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Melanie Murray
Edith Cowan University

Deborah Sundin
Edith Cowan University

Vicki Cope

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New graduate nurses' clinical safety knowledge by the numbers.

Abstract

Aim: To explore new graduate registered nurses' knowledge and attitudes concerning medical error and patient safety, during their first six months of professional practice.

Background: New graduate registered nurses demonstrate basic skills and levels of performance due to limited exposure and experience in actual situations. There is a concern held for their clinical reasoning skills required to recognise patient deterioration, posing a threat to patient safety.

Methods: An online questionnaire was used to survey New graduate registered nurses at three time points during graduate nurse programs between August 2016 and February 2018.

Results: A decrease in self-reported knowledge and attitudes regarding medical errors was noted over the three time points. These results indicate initial confidence in theoretical knowledge and attitudes upon completion of undergraduate education, and prior to commencing professional practice.

Conclusion: Results suggest that a theory practice gap persists with respect to medical error for transitioning new nurses.

Impact for Nursing Management

New nurses lack confidence around compromised patient safety situations and a knowledge gap around actions related to medical error. Nurse managers and educators should be made aware of this gap to implement strategies to decrease risk during novice nurse transition.

Keywords Graduate nurses, Medical errors, Patient safety, Quantitative, Transition

Introduction

The catalyst for the global patient safety focus of today was the Institute of Medicine's report *To Err is Human* (Kohn, Corrigan & Donaldson, 2000) where it was recognised that medical errors caused thousands of deaths annually, a figure that has had limited improvements in the years since (Gluyas & Morrison, 2013; Makary & Daniel, 2016), with Ghebreyesus (2018), Director General of the World Health Organisation asserting that medical error could be considered the 14th leading cause of death globally. The World Health Organisation (WHO), Organisation for Economic Co-operations and Development (OECD), and The World Bank's (2018) report indicates 10% of patients in high income countries experience an adverse event during an episode of care, and seven percent acquire a preventable hospital acquired infection. Australian hospitals report nosocomial diagnoses (a complication arising during an episode of care) occur for 10.3% of hospitalised patients and adverse events occur for approximately 5.5% of hospitalised patients, many of which are considered preventable (Australian Institute of Health and Welfare, 2018). Duckett and Moran (2018) proclaim that during times of staff disruption, such as induction of new practitioners, more preventable errors occur in Australian hospitals than any other time of year, leading to the conclusion that new graduate registered nurses are at high risk of making an error during their transition. This paper presents the quantitative findings of a larger mixed methods study of new graduate registered nurses' self-reported knowledge and attitudes regarding medical error and patient safety.

Background

New graduate registered nurses (NGRNs) represent approximately six percent of the nursing workforce (Nursing and Midwifery Board of Australia [NMBA], 2018) and, as per Benner's (1984) *novice to expert* model of skill acquisition, have the clinical skills of an advanced beginner. That is, they may demonstrate basic skills and levels of performance due to limited exposure and experience in actual situations (Benner, 1984). In the safety critical environment that is healthcare, nurses of all levels need "to be able to competently manage emergent situations, achieving the best possible outcome for all in the given situation" (Murray, Sundin & Cope, 2019, p.201). These new nurses have been assessed to perform adequately within their scope of practice as an advanced beginner, however, there is a concern held for the level of development for their clinical reasoning skills required to recognise deterioration in patients which poses a threat to patient safety (Kavanagh & Szweda, 2017; Missen, McKenna, Beauchamp & Larkins, 2016).

It is recognised that, in the first six to twelve months of clinical practice NGRNs endure what Duchscher (2009) has coined *transition shock*. Transition shock is the non-linear movement through professional role transition encompassing "developmental and professional, intellectual and emotive, [and] skill and role-relationship changes" (Duchscher, 2009, p.1105). Duchscher describes three stages of transition 'doing', 'being', and 'knowing', that occur over a 12-month period, with transition shock culminating between the 'doing' stage and the 'being' stage (Duchscher, 2008). Each stage is defined by the psychological development of the NGRN that influences the progression of their clinical skill set over this time period. It is during the 'doing' stage that NGRNs idealistic expectations and anticipations of practice are found to be disparate from reality (Duchscher, 2012, Murray et al.,

2019). The NGRNs practice in these early months is bound by linear thought processes and limited situation awareness due in part to restricted exposure to clinical experiences (Benner, 1984; Duchscher, 2012), which has been recognised to change over time. All of these factors are a cause of stress and anxiety for the NGRN.

