while workload ($r = .43$, $p < .01$) and conflict with other nurses and supervisors ($r = .32$, $p < .01$) were the job demands most strongly correlated with emotional exhaustion (see table 2).

In assessing the relationships between job resources and positive work outcomes, analyses revealed statistically significant correlations between all job resources and work engagement and job satisfaction ($p < .01$). Work engagement was most strongly correlated with job control ($r = .32$, $p < .01$) and possibilities for development ($r = .30$, $p < .01$). Possibilities for development ($r = .44$, $p < .01$) and opportunity for professional development ($r = .43$, $p < .01$) were the job resources which held the most significant relationships with job satisfaction (see table 3).

Table 3: Means, Standard Deviations and Correlations for Nurses Working in Major Hospitals (N=277) and Nurses Working in Very Remote Australia (N=349) between Job Resources and Positive Work Outcomes

Job Resource	M (SD)	Work Engagement	Job Satisfaction
1. Hospital Nurses			
Supervision	10.5 (3.6)	.21**	.46**
Social Support	10.9 (2.5)	.17**	.36**
Opportunity for PD	9.7 (3.2)	.18**	.41**
Job Control	29.0 (8.6)	.21**	.36**
Possibilities for Devt	1.8 (1.9)	.30**	.36**
2. Remote Nurses			
Supervision	10.1 (3.9)	.19**	.42**
Social Support	11.1 (2.8)	.21**	.36**
Opportunity for PD	8.8 (3.6)	.22**	.43**
Job Control	23.7 (8.5)	.32**	.40**
Possibilities for Devt	1.3 (1.7)	.30**	.44**

**=correlation significant at $p < .01$ (two-tailed)

PD=Professional Development

Devt=Development

DISCUSSION

Nurses working in major Australian hospitals reported higher levels of psychological distress and significantly higher levels of emotional exhaustion than nurses working in remote Australia. We propose the possibility that the prevailing work cultures surrounding the treatment of occupational stress in each of these nursing contexts may lend itself to some justification. For example, a nurse suffering from stress in a hospital-based health care administration is often presented with the options of accessing counselling from the designated Employee Assistance Program (EAP), assuming stress leave or applying for a ward transfer. While some of these options may also be available to nurses working remotely, staff relief is difficult to achieve in remote regions and consequently the nurse may remain in his/her position, minimising the issue and fostering a more self-reliant approach. According to Fisher et al (1996, pp. 198) nurses working remotely “are reluctant to draw attention to themselves and the state of their job conditions for fear of drawing unwanted media attention to local community problems”. This may help to explain the reportedly lower levels of psychological distress and emotional exhaustion for nurses working in very remote Australia.

Results also demonstrated that nurses working remotely reported higher levels of work engagement and job satisfaction than nurses working in major hospitals. This finding is consistent with previous relevant research. According to Hegney et al (1997), many nurses working remotely have made a deliberate decision to do so, often because of lifestyle and occupational factors that would be otherwise unavailable to them. Such factors include the remote environment itself and also the relatively autonomous, extended generalist role of remote nurses. Unlike nurses working in a metropolitan setting who perform more consistently in acute areas of practice and therefore consolidate the specialists roles they carry out, nurses working remotely reportedly derive increased job satisfaction from the clinical variety and the requirement to use a large range of advanced skills (Hegney et al 1999).

It is interesting to note that some job demands and job resources were consistent for both nursing populations in their relationships with work outcomes. Workload was significantly positively correlated to emotional exhaustion, while conflict with other nurses and supervisors was significantly positively correlated with psychological distress – for both samples. Furthermore, possibilities for development and opportunity for professional development were significantly positively correlated with work engagement and job satisfaction, respectively. Again, this finding applied to both hospital-based nurses and nurses working very remotely.

A limitation of the study is that the analysis is cross-sectional. Without longitudinal analysis we are not able to confirm the causal direction of the relationships. However, some weight is provided to our interpretation, given that our research is theory-based and several other studies support the directional hypothesis. Additionally, as we were only able to survey those employed at the time of survey distribution, we were unable to access data from those nurses who have left the profession. Results may consequently under-represent levels of stress and burnout in the two nursing populations.

CONCLUSION

Whilst levels of occupational stress were higher for nurses working in hospital-based settings than nurses working in very remote regions across Australia, occupational stress is clearly a significant workplace issue for nurses in both samples. Levels of stress in both nursing populations are undeniably high and present important implications for the psychological well-being of staff in both nursing contexts. Future research should consider workplace interventions that address job demands and increase job resources. While stressors themselves may be unique in each nursing field, demands and resources, and their impact on work outcomes may be similar for these two nursing populations.

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The nurse educator role in the acute care setting in Australia: important but poorly described

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KEY WORDS

nurse educator, clinical nurse educator, hospital based educator

ABSTRACT

Objective

The purpose of this paper is to describe the nurse educator role in the acute care setting in Australia.

Method

A literature review using Ganong's (1987) method of analysis was undertaken. Computerised databases were searched for articles published in English between 2000 and 2008 using the key words: 'education', 'nursing', 'nurse-educator', 'teaching methods', 'clinical', 'outcomes health care' and 'Australia'. Information was summarised to identify issues impacting on the nurse educator role using a standardised data extraction tool.

Results

The search strategies generated 152 articles and reports. The review identified that the nurse educator role is fundamental in supporting clinical practice and integral to developing a skilled and competent health workforce.

Conclusion

Confusion in nursing roles and role ambiguity contribute to the challenges for nurse educators in acute care. The absence of a national, standardised approach to role description and scope of practice in Australia may adversely impact role enactment. Further discussion and debate of the nurse educator role in Australia is warranted.

INTRODUCTION

The Australian health care system has experienced significant change in recent years and faces considerable challenges in continuing to provide world class health care services. In response to these challenges, the National Health and Hospitals Reform Commission (NHHRC) has identified a challenging reform agenda (National Health and Hospitals Reform Commission 2009). Issues addressed by the NHHRC include reviewing health service demand and expenditure, increasing the emphasis on patient care safety and quality, addressing inequities in health care access and outcomes and examining workforce models (National Health and Hospitals Reform Commission 2009). As nurses' play a major role in health care delivery in primary, secondary and tertiary care nurses' contribution in achieving health reform is indisputable (Needleman et al 2002). Ensuring that nurses have the appropriate skills, knowledge, competencies and professional values to achieve reform objectives is contingent upon their engagement in evidence-based education strategies.

Historically, nurse educators have played a critical role in the professional development of nurses and maintaining and advancing nursing practice standards (Conway and Elwin 2007). Their role in contemporary service models is less well defined (Conway and Elwin 2007). The nurse educator role in Australia has evolved over time and changed significantly following the transfer of nurse education from hospitals to universities (Conway and Elwin 2007). Prior to the introduction of baccalaureate nursing programs, acute care nurse educators assumed overall responsibility for student nurses as well as providing continuing and professional education of registered nurses.

A nurse educator is defined as a registered nurse who assesses, plans, implements and evaluates nursing education and professional development programs (Australian Nursing Federation 2009). They are also responsible for advancing practice development and student support rather than having complete responsibility for nurse education as in the academy

(Conway and Elwin 2007). To date their roles, scope of practice and contribution to patient outcomes is unclear (Conway and Elwin 2007). This lack of clarity is compounded by increasing scrutiny of positions not directly responsible for patient care. Therefore it is timely to consider the role and contribution of the nurse educator to patient care outcomes and the professional development of nursing (Conway and Elwin 2007).

This paper reports on an integrative literature review of the nurse educator role with a focus on the role in acute care hospitals within the Australian health care system. It is argued that the nurse educator role is critical to the continuing professional development of the nursing and broader health workforce and influences the delivery of safe, quality patient care. The integrative review has allowed the summary and synthesis of these issues and identification of challenges to role enactment and advancement.

The Australian health care system

Australia supports a system of universal health care coverage and although there is an increasing emphasis on community-based care, acute hospitals still remain an important focus of care. Nurse educators work within acute care hospitals in public and private sectors within cities, suburban, rural and remote regions across Australia. Multidimensional system, provider and patient factors have significantly impacted professional practice and patient outcomes in recent years prompting service and system reviews at State and Federal government levels. Several reviews have debated health care relating to expenditure, service demands, inequities in health care access and outcomes, workforce shortages, patient care quality and safety and the lack of integration across State and Federal systems (National Health and Hospitals Reform Commission 2009). The Australian health care system services a culturally diverse society with significant complex care needs including Aboriginal and Torres Strait Islanders (Australian Institute of Health and Welfare 2009). Nurse educators work in acute care facilities within these communities across Australia.

Workforce Challenges

Landmark nursing workforce reports have identified the requirement for a national focus on the interface between nursing, health and workforce development (Heath 2000; National Nursing and Nursing Education Taskforce 2006). This includes modification to the profile and educational preparation of future health care workers to meet service and consumer demands for care (National Nursing and Nursing education Taskforce 2006). These issues have driven modification of skill mix in nursing in Australia (Conway and Elwin 2007).

Although nurse education has been in the tertiary settings since the mid-1980s, there are calls to change the nursing workforce focus from a predominately baccalaureate preparation to one of much greater diversity through broadening the scope of practice of enrolled nurses and the creation of new categories of health workers (Daly et al 2008). Changes to the enrolled nurse role and scope of practice have been made including authorisation to administer medications (Conway and Elwin 2007). This change is coupled with the emergence of a health workforce of increasingly divergent knowledge and skills who some argue have limited educational preparation to address the population's changing health care needs (Conway and Elwin 2007; Daly et al 2008).

These trends have emerged not merely to address workforce shortages, but to attend to the increasing needs of individuals with chronic conditions and the elderly. The described role diversity within nursing and the broader health workforce mean that the educative and supportive role of the nurse educator is likely to become more critical to support knowledge, skill and clinical practice development (Conway and Elwin 2007).

The changing work environment

The role of the nurse educator in the acute care system has been eroded in a push towards more generic health professional and health worker education programs (Conway and Elwin 2007). Although this is advantageous in developing interprofessional relationships, it can be problematic as there is

potential to lose nursing identity and compromise patient safety and outcomes in the ongoing quest to address the global shortage of health care workers (Daly et al 2008). The introduction of the Health Training Package for example means that a new cadre of health workers with varied educational preparation who may provide "basic care" are evident in hospitals. The training package is a nationally recognised framework that provides pathways to a wide variety of health care work and qualification options and facilitates articulation of both regulated and unregulated workers to engage in health care provision (Conway and Elwin 2007). Whilst these initiatives may address staffing deficits in the short term, they have potential to negatively impact the achievement of safe, quality patient outcomes (Duffield 2007; Daly et al 2008). A direct consequence for the registered nurse of a more diverse health workforce is the potential for a role shift whereby the registered nurse may not be the direct care provider but be responsible for delegation and supervision of care as a consequence of the changing scope of practice of nurses and other health care workers (Conway and Elwin 2007).

The prediction that almost 60% of the current Australian nursing workforce will retire in the period 2006 – 2026, challenges the capacity of the nursing profession and the health care system to recruit and retain sufficient appropriately skilled staff, of the right skill mix, in the right geographic location to meet service demands and importantly achieve safe patient outcomes (Duffield et al 2007).

METHOD

An integrative review of the literature utilising Ganong's (1987) method of analysis was undertaken. An integrative literature review is a method for assessing information based on a question or hypothesis that guides the review, interpretation and synthesis of findings (Weaver and Olson 2006; Whittemore and Knafl 2005; Ganong 1987). Commonly, an integrative literature review is useful to gather and integrate information to inform scholarly debate and suggest further areas for research.

The integrative review method was selected as it provides a structured approach to the identification and interpretation of themes and differences in the literature (Weaver and Olson 2006). The Cumulative Index of Nursing and Allied Health (CINAHL), Science Direct databases, and the Google search engine were employed in the literature search of Australian publications from 2000 to 2008. Search terms were 'education', 'nursing', 'nurse-educator', 'teaching methods', 'clinical', 'outcomes health care' and 'Australia'. Reference lists of retrieved articles and reports were hand-searched for any additional references. Questions guiding the review were: (1) What is the role of the nurse educator in the contemporary Australian health care system? (2) What is the impact of the nurse educator role on patient outcomes? and (3) What are the key challenges facing the nurse educator role?

Inclusion and Exclusion

Inclusion criteria required that references focus on the nurse educator role and nurse education in the Australian acute care setting and be published in English between 2000 and 2008. References not meeting these criteria were excluded.

FINDINGS

The search strategies generated 152 articles and reports. Each paper was analysed by two reviewers using the research questions as a guide. Key themes namely, role ambiguity, educational preparation for the role and career pathways, nursing workforce shortages and partnerships with academia were generated using the method of thematic analysis which draws together common issues and concerns. A feature of the review was the limited discussion of the nurse educator role. Within the literature, the term 'nurse educator role' was used generically making it difficult to differentiate between roles in the university and health care sector.

The literature is reported beneath headings corresponding to the questions that guided the review process and emergent themes that impact the nurse educator role.

