Ratios and Safe Patient Care
The New South Wales Nurses and Midwives’ Association (NSWNMA) is the registered union for all nurses and midwives in New South Wales. Membership comprises of those who perform nursing and midwifery work at all levels including management and education. This includes registered nurses and midwives, enrolled nurses and assistants in nursing (who are unlicensed).

The NSWNMA has approximately 64,500 members, of which over 10,500 work in aged care. Eligible members of the NSWNMA are also deemed to be members of the New South Wales Branch of the Australian Nursing and Midwifery Federation (ANMF). Our role is to protect and advance the interests of nurses and midwives and the nursing and midwifery professions. We are also committed to improving standards of patient care and the quality of services in health and aged care services.

This paper is authorised by the Elected Officers of the New South Wales Nurses and Midwives’ Association.

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Of all the members of the interdisciplinary healthcare team, the nurse is the only one who provides a continuous (24 hours/day, seven days/week) presence at the patient’s bedside. Thus, the nurse is the member of the healthcare team most likely to pick up deterioration in a patient’s condition and initiate interventions that minimise the impact of adverse events and prevent negative outcomes for the patient.

Following on from the seminal work by Needleman et al. (2002) many researchers have investigated a number of key patient outcomes known as ‘outcomes potentially sensitive to nursing’ (OPSN) i.e. adverse events that lead to increased length of stay in hospital (LOS) and in-hospital mortality. Eleven OPSN have been identified for both medical and surgical patients (urinary tract infection, pressure ulcers, hospital-acquired pneumonia, shock or cardiac arrest, upper gastrointestinal bleeding, hospital-acquired sepsis, deep vein thrombosis, central nervous system complications, in-hospital death, failure to rescue) and an additional three have been identified for surgical patients only (wound infection, pulmonary failure and metabolic derangement) (Needleman et al., 2001; 2002). A variety of other adverse patient outcomes, including falls and adverse drug events, have been investigated with respect to their relationship to nursing.

In the majority of costing models, the cost of an adverse event is calculated by comparison of costs between similar patients i.e. costs of a routine inpatient stay contrasted with those associated with an inpatient stay during which complications developed (Carryer & Budge, 2010).

All members of the interdisciplinary healthcare team have a role to play in prevention of adverse outcomes; however the depth and breadth of evidence – both domestic and international – describing the significant link between nurse-to-patient ratios/nursing hours per patient day and patient outcomes provides a compelling case for mandated minimum staffing in inpatient settings. The growing body of evidence clearly demonstrates that inadequate nurse staffing leads to an increase in negative outcomes for patients and ultimately a greater burden of cost to both the healthcare budget and society.

While there is consensus in the literature about the link, unfortunately there is not clear consensus with regard to a precise ratio that maximises quality, safety and efficiency. This is the ‘sweet spot’ that we must all aim for. There are a range of contextual factors that must be taken into consideration as we seek to make this judgement in NSW but it is also crucial that the process is guided by the available evidence.

The following list presents summaries of a sample of the recent evidence demonstrating the benefits associated with improved overall nurse-to-patient ratios and a higher proportion of Registered Nurses (RNs) in the nursing skill mix.

**Of all the members of the interdisciplinary healthcare team, the nurse is the only one who provides a continuous presence at the patient’s bedside.**
Research


Nurses were surveyed in general acute care hospitals (488 in 12 European countries; 617 in the United States); patients were surveyed in 210 European hospitals and 430 US hospitals. Participants 33,659 nurses and 11,318 patients in Europe; 27,509 nurses and more than 120,000 patients in the US.

Improved work environments and reduced ratios of patients to nurses were associated with increased care quality and patient satisfaction. In European hospitals, after adjusting for hospital and nurse characteristics, nurses with better work environments were half as likely to report poor or fair care quality and give their hospitals poor or failing grades on patient safety. Each additional patient per nurse increased the odds of nurses reporting poor or fair quality care and poor or failing safety grades. Patients in hospitals with better work environments were more likely to rate their hospital highly and recommend their hospitals, whereas those with higher ratios of patients to nurses were less likely to rate them highly or recommend them. Results were similar in the US. Nurses and patients agreed on which hospitals provided good care and could be recommended.