Realisation of their limited exposure to clinical experiences and situations during undergraduate clinical practicums sets the grounding for the stress and anxieties experienced as a part of transition shock (Duchscher, 2008, 2009), often impinging on the NGRNs' ability to practice with confidence due to feelings of self-doubt (Murray et al., 2019b). Consequences of this stress flows on to NGRNs' ability to adequately manage their time, especially during medication administration and the potential for error prone practice (Halpin, Terry & Curzio, 2017; Myers et al., 2010) In addition, and alarmingly, Treiber and Jones (2018) report that roughly 55% of nurses admit to making an error within their first five years of clinical practice Halpin et al. (2017, p.2581) report that NGRNs are "terrified" of making an error. This statistic demonstrates the explicit need for NGRNs to work in a safe, supported environment during the early part of their transition (ten Hoeve, Kunnen, Brouwer & Roodbol, 2018).

Nurses, especially those with experience limitations, are prone to making errors when they are new and still learning their role, working in an unfamiliar area, and when they are just trying to cope with the demands of the shift (Koehn, Ebright & Draucker, 2016; Murray et al., 2019b). The establishment of transition to practice programs, such as graduate nurse programs, offer extended orientations, ongoing

support, and opportunities to develop advanced skills in a supported environment (Walsh, 2018). With nurses and midwives making up 57% of the registered health workforce (NMBA, 2018), and who are at the front line of influencing patient outcomes (Hendricks, Cope & Baum, 2015), it is imperative that they practice at the highest level of safety. It is likewise imperative to understand how NGRNs interpret and apply medical error and patient safety theory upon transition to clinical practice.

The study

The overall study was undertaken using a convergent mixed method design allowing for both qualitative and quantitative data to be collected to gain a more complete understanding of NGRNs knowledge of, and practices pertaining to, medical error and patient safety during transition from nursing student to qualified registered nurse. The results reported here extrapolate the quantitative responses to NGRNs perceptions and understanding of patient safety and transition to professional practice. The results from the qualitative arm of this study have been reported elsewhere (Murray, Sundin & Cope, 2019b)

Aim: The purpose of this study was to explore the a priori hypothesis that time will have an effect on NGRNs knowledge and attitudes regarding medical error, patient safety, and quality care.

Design and sample: A longitudinal design was used to study NGRNs (n=210) commencing work as a newly registered nurse within a graduate nurse program (GNP) at either of two metropolitan hospitals in Australia. Participants were purposefully recruited as a representative sample of NGRNs commencing work in a GNP (Creswell & Plano Clark, 2018; Schneider, Whitehead, LoBiondo-Wood & Haber, 2016). Data was collected via an online questionnaire, adapted from the

World Health Organisation Patient Safety Curriculum guide for medical schools, validated for medical students by Flin, Patey, Jackson, Mearns & Dissanayaka (2009) and Li et al. (2012). This study is the first to use this questionnaire in the nursing context. The questionnaire consisted of 43 questions using a 5- Likert scale, and three demographic questions (age, gender and university where undergraduate nursing education was completed). All NGRNs commencing in the three intakes (August 2016, February 2017 and August 2017) of the Graduate Nurse Programs at the two participating hospitals were invited to participate in the study via a short presentation delivered by the researcher. Written consent was gained immediately following the presentation.

Data collection: Consenting participants were emailed a link to the online questionnaire at three time points within their GNP, corresponding with the timeline of Duchscher's Stages of Transition Theory (2008) (Figure 1). These time points were at the commencement of the GNP (time point one), at three months (time point two), and at six months (time point three). To ensure consistency in the results, there were no changes to the questionnaire at each time point to ensure the same measures were captured. Questionnaires were made available to the participants for a period of four weeks with reminder emails sent weekly to encourage ongoing participation. This process was replicated at each time point. On completion of the three questionnaires, data were exported to IBM SPSS® 25 for analysis.