The role of the nurse educator in the contemporary Australian health care system

The role of the nurse educator is multi-faceted and dependent on the context of practice and employment (Conway and Elwin 2007). Nurse educators in America and the United Kingdom may have dual roles in academia and the hospital setting (Koh 2002; Billings 2003; Conway and Elwin 2007). In contrast, nurse educators in Australia work primarily within hospitals. They are considered to be expert nurses and their role is pivotal to the integration of theory and clinical practice (Conway and Elwin 2007). This role in Australia has evolved from one where the hospital based educator had overall responsibility for the pre-registration education of nurses and professional development in a hospital based system, to providing student support and facilitation of professional education, nursing practice and organisational goals (Conway and Elwin 2007). Some educators are responsible for organisation wide programs for example preceptor programs and others work within a clinical specialty such as cardiology (Conway and Elwin 2007). It is apparent that this is a complex and varied role (Mateo and Fahje 1998; Conway and Elwin 2007).

Conway and Elwin acknowledge the diversity of nurse educator role descriptions and boundaries (Conway and Elwin 2007). Also there is a blurring across various categories of nurses providing education in hospitals (Conway and Elwin 2007). This lack of clarity may adversely impact role description and enactment (Conway and Elwin 2007; Dubois and Singh 2009). Similar issues in defining and describing the nurse educator role are also seen internationally as roles and functions blur across practice settings (Billings 2003; Gillespie and McFetridge 2006). The nurse educator practices in accordance with the competency standards for registered nurses developed by the Australian Nursing and Midwifery Council (2005). Nurse educators may also practice in accordance with the competency standards for nurse teachers (educators either working in academia or the clinical arena) developed by the Australian Nurse Teachers Society (1998).

The impact of the nurse educator role on patient outcomes

The impact of patient acuity, decreased length of stay and increased numbers of adverse events is featured prominently in the literature, yet little attention has been paid to the impact or role of nurse educators in addressing these dilemmas. An emerging body of literature has determined the importance of a well-educated nursing workforce, particularly in the acute care setting, to improve patient outcomes (Aiken et al 2003). Nurse-sensitive patient outcomes, or the nurse-led interventions that contribute to patient outcomes, are critical in determining the impact of nursing care on the patient journey (O'Brien-Pallas et al 2004; Tourangeau et al 2005; Duffield et al 2007). Changes in healthcare, decreasing length of stay, and an increasingly divergent nursing skill mix inextricably link with higher reporting of adverse patient events and outcomes (Buerhaus et al 2007; Duffield et al 2007; Rafferty et al 2007; O'Brien-Pallas et al 2004). Duffield's (2007) recent study of hospital nursing wards in NSW has demonstrated that adverse events decrease when a nurse educator is within a ward, identifying a relationship between nurse educator practice and safe patient outcomes (Duffield et al 2007).

DISCUSSION

Key challenges facing the nurse educator role

Contemporary health care mandates the continued growth and renewal of the nursing profession to address the nexus between education and practice in the clinical context. Challenges facing the nurse educator role have been minimally explored in the literature but should be considered in the context in which nurse educators' work and practice as health systems are driven by funding, policy and regulatory issues and the relationship between patient outcomes, the work environment, skill mix and workload are indisputable. Crisis management, coupled with emerging roles for alternate health workers, who may have limited educational preparation and no professional affiliations, have been identified as workplace trends in response to workforce deficits in the clinical environment

(Daly et al 2008). In the clinical practice domain, these factors may negatively impact patient care, safety and outcomes. To prevent this, recognition of changing workforce roles and associated diversity of educational attainment among health workers is necessary to lead educational change and support new service models (Conway and Elwin 2007). Nurse educators also have an intrinsic role to play in the development of nursing, education and health research and are well placed to initiate or collaborate in research focussing on clinical practice and education. Engaging in collaborative clinical and academic research partnerships may further contribute to dynamic and innovative education and teaching practices actively supporting the intensive learning required by nurses to attain expert clinical skills and competency.

At a system level, sustaining and developing a sufficient nurse educator workforce is essential to continue the development of a competent, well educated workforce – a key health reform issue. As nursing workforce shortages continue to grow and the sustainability of this position is questioned, shortages of nurse educators may also emerge. Role, identity, nurse educator education and career pathways, were identifiable themes throughout the literature reviewed. Addressing these challenges may contribute to positive role enactment and advancement and importantly sustaining this important nursing workforce role.

Challenges

1. Role identity, ambiguity and conflict

Health workforce resources are reportedly underutilised (Oelke et al 2008; Dubois and Singh 2009), although factors influencing role optimisation are not well understood. A critical factor in addressing workforce shortages and retention is ensuring nurses work to their full scope of practice (Oelke et al 2008). Although the concepts of 'nursing scope of practice', and 'role enactment' are widely used in the literature, they are not clearly defined in terms of the nurse educator role (Oelke et al 2008). This lack of clarity has been further compounded following the restructuring of nursing in recent years and minimal

acknowledgement of the effect of these changes and the subsequent potential for role conflict and ambiguity within nursing (Conway and Elwin 2007). As other nursing specialist roles have emerged and assumed responsibility for engaging nurses in education in practice settings, nurse education is no longer the exclusive mandate of the nurse educator (Conway and Elwin 2007). Conway and Elwin (2007) acknowledge that role identity and enactment may be eroded and blurred in health environments experiencing constant change and where there is overlap between roles supporting clinical education. The described changes have significantly impacted the nurse educator role and role erosion has occurred. The threat of intra-professional discord, professional isolation and a lack of supportive relationships may remain whilst the nurse educator role remains poorly defined (Conway and Elwin 2007). Also the role may continue to be undervalued and role enactment, job satisfaction and staff retention may be negatively impacted unless role uncertainty is resolved (Conway and Elwin 2007). If nurse educators are to continue to facilitate empowerment of other nurses and health workers in developing skill proficiency, critical thinking and reasoning skills, enabling nurse educators to articulate their role and scope of practice is essential (Conway and Elwin 2007). This is important at a time when sustainability of the role is questioned (Conway and Elwin 2007) and as enabling health professionals may enhance their productivity (Scott 2009). Importantly, the advancement of nurse education practice is contingent upon clarification of role boundaries and role description (Conway and Elwin 2009). Lastly, the literature is devoid of comment regarding the interface between the various nurse educator clinical roles. A strategic, structured approach to discipline specific and interprofessional clinical education in the practice environment is required.

2. Educational preparation of the nurse educator

Registered nurses in Australia practice in accordance within competency standards developed by the Australian Nursing and Midwifery Council (2005). The nurse educator is no different from the registered

nurse, midwife or specialty nurse in requiring core knowledge, skills and competence to perform their role. It is also argued that whilst the nurse educator needs to be clinically competent, this alone is insufficient to perform successfully. The knowledge and expertise nurse educators acquire through their educational preparation and experience inform their competency when facilitating learning, designing engaging learning experiences, and evaluating learner outcomes (National League of Nursing 2003).

Educational preparation for nurse educators in Australia is not mandated by the profession or any specific regulatory authority. Role criteria and education qualifications required vary from hospital to hospital and state to state. Yet, the expectations of the profession and consumers are that nurses must be well educated to positively impact on nursing practice and patient outcomes. The ad-hoc and non-standardised educational requirements of the nurse educator role are not helpful in fostering the identity and credibility of the nurse educator. Increases in new graduate nurse numbers enter the workforce requiring clinical education, support and mentoring has resulted in nurse educators with a diverse range of skills and professional qualifications being employed (Conway and Elwin 2007). Nurses in clinical practice need to be effectively supported to develop as lifelong learners. Nurse educators are responsible for creating engaging learning environments and experiences to support this. The authors argue they require knowledge and expertise in adult education principles to inform their practice. Clinical leadership, critical thinking, reflection, communication skills and knowledge of and commitment to learning and teaching processes are also required for nurse educators to perform successfully (Conway and Elwin 2007; Iliffe 2007; Oelke et al 2008). Knowledge and expertise nurse educators gain through postgraduate study and experience is instrumental in their design and facilitation of learning experiences and evaluating learner outcomes (Royal College of Nursing 2008). Current variations in the nurse

educator role, clinical competence and qualifications may complicate nurse educator preparation and subsequent role development. Study leave and fee support however, may enhance nurse educator participation rates in initial and continuing professional education and scholarship (National Nursing and Nursing Education Taskforce 2005). In light of recent public debate regarding the professional preparation of nurses (Jackson and Daly 2008), it may be timely to reconsider the role of the nurse educator and the educational preparation required to perform in the role.

3. Career pathways

Various reports (Heath 2002; Garling 2008) highlight the importance of ensuring a well educated and supported health workforce. In particular, educational support for newly qualified staff entering the workplace and the need to support the continuing clinical education of nurses is noted (Heath 2002). In response, the Commonwealth government has funded the support of undergraduate education in the clinical environment and the establishment of new clinical nurse educator positions (National Nursing and Nursing Education Taskforce 2005). Australian nurse educators may come from a variety of backgrounds. They may have experience as a preceptor, mentor, or have been a clinical specialist, clinical educator or manager prior to embarking on a career as a nurse educator. Yet the literature reviewed is devoid of discussion regarding a specific career pathway for nurse educators. It is argued that a clearly articulated, industry and specialty endorsed delineation of the nurse educator role and scope of practice, supported by a flexible career pathway would significantly contribute to the further development of the specialty. A defined career pathway may enhance nurse educator recruitment, job satisfaction, and a sustainable educator workforce as has occurred for other nursing roles. A flexible pathway facilitating educators to work both within academia and hospitals may also enhance the role and diminish the divide between academia and practice. This in turn may influence cooperative working partnerships and importantly curriculum innovation between

academia and the clinical setting further impacting safe evidence based practice and patient care outcomes. Significantly, these measures may assist, nurses, academics, management and other health professionals to gain insight into this complex and challenging role.

4. Partnerships with academia

Education in the practice setting requires reform to address the educational needs of the current and future nursing workforce to optimise safe patient care outcomes (National Nursing and Nurse Education Taskforce 2006; Daly et al 2008). The blurring of nursing roles regarding responsibility for educational interventions may cause conflict rather than collegiality and collaboration in nurse education. Substantive partnerships between nurse academics and nurse educators within disparate healthcare settings are imperative to enable nurses to continue to develop their skills and expertise and contribute to quality patient outcomes (Heath 2002; National League of Nursing 2003). These partnerships may engender a positive climate influencing the development of nursing practice and influencing safe patient care and importantly, the nursing profession.

Implications for policy, practice, research

Changes to the nurse educator role over time, although minimally described in the literature, have led to a decrease in the influence that nurse educators have, not only in the acute setting but also more broadly within the nursing profession. This is a broad generalisation and does not imply that nurse educators do not have a sphere of influence in nursing practice and on curriculum advisory boards. In spite of this the nurse educator plays a critical and dynamic role in transforming clinical practice, maintaining practice standards and supporting the professional role of the nurse and advancing nursing.

The information summarised above reflects the poorly characterised description of the nurse educator role in the acute care setting in Australia. Further, the discussion of the nurse educator role is inconsistent and sporadic. Conversely, many sources attest to the

importance of education and support of practice that optimises clinical outcomes (Aiken et al 2001; Heath 2002; Daly et al 2008, Garling 2008). Several features of the practice environment, in particular, the diversification of the workforce, underscore the importance of focussing on the nurse educator role. On the basis of this review, we recommend further research is required to elucidate the nurse educator role. In addition, despite considerable discussion in the global literature regarding the link between nursing care and patient outcomes, comment focussing on the relationship between the nurse educator, nursing care and the patient, in the context of how such interactions may influence patient outcomes, is limited. Given the current focus on this issue, further research is warranted.

Nurse educators have a pivotal role to play in the clinical environment preparing registered nurses to develop competence in assuming increasingly complex and challenging clinical leadership roles within the described diverse multidisciplinary teams of today (Conway and Elwin 2007). Nurse educators can also be instrumental in facilitating workplace postgraduate clinically based courses and continuing education programs. These programs facilitate and support degree-qualified registered nurses to achieve their potential to build capacity, interprofessional partnerships, and initiate and lead unprecedented reform in health care delivery at the point of care (Thorne 2006; Conway and Elwin 2007). An important emerging element of nurse educator practice is the advancement of interprofessional capability through interprofessional learning (Walsh et al 2005). The nurse educator is well placed to assume a clinical leadership role in interprofessional education in the practice environment and developing a team approach to problem solving and effective clinical decision making within the health team.

CONCLUSION

The literature acknowledges nursing education as the foundation for nurses to build clinical competence to provide safe patient care and the nurse educator is integral to nurses achieving this goal. However,

blurring across nursing roles providing education in clinical practice and the absence of a national, standardised approach to role description and scope of practice may adversely impact role enactment. Explicit identification of the role within the health workforce and clarification of role boundaries and role description is required to advance nurse educator practice. Further research is also required to identify the influence of the nurse educator in achieving safe patient outcomes.

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Nurses' experience establishing a nurse-led bladder cancer surveillance flexible cystoscopy service

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ABSTRACT

Objective

The aim of this article is to describe and evaluate the processes involved in setting up a nurse-led bladder cancer surveillance flexible cystoscopy service.

