



THE BENEFIT OF MORE NURSES

The New South Wales Nurses and Midwives' Association is campaigning for an improved and expanded nursing hours/ratios system in regional and rural hospitals, as well as in some speciality units within hospitals.



The key principle driving this campaign is patient safety as we believe improving ratios puts patient safety first.

In preparing our proposals, we invited all Association members to participate in an online survey. We conducted discussion groups and expert reference groups of clinicians to develop and test the draft proposals.

We also undertook an extensive literature search of the research on the relationship between the level of nursing staff and improved patient outcomes, and the economic costs/benefits of expanding the current system.

This booklet summarises the compelling evidence we have collected. The research shows that increasing the nursing hours available to the patient reduces a variety of adverse outcomes, saves money and – most importantly – saves lives.

A handwritten signature in black ink that reads "Brett Holmes". The signature is written in a cursive, flowing style.

Brett Holmes
General Secretary,
New South Wales Nurses and Midwives' Association

March 2013

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 rescue¹) 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, numerous studies – both national and international – now describe the significant link between nurse-to-patient ratios/nursing hours per patient day and patient outcomes. 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.

Tables One and Two provided below present summaries of a sample of the results of studies demonstrating the benefit of (1) improved overall nurse-to-patient ratios and (2) a higher proportion of Registered Nurses (RNs) in the nursing skill mix. Table Three presents the results of a sample of studies which have estimated the cost savings related to the decreased incidence of adverse patient outcomes resulting from increased nurse staffing.

1 Failure-to-rescue is defined as patients who have died after developing a complication while in the hospital, i.e., patients who, under normal circumstances of care, might have been 'rescued' from the complications of pneumonia, deep vein thrombosis/pulmonary embolus, sepsis, acute renal failure, shock/cardiac arrest, gastrointestinal haemorrhage/acute ulcer (Cook *et al.*, 2012).

TABLE ONE

Outcomes Potentially Sensitive to Nursing (OPSN)

STUDY	FINDING
Urinary tract infection (UTI)	
<p>Dall <i>et al.</i> (2009)</p>	<p>Discharge data from 610 hospitals (5.4 million patient discharges) was analysed to estimate the patient's risk of hospital-acquired complications. With respect to UTI it was shown that each incidence resulted in:</p> <p>Increased Length of Stay (LOS): Medical patient = 1.68 days Surgical patient = 4.58 days</p> <p>Increased cost: Medical patient = \$1,582² Surgical patient = \$4,636</p>
<p>Esparza <i>et al.</i> (2012)</p>	<p>A study of 235 Californian hospitals found (1) that with increased nursing hours per patient day (NHPPD) the odds of UTI decreased 1.013 times, and (2) as the RN proportion of skill mix increased, the odds of a UTI decreased by 4.25 times.</p>
<p>Needleman <i>et al.</i> (2002)</p>	<p>This study used data from 799 hospitals in 11 US states (covering 5,075,969 discharges of medical patients and 1,104,659 discharges of surgical patients) to examine the relationship between the amount of care provided by nurses and patient outcomes. It found that an increased proportion of hours provided by RNs and greater RN NHPPD was associated with decreased UTI.</p>
Pressure ulcer	
<p>Dall <i>et al.</i> (2009)</p>	<p>Discharge data from 610 hospitals (5.4 million patient discharges) was analysed to estimate the patient's risk of hospital-acquired complications. With respect to pressure ulcers, each per patient incidence lead on average to increased:</p> <p>LOS: Medical patient = 4.19 days Surgical patient = 6.59 days</p> <p>Cost: Medical patient = \$5,032 Surgical patient = \$5,330</p>
<p>Duffield <i>et al.</i> (2011)</p>	<p>This study, using data from 80 units in 19 NSW hospitals, found (1) increased RN/CNS (Clinical Nurse Specialist) staff to be associated with significantly decreased rates of pressure ulcers, and (2) increased RN/CNS (Clinical Nurse Specialist) staff as a proportion of nursing hours was associated with significantly decreased rates of pressure ulcers.</p>
<p>Blegen <i>et al.</i> (2011)</p>	<p>Using data from 1.1 million adult discharges in the US and staffing for 872 wards in 54 hospitals, this study found that an increase in NHPPD was associated with lower rates of pressure ulcers in intensive care.</p>