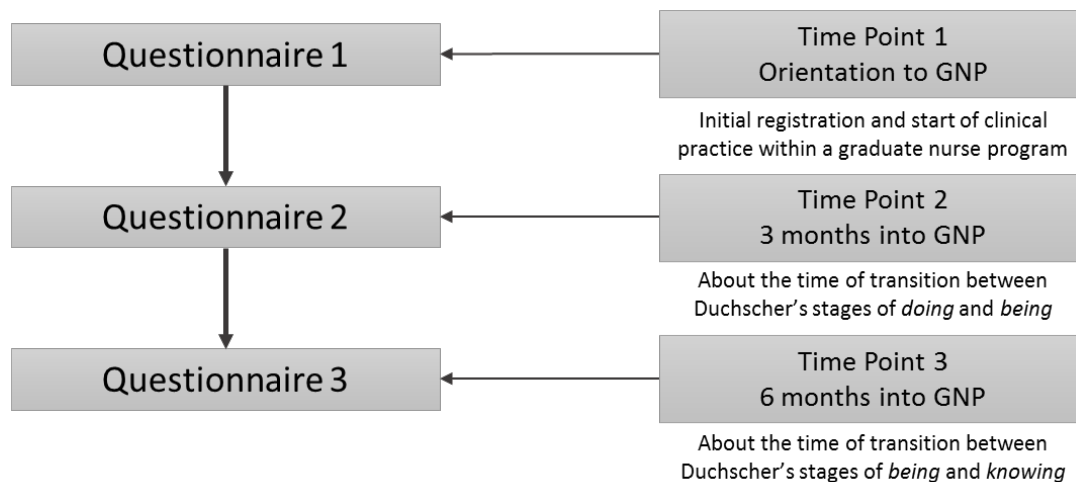


Figure 1: data collection linked with Duchscher's stages of transition theory.

Ethical considerations: The University Human Research Ethics Committee approved the study (#12959). The Human Ethics Research Committees of both participating sites also approved the study (#2016-068 & #1607). All participants were volunteers and could withdraw from the study at any time. The research was conducted according to the National Health and Medical Research Council *National Statement on Ethical Conduct in Human Research 2007 (updated 2018)*.

Data analysis: Data were analysed using SPSS® version 25 using descriptive statistics. The 43 questions were recoded where appropriate and categorised into four question groups - knowledge of medical error; knowledge of actions regarding medical error; attitudes to compromised patient safety; and intentions regarding patient safety prior to analysis. For all analyses, $p < 0.05$ was considered statistically significant. A one-way repeated measures ANOVA was used to investigate the effect of time on self-reported knowledge and attitudes regarding medical errors and patient safety of NGRNs. The independent variable was time point. To check for linearity, normality, multivariate and bivariate outliers, and multicollinearity, preliminary assumption testing was conducted with no serious violations noted. The

Levene’s test for homogeneity of variances was conducted for each of the three time points with no violation noted. A reliability of scale, Cronbach’s alpha, was used to check the internal consistency of the question groups within the questionnaire.

Cronbach’s alpha reliability score for the four question groups was between 0.71 and 0.89 indicating acceptable correlation of items in each of the question groups (Field, 2018.) In addition, item-total correlations were examined, and an item was deleted if its inclusion resulted in the Cronbach alpha value falling out of the ideal range of 0.71 to 0.89 (Streiner, Norman & Cairney, 2015). The question groups ranged from four to nine items. Post hoc comparisons were made by way of Tukeys HSD. The means and standard deviations for each question group at each time point is displayed in Table 1.

Table 1 Descriptive Statistics

Descriptive Statistics					
	Timepoint	Mean	Std. Deviation	N	Sig.
Knowledge of Medical Errors	1.00	19.32	3.33	68	
	2.00	16.26	3.49	45	
	3.00	14.15	3.20	45	
	Total	16.98	3.98	158	.000
Knowledge of Actions regarding Medical Errors	1.00	20.23	5.59	68	
	2.00	17.00	4.95	45	
	3.00	14.84	4.52	45	
	Total	17.79	5.58	158	.000
Attitudes to compromised Patient Safety	1.00	12.26	3.99	68	
	2.00	13.73	4.07	45	
	3.00	13.93	3.77	45	
	Total	13.15	4.01	158	.049
Intentions regarding Patient Safety	1.00	9.89	2.86	68	
	2.00	9.73	2.51	45	
	3.00	9.04	2.37	45	
	Total	9.61	2.64	158	.228

Results

The participants were mostly female representing 93.9% of the total sample, a figure representative of the Australian registered nurse female workforce (88.6%) as reported by the Department of Health ("Registered Nurses: 2017 Factsheet", 2018). A majority of respondents (81.1%) were aged 18 to 34 years (range 18-55), which is representative of 31% of the registered nurse workforce in Australia (NMBA, 2018).