Setting

Day Surgery Unit, Royal Melbourne Hospital, Melbourne, Australia.

Subjects

Registered nurses, follow-up bladder cancer patients and the urological team.

Primary argument

As a result of inefficiencies in current practice including, waiting times, utilisation of doctors' time, poor documentation and communication and patients being lost to follow-up the existing system for bladder cancer surveillance was questioned.

Conclusion

This experience has resulted in the creation of a training-tool with competencies, patient pathways, guidelines and protocols. In turn there was a noticeable reduction in waiting times and improved communication and documentation resulting in a robust nurse-led bladder cancer surveillance service.

KEY WORDS

Bladder cancer surveillance, flexible cystoscopy, nurse cystoscopist, training tool, consent.

INTRODUCTION

The global incidence of bladder cancer is estimated at 356,600 new cases each year (Cancer Research 2002). Seventy-five to eighty-five percent are non-muscle invasive bladder cancers (NMIBC) (pTa, pT1, carcinoma in situ) confined to the mucosa or sub mucosa (Babjuk et al 2010; Sylvester et al 2006). The treatment and prognosis of bladder cancer depend upon its stage, grade, and other risk factors determining whether the cancer will recur or progress. Staging is based on how far the cancer has penetrated into the bladder wall tissues and tumours are classified as either low or high grade disease. Grading relates to how differentiated the cells are under a microscope.

Several factors are used to stratify whether a bladder cancer is low risk or high risk for recurrence and progression. These factors include the size, number, and appearance of the tumour(s), if it recurs early, and how deeply it invades into the bladder. Thirty to eighty percent of NMIBC cases will recur and up to 45% of cases will progress to muscle invasion within 5yrs (Babjuk et al 2010; Sylvester et al 2006). Due to the risk of recurrence and progression, patients with NMIBC need to have regular check cystoscopic surveillance usually by flexible cystoscopy, using a fibre optic cystoscope under local anaesthetic. The frequency of cystoscopies is tailored to the patient's degree of risk (Babjuk et al 2010). The first flexible cystoscopy should be three months after the original resection of bladder tumour as this is an important prognostic time to predict subsequent recurrence and progression (Sylvester et al 2006).

In September 2008 Melbourne Health (MH) approached the Department of Human Services seeking support to establish a urology service model involving the delivery of flexible cystoscopy procedures for bladder cancer surveillance, by nurses who have received training and preparation to undertake the procedure. Traditionally it had been the role of the urology registrar and visiting international fellows to perform cystoscopies. However it had not been possible for the medical staff to keep up with demand, with 13 flexible cystoscopy lists cancelled in 2007 due to doctor unavailability.

At the start of the project there were over 200 patients on the waiting list for surveillance cystoscopies. The current practice was being questioned due to inefficiency of the system coupled with a high turnover of medical staff, resulting in fragmented care and little ownership of this patient group or service. This affected; waiting times, utilisation of doctors' time, poor documentation, ineffective communication and patients lost to follow-up. MH received a one-off funding grant to support the employment of two part time nurses. The key deliverables within a year were:

- Development of a training package, competency standards and patient pathways and guidelines for nurse cystoscopy clinics for bladder cancer surveillance at the Royal Melbourne Hospital (RMH); and
- Development of establishment and evaluation of the nurse-led bladder cancer surveillance service at RMH.

Nurse-led clinics allow nurses to demonstrate advanced nursing practice involving assessment, diagnosis, treatment and patient management (Lane and Minns 2010). This offers role development but improves patient experience with a positive impact on quality of care (Loftus and Weston 2001). It has also been noted within the literature that by providing a nurse-led clinic within an outpatient setting, waiting times are cut with a more effective and efficient service (Lane and Minns 2010; Lipley 2001).

A nurse working within the department had previously had experience in the United Kingdom (UK) in establishing a nurse-led flexible cystoscopy service. This knowledge and experience was utilised to achieve the desired key deliverables. Within the flexible cystoscopy setting it has been acknowledged that nurses are safe, accurate and can improve services with consistency (Gidlow 2000; Gidlow et al 2000; Taylor et al 2002) including regular audit (Kilburn 2002). This article gives the authors an opportunity to share experiences, enlighten the work behind the scenes and create awareness into setting up nurse-led clinics and encourage fellow nurses to do similar.

DISCUSSION

Gaining approval

First, it is essential to have the medical support of the department, prior to embarking upon this advanced nursing skill (Taylor et al 2002). In combination with support, a training tool needed to be developed. In 2000, the British Association of Urological Surgeons (BAUS) realised the need to create guidelines to ensure consistency amongst nurses learning to utilise flexible cystoscopy within the UK. A working party identified a theoretical, observational and supervision guide for nurses to complete training which was published (BAUS 2000). Incorporating these guidelines, the New Zealand experience (Osbourne 2007) and previous experience from the UK – a suitable training program was created for use within Victoria, Australia, adhering to the Nursing Board of Victoria scope of professional practice. Prior to the tool being utilised it needed to be endorsed. A meeting was organised with the Executive Director of Nursing, Head of Clinical Governance, Professor of Urology and the Divisional Director of Nursing. Subsequently, project planning began with realistic timelines; integrating process mapping, networking, training, data collection, consent and governance.

Process mapping comprehensively considers every relevant detail needed for a producer to deliver a final product/outcome to its clients (Patterson 2008). A process mapping meeting was arranged, with the key members of staff involved within the flexible cystoscopy patients' journey including: the urology consultant, pre-admission nurse, admissions officer, urology nurses and day surgery nurses. The meeting involved dissecting the patients' pathway from referral to diagnosis, treatment and surveillance flexible cystoscopy. These are an unusual cohort of patients as they are very rarely discharged from follow-up due to the continuing long-term risk of recurrence of bladder cancer, resulting in most patients on lifelong annual surveillance.

Two key areas were highlighted from this meeting and identified for improvement. Firstly, there was no system of determining how many patients were on the waiting list for surveillance flexible cystoscopy as

the lists were all amalgamated with the diagnostic cystoscopies. With no structured management for follow-up this led to patients being lost to follow-up; if patients did not attend their appointment or cancelled, this resulted in some not being rebooked. In order to create a nurse-led surveillance flexible cystoscopy service the number of patients waiting needed to be ascertained, with regards to demand and capacity of the new service. The elective surgery access manager was advised to instigate a separate code for the designated bladder cancer surveillance flexible cystoscopy to create a more efficient management for follow-up. Sequentially patients can now be audited with ease, including volume of patients waiting and scheduling of requested follow-up dates to ensure no delays in surveillance.

Secondly it emerged that not every doctor was generating a letter to the GP. This inconsistency identified no or lack of correspondence. It was imperative to re-educate the doctors to ensure all patients had a letter dictated both for the notes and for the GPs to improve communication and follow-up.

Training Tool

Appropriately qualified nurses should be empowered to undertake a wider variety of clinical tasks (Lane and Minns 2010). It is recommended that the nurse will have had two years' experience in urology and additionally complete a comprehensive in-house training program with the support of a urology consultant, to undertake flexible cystoscopies independently (BAUS 2000). Also stipulated by the BAUS (2000) guidelines; there must always be an experienced and designated urologist immediately available within proximity in the event of complications and the need for technical or diagnostic advice.

The assessment of the potential nurse cystoscopist is agreed using competencies. The nurse cystoscopist is then required to demonstrate competence through assessment using the training tool. The assessors should include the supervising consultant urologist plus one other experienced urologist, to enable nurses to achieve a high standard of safe practice (Lane and Minns 2010).

The training tool created was divided into four sections: theoretical, observational, practical (supervised) and consolidation of practical competence (unsupervised).

Theoretical competencies cover the following key topics; anatomy and physiology of the lower urinary tract, management and pathology of NMIBC, principles and complications of cystoscopy and documentation, coding and audit.

Training encompasses a thorough knowledge of bladder anatomy and the conditions likely to be detected by cystoscopy so that the nurse can accurately and confidently discuss diagnostic issues with patients and medical colleagues. The theoretical assessment completion includes a self-directed learning package (created in-house with the support and collaboration of the urology consultants) with an oral assessment by a consultant urologist. Self – directed learning is an excellent way of taking your own initiative by identifying learning needs, goals, create competencies and evaluate learning outcomes (Knowles 1975; Levett-Jones 2005). The following topics were included; anatomy and physiology of the bladder, investigation of haematuria, bladder cancer overview, workings of a cystoscope, principles of cystoscopy, complications and antibiotic prophylaxis guidelines, bladder cancer follow – up protocol, Olympus equipment and nurse cystoscopy literature.

It is imperative that the nurse has the knowledge to plan further management for conditions detected by or resulting from cystoscopy, guided by clearly written protocols, which are reviewed on a regular basis (BAUS 2000). Clear consultant-led directives must guide the nurse's practice in particular with regards to antibiotic prophylaxis to reduce the patient's risk of urinary tract infection post-cystoscopy. There is always a urology doctor available during the nurse cystoscopy list who can attend the clinic if antibiotics are required to be prescribed.

The observation period specifically focused on meeting learning competencies which is an important skill (Gaberson and Oermann 1999). In addition the observation of another person performing a skill provides an image of how that skill should be

performed (Reilly and Oermann 1992). Learning by observing the correct technique, initiates learning to accurately communicate with patients by observing the whole consultation with the consultant urologist from the start, recommending a minimum of 10 patients. This allows the nurse to build an initial understanding of normal and abnormal anatomy through observation while having the opportunity to seek clarification of the findings with the consultant urologist. This is best observed using videoscopes through closed circuit television.

The practical element incorporates supervision of the passage of the cystoscope in a minimum of 50 consecutive cases of surveillance cystoscopy with confirmation of the accuracy of findings by the supervising urologist. Confidence and competence will be achieved by individual nurses at varying rates (Taylor et al 2002; Radhakrishnan et al 2006) and may be related to prior experience with equipment similar to a cystoscope, previous exposure to cystoscopy and hand-eye/video coordination skills. For this reason 50 is suggested purely for guidance purposes.

Once the observational, theoretical and practical competencies had been accomplished, consolidation was necessary. The additional consolidation allows the nurse to conduct the entire patient consultation and cystoscopy procedure as if they were in independent practice, with the security of knowing that their clinical findings and decision making are closely scrutinised for accuracy. A minimum of 30 consecutive cases of surveillance cystoscopy, unsupervised, with confirmation of the accuracy of findings by the supervising urologist are retrospectively reviewed using video data. These specific patients are also given a patient satisfaction questionnaire to evaluate the service and a 48hour post cystoscopy telephone call to discover whether there were any complications.

After completion of the training tool it is recommended reassessment should take place after a period of six months of practice or at the discretion of the individual nurse or supervising consultant. It is important as nurses to have evidence of the flexible cystoscopies within the training period (BAUS 2000), a report was devised specifically for the nurses' portfolio.

Data Collection

Data was collected from the commencement of the project by establishing a bladder cancer database from the outset within the urology department. A data management system, ENDOBASE, was purchased with some of the grant. It integrates with the existing RMH cystoscopy equipment within day surgery allowing examination reports to be generated. To construct a surveillance bladder cancer examination report, this involved intensive training and time for the urology team, capturing relevant information and data with a high degree of standardisation. As data accumulates it can be extracted and examined as necessary for audit and data trails.

The examination report is divided into five sections: Indication (bladder cancer surveillance), Urological History (incl. initial diagnosis of bladder cancer, histology, recurrences, and treatment), Investigations (urinalysis, cytology, radiological), Findings (cystoscopic appearance) and Follow-up. Still pictures can be taken and produced on the report with specific mapping on a picture of the bladder. The convenience of this report is that data can be preloaded and subsequently generated in real time. The benefits of this include: improvement of communication as the patient can take home a copy; be filed directly into the patient's notes and one sent to the GP immediately. The data entered is available at the next surveillance flexible cystoscopy which saves time re-entering previous history; it also reduces time wasted navigating through poorly filed notes. It creates a bladder cancer tumour chart that fundamentally improves practice in bladder cancer with accurate notes, histories and data management. Good record keeping; safeguards, promotes and empowers nursing practice to the highest standard of care (Callaghan 2006).

Follow-up appointments are now generated at the time of cystoscopy using the system. Patients are given their next appointment by the nurse cystoscopists before they leave. Two weeks before their next appointment a reminder is sent, so with improved communication this avoids loss to follow-up, delays in waiting lists and prevents non-attendees.

An important aspect of data management is quality assurance (Koch 1992), with the seamless documentation of all the work flow steps it is possible to retrace all videos and images captured at the time of the cystoscopy. This is particularly helpful for achieving the training tool competencies as it enables the urology consultant to review the video data and ensure appropriate management of the patients is consistent throughout the nurse cystoscopists' practice. Furthermore, each week the nurses have the opportunity to discuss their findings and waiting list patients with a doctor if there are any concerns.

Retrospective data is entered into a database to accumulate a spreadsheet to assess the percentage of positive pathology from patients admitted for general anaesthetic surgery. Future improvements could involve booking the theatre lists more effectively using these detailed reports, by estimating the approximate length of the operation and utilising the allocated theatre slots resourcefully.