A study of discharge data for 422,730 patients aged 50 years or older who underwent common surgeries in 300 hospitals in nine European countries. Surveys of 26,516 nurses practising in study hospitals were used to measure nurse staffing and nurse education.

An increase in a nurses’ workload by one patient increased the likelihood of an inpatient dying within 30 days of admission by 7% and every 10% increase in bachelor’s degree nurses was associated with a decrease in this likelihood by 7%. These associations imply that patients in hospitals in which 60% of nurses had bachelor’s degrees and nurses cared for an average of six patients would have almost 30% lower mortality than patients in hospitals in which only 30% of nurses had bachelor’s degrees and nurses cared for an average of eight patients.

+ 1 PATIENT
increase in a nurses’ workload = 7% INCREASE
likelihood of an inpatient dying within 30 days of admission

10% INCREASE
in bachelor’s degree nurses = 7% DECREASE
likelihood of an inpatient dying within 30 days of admission

Survey data were used from 9688 nurses and 5786 patients in 181 Chinese hospitals to estimate associations between nurse workforce characteristics and nurse and patient outcomes in China. Nurse and patient assessments in China were compared with a similar study in Europe. Higher percentages of baccalaureate nurses were strongly related to better patient outcomes, with each 10% increase in the percent of baccalaureate nurses increasing patient satisfaction, high ratings, and willingness to recommend their hospital by factors ranging from 1.11 to 1.13.


The study was conducted in 181 hospitals across all of the eight economic zones in mainland China using a four-stage sampling design. 7,802 nurse surveys and 5,430 patient surveys from 600 medical and surgical units were analyzed. The adjusted joint effects of nurse staffing on patient outcomes from logistic regression analyses showed that more nursing staff per patient had statistically significant positive effects on all necessary nursing care, nurses' reports of quality of care, their confidence on patients’ self-care ability on discharge from the hospital, patient adverse events, as well as patients' report of satisfaction. When the nurse-to-patient ratio (total number of nurses on all shifts on the unit divided by total number of patients who stay on the unit) increased to the 0.5-<0.6 category, most patient outcomes were significantly improved, considering hospital and patient factors and nurse skill mix in the logistic regression models.


The aim of this study was to evaluate the effects of nurse staffing on hospital readmissions of COPD patients. A total of 1,070 hospitals and 339,379 hospitalization cases were included in the analysis. A higher number of RNs was associated with lower readmission rates of 8.9% and 7.9% respectively. A similar effect was observed as the proportion of RNs among the total nursing staff gradually increased, resulting in lower readmission rates of 7.7% and 8.3%. There were notable positive effects of nurse staffing by RNs on patient outcomes. In addition, the magnitude of impact differed between different sizes of hospitals. Thus, human resource planning to solve staffing shortages should carefully consider the qualitative aspects of the nursing staff composition.

Registered Nurses (N=14,194) providing direct patient care in study hospitals (N=225) and children hospitalised for common conditions (N=90,459) were included. Each one patient increase in a hospital’s average paediatric staffing ratio increased a medical child’s odds of readmission within 15-30 days by a factor of 1.11, or by 11% and a surgical child’s likelihood of readmission within 15-30 days by a factor of 1.48, or by 48%. Children treated in hospitals with paediatric staffing ratios of 1:4 or less were significantly less likely to be readmitted within 15-30 days. Children with common conditions treated in hospitals in which nurses care for fewer patients each are significantly less likely to experience readmission between 15 and 30 days after discharge. Lower patient-to-nurse ratios hold promise for preventing unnecessary hospital readmissions for children through more effective pre-discharge monitoring of patient conditions, improved discharge preparation and enhanced quality improvement success.