² Australian dollars at exchange rate on 09.02.13 (US\$1=0.969086 AUS)

STUDY	FINDING
Pneumonia	
Dall <i>et al.</i> (2009)	<p>Discharge data from 610 hospitals (5.4 million patient discharges) was analysed to estimate the patient's risk of hospital-acquired pneumonia. Per patient each incident, on average, lead to increased:</p> <p>LOS: Medical patient = 2.79 days Surgical patient = 4.48 days Cost: Medical patient = \$5,673 Surgical patient = \$8,273</p>
Twigg <i>et al.</i> (2010)	<p>This retrospective study of three adult tertiary hospitals in Perth utilised 236,454 patient records and 150,925 nurse staffing records and found that increased NHPPD lead to a 17% decrease in pneumonia.</p>
Duffield <i>et al.</i> (2011)	<p>Using data from 80 units in 19 NSW hospitals, this study found that an increase in RN/ CNS (Clinical Nurse Specialist) staff was associated with significantly decreased rates of pneumonia.</p>
Pappas (2008)	<p>Analysis of data from 3,230 patients in 6 inpatient nursing units in the US showed that the average incidence cost of hospital-acquired pneumonia in surgical patients was US\$1,631.</p>
Mark <i>et al.</i> (2007)	<p>Administrative data (1996-2001) was used to examine discharges of 3.65 million paediatric patients in 286 general and children's hospitals in California. Increased RN staffing lead to significant decreases in postoperative pneumonia in hospitalised children.</p>
Needleman <i>et al.</i> (2002)	<p>The researchers used data from 799 hospitals in 11 US states (covering 5,075,969 discharges of medical patients and 1,104,659 surgical patient discharges) to examine the relationship between the amount of care provided by nurses and patient outcomes. It found an increased proportion of hours provided by RNs was associated with a decreased rate of pneumonia.</p>
Kane <i>et al.</i> (2007)	<p>This US meta-study reviewed data from 94 studies conducted between 1990 – 2006 and found that every additional patient per RN per shift was associated with a 7% increase in relative risk of hospital-acquired pneumonia.</p>
Cho <i>et al.</i> (2003)	<p>This US study of 232 acute care Californian hospitals and 124,204 patients found that an increase of one RN NHPPD (from an average of 6.3 RN NHPPD) was associated with a 8.9% decrease in the odds of getting pneumonia. Lower RN staffing levels increased the probability of acquiring pneumonia with increased:</p> <p>LOS: 5.1-5.4 days Cost: \$4,094 – \$5,115/day/patient or \$21,697 – \$27,623 per episode.</p>

STUDY	FINDING
Deep vein thrombosis (DVT)	
Dall <i>et al.</i> (2009)	<p>Discharge data from 610 hospitals (5.4 million patient discharges) was analysed to estimate the patient's risk of hospital-acquired complications. On average each incidence of hospital-acquired DVT lead to increased:</p> <p>LOS: Medical patient = 3.09 days Surgical patient = 5.65</p> <p>Cost: Medical patient = \$5,133 Surgical patient = \$10,062</p>
Needleman <i>et al.</i> (2002)	<p>The researchers used data from 799 hospitals in 11 US states (covering 5,075,969 discharges of medical patients and 1,104,659 discharges of surgical patients) to examine the relationship between the amount of care provided by nurses and patient outcomes. An increased proportion of hours provided by RNs is associated with decreased incidence of DVT.</p>
Upper gastrointestinal (GI) bleeding	
Dall <i>et al.</i> (2009)	<p>Discharge data from 610 hospitals (5.4 million patient discharges) was analysed to estimate the patient's risk of hospital-acquired complications. On average, developing upper GI bleeding lead to increased:</p> <p>LOS: Medical patient = 1.37 days Surgical patient = 2.64 days</p> <p>Cost: Medical patient = \$2,730 Surgical patient = \$5,699</p>
Twigg <i>et al.</i> (2010)	<p>This retrospective study of three adult tertiary hospitals in Perth utilised 236,454 patient records and 150,925 nurse staffing records and found that increased NHPPD lead to a 37% decrease in ulcer/gastritis/upper GI bleeds.</p>
Duffield <i>et al.</i> (2011)	<p>Using data from 80 units in 19 NSW hospitals, Duffield and associates found increased RN/CNS (Clinical Nurse Specialist) staff as a proportion of nursing hours to be associated with significantly decreased rates of GI bleeding.</p>
Needleman <i>et al.</i> (2002).	<p>This study used data from 799 hospitals in 11 US states (covering 5,075,969 discharges of medical patients and 1,104,659 discharges of surgical patients) to examine the relationship between the amount of care provided by nurses and patient outcomes. An increased proportion of hours provided by RNs and greater RN NHPPD is associated with decreased upper GI bleeding.</p>
Central nervous system (CNS) complications	
Dall <i>et al.</i> (2009)	<p>Discharge data from 610 hospitals (5.4 million patient discharges) was analysed to estimate the patient's risk of CNS complications. Development of CNS complications lead to increased:</p> <p>LOS: Medical patient = 0.8 days Surgical patient = 2.99</p> <p>Cost: Medical patient = \$1,071 Surgical patient = \$3,484</p>
Twigg <i>et al.</i> (2010)	<p>This WA study utilised 236,454 patient records and 150,925 nurse staffing records and found that increased NHPPD lead to a 54% decrease in CNS complications in surgical patients.</p>