Consent

Consent for flexible cystoscopy within the day surgery unit is incorporated on the request for admission and consent form using the terms, doctor, surgeon and clinician. Advance nursing skills are associated with legal and professional issues (Greenwood 2003). This is something that needs to be addressed prior to commencing nurse-led cystoscopies, to ensure the patient is aware a nurse is doing the cystoscopy and a legitimate consent form is signed. Informed written consent should enable the patient to be involved with their care and reduce unnecessary anxiety and improve the patient's understanding of the procedure and common risks (Burke et al 2002).

As specified within the BAUS (2000) working document, a patient expects that any operation is carried out with a good standard of skill and care and that appropriate action is taken on the findings. It is not strictly relevant whether the individual performing the procedure is a nurse or doctor when deciding what action needs to be taken, as the training skills and experience must be adequate for good care to be delivered, regardless of professional background.

A nurse will be held to the standard of a competent cystoscopist and inexperience will not excuse either the doctor or nurse from liability in the case of negligent or unacceptable care. It is deemed both appropriate and acceptable for a nurse to gain patient consent when performing flexible cystoscopies (BAUS 2000). Nevertheless patients are allowed to refuse treatment by a nurse and given the opportunity to discuss the procedure with the team involved (Nursing and Midwifery Council 2010).

It is important that the nurse makes it clear to the patient that they are not a trained urologist. This is communicated verbally and in writing. The consent form may be invalid and a battery committed if the patient is led to believe that the person performing the procedure is a doctor rather than a nurse. Unlike cases of negligence, the patient need not show harm to be entitled to bring legal action.

The nurse cystoscopy protocol should be agreed between the nurses and medical staff involved. It has to be subject to regular review and updating. The vicarious liability of MH extends to all procedures performed by a nurse acting within the course of their employment. Thus it is essential that the hospital is aware of these nursing role developments and agrees to accept responsibility should a claim arise.

Advice was gained from Senior Legal Counsel with the recommendation to create a Patient Information and Consent Form. This was endorsed by Legal counsel, Clinical governance, Executive Director of Nursing and the forms committee meeting.

CONCLUSIONS

A specific designated flexible cystoscopy bladder cancer surveillance list ensures the nurse cystoscopist sees follow-up bladder cancer patients only; it also enables audit and data management to be more readily available within an established bladder cancer surveillance service.

The new data management equipment generates real time reports, which automatically improves the communication, within the notes and notifying GPs.

Appointment times are staggered and patients are given the appointment of their next surveillance cystoscopy before leaving the department to ensure a robust, seamless service is delivered. Urology consultants/registrars have been released to meet clinical demand and focus on diagnostics and one stop haematuria clinics allowing nurses to optimise advance skills. Between June 2009 and June 2010 the average number of patients waiting per month for diagnostic cystoscopy has been reduced from 57 to 16 which is a 72% improvement. There is currently no waiting list for surveillance flexible cystoscopy.

NMIBC patients are bound to lifelong surveillance, whilst the junior doctors and registrars are highly pressurised and regularly rotating. Initial auditing of this new service has shown that patients value the added time given to each consultation, the same point of contact and appreciate the continuity of care provided by the nurse cystoscopist.

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Postoperative hypothermia and mortality in critically ill adults: review and meta-analysis

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KEY WORDS

hypothermia, core temperature, hospital mortality, intensive care unit, postoperative, critically ill.

ABSTRACT

Objective

To identify, appraise and synthesise published literature about hospital mortality associated with inadvertent postoperative hypothermia of adult patients directly transferred to the Intensive Care Unit (ICU) after surgery.

Design

Systematic literature review and meta-analysis.

Methods

Using key terms, a search was conducted in English-language, peer-reviewed journals indexed by CINAHL, PubMed and Cochrane Database focusing on articles published between 1980 and 2010. Data extraction and quality appraisal was performed. After evaluating heterogeneity among studies, quantitative synthesis was applied where possible.

Results

Seven observational studies met the inclusion criteria. In five of them, hospital mortality was significantly higher in hypothermic patients. Unadjusted odds ratio of core temperature <35°C on hospital mortality was combined in a meta-analysis and the pooled estimate was 3.29 (95% confidence interval 1.58-6.85). In the multivariate level, independent associations between hypothermia and mortality were detected in four studies.

Conclusions

Existing evidence supports the positive association between postoperative hypothermia and hospital mortality in surgical ICU patients. Effective hypothermia prevention can be crucial for improving outcomes of this population, but further research is needed for confirming the independent contribution of hypothermia on mortality.

INTRODUCTION

Hypothermia is defined as body core temperature (T_c) decrease greater than one standard deviation below the mean value, under resting conditions in a thermoneutral environment (Buggy and Crossley 2000). T_c refers to core thermal compartment and normally ranges between 36.4-37.5°C (Kempainen and Brunette 2004). Although there is no consensus concerning hypothermia threshold, hypothermia is generally considered to appear at a $T_c < 36^\circ\text{C}$ or $< 35^\circ\text{C}$. During the perioperative period, incidence of inadvertent hypothermia may reach up to 70% (Burger and Fitzpatrick 2009), mainly coming as a result of body surface exposure to low ambient temperature and increased heat loss to the environment (Arndt 1999). In addition, vasodilation and lack of muscular tone, due to the action of general anaesthetic agents or regional anaesthesia, allows internal heat flow to periphery, resulting thus in T_c decrease (Sessler 2000).

Even mild hypothermia (32-35°C) can be associated with adverse perioperative outcomes (Sessler 2001). Cold-induced post-anaesthetic shivering refers to involuntary contractions of small skeletal muscles (Buggy and Crossley 2000). In combination with increased catecholamine secretion due to thermal discomfort, and a left shift in oxyhemoglobin dissociation curve, shivering results in considerable increases in the heart, respiratory and metabolic rate (Sessler 2001). By raising oxygen consumption and cardiac activity, shivering may trigger myocardial ischaemia, especially in patients with pre-existing cardiovascular diseases (Frank et al 1997; Kurz et al 1995).

Besides increased cardiac morbidity, severe complications of mild perioperative hypothermia include increased blood loss (Winkler et al 2000) and high incidence of surgical infections (Kurz et al 1996). Increased allogeneic transfusion requirement can be a result of coagulation disorders, including the inhibition of normal platelet or clotting factor enzyme function, and fibrinolytic activity (Reynolds et al 2008; Sessler 2001). Local tissue vasoconstriction, decreased blood perfusion and oxygen availability,

and suppression of immune system activity can be followed by impaired surgical wound healing and increased infection risk (Kumar et al 2005; Reynolds et al 2008).

Despite the documented hypothermia complications, association between inadvertent perioperative hypothermia and mortality has attracted little attention. In a recent large cohort study, perioperative hypothermia was not identified as an independent risk factor for mortality at 48 hours or 30 days after surgery (Fecho et al 2008). However, postoperative patients who need intensive care treatment can be particularly susceptible to hypothermia complications. Thus, the aim of this paper was to present a systematic literature review and meta-analysis of the association between inadvertent postoperative hypothermia and mortality of patients directly transferred to the Intensive Care Unit (ICU) after surgery.

METHODS

Search strategy and selection criteria

Articles published between January 1980 and June 2010 in English-language peer-reviewed journals indexed by the Cumulative Index for Nursing and Allied Health Literature (CINAHL), PubMed (National Library of Medicine) and Cochrane Database, were systematically searched for clinical studies on inadvertent hypothermia and mortality of patients transferred to the ICU after surgery. Online searches took place at the first week of June 2010. Additional articles were retrieved through hand-searches, from reference lists of online found articles. A combination of the following search terms was used: hypothermia, temperature, postoperative, surgery/surgical, mortality, intensive/critical care unit, ICU/CCU, critically ill. Specific criteria for considering studies for this review were:

- study subjects: adult, postoperative patients directly transferred to surgical or general ICUs after surgery;
- study design: observational, prospective or retrospective, single- or multi-centre;
- exposure: early postoperative hypothermia, evident on ICU admission or at the first

temperature measurement after ICU admission. Hypothermia was generally defined as $T_c < 36^\circ\text{C}$ measured at any appropriate site; T_c threshold for hypothermia could differ among studies; and

- outcome measure: hospital mortality.

Retrieved studies were screened for inclusion by two independent reviewers (P.K., N.S.) by using titles and abstracts. Discrepancies between reviewers were resolved by discussion. The full text of selected articles was obtained and thoroughly read by both reviewers for a final determination regarding eligibility of each study for inclusion.

Data analysis and synthesis

Main study characteristics and findings were summarised in tables. Quantitative synthesis method was applied to a limited extent, according to the number of studies that reported comparable exposures. Due to the small number of included studies, both Q statistic and I^2 index were used for evaluating heterogeneity among studies, with a p value of Q statistic < 0.10 and a value of $I^2 > 50\%$ indicating significant heterogeneity (Huedo-Medina et al 2006). Study findings were reported as odds

ratios (ORs). A Forest plot was constructed to describe the range and distribution of effects across studies, and unadjusted ORs were pooled. Since heterogeneity was relatively high among studies, ORs were combined with DerSimonian and Laird random effects model. Appraisal criteria for the quality of studies were discussed. Data analysis was conducted using Comprehensive Meta-Analysis 2.0 (Biostat; Englewood, NJ).

RESULTS

Study characteristics and quality

Online searches revealed 18 potentially relevant citations. Six articles were selected based on abstract evaluation (12 were excluded, mainly as duplicate entries) and the searches of their reference lists revealed five citations. Full text of these 11 articles was evaluated and four articles were excluded. Of these, one was a preliminary report of an already included study, in two there was no separate report on surgical patients admitted to the ICU, while in the rest one, there was no separate report on patients admitted to the ICU after surgery. Thus, seven articles finally met the inclusion criteria for this review.

Table 1: Main characteristics of reviewed studies

Author (year)	Study design / country	Study subjects	Hypothermia definition / incidence	T _c measurement site
Slotman et al (1985)	Retrospective, single-center / USA	100 pts after general, non-cardiac surgery)	$T_c < 36^\circ\text{C}$ at 2 hours after the end of surgery / 39.2%	Esophagus / rectum
Bush et al (1995)	Prospective, single-center / USA	262 pts after elective abdominal aortic aneurysm repair	$T_c < 34.5^\circ\text{C}$ on ICU admission / 25.2%	Pulmonary artery
Insler et al (2000)	Retrospective, single-center / USA	5,701 pts after coronary artery bypass grafting with cardiopulmonary bypass	$T_c < 36^\circ\text{C}$ on ICU admission / 28.0%	Bladder
Kongsayreepong et al (2003)	Prospective, single-center / Thailand	194 pts after elective or emergency non-cardiac surgery	$T_c < 36^\circ\text{C}$ on ICU admission / 57.1% of pts had $T_c < 36^\circ\text{C}$, 41.3% had $T_c < 35.5^\circ\text{C}$, 28.3% had $T_c < 35^\circ\text{C}$	Tympanic membrane (thermometer)
Abelha et al (2005)	Prospective, single-center / Portugal	185 pts after elective or emergency non-cardiac surgery (non-neurosurgical)	$T_c < 35^\circ\text{C}$ on ICU admission / 57.8%	Tympanic membrane (thermometer)
Inaba et al (2009)	Prospective, single-center / USA	1,252 pts after laparotomy / thoracotomy due to trauma	$T_c < 35^\circ\text{C}$ on ICU admission / 15.1% of pts had $T_c < 35^\circ\text{C}$, 4.9% had $T_c < 33^\circ\text{C}$	Not defined
Karalapillai et al (2009)	Retrospective, single-center / Australia	5,050 pts after cardiac (23.8%) and general surgery (76.2%)	$T_c < 36^\circ\text{C}$ within 24 hours of ICU admission / 35% of pts had $T_c < 36^\circ\text{C}$, 5.8% had $T_c < 35^\circ\text{C}$	Tympanic membrane (thermometer)

ICU: Intensive Care Unit, pts: patients, T_c : core temperature

Four studies were conducted in USA, with the remaining being conducted in Australia, Thailand and Portugal (table 1). All studies were single-centre, with four of them employing prospective data collection. Hypothermia was defined as $T_c < 36^\circ\text{C}$ in four studies; among them, Karalapillai et al (2009) and Kongsayreepong et al (2003) also provided data for $T_c < 35^\circ\text{C}$. Hypothermia was defined as $T_c < 35^\circ\text{C}$ in two studies and $T_c < 34.5^\circ\text{C}$ in one study. In five studies, T_c measurements for defining hypothermia were conducted on ICU admission. Hypothermia incidence ranged between 28-57.1% when hypothermia was defined as $T_c < 36^\circ\text{C}$, and between 15-57.8% when it was defined as $T_c < 35^\circ\text{C}$.

Besides data collection method, the quality of reviewed studies also differed according to the number and subgroups of patients included, and temperature measurement site used (table 1). Four studies employed small convenience samples ranging between 100-262 patients, while in the other three the samples were considerably larger (1,252-5,701 patients). Only one study enrolled both cardiac and

general surgery patients and three studies enrolled non-cardiac, general surgery patients. In three studies, T_c was measured at tympanic membrane. Although a widely accepted method, infrared tympanic thermometry has been considered to be less accurate and reliable than the other T_c measurement methods (thermistors at pulmonary artery, bladder, oesophagus and rectum) (O'Grady et al 2008).