Of the 210 NGRNs invited to participate in the study, 95 consented. The response rate of consenting participants was 72.6% at time point one, 48.4% at time point two, and 50.5% at time point three. Of those 95, 69 completed time point one, 46 completed all or part of time point two, and 48 completed all or part of time point three. Forty-one participants completed all three time points, 12 completed just two time points, and 17 completed only one time point.

Testing revealed that there was a statistically significant difference over time for question groups one and two. Using Wilks' Lambda statistic, there was a significant effect of time on the knowledge and attitudes regarding medical errors, $\Lambda = 0.65$, $F(8, 304) = 9.2$, $p = <0.001$, partial $\eta^2 = 0.19$. A test of between-subjects effects revealed no significant changes in question groups three and four, the self-reported attitudes to compromised patient safety or intentions regarding patient safety.

There was a statistical significance ($p < 0.001$) for question group one (knowledge of medical errors) with an inspection of means (time point 1: $M = 19.32$; time point 2: $M = 16.26$; time point 3: $M = 14.15$) indicating decrease in self-reported knowledge of medical errors across three time points. There was also a statistical significance

($p < 0.001$) in question group two (knowledge of actions regarding medical errors) with an inspection of means (time point 1: $M = 20.23$; time point 2: $M = 17.00$; time point 3: $M = 14.84$) also indicating decrease in knowledge of actions regarding medical errors over the three time points. The third question group (attitudes to compromised patient safety) and fourth question group (intentions regarding patient safety) results show $p = 0.05$ and $p = 0.23$ respectively, indicating no significant difference in attitudes or intentions regarding patient safety over the three time points. These results are graphically demonstrated at figure 2.

A Tukey HSD test was used to test for post-hoc comparisons. This test indicated that the mean score for question group one, time point one ($M = 19.32$, $SD = 3.33$) was significantly different ($p < 0.001$) to time point two ($M = 16.27$, $SD = 3.50$), and was also significantly different ($p < 0.001$) to time point three ($M = 14.16$, $SD = 3.20$). This test also signified the mean score for question group two, time point one ($M = 20.24$, $SD = 5.59$) was significantly different from time point two ($p = 0.004$, $M = 17.00$, $SD = 4.95$) and time point three ($p < 0.001$, $M = 14.84$, $SD = 4.52$), however, there was no statistical significance between time points two and three of this question group ($p = 0.117$).