The sample included 36,529 patient admissions over a two-year period from October 2004-November 2006. The prevalence ratio showed that for each of the nurse-sensitive outcomes there was an increase in prevalence for those who were exposed to an understaffed shift, with all ratios being greater than one. After adjusting for patient characteristics, nurse-sensitive outcomes found to have the understaffed variable significant in the logistic regression model were surgical wound infection, urinary tract infection, pressure injury, pneumonia, deep vein thrombosis, upper gastrointestinal bleed, sepsis and physiological metabolic derangement.


108 general medical and surgical wards in 30 hospitals throughout Ireland. All nurses in direct patient care in the study wards were invited to participate. Data from 1397 of these nurses were used in this analysis. The study results support other research findings indicating that a positive practice environment enhances patient safety outcomes. Specifically at ward level, factors such as the ward practice environment and the proportion of nurses with degrees were found to significantly impact safety outcomes. The models developed for this study predicted 76% and 51% of the between-ward variance of these outcomes. The results can be used to enhance patient safety within hospitals by demonstrating factors at ward-level which enable nurses to effectively carry out this aspect of their role.
Surgical outcomes


This study linked hospital facility data with staff nurse survey data (N = 1024) and surgical patient discharge data (N = 76,036).

Risk-adjusted models reveal that nurse staffing, nurse work environments, and nurse education were significantly associated with patient mortality. These odds ratios imply that each additional patient per nurse is associated with an 5% increase in the odds of patient death within 30 days of admission, that the odds of patient mortality are nearly 50% lower in the hospitals with better nurse work environments than in hospitals with mixed or poor nurse work environments, and that each 10% increase in nurses having Bachelor of Science in Nursing Degree is associated with a 9% decrease in patient deaths.


This study included 25,752 elderly Medicare general surgery patients treated at focal hospitals and 62,882 patients treated at control hospitals during 2004-2006 in Illinois, New York, and Texas. Hospitals with better nursing environments and above-average staffing levels were associated with better value (lower mortality with similar costs) compared with hospitals without nursing environment recognition and with below-average staffing, especially for higher-risk patients. These results show that patients undergoing general surgery at hospitals with better nursing environments generally receive care of higher value.
The final sample for this study of AAA repair included 25,265 nurses and 20,409 patients in the 517 hospitals.

Higher workload (or each additional patient per nurse) increases the odds on patients dying and being involved in a FTR, by factors of 1.12 and 1.08, respectively. Better practice environments decrease the odds on deaths and failures, by factors of .85 and .88, respectively.

Using Pennsylvania nurse survey and patient discharge data from 1999 and 2006, we found that a ten-point increase in the percentage of nurses holding a baccalaureate degree in nursing within a hospital was associated with an average reduction of 2.12 deaths for every 1,000 patients – and for a subset of patients with complications, an average reduction of 7.47 deaths per 1,000 patients. We estimate that if all 134 hospitals in our study had increased the percentage of their nurses with baccalaureates by ten points during our study’s time period, some 500 deaths among general, orthopedic, and vascular surgery patients might have been prevented.

There were 294,602 emergency admissions to 156 NHS Trusts (hospital systems) with a 30-day mortality of 4.2%. Trust-level mortality rates for this cohort ranged from 1.6 to 8.0%. The lowest mortality rates were observed in Trusts with higher levels of medical and nursing staffing, and a greater number of operating theatres and critical care beds relative to provider size. Higher mortality rates were seen in patients admitted to hospitals with lower nursing staff ratios.
Intensive Care


The merged dataset had information on 65 ICUs and 38,168 patients. After controlling for patient characteristics and workload we found that higher numbers of nurses per bed and higher numbers of consultants were associated with higher survival rates. Further exploration revealed that the number of nurses had the greatest impact on patients at high risk of death whereas the effect of medical staffing was unchanged across the range of patient acuity.


The patient sample included 55,159 older adults on mechanical ventilation admitted to a study hospital.