Study findings

Overall hospital mortality ranged between 1.8-15.7% (table 2). Irrespective from the hypothermia definition threshold, unadjusted hospital mortality of hypothermic patients was significantly higher in five studies, while it was remarkably higher in the other two studies, without reaching statistical significance (Abelha et al 2005; Kongsayreepong et al 2003). Of importance, in the studies of Karalapillai et al (2009) and Kongsayreepong et al (2003), ORs for hospital mortality were higher for $T_c < 35^\circ\text{C}$ compared with ORs for $T_c < 36^\circ\text{C}$. Likewise, in the study of Inaba et al (2009), OR for hospital mortality was higher for $T_c < 33^\circ\text{C}$ compared with OR for $T_c < 35^\circ\text{C}$.

Table 2: Findings of reviewed studies

Author (year)	Overall hospital mortality	Unadjusted hospital mortality of hypothermic vs normothermic pts / OR (95% CI)	Adjusted hospital mortality
Slotman et al (1985)	12.2%	31.8% vs 4.6% / 6.84 (1.31-35.74), $p=0.011$	-
Bush et al (1995)	4.2%	12.1% vs 1.5% / 8.87 (2.28-34.54), $p<0.01$	$T_c < 34.5^\circ\text{C}$ was associated with multiple organ dysfunction ($p=0.030$), which was a significant predictor of death ($p=0.003$)
Insler et al (2000)	1.8%	Pts with $T_c < 36^\circ\text{C}$ had a higher mortality, $p=0.02$ (univariate ORs not presented)	After excluding pts $< 35^\circ\text{C}$ and $> 37^\circ\text{C}$: pts $< 36^\circ\text{C}$ had a higher mortality ($p=0.02$)
Kongsayreepong et al (2003)	6.2%	For pts with $T_c < 36^\circ\text{C}$: 2.09 (0.54-8.14), $p=0.279$ For pts with $T_c < 35.5^\circ\text{C}$: 1.77 (0.52-6.01), $p=0.358$ For pts with $T_c < 35^\circ\text{C}$: 2.23 (0.65-7.67), $p=0.191$	-
Abelha et al (2005)	15.7%	18.7% vs 11.5% / 1.76 (0.76-4.11), $p=0.190$	-
Inaba et al (2009)	11.8%	For pts with $T_c < 35^\circ\text{C}$: 35.1% vs 7.7% / 6.45 (4.44-9.39), $p<0.001$ For pts with $T_c < 33^\circ\text{C}$: 55.0% vs 10.4% / 10.53 (5.50-20.17), $p<0.001$	OR (95% CI) for $< 35^\circ\text{C}$: 3.15 (1.88-5.27), $p<0.001$
Karalapillai et al (2009)	6.8%	For pts with $T_c < 36^\circ\text{C}$: 8.9% vs 5.6% / 1.64 (1.32-2.05), $p<0.001$ For pts with $T_c < 35^\circ\text{C}$: 14.7% vs 6.3% / 2.58 (1.83-3.65), $p<0.001$	OR (95% CI) per 1°C decrease: 1.83 (1.28-2.60), $p<0.001$

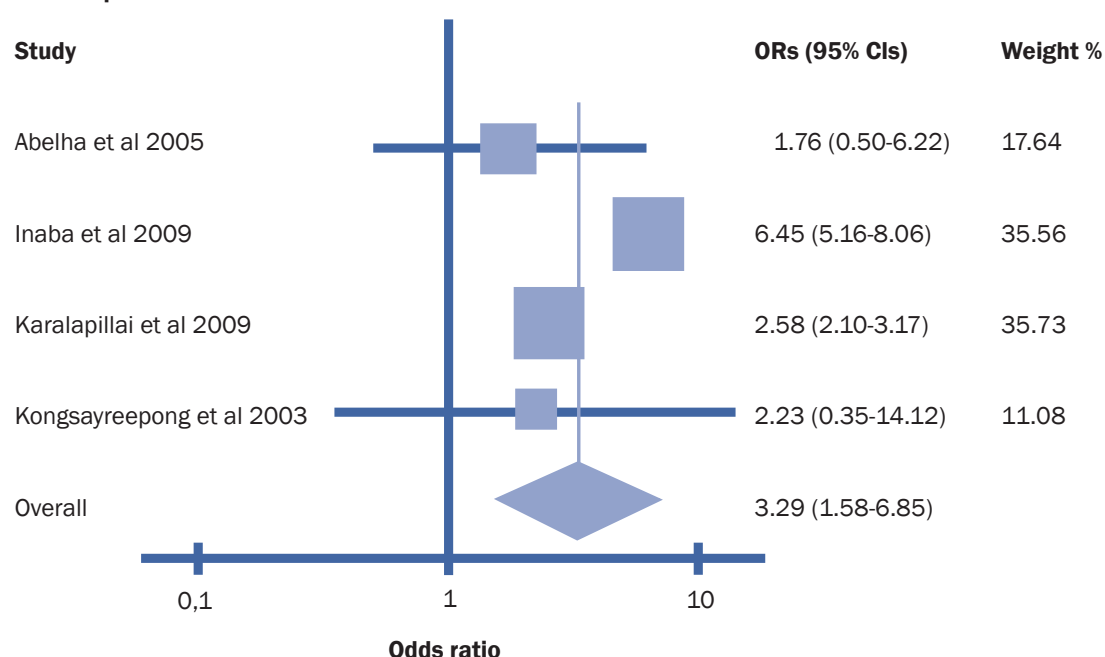
ICU: Intensive Care Unit, pts: patients, OR: odds ratio, CI: confidence interval, T_c : core temperature

For the hypothermia definition threshold of $<36^{\circ}\text{C}$, unadjusted ORs for hospital mortality in hypothermic patients extracted from three studies (Karalapillai et al 2009; Kongsayreepong et al 2003; Slotman et al 1985) demonstrated significant heterogeneity ($Q=4.874$, $p=0.087$, $I^2=58.969\%$), thus these could not be combined in a meta-analysis. Two of these studies showed significantly higher ORs for hospital mortality in hypothermic patients. In the study of Insler et al (2000), unadjusted hospital mortality was also significantly higher in patients with $T_c < 36^{\circ}\text{C}$, but ORs were not presented. For the hypothermia definition threshold $<35^{\circ}\text{C}$, unadjusted ORs for hospital mortality in hypothermic patients extracted from four studies (Inaba et al 2009; Karalapillai et al 2009; Abelha et al 2005; Kongsayreepong et al 2003) did not demonstrate significant heterogeneity ($Q=5.008$, $p=0.171$, $I^2=40.099\%$) and were combined

in a Forest plot (figure 1). Two of these studies showed significantly higher ORs for hospital mortality in hypothermic patients, with an overall OR of 3.29 (95% confidence interval, 1.58-6.85).

Multivariate analyses were conducted in four studies. $T_c < 35^{\circ}\text{C}$ in the study of Inaba et al (2009) and $T_c < 36^{\circ}\text{C}$ in the study of Insler et al (2000) was independently associated with higher hospital mortality ($p < 0.001$). In the study of Karalapillai et al (2009), T_c as a continuous variable was independently associated with higher hospital mortality ($p < 0.001$). In the study of Bush et al (1995), $T_c < 34.5^{\circ}\text{C}$ was independently associated with longer hospital length of stay ($p=0.047$) and risk for multiple organ dysfunction ($p=0.030$). Multiple organ dysfunction after hypothermia was a significant predictor of death ($p=0.003$).

Figure 1: Forest plot with odds ratios (ORs) and 95% confidence intervals (CIs) of hospital mortality for patients with core temperature $<35^{\circ}\text{C}$



DISCUSSION

This systematic review investigated the associations between postoperative inadvertent hypothermia and hospital mortality of patients directly transferred to the ICU after surgery. Findings from four studies indicated a significantly higher pooled unadjusted OR for mortality for $T_c < 35^{\circ}\text{C}$, while significantly

higher mortality for $T_c < 36^{\circ}\text{C}$ was reported in three studies. In addition, three studies indicated an increase in unadjusted mortality with decreasing thresholds of T_c . Existing evidence also provided considerable suspicion that T_c below normal can be an independent predictor of mortality. In the multivariate level, significant positive associations between

hypothermia and mortality were reported in three studies, with a fourth study reporting independent associations between hypothermia, multiple organ dysfunction and subsequent mortality.

Diverse patient subgroups enrolled among studies, in combination with differences in T_c measurement methods and hypothermia prevention methods used, are possibly responsible for the considerable variation in hypothermia incidence among studies. The use of a higher T_c threshold for defining hypothermia can be justified in cardiac surgery patients, who are actively warmed during cardiopulmonary bypass, and are expected to be warmer on ICU admission than non-cardiac surgery ones. This hypothesis was corroborated by a prospective audit (Karalapillai and Story 2008), in which a significantly lower proportion of cardiac surgery patients had $T_c < 36^\circ\text{C}$ on ICU admission (31% vs 55% in non-cardiac surgery patients, $p=0.004$).

In all included studies, patient outcome used was mortality during hospitalisation. This is considered to be more reliable than ICU mortality, which can be influenced by decisions to discharge patients from ICU. Mortality has the most robust operational definition as an outcome measure, has been commonly used for safety assessment of patient care and is expected to be more sensitive in case its rate is high, as in critically ill population (Numata et al 2006). However, due to differences in clinical severity among patients, individual mortality risk is a major confounding factor that has to be adjusted when mortality is studied. Otherwise, considering that severely ill patients are more susceptible to hypothermia, high clinical severity may account for high incidence of both death and hypothermia. In the reviewed studies that presented multivariate analyses, adjustment included factors associated with patient baseline characteristics or abnormal physiologic variables. However, none of them included standardised scores for stratifying overall patient mortality risk, and this may have led to incomplete risk adjustment.

Can early hypothermia of critically ill surgical patients not only be a marker but also a mediator of mortality? Severe complications of mild hypothermia

could account for direct negative effects on patient survival. During hospitalisation, attributable mortality of surgical infections has been reported to be particularly high (Kirkland et al 1999). Similarly, in non-cardiac surgery patients, perioperative cardiac events have been followed by a considerably high mortality rate (Deveraux et al 2005). As regards allogeneic blood transfusion, this can be followed by severe complications, mainly transfusion-related acute lung injury and hemolytic transfusion reactions, which are also associated with high mortality (Vamvakas and Blajchman 2009).

Associations between hypothermia and adverse outcomes have also been reported for other patient groups. In a mixed medical-surgical ICU population (Peres Bota et al 2004), ICU mortality was significantly higher in patients with $T_c < 36^\circ\text{C}$ at some time during ICU stay (33.3% vs 10.3%, $p < 0.01$). Although independent associations were not investigated, organ failure was significantly more common in hypothermic patients, raising the possibility that higher mortality was rather attributed to their worse physical status. In trauma patients, hypothermia on Emergency Department admission was independently associated with higher hospital mortality in two studies that analysed data from the National Trauma Data Banks (Martin et al 2005; Shafi et al 2005). However, trauma patients often have multiple physiological derangements, being in critical condition on hospital admission, and may not be comparable to postoperative ICU patients, who are expected to be healthy enough to sustain an operation. In addition, highest mortality rates were reported for $T_c < 32^\circ\text{C}$ in trauma patients, while postoperative patients generally manifest mild hypothermia with T_c barely reaching such low values.

Clinical guidelines for preventing perioperative hypothermia have been developed by the American Society of PeriAnesthesia Nurses (2001) and the American College of Surgeons (Forbes et al 2009). Despite these guidelines, hypothermia incidence in patients transferred to the ICU after surgery has been remarkably high in recent studies. Continuous

perioperative T_c monitoring by the use of accurate and reliable methods along with maintaining warm operating room temperature are the first steps for preventing hypothermia in the high-risk population of surgical ICU patients. In addition, since these patients generally sustain extensive surgical procedures or have high pre-existing comorbidity, a combination of active warming methods is needed. Forced air warming is a non-invasive, low-cost, easy to apply, effective method, and its use is recommended both intraoperatively and preoperatively, to prevent heat redistribution. Heating crystalloid solutions or blood / blood products is necessary, especially when large amounts of fluids are administered, while airway rewarming with humidified oxygen decreases evaporative heat loss (McCullough and Arora 2004). Implementing a perioperative normothermia care plan is strongly recommended, since it has been shown to decrease hypothermia incidence of patients undergoing elective abdominal operations in post-anaesthesia care unit from 39% to 2% (Forbes et al 2008).

Study limitations

A major limitation of this literature review was the small number of original studies included and methodological weaknesses identified in some of them, such as retrospective design. All studies were single-centre, most of them focused on specific surgical patient subgroups, while four studies were underpowered. Another four studies were coming from the same country which, in combination with the inclusion of articles published only in English language, may limit generalisability of findings to other countries. A second limitation was that the meta-analysis performed should be seen with caution. Although high proportions of positive results are expected to be published, analytical methods for studying publication bias were not used. Moreover, the number of studies combined was very small, while study heterogeneity was considerable, although not significant. Finally, it cannot be excluded that hypothermia-mortality associations reported in some studies were due to non-adjusted confounders.