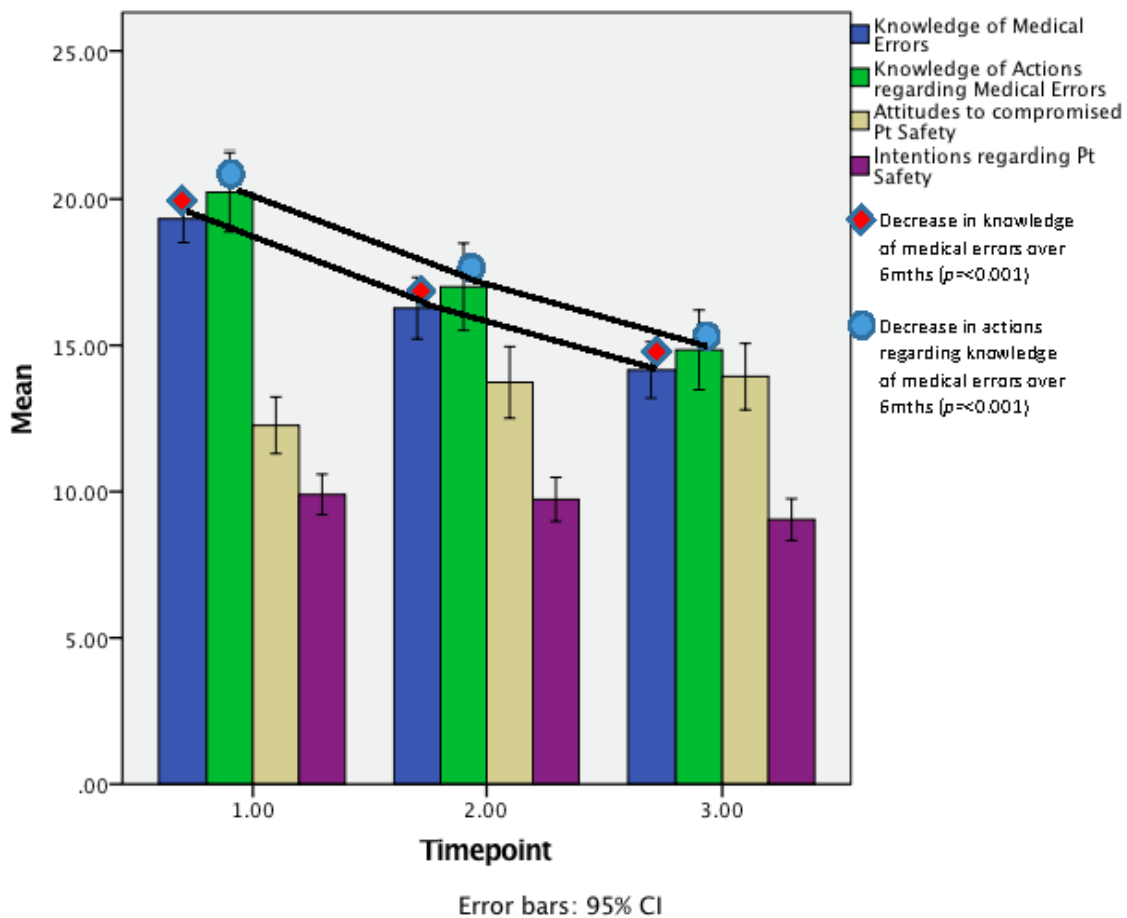


Figure 2: Mean self-reported knowledge and actions regarding medical error; and attitudes and intentions regarding patient safety over three time points with 95% confidence interval

Discussion

This study examined the longitudinal changes in self-reported knowledge and attitudes regarding medical errors and patient safety. The results, confirming the a priori hypothesis of the effect of time on the NGRNs knowledge and attitudes regarding medical error, patient safety, and quality care, reveal that the self-reported knowledge of, and actions regarding medical errors, decreased over time (Figure 2). That is, NGRNs understanding or knowing the factors influencing and/or contributing to medical errors, understanding or knowing what should happen if an error is made,

knowing how to report an error they had made, and knowing what to do if they had witnessed an error, decreased over the six months of the study.

The reported decrease indicates an initial confidence in theoretical knowledge of medical errors and actions regarding medical errors upon completion of undergraduate education, prior to commencing professional practice. This correlates with El Haddad, Moxham and Broadbent's (2017) confirmation of the theory-practice gap remaining for NGRNs, with university educated nurses being theory proficient, but lacking in practical competence, as well as the notion of 'they do not yet know what they do not know' (Missen et al., 2016).

The decrease in reported knowledge scores points to a gap between what the participant NGRNs know about medical errors in theory alternate to what happens in professional practice where their initial confidence working in the 'real world', without constant supervision as nursing students, is low (Duchscher, 2009; Murray et al., 2019b). This result may also be reflective of perceived readiness for practice of graduate nurses (El Haddad et al., 2017; Missen et al., 2016) where NGRNs perceived their own practice readiness higher than that reported by the senior RNs (Missen et al., 2016). These studies report that senior nurses, such as nurse unit managers, also have an unrealistic expectation of NGRNs being at Benner's 'expert' level upon registration (El Haddad et al., 2017).

The third question group, attitudes regarding compromised patient safety recorded no statistical significance ($p=0.05$). It is worthwhile noting, though, that NGRN attitudes toward compromised patient safety improved slightly over the three time

points as demonstrated in figure 2. This may be as a result of increased confidence in time management and communication, as explained during the second stage of Duchscher's stages of transition theory, 'being', where NGRNs at the four to five-month mark demonstrate a "consistent and rapid advancement in their thinking, knowledge level, and skill competency" (Duchscher, 2012, p. 445).