Patients in critical care units with better nurse work environments experienced 11% lower odds of 30-day mortality than those in worse nurse work environments. Additionally, each 10% point increase in the proportion of ICU nurses with a bachelor’s degree in nursing was associated with a 2% reduction in the odds of 30-day mortality, which implies that the odds on patient deaths in hospitals with 75% nurses with a bachelor’s degree in nursing would be 10% lower than in hospitals with 25% nurses with a bachelor’s degree in nursing.

Higher numbers of nurses per bed and higher numbers of consultants were associated with HIGHER SURVIVAL RATES.
Missed care


Cross-sectional survey data (RN4Cast study - 26,516 RNs) on nurse staffing levels on acute hospital wards, nurse reports of care left undone, and routinely collected data on hospital related mortality are analysed. Mortality within 30 days of admission (adjusting for hospital and patient characteristics) for 422,730 patients following common surgeries in 300 hospitals in nine European countries examined. Multi-level regression models are used to assess the relationship between staffing, care left undone and mortality. Lower registered nurse staffing levels are associated with higher levels of care left undone and with an increased risk of patient death, even when other factors are controlled for.


Cross-sectional survey of 2917 registered nurses working in 401 general medical/ surgical wards in 46 general acute NHS hospitals.

Most nurses (86%) reported that one or more care activity had been left undone due to lack of time on their last shift. Most frequently left undone were: comforting or talking with patients (66%), educating patients (52%) and developing/ updating nursing care plans (47%). The number of patients per registered nurse was significantly associated with the incidence of ‘missed care’. A mean of 7.8 activities per shift were left undone on wards that are rated as ‘failing’ on patient safety, compared with 2.4 where patient safety was rated as ‘excellent’.


A moderated mediation analysis of survey data from 11,549 patients and 10,733 nurses in 217 hospitals in eight European countries shows that patient care experience is better in hospitals with better nurse staffing and a more favorable work environment in which less clinical care is left undone. Clinical care left undone is a mediator in this relationship. Clinical care is left undone less frequently in hospitals with better nurse staffing and more favorable nurse work environments, and in which nurses work less overtime and are more experienced. Higher proportions of nurses with a bachelor’s degree reduce the effect of worse nurse staffing on more clinical care left undone.

Data were collected from 33,659 nurses in 488 hospitals across 12 European countries for a large multicountry cross-sectional study.

Across European hospitals, the most frequent nursing care activities left undone included ‘Comfort/talk with patients’ (53%), ‘Developing or updating nursing care plans/care pathways’ (42%) and ‘Educating patients and families’ (41%). In hospitals with more favourable work environments, lower patient to nurse ratios, and lower proportions of nurses carrying out non-nursing tasks frequently, fewer nurses reported leaving nursing care undone.


A survey of 10,174 RNs working on general medical and surgical wards in 79 acute care hospitals in Sweden (January-March 2010). Seventy-four per cent of nurses reported some care was left undone on their last shift. The time of shift, patient mix, nurses’ role, practice environment and staffing have a significant relationship with care left undone. The odds of care being left undone is halved on shifts where RN care for six patients or fewer compared with shifts where they care for 10 or more.

74% of nurses reported some care was left undone on their last shift. The odds of care being left undone is halved on shifts where RN care for six patients or fewer compared with shifts where they care for 10 or more.
**Patient safety**


Utilized data from 1630 registered nurses (RNs) working in 132 surgical, medical and mixed surgical–medical units within 35 Swiss acute care hospitals.

After controlling for major organizational variables and hierarchical data structure, higher levels of implicit rationing of nursing care resulted in significant decrease in the odds of patient satisfaction and significant increase in the odds of nurse reported medication errors, bloodstream infections and pneumonia.


Using a retrospective design, researchers analyzed secondary data from administrative databases of one hospital containing 801 weekly staffing intervals and 31,080 patient observations. The current study shows that increasing the number of RN hours and decreasing or eliminating LPN hours can be a strategy to reduce medication errors.