CONCLUSIONS AND RECOMMENDATIONS

This review has confirmed that, in patients transferred to the ICU after surgery, hospital mortality is higher among those with early inadvertent hypothermia. Considerable possibility was also raised that hypothermia can be a mediator of mortality due to its well-described severe complications. The importance of effective perioperative hypothermia prevention has been previously highlighted in terms of decreasing morbidity, but it seems further to be a priority in surgical critically ill patients, since it may have a beneficial effect on their survival. Being at the front line in the management of perioperative hypothermia, nursing personnel are called to be aware of hypothermia complications and vigilant for signs/symptoms of hypothermia, actively participate to the application of preventive measures for hypothermia and evaluate the effectiveness of available warming methods.

Adequately powered, prospective studies are necessary for confirming the association between inadvertent hypothermia and mortality in postoperative ICU patients. To elucidate whether hypothermia independently contributes to mortality, future studies should control for patient clinical severity, as well as for other potential confounders, such as age, infections or sepsis, complications not associated with hypothermia, injury severity, magnitude of surgery and baseline characteristics. In case an independent association between hypothermia and mortality is confirmed, the impact of hypothermia degree on mortality should be investigated. Moreover, since ICU admission T_c may poorly correlate with T_c intraoperative values, hypothermia during surgery should separately be studied for associations with adverse outcomes. Evaluating hypothermia-mortality associations among subgroups of postoperative ICU patients is also recommended, especially for patients after cardiac, emergency or trauma surgery, since hypothermia threshold for increased mortality risk may differ among these subgroups. Determining the effectiveness of intraoperative preventive measures for hypothermia with regard to adverse patient outcomes can finally be suggested.

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Emergency surgery: measure, change and benefit

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KEY WORDS

After hours surgery, emergency surgery, trauma.

ABSTRACT

Background

Emergency surgery comprises a large part of surgical services. However, it rarely has received the attention that surrounds waiting list management and elective surgery.

Objective

This article identifies principles for models of emergency surgery care and describes the redesign of emergency surgery for the benefit of nurses, surgeons and patients.

Setting

The redesign of emergency surgery services in New South Wales.

Primary argument

Nurses understand the many challenges in delivering care to emergency surgery patients. Access to operating theatres, surgeon availability and frequent reworking of operation schedules are but some of the issues that impinge on the nurse's ability to deliver quality, planned and organised care to emergency surgery patients.

The development of the NSW Health *Emergency Surgery Guidelines* provides nurses with an opportunity to actively contribute to the redesign of emergency surgery. The principles of emergency surgery redesign described in the *Guidelines* address all the major problems in emergency surgery care.

Conclusion

The nursing benefits include improved access to consultant surgeons for patients, nurses and junior doctors, the alignment of surgeons to emergency surgery theatre time and a coordinated approach to the delivery of emergency surgery in a hospital or across a network of hospitals. Nurses will also benefit from a defined career path in emergency surgery, a coordinated approach to a previously unplanned workload and opportunities for career advancement in a previously professionally unstructured specialty. It is crucial nurses participate actively in emergency surgery redesign.

INTRODUCTION

Emergency surgery is often considered to be the ‘fly in the ointment’ when scheduling operative surgery lists as it frequently interferes by ‘bumping’ cases on the elective lists. The emergency case is managed rather as an after-thought and is frequently scheduled only when time and operating theatre sessions permit. Rarely, is there sufficient sessional operating theatre time allocated to deal with the emergency surgery load and so emergency cases go well into the night or into early hours of the morning when there is no competition with elective lists for theatre time.

Nurses working in the emergency department, operating theatres and surgical wards will recognise the many challenges in delivering peri-operative, intra-operative and post-operative nursing care to emergency surgery patients. Access to operating theatres, misalignment of operating time to surgeon availability, regular after-hours operating and frequent reworking of operation schedules are some of the issues that are familiar to nurses and impinge on their ability to deliver quality, planned and organised care to emergency surgery patients.

The perception that emergency surgery is random and erratic in presentation to hospital and therefore cannot be properly managed is simply incorrect. Emergency surgery is predictable and highly amenable to planning (New South Wales Department of Health 2009). Unfortunately, it has rarely gained the benefits of systematic planning.

New South Wales (NSW) Health, in conjunction with the Surgical Services Taskforce (SST) have developed and published the *Emergency Surgery Guideline* (New South Wales Department of Health 2009). These guidelines set out the principles of emergency surgery management and provide examples of models of care that will assist hospitals to enhance their management and delivery of emergency surgery.

Implementation of the *Emergency Surgery Guidelines* provides nurses with an opportunity to actively contribute to the redesign of emergency surgery. Nurses have a crucial role in establishing the most appropriate model that will enhance the management of emergency surgical patients in their facility.

This article outlines the principles of emergency surgery redesign and the main components of the redesign that will provide benefit to hospital nursing staff and their emergency surgery patients.

Principles of emergency surgery management

Emergency surgery is reasonably predictable over a period of time in terms of its volume, complexity and the type of emergency conditions presenting. While most operating theatre staff are resigned to the common practice of scheduling emergency surgery operations after standard theatre hours, much of that surgery can actually wait until standard hours later that day or the following day without detriment to the patient’s clinical condition. In fact, many patients can be better prepared physiologically when the operation is planned ahead during standard hours rather than during the middle of the night (Adie et al 2009). Patients may also receive information and education pertinent to their condition, which is often not delivered after-hours due to lack of time or access to specialist staff. This preparation time can deliver a patient who is better prepared for their operation both physically and psychologically.

The main barrier to accessing operating theatre sessions during standard hours is a lack of planning for the predictable emergency surgery load. In planning for emergency surgery, a number of principles should be applied.

They are:

- scheduling operating theatre sessions during standard hours where clinically appropriate;
- balancing the required operating theatre sessions by including their emergency surgery load;
- matching the resources in terms of staffing, equipment and funding required for both planned and emergency surgery; and
- establishing consultant-led models of emergency surgery care.

The NSW *Emergency Surgery Guidelines* identify the processes involved in applying these principles to emergency surgery redesign, appropriate for any

hospital receiving emergency surgery patients. Of particular importance, is the measurement of the emergency surgery load by sub-specialty and the subsequent calculation of the required operative sessions to manage the estimated load. The appropriate models of care for emergency surgery can then be determined and the *Guidelines* provide a number of suitable models depending on the load and designation of the facility.

Application of the principles of emergency surgery redesign has consequences for nursing and provides significant opportunities to enhance and improve the surgical nursing management of the emergency surgery patient.

Standard hours scheduling

Patients whose condition is limb or life-threatening need operative intervention as soon as possible as dictated by their clinical presentation. This does mean for some patients that their urgent operations will be undertaken at any time regardless of day or night. Adequate operating theatre access must always be available to enable this small proportion of emergency surgical work to be performed without delay or compromise. It is imperative that this system of care continues with a high degree of responsiveness to ensure preservation of life and limb.

The decision to operate after-hours should be based on whether the patient will be clinically compromised if they do not receive an urgent operation. It should not be undermined by a lack of access to standard-hours operating theatre sessions.

Clinical conditions that are neither life nor limb-threatening can generally be scheduled for sessions made available during standard hours. A considerable amount of emergency surgery can in fact wait until daylight hours without detriment to the patient's condition (Adie et al 2009; Deane et al 2010). For operating theatre nurses, this means managing emergency patients in a manner similar to planned admissions. This also provides operating theatre nurses with roster certainty for the emergency surgery sessions, reduces overruns from elective lists due to unplanned additions, improves skill mix in the operating theatre and provides experience for the nurses allocated to emergency sessions (Willis

et al 2010). This is important for nurses and theatre managers, as night duty is traditionally the least popular and most difficult shift to staff.

Surgical wards are generally staffed at their leanest overnight. Reducing the after-hours theatre activity will reduce the burden for the ward staff of preparing and receiving post-operative patients overnight and will minimise the disturbance of other ward patients.

Night duty itself compounds patient management for nursing staff. Locating dressings or equipment used infrequently, ordering urgently required non-stock clinical items or administering medications not available in that specific ward area is a source of frustration and is very time consuming after-hours. If the amount of surgery performed after-hours can be reduced this will ensure night duty is less stressful and more patient focussed.

Access to nurse educators and clinical nurse consultants is traditionally more difficult for nursing staff working after-hours. In many hospitals, night shift nurses have limited or no access to specialist education. Stomal nurses, diabetic educators and wound care specialists are just some of the specialty educators that are unavailable to night duty nurses. As a result, the credentialing and accrediting of permanent night duty nurses in extended skills, such as central line management, pain management systems and specific therapeutic regimes is difficult and occasionally neglected.

Load balancing/operating theatre sessions

Once the amount of emergency surgery that is managed in each hospital is measured for each sub-specialty, the required sessions in standard hours can then be estimated. This calculation should take into account the necessary adjustments in procedure times for surgical trainee teaching. There are different models for planned and emergency theatre access that can be integrated into theatre schedules⁴. These different models are important as they describe possible theatre configurations for varying volumes of emergency surgery. Acute Surgery Units (ASU), mixed emergency and elective sessions, designated emergency and elective sessions and evening or 'twilight sessions' are some of the identified models (table 1).

Table 1: Models of emergency surgery care⁴

Model	Key features	Suitability	Working Example
Acute Surgery Unit (ASU)	• Consultant surgeon led with consultant surgeon on site in standard operating hours • Consultant rostered on with no other commitments during period as rostered as ASU surgeon • Dedicated emergency theatre sessions in standard operating hours • Surgeon control of case priority in operating room sessions • Surgeon present, teaching, and supervising when surgery is being performed • ASU team (Registrar, RMO, CNC) • Agreed clinical guidelines for common emergency surgical admissions • Formalised handover process • Designated beds or ward for assessment and management of ASU patients	Principal referral hospital with large emergency surgery load and high case complexity	• Prince of Wales Hospital • Nepean Hospital • Westmead Hospital • John Hunter Hospital
Mixed emergency & elective sessions	• Sessions are planned to accommodate expected emergency cases and any variation in emergency surgery load could be covered by short notice elective cases	Low emergency surgery load and low complexity of cases	
Designated Emergency & Elective Sessions (Auburn Hospital Model)	• Full day sessions are divided into a set amount of time for elective and emergency surgery • Elective sessions run from 0800-1430 with emergency surgery commencing at 1430-1830	Hospitals where emergency surgery load and case complexity are relatively low	• Auburn Hospital
Designated daily full emergency surgery sessions for single specialties	• Daily emergency session available for single specialty e.g. orthopaedics & general surgery • Availability of appropriate surgeon to ensure full utilisation	When emergency surgery load is sufficient	• Liverpool Hospital • Lismore Base Hospital
Designated full emergency sessions less frequent than daily	• Sessions available for a number of lower volume emergency surgery specialties	Lower volume emergency surgery specialties e.g. plastics, ENT, Urology	
Designated daily emergency surgery sessions	• High volume of orthopaedic emergency caseload allocated a designated daily session within standard hours. Orthopaedic consultant surgeon allocated to supervise the session • A general emergency session staffed 24/7 for all other specialties	Principal referral hospital with large emergency surgery load and high case complexity	• St George Hospital
Late afternoon session "Twilight session"	• Facilitates patient preparation during the day • Usually conducive for surgeon available • Difficult to coordinate multiple consultants	Low volume emergency surgery load	

In some hospitals, the emergency surgery load can be managed by providing a few additional sessions in standard hours (Sing et al 2005) However, in many hospitals, the available sessions in standard hours are few in number and the hospitals have limited or no capacity to create the additional sessions due to the

volume of elective surgery. In these circumstances, some surgery may require to be allocated to another hospital within their hospital network.

A change in the designation of hospitals can provide opportunities for nurses. In hospitals that have a significant load of emergency surgery, nurses will

be able to specialise in emergency surgery nursing. Indeed, if an emergency surgery model, such as an Acute Surgical Unit, is supported then opportunities will be available for specialist nurse roles specific to emergency surgery, especially for orthopaedics and general surgery.

The down side of adding the emergency load to daylight operating theatre sessions is that emergency surgery is still incorrectly perceived as unpredictable and unplanned. However, the redesign of emergency surgery makes it more closely resemble the planned arrangements of elective surgery. Emergency cases are allocated theatre times, during daylight hours with an assigned surgeon. The resultant patient and staff education can be provided at an appropriate time in an environment conducive to learning.

The streaming of elective from emergency surgery in hospitals is increasingly being implemented in Australia and in many other countries. Commissioner Garling, in his review of acute care services in NSW recommended separation or streaming of elective and emergency surgery (New South Wales Department of Health 2008). In NSW, examples already exist in general surgery, orthopaedic surgery, obstetrics, trauma surgery and hand surgery. More widespread application of the principles must be achieved to provide emergency surgery in the most efficient and safe manner and to the highest levels of satisfaction for patients and clinicians.

Not all hospitals have the full complement of services required by every patient presenting in need of emergency surgery. It is appropriate, where possible, that patients receive their treatment close to their home. Nevertheless, some patients will be required to travel or be transported to more distant hospitals in order to receive the specialised emergency surgical care they require.