Intentions regarding patient safety, the fourth question group showed no significant changes across the three time point's, however the mean score of 9.6/30 indicates a moderately low level of confidence regarding intentions to act in compromised patient safety situations. Confidence in practice is often dependant on the transition experience and culture of the work environment, and feelings of low self-efficacy for NGRNs may put both nurses and patients at risk though "poor performance, omission or delayed care, and an increase risk of errors" (Hayes, 2018).

Participants in the current study have reported low to moderate levels of self-reported knowledge and attitudes regarding medical errors and patient safety. This could be translated to having low self-confidence in these areas, reflecting the need for support with clinical decision making and skill development such as that provided by a transition program or mentorship (Ankers, Barton & Parry, 2018). Nurse leaders and managers need to be aware of the clinical limitations and psychological requirements of transitioning NGRNs, especially for those working in complex clinical areas that have been highlighted to compound the risk of error (Hayes, 2018).

Support is not only required on a personal level for the NGRN, but also at the organisational level by way of appropriate skill mix, staffing, and realistic workloads

for the new graduate (Regan et al., 2017). A culture of safety built and supported by nursing and organisational leadership gives the NGRNs the ability to seek support without fear of recrimination (Murray, Sundin & Cope, 2018b), providing the opportunity to build professional confidence. However, due to workload and fiscal limitations in some settings, such as rural or primary care settings, senior nurses are struggling to avail themselves to adequately support their fledgling nurses (Lea & Cruickshank, 2017).

With the global issue of increasing NGRN attrition, it is evident that provision of support is necessary to mitigate the critical vulnerability of new graduates transitioning to the role of registered nurse (Gazaway, Schumacher & Anderson, 2016; Laschinger et al., 2016). Retention of these nurses in the profession is necessary to maintain appropriate levels of safety for patients, and as such it is important for nurse managers and leaders to maintain that culture of safety through the provision of a just and civil work environment that nurtures NGRNs. This will then have the flow on effect of increasing professional confidence, advancing clinical skill levels and ultimately improving quality patient care (Ammouri, Geethakrishnan & Al Kindi, 2015).

Limitations: This is the first study to have used the questionnaire adapted from the World Health Organisation Patient Safety Curriculum guide (2009) for medical schools in a nursing context. Further use of this questionnaire in this context is required for validation. This study was conducted with participants from two metropolitan hospitals in Australia offering Graduate Nurse Programs, limiting the pool of potential participants. The collection of data from the wider population of the

pool of participants is not controlled by the researcher. The population was pre-determined (N=210) yet only 95 consented to undertake the survey. Participants finally numbered 68 at the first time point and 46 and 48 for the second and third time points respectively. The information sought was from the larger population of interest, however, the smaller number of responses still allowed for data collection from those individuals.

Due to the sample size generalisability, both nationally and internationally, may be limited and further research with larger samples by way of a repeat longitudinal cohort study across a greater number of GNPs is required to confirm our findings. The transition period of the NGRN has been highlighted as being a difficult time both physically and psychologically. This may be a contributing factor for the drop-out rate across the time points as these new nurses adjust to their new role and contend with the challenges faced during these initial months of practice. This study was seeking the self-reported knowledge of the participating NGRNs as such these results cannot be construed to actual knowledge.

Conclusion

This study demonstrates that this cohort of NGRNS enter professional practice with a theoretical confidence regarding medical errors. This theoretical confidence diminishes, though, during the initial six months of clinical practice. Attitudes regarding patient safety practices did not change over the three time points. These new graduate registered nurses are important to the nursing workforce and, as with all health professionals, are expected and required to provide safe, quality care. The identification of a decrease in self-reported knowledge of, and actions regarding

medical errors over a six-month period shows there remains a theory practice gap in this area of nursing, within the reality of clinical practice. This would seem to indicate a need for education, mentorship and support from nurse unit managers and nurse educators concerning medical errors and actions to undertake should one make an error, and to foster confidence regarding patient safety practices and interventions.

Conflict of Interest Statement

No conflict of interest has been declared by the authors

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