STUDY	FINDING
Sepsis	
Dall <i>et al.</i> (2009)	<p>Discharge data from 610 hospitals (5.4 million patient discharges) was analysed to estimate patient risk of hospital acquired sepsis and the subsequent impact in terms of increased LOS and cost.</p> <p>LOS: Medical patient = 5.51 days Surgical patient = 9.3 days Cost: Medical patient = \$10,946 Surgical patient = \$19,830</p>
Duffield <i>et al.</i> (2011)	<p>Analysis of data from 80 units in 19 NSW hospitals revealed that (1) increased RN/CNS (Clinical Nurse Specialist) staff is associated with significantly decreased rates of sepsis, and (2) increased RN/CNS (Clinical Nurse Specialist) staff as a proportion of nursing hours is associated with significantly decreased rates of sepsis.</p>
Mark <i>et al.</i> (2007)	<p>Administrative data (1996-2001) was used to examine discharges of 3.65 million paediatric patients in 286 general and children's hospitals in California. It found that increased RN staffing lead to significant decreases in postoperative infection in hospitalised children.</p>
Blegen <i>et al.</i> (2011).	<p>This study, using data from 1.1 million adult discharges in the US and staffing for 872 wards in 54 hospitals, found that an increase in RNs as proportion of skill mix was associated with fewer cases of sepsis.</p>
Shock/cardiac failure	
Dall <i>et al.</i> (2009)	<p>Discharge data from 610 hospitals (5.4 million patient discharges) was analysed to estimate the patient's risk of hospital-acquired shock/cardiac failure and the impact of increased length of stay and cost.</p> <p>LOS: Medical patient = 0.56 days Surgical patient = 1.36 days Cost: Medical patient = \$5,428 Surgical patient = \$8,989</p> <p>The study found a 31% increased mortality risk in medical patients with shock/ cardiac failure.</p>
Duffield <i>et al.</i> (2011)	<p>Using data from 80 units in 19 NSW hospitals it was found that increased RN/CNS (Clinical Nurse Specialist) staff as a proportion of nursing hours is associated with significantly decreased rates of shock.</p>
Needleman <i>et al.</i> (2002)	<p>This study found that an increased proportion of hours provided by RNs is associated with decreased shock/cardiac arrest.</p>
Rochman (2012)	<p>This US study of 299 patients in 22 units in one US hospital found that one additional hour per patient day of RN care resulted in 28% greater odds of surviving to discharge post in-hospital cardiac arrest.</p>