Matching the resources

The designation of hospitals for either high volume emergency or elective surgery consolidates the expertise required to deliver timely and quality care. Where necessary, equipment, information technology and other resources will need to be relocated to meet the needs of the reconfigured emergency

surgery service. Of particular importance is the responsiveness of diagnostic services for emergency surgery. Radiology and pathology services have to facilitate and prioritise the necessary emergency surgery patient investigations in a timely manner and support the theatre scheduling of these patients in standard hours.

Matching of resources to the needs of the hospitals that are designated to provide high volume emergency surgery is crucial. This ensures Intensive Care Units, diagnostic services and the associated levels of staff will also be present. This concentration of staff and resources will benefit nurses working in the emergency department, the operating theatres and the surgical wards. A system of ward and theatre rotation for nurses could also be established to expose and educate nurses who are interested in emergency surgery as a specialty and to support their upskilling and development.

Potential benefits exist in bed aggregation and designation of beds for emergency surgery. A unit specific to emergency surgery admissions works to support the wards and operating theatres, improve hospital processes and provide high quality of care. The primary focus is on rapid assessment, faster diagnosis and earlier treatment for surgical patients.

The support of appropriate levels of allied health staff is also an essential success factor in emergency surgery redesign. These patients are acutely unwell by the very nature of their clinical presentation and many will require a higher level of allied health management than equivalent patients undergoing elective surgery.

Surgeon-led models of emergency surgery

The surgeon-led model requires a surgeon to take responsibility for managing all emergency surgery patients and being 'on site' during a designated period of time. As the surgeon has no additional commitments and is 'on site', the specialist management of patients is immediately available. Consultant surgeon operations are more time efficient than those of trainees and their clinical decisions more certain.

In many hospitals, identifying the appropriate surgical specialty or the surgeon responsible for newly admitted emergency surgery patients can be problematic. Roster swaps, clarity of admitting specialty, pre-admission investigations and the absence of protocols for emergency surgery patients are some of the problems currently faced by nurses. With the adoption of a surgeon-led model of care, much of this uncertainty can be eliminated.

Consultant surgeon-led models of emergency surgery care already exist in some hospitals in Australia and there are a number of examples in NSW. The specifics of the models selected will be determined in part by the emergency surgery volume, the surgical specialty requirements, the role of the designated hospital and surgical staff availability in the hospital.

A hospital with sufficient emergency surgical load in general surgery or orthopaedic surgery can establish an Acute Surgical Unit (ASU) (Parasyn et al 2009) in one or both of these specialties. The ASU model is consultant-led with surgeons limiting or relinquishing all competing commitments (e.g. consulting in private rooms, private sector operating) during period's on-call. The on-call frequency for the consultants will be influenced by the emergency surgery caseload. The ASU surgeon works with a team of registrars and specialised nurses to assess and manage pre-operative and post-operative surgical patients. This streamlines surgical assessment and decision making by surgeons, improves theatre scheduling, increases theatre utilisation and ultimately improves the patient outcomes.

ASUs have already been established in a number of hospitals in NSW. Some examples exist outside NSW and are generally in hospitals with high emergency load specialties e.g. orthopaedics, plastics, general surgery and paediatrics. Many advantages of ASUs exist for patients, staff and hospital function. Timely patient assessment, improved communication between surgical teams and other treating and referring specialties and increased consultant input into patient management are some of the advantages. Emergency departments will also experience certainty in contacting the emergency surgery team as they will have a more defined focus on assessing and directing emergency surgery care.

There is increasing use of event driven protocols for a range of emergency surgical conditions. Protocols provide a comprehensive care path for medical, nursing and allied health. They express the agreed clinical decisions of the involved specialists and they encourage continuity of patient management by registrars, junior medical officers and case managers when individual consultants are handing over care. Protocols provide an effective and efficient system for monitoring and recording variances for the purpose of reviewing and improving patient care and their further adoption should be encouraged.

Effectively, a surgeon-led model, will improve communication between clinicians, increase the level of supervision for trainee registrars and improve outcomes for patients.

CONCLUSION

The benefits of the redesign of emergency surgery will be observed clinically, in the workforce and in resource management. The benefits will be realised by commitment and active partnership between managers, surgeons, nurses and other surgical staff. Clinical benefits anticipated include improved patient outcomes, enhanced patient and surgical team satisfaction and increased trainee supervision in emergency surgery. Significant management benefits will ensue from high rates of emergency operating theatre utilisation reduced patient cancellations and reduction in after-hours costs.

The specific advantages for nurses in redesigning emergency surgery in any hospital, whether working in the emergency department, surgical wards and the operating theatres, are undeniable. Improved access to consultant surgeons for patients, nurses and junior doctors, the alignment of surgeons to emergency surgery theatre time and a co-ordinated approach to the delivery of emergency surgery in a hospital or across a network of hospitals are all achievable.

The inclusion of nurses in an ASU provides nurses with a determined career path in emergency surgery, in an established team with a dedicated purpose. Similarly, even without establishing a full ASU, opportunities exist for nurses to work closely with

consultant surgeons in an environment tailored to the actual workload rather than working in an under resourced service.

The opportunities for nurses to take part in redesign are numerous and this should be promoted as a way of working with surgeons, having the common goal and clear direction to deliver patients an improved, timely and high quality emergency surgery service.

The greatest benefits of emergency surgery redesign will be to operating theatre nurses in terms of theatre access in daylight hours, a reduction in call backs, overtime and over runs of theatres and a planned approach to emergency theatre allocation. Emergency department nurses and ward nurses will also benefit from a defined career path in emergency surgery, a coordinated approach to a previously unplanned workload and opportunities for career advancement in a previously professionally unstructured specialty. Emergency surgery for nurses does mean measure the load, change the service delivery configuration and reap the benefits.

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Medication calculation competencies for registered nurses: a literature review

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KEY WORDS

dosage calculation, patient safety, nursing, education, professional knowledge.

ABSTRACT

Objective

To describe the literature that focuses on safe administration of medications, medication calculation skills development and maintenance of ongoing competence in nurses.

Setting

University and hospital nurse education departments.

Subjects

Theoretical and empirical literature focusing on nurse mediated medication administration errors

Primary argument

Nurse education departments devote a high proportion of time to medication calculation skill development and testing. Annual testing is time consuming for both nurse educators and nurses, and the validity, frequency, acceptable pass mark, self-efficacy and maintenance of skills related to medication calculation testing is largely unclear.

Conclusion

The theoretical literature focuses on drug administration errors, development of tools and techniques to improve nurses' medication calculation skills and guidelines. There is considerable debate as to nurses' self-perception of their arithmetical skills, their educational needs in this area and the relationship between skill level and patient outcomes. Empirical literature focuses on the incidence of errors, evaluation of medication calculation skills; the relationship between test results and errors, effectiveness of strategies to improve medication calculation skills and medication calculation testing and policy. Course content and delivery are thought to influence safe medication administration; however, there has been a lack of rigorous research demonstrating the efficacy of educational models. Several studies report low levels of calculation proficiency in nurses; however, it is unclear whether medication calculation testing affects medication administration error rates. Further research is required to determine the robustness of the current processes to assess nurses' medication calculation competence and ensure optimal patient safety.

INTRODUCTION

Promoting a culture of safety is a priority for healthcare providers today. International literature suggests medication errors occur in all health care settings. Adverse events, defined as incidents in which harm resulted to a person receiving health care (AIHW 2007), include medication errors. Medication errors are defined as “any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of health professional, patient or consumer” (National Coordinating Council for Medication Error Reporting and Prevention 2008). Of all hospital adverse events, medication errors are considered the most preventable (Williams 2007). Not only do they have an effect on patients and clinicians, they impact significantly on patient length of stay and financial cost to the health service.

In Australia it is estimated that medication errors are responsible for 27% of adverse event deaths (Runciman et al 2003), and hospital studies demonstrate that harmful medication errors are reported in approximately 1% of all admissions (Wilson et al 1999; Runciman et al 2003). This problem is not unique to Australia, medication error rates have similarly escalated in the United States of America (USA) and United Kingdom (UK). In the USA over 7,000 deaths occur annually as a result of medication errors (Kohn et al 2000) with more than 17% of these due to miscalculation of dosages (Bayne and Bindler 1988; Bayne and Bindler 1997; Phillips et al 1998; Kohn et al 2000; Capriotti 2004; Greenfield et al 2006; Harne-Britner et al 2006). There are limited data available from the UK, though it is broadly reported that medication errors account for 10-20% of all adverse events, many of which are preventable (Smith 2004).

The causes of medication errors or medication adverse events can be grouped into system, environmental and human factors (Wilson et al 1999; Deans 2005). Whilst adverse events such as medication allergy and anaphylaxis are largely unavoidable, one cause of medication adverse events, mediated by nurses, that may be able to be

ameliorated is dosage error caused by calculation error (Leape et al 1995; Lesar et al 1997; Balas et al 2004; Kopp et al 2006; Haw et al 2007). Consequently nurse educators have assigned a significant amount of time and effort to assessing medication calculation skills. In order to improve nursing competence in this area clear evidence of the effectiveness of different educational or systems interventions is required.

AIMS

The aims of this review are to describe the literature, both theoretical and empirical, that focuses on factors affecting safe administration of medications, medication calculation skills development and maintenance of ongoing competence in registered nurses. This review discusses the validity, frequency, acceptable pass mark, self-efficacy and maintenance of skills related to medication calculation testing.

METHODS

The literature was accessed through the online bibliographic databases CINAHL and Medline using the MeSH headings: medication errors, registered nurses, dosage calculation, and mathematics. Cochrane and Joanna Briggs Institute databases were accessed to search for the existence of systematic reviews related to medication competency and medication error reduction. Articles were also sourced from citations in the reference lists of retrieved articles. Articles selected included primary research, academic reviews of literature, systematic reviews and papers containing current government statistics. Articles related to the performance of medication calculations were excluded. All articles were published in English and, with the exception of two research papers considered pertinent to the topic, were no older than 13 years owing to the fact that the focus on medication safety has come to the forefront since the mid-1990s (World Health Organization 2002). One systematic review, one best practice sheet, 38 research articles, 20 theoretical articles (reviews, guidelines, discussion papers and opinion papers), three reports, two electronic sources and one book were included in this review.

DISCUSSION

Nurses' medication calculation skills

Research studies have indicated that mathematical anxiety, negative attitudes and poor numeracy skills are evident in the nursing population at both undergraduate (Bayne and Bindler 1988; Brown 2002; Glaister 2005; Greenfield et al 2006; Jukes and Gilchrist 2006; Sredl 2006) and postgraduate levels (Bayne and Bindler 1988; Calliari 1995; Harne-Britner et al 2006). A substantial number of articles have identified that many nurses lack sufficient skill to calculate drug dosages correctly (Bayne and Bindler 1988; Polifroni et al 2003; King 2004; Ferri and Snyder 2005; Joint Commission Benchmark 2005; Grandell-Niemi et al 2006).

Two USA sources suggest only 35% of nurses achieve 90% proficiency in a medication calculations test at orientation (Bayne and Bindler 1988; Joint Commission Benchmark 2005). According to Bayne and Bindler (1988) nurses regularly score lower on medication calculation exams than doctors and pharmacists and years of experience does not necessarily improve their performance (Bayne and Bindler 1988). Some research papers report nurses who have been working for a few years often attain lower scores than graduate nurses and graduates do not have the required mathematical skills as their entry level maths proficiency is set at 80% which is below what is expected for medication administration (Polifroni et al 2003; Joint Commission Benchmark 2005).

US and UK studies similarly indicate general numeracy skills in nursing students is below par (Brown 2002; Wright 2004; Harne-Britner et al 2006; Jukes and Gilchrist 2006; Wright 2006; Wright 2007a) as nursing students were under prepared for the mathematical requirements of safe medication administration, and lacked the necessary skills to calculate dosages particularly when using fractions, percentages, decimals and ratios. Concern over the mathematical skills of undergraduate nursing students was also evident in studies from other countries (Gillham and Chu 1995; Kazaoka et al 2007) with the exception of two Finnish studies which

reported nurses and student nurses found maths interesting and self-rated their mathematical skills as sufficient (Grandell-Niemi et al 2003; Grandell-Niemi et al 2005).

Teaching medication skills

Basic medication calculation education and testing have been included in undergraduate nursing programs since their inception, however, it has been suggested that differences in students' baseline mathematical abilities, and not requiring mastery of calculation tests prior to graduation (Bayne and Bindler 1988), have resulted in inconsistencies in the medication calculation skills of graduate nurses. UK opinion papers claim falling standards of maths is not limited to nursing, but is community wide, and that more must be done to raise the accepted standards (Coombes 2000; Mathieson 2000). One Australian paper highlights the shortcoming, common in tertiary educational facilities, of using normative assessment to grade students when mastery should be required (Manias and Bullock 2002).