Registered nurses employed in hospitals in Finland (n = 535) and the Netherlands (n = 334), with overall response rates of 44.9% and 33.4%, respectively, participated. Frequencies of patient falls were related to the patient-to-nurse ratio in both countries. Finnish participants reported the occurrence of adverse patient outcomes more frequently. Significant associations were found between nurse staffing and adverse patient outcomes in hospital settings. Compared with the Netherlands, in Finland, nurses appear to have higher workloads, there are higher patient-to-nurse ratios, and these adverse staffing conditions are associated with higher rates of adverse patient outcomes.


The article reports findings of a British study that indicated higher weekend nursing levels on stroke units significantly reduced the risk of patient health. According to the study, weekend nursing ratios were potentially associated with mortality outcomes. The research also found that patients admitted on weekends to stroke units with three nurses per ten beds had a 30-day mortality risk of 11%.
Failure to rescue


Discharge data from 66,100,672 surgical admissions to 146 general acute hospital trusts in England. Analyses showed that mortality based failure to rescue rates were significantly associated with several hospital characteristics previously associated with quality, including staffing levels. Lower rates of failure to rescue were associated with a greater number of nurses per bed and doctors per bed in a bivariate analysis. Higher total clinically qualified staffing (doctors + nurses) per bed and a higher number of doctors relative to the number of nurses were both associated with lower mortality based failure to rescue in the fully adjusted analysis; however, the extended stay based measure showed the opposite relationship.


This retrospective cross-sectional study included 284,097 patients discharged during 2007-2008 from 446 acute care nursing units at 128 Veterans Affairs medical centers. For non-ICU patients, higher RN skill mix was associated with lower 30-day mortality across all three levels of risk adjustment.


The data included 42 hospitals, representing 759 nursing units and about 1 million inpatients. Higher RN staffing was associated with lower FTR. When patient turnover increased from 48.6% to 60.7% on non-intensive units (non-ICUs), the beneficial effect of non-ICU RN staffing on FTR was reduced by 11.5%. RN staffing should be adjusted according to patient turnover because turnover increases patient care demand beyond that presented by patient count, and outcomes may be adversely affected.
The final sample was comprised of a total of 1,267,516 surgical patients, 29,391 nurses, and 665 hospitals. Logistic regression models demonstrated that each 10% increase in RN skill mix (proportion of RNs to total nursing staff) was associated with a 7% decrease in the odds of 30-day mortality and FTR in the surgical patient population. A strategic and sustained focus on the role that nursing care plays in reaching quality outcomes is key to bridging the gap in care for surgical patients. As hospital administrators continue to encounter pressure to increase quality and decrease costs, maintaining a nursing skill mix with a high proportion of RNs is one evidence-based strategy to improve surgical patient mortality and FTR.

**Efficiency**

Hospital morbidity and staffing data from September 2000 until June 2004, obtained in 2010 from a previous study, were used to analyse nursing-sensitive outcomes pre- and post-implementation of the Nurse Hours per Patient Day staffing method, which remains in place today. The cost of the intervention comprised increased nursing hours following implementation of the staffing method. Results The number of nursing-sensitive outcomes was 1357 less than expected post-implementation and included 155 fewer ‘failure to rescue’ events. The 1202 other nursing-sensitive outcomes prevented were ‘surgical wound infection’, ‘pulmonary failure’, ‘ulcer, gastritis’, ‘upper gastrointestinal bleed’, and ‘cardiac arrest’. One outcome, pneumonia, showed an increase of 493. Analysis of life years gained was based on the failure to rescue events prevented and the total life years gained was 1088. The cost per life year gained was AUD$8907. Conclusion The implementation of the Nurse Hours per Patient Day staffing method was cost-effective when compared with thresholds of interventions commonly accepted in Australia.
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Published by the NSWNMA/ANMF NSW Branch, 50 O’Dea Avenue, Waterloo NSW 2017, Australia.

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Issued August 2018.
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