Various approaches to improving student performance have been suggested including: focusing on calculation from the beginning of the program (Brown 2002); pre-entry assessment of maths skills (Coombes 2000); assessment of maths skills every semester in both classroom and in practice settings (Brown 2002; Jukes and Gilchrist 2006). The employment of learning through practical sessions and assessments in safe environments has been shown to have benefit for the more hands on learner and also as a means to assisting undergraduate nurses to become more confident practitioners (Banning 2004; Warburton and Kahn 2007). Brown (2002) additionally contends that testing should be supported by remedial help for those who require it (Brown 2002).

There have been several research and discussion papers about the best way of teaching maths skills to undergraduate nursing students, with the majority acknowledging a large proportion of students do struggle with maths (Kelly and Colby 2003; Banning 2004; Maag 2004; Wright 2004; Greenfield et al 2006; Harne-Britner et al 2006; Jukes and Gilchrist

2006; Sredl 2006; Wright 2007a; Wright 2008). It is suggested a combination of teaching styles may prove more appropriate in situations where learners have different experiences, needs, motivations and learning styles (Brunt 2000; Wright 2004). Providing opportunities for practice is the key to enhancing math ability not only in the tertiary setting but also continuing into the workplace of the practising nurse (Polifroni et al 2003).

Empirical studies in the UK call for strategies to focus on the conceptual skills of students so they can learn to interpret and think about numeracy before applying the principles to practice (Jukes and Gilchrist 2006; Wright 2007a; Wright 2008). Research evidence suggests using different educational strategies leads to positive changes in participants' mathematical knowledge (Kelly and Colby 2003; Banning 2004; Maag 2004; Greenfield et al 2006; Harne-Britner et al 2006; Sredl 2006). Revision, refresher classes and face-to-face tutorial sessions may also prove beneficial in facilitating retention of knowledge (Wright 2008).

Empirical studies undertaken in the US have similarly identified that interactive multimedia learning tools and online tutorials have benefit and are generally well accepted by nursing students and nurses (Maag 2004; Frush et al 2006; Harne-Britner et al 2006). Survey evaluation of these approaches has shown students have found them a more enjoyable, interesting, realistic and creative way to develop maths skills and have found the feedback available within these programs sufficient for their learning needs (Maag 2004; Frush et al 2006; Harne-Britner et al 2006). It is suggested that nursing student education should focus not only on basic maths skills but also on pharmacology and safe medication administration (Wright 2006). Further research is required to determine which strategies are the most effective in both the short and long term (Wright 2007a).

Ongoing maintenance of competence

It is expected nurses are able to calculate medication dosages precisely (Brown 2002). However, research studies show many nurses are insufficiently skilled

in performing this task and are unable to achieve the required proficiency set by individual institutions (Bayne and Bindler 1988; Calliari 1995; Joint Commission Benchmark 2005; Harne-Britner et al 2006). Proficiency marks range from 70-100% (Polifroni et al 2003; Grandell-Niemi et al 2006). In the US (Bayne and Bindler 1988; Calliari 1995; Joint Commission Benchmark 2005; Harne-Britner et al 2006) and UK (Trim 2004; Jukes and Gilchrist 2006) pass marks are commonly set at 90% whilst in Australia 100% is normally sought (Gillham and Chu 1995). It is also interesting to note that 75% is a frequently accepted college pass mark in the US (Brown 2002).

Two US studies identified a significant relationship between nurses who made medication errors and their ability to pass a medication calculation exam, in brief; nurses who failed were more likely to make errors than nurses who passed (Conti and Gauntlett Beare 1988; Calliari 1995). However, Conti and Gauntlett Beare (1988) conceded poor performance on medication calculation tests alone is not a reliable predictor of those most likely to make a medication administration error. One UK author argues strongly against the validity of medication calculation testing, asserting that written medication calculation tests are not a reliable indicator of the numeracy skills required for clinical practice (Wright 2007b). However, this lone opinion is contrary to the bulk of the literature which supports the testing of nurses' medication calculation skills as fundamental to ensuring medication safety (Bayne and Bindler 1988; Calliari 1995; Bayne and Bindler 1997; Hamner and Morgan 1999; Meyer 2004; Preston 2004; Ferri and Snyder 2005; Glaister 2005; Grandell-Niemi et al 2005; Grandell-Niemi et al 2006; Warburton and Kahn 2007).

There is no clear evidence regarding when and how regular testing should occur. Nor is there uniformity with regards to acceptable passing grades. An observational study found that some US hospitals do not impose medication calculation testing, as they feel that it is an expected skill in order to obtain a nursing license (Hamner and Morgan 1999). However, empirical research indicates that most US

hospitals and nursing educational facilities support medication calculation assessment establishing their own standards for testing (Bayne and Bindler 1988; Bayne and Bindler 1997; Hamner and Morgan 1999; Brown 2002; Greenfield et al 2006; Harne-Britner et al 2006). Several research studies and opinion papers suggest during orientation would be the ideal time to make an initial assessment of nurses' medication calculation abilities (Bayne and Bindler 1988; Calliari 1995; Hamner and Morgan 1999; Meyer 2004).

Bayne and Bindler's (1988) study recognised that nurses who have practised for more than three years tend to have greater difficulty performing medication calculations, and thus there would additionally be a need for nurses' medication calculation competence to be assessed at regular intervals (annually or bi-annually) (Bayne and Bindler 1988). The inclusion of medication calculation skills in continuing nursing education programs, subject to periodic review and updating of skills, was also supported in Capriotti's (2004) guidelines paper.

Many nurses consider medication calculation testing to be highly stressful and exceptionally challenging (Bayne and Bindler 1988; Glaister 2005). In studies that tested self-efficacy versus knowledge, most nurses were able to accurately predict their maths ability before they sat the exam (Bayne and Bindler 1988; Grandell-Niemi et al 2003; Maag 2004; Glaister 2005; Grandell-Niemi et al 2005; Grandell-Niemi et al 2006; Andrew et al 2009). This empirical research demonstrates that nurses have insight into their weaknesses and strengths with regard to maths ability. Bayne and Bindler (1988) recommended that opportunities for self-assessment prior to sitting a medication calculation exam may help identify problem areas and minimise anxiety (Bayne and Bindler 1988). It has been suggested that the keys to increasing nurses' confidence with medication administration and reducing anxiety lie within ongoing education and training in mathematical skills (Brown 2002) and regular practice reviews (Dixon and Evans 2006).

There has been limited research which has assessed nurses' medication calculation scores in the UK. US and Finnish studies indicated the average score attained by nurses on medication calculation exams was approximately 75% (Bayne and Bindler 1997; Grandell-Niemi et al 2006; Harne-Britner et al 2006) with only a very few attaining close to the 90% score which some had imposed (Conti and Gauntlett Beare 1988; Greenfield et al 2006). Research studies undertaken in both the US and UK, identified the main areas of difficulty included those calculations which involved percentages, ratios, fractions, multiplying fractions, place values and interpreting information (Salvucci 2000; Brown 2002; Capriotti 2004; Wright 2004; Rice and Bell 2005; Wright 2006; Wright 2007a). Bayne and Bindler's (1997) research demonstrated intravenous dosages and flow rates are equally problematic for nurses who find them significantly more challenging than intramuscular, subcutaneous or oral dosages (Bayne and Bindler 1997). Salvucci's (2000) study suggested this may be a result of the infrequency with which these calculations are undertaken, and thus training in less frequently used skills may need to be provided (Salvucci 2000). Nurses further found calculations difficult when they had to apply formulas or conversions which were not on hand (Bayne and Bindler 1997). Trim (2004) maintains it is essential that formulas are readily available and that nurses are familiar with and have a basic understanding of the formulas that exist and how to apply them to calculate the correct dosages when preparing medications.

Many authors recommend that nurses' involvement in the review of reported medication errors raises awareness (King 2004; Glaister 2005; ISMP 2005; Joanna Briggs Institute 2005; Hodgkinson et al 2006; McBride-Henry and Foureur 2006). Through medication safety focus groups, review of the safety literature, provision of updates and close monitoring of reporting of medication errors, nurses' can make suggestions on how to avoid future errors (King 2004; Glaister 2005; ISMP 2005; Joanna Briggs Institute

2005; Hodgkinson et al 2006; McBride-Henry and Foureur 2006). Raising awareness of medication calculation errors and the provision of practical initiatives to improve nurses' medication calculation skills will likely result in improvements in nurses' abilities to administer medications in a correct and safe manner for best patient outcomes (Gray and Jackson 2004). More research is still required to determine the impact that raising awareness has on reducing error rates. What is known, however, is that the current approach to reducing medication errors is inadequate, reporting of errors is generally poor and this will only improve through education and a change in culture towards this issue (Coombes 2000; Preston 2004; Greenfield et al 2006).

Openness in identification and reporting of drug errors by nurses is vital if medication calculation error is to be addressed and improved. Nurses who report errors honestly should not receive disciplinary action (Preston 2004). Similarly nurses who do not make the grade during medication calculation assessments should not be subject to punitive or embarrassing remediation processes (Coombes 2000). Practice development initiatives including education, realistic practice sessions, review of adverse medication event incidents, medication safety focus groups, regular updates, and the time to achieve competency can positively affect medication administration outcomes and ultimately result in better patient safety (King 2004; Glaister 2005; Joanna Briggs Institute 2005; Hodgkinson et al 2006; McBride-Henry and Foureur 2006).

The key to minimising the risk of medication error is through the adoption of commonsense approaches (Preston 2004). Nurses should be encouraged to check medication dosages with another nurse (Grandell-Niemi et al 2005; ISMP 2005; Joanna Briggs Institute 2005; Hodgkinson et al 2006; Mulloney and Moloney-Harmon 2006), avoid distractions (Capriotti 2004; Grandell-Niemi et al 2005) and not rush (ISMP 2005). Use of vests or do not disturb signs as a strategy to prevent interruptions when calculating and dispensing medications has been successfully implemented in several facilities as

part of a transforming care at the bedside approach to patient safety (Bennett et al 2006; Kaiser Permanente 2009). Use of calculators and conversion charts may be helpful but should never be used as a substitute for taking into consideration the logical or expected answer (Capriotti 2004; Trim 2004; Pentin and Smith 2006).

Commentators suggest medication administration skills, particularly maths, be a core component of all nurses' continuing education (Capriotti 2004) and be regularly maintained. In one study over half of the nurses (54%) said they retained their skills by practising (Grandell-Niemi et al 2003), other means included attending lectures (6%); use of textbooks (33%); calculating with peers (43%) and use of computer assisted programmes (2%) (Grandell-Niemi et al 2003). Practice appears to be the key to maintaining skills, however, practising to maintain calculation skills is not regular among nurses and students (Grandell-Niemi et al 2005). Practice opportunities need to be provided within the undergraduate curriculum and continue into the workplace (Bayne and Bindler 1988; Polifroni et al 2003).

CONCLUSION

There is considerable debate regarding nurses' self-perception of their arithmetical skills, their educational needs in this area and the relationship between skill level and patient outcomes. A substantial number of international papers have identified that many nurses lack sufficient skill to calculate drug dosages correctly raising concern about the mathematical skills and preparedness of student nurses for practice. Course content and delivery are thought to influence safe medication administration. A combination of teaching styles may prove more appropriate where learners have different experiences, needs, motivations and learning style; however, there has been a lack of rigorous research demonstrating the efficacy of educational models. Several research studies report low levels of calculation proficiency in RNs, however, it is unclear whether medication calculation testing affects medication administration error rates.

Research has identified a significant relationship between nurses who have made medication errors and their ability to pass a medication calculation exam, however, poor performance on medication calculation tests alone is not a reliable predictor of those most likely to make a medication administration error and research studies do not show high error rates attributed to drug calculation.

There needs to be further discussion with regards to acceptable pass marks and how regularly nurses should have their medication calculation skills evaluated. Statistical data and research studies show many nurses are insufficiently skilled in medication calculations with the average score attained by nurses on exams reported as 75%. Further research is required in this area.

RECOMMENDATIONS

Nurses need to maintain their mathematical skills to safeguard against medication errors (Capriotti 2004) and employers need to encourage this through the incorporation of practice development initiatives (King 2004; Joanna Briggs Institute 2005; Hodgkinson et al 2006; McBride-Henry and Foureur 2006). In order to improve nurses' and student nurses' mathematical skills educational programs should implement effective strategies, such as on-line training, refresher classes, face-to-face tutorials and practice sessions. Remedial education should be tailored to the individual knowledge deficits that surface during testing.

The evaluation of different educational and testing models should address the issues of access and the time burden associated with assessment of the large numbers of nursing staff which is currently undertaken by most institutions on an annual basis. Practical assessment of nurses' medication administration skills must also be considered to ensure nurses are able to practice within safe guidelines as set out by the institution and relevant safety councils.

Recommendations from research and opinion papers by practising nurses and educators have called for 100% mastery to be imposed across the board,

especially when there is no room for less than 100% accuracy in practice (Polifroni et al 2003; Meyer 2004). The key to minimising the risk of medication error is through the adoption of commonsense approaches such as double checking of medication dosages with another nurse, avoiding distractions and not rushing. Finally, further research is required to determine the robustness of the current processes in place to assess nurses' medication calculation competence and ensure optimal patient safety with regards to medication administration and drug error.

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