STUDY	FINDING
Failure to rescue	
Blegen <i>et al.</i> (2011)	This study, using data from 1.1 million adult discharges in the US and staffing for 872 wards in 54 hospitals, found that increased NHPPD is associated with lower rates of failure to rescue.
Hospital mortality rates	
Twigg <i>et al.</i> (2010)	This retrospective study of three adult tertiary hospitals in Perth utilised 236,454 patient records and 150,925 nurse staffing records and found that increased NHPPD was significantly associated with a 25-26% decrease in mortality rates.
Aiken <i>et al.</i> (2003)	Nurse workloads of 22,336 hospital nurses in three US states were compared and examined against patient outcomes. Ratios established in California were associated with significantly lower mortality than those found in US states with less favourable NTPRs.
Aiken <i>et al.</i> (2002)	Analysis of data from 10,184 nurses and 232,342 patients in 168 hospitals in the US found that each additional patient per nurse was associated with a 7% increase in likelihood of dying within 30 days of admission for surgical patients.
Rafferty <i>et al.</i> (2007)	Patients in UK hospitals with the lowest NTPR had a 26% higher mortality rate. This study involved 30 acute care trusts; the authors concluded that 246 lives could have been saved if all of this subset of surgical patients had been nursed in those trusts with the most favourable staffing levels.
Wiltse Nicely <i>et al.</i> (2012)	Hospitals with higher NTPR have lower rates of mortality for patients undergoing Abdominal Aortic Aneurysm repair, according to this US study.
Tourangeau <i>et al.</i> (2006)	This Canadian study used discharge data from 46,993 patients and a survey of 5980 nurses. Lower 30-day mortality rates were associated with hospitals that had a higher proportion of RN staff.
Eastabrooks <i>et al.</i> (2005)	A Canadian study of mortality rates from 18,142 patients in 49 acute care hospitals found hospitals with a higher proportion of RN nurses had lower rates of 30-day mortality.
Blegen <i>et al.</i> (2011)	This study, using data from 1.1 million adult discharges in the US and staffing for 872 wards in 54 hospitals, found that higher nursing staffing was associated with lower rates of congestive heart failure mortality in general wards.
Kane <i>et al.</i> (2007)	This US meta-study reviewed data from 94 studies conducted between 1990 – 2006 and found that every additional RN full time equivalent (FTE) per patient day would save 5 lives per 1,000 medical patients and 6 per 1,000 surgical patients. This study also found that an increase in total nurse hours/patient day was associated with reduced hospital mortality. The death rate decreased by 1.98% for every additional total nurse hour per patient day.

TABLE TWO

Additional research on the impact of nurse staffing on adverse patient outcomes

STUDY	FINDING
Adverse events in intensive care	
Rothschild <i>et al.</i> (2009)	This US study found that an adverse event in critical care lead to an average increased LOS of 1.08 days at a cost of \$3,857/event. Estimated savings from prevented adverse events ranged from \$2.31 million to \$12.8 million. Nurse staffing for the same time frame cost \$1.32 million.
Marcin <i>et al.</i> (2005)	Paediatric patients are more likely to experience an unplanned extubation when there is 1 nurse for every 2 patients rather than a 1:1 ratio.
Length of Stay (LOS)	
Esparza <i>et al.</i> (2012)	The higher the proportion of RN skill mix, the shorter the LOS according to two separate studies conducted a decade apart.
Needleman <i>et al.</i> (2002)	
Blegen <i>et al.</i> (2011)	This study, using data from 1.1 million adult discharges in the US and staffing for 872 wards in 54 hospitals, found that increased NHPPD was associated with decreased LOS.
Kane <i>et al.</i> (2007)	This US meta-study reviewed data from 94 studies conducted between 1990 – 2006 and found that LOS was shorter by 24% in ICUs and by 31% for surgical patients for each additional RN FTE/patient day.
Outcomes for high risk infants	
International Neonatal Network, Scottish Neonatal Consultants, Nurses Collaborative Study Group (2000)	This comparison of risk adjusted hospital outcomes in Scottish and Australian Neonatal Intensive Care Units found reduced levels of cerebral damage and mortality where more nursing hours per patient are provided.
Waiting time	
Chan <i>et al.</i> (2010).	A study of 30,404 patients in the waiting rooms of two US hospitals found that waiting time and care time were decreased in Emergency Departments with a mandated nurse-to-patient ratio.

STUDY	FINDING
Falls	
Dall <i>et al.</i> (2009)	Increased LOS = 2.39 days/fall Cost = \$6,919
Hinno <i>et al.</i> (2011).	A survey of 535 Finnish RNs and 334 RNs from the Netherlands found that lower nurse staffing is associated with an increased number of patient falls.
Adverse drug event	
Dall <i>et al.</i> (2009)	This study found that each adverse drug event on average leads to increased LOS of 3.8 days at a cost of \$7,572/event.
Readmission to hospital	
Bobay <i>et al.</i> (2011)	In this US study researchers examined the impact of unit-level nurse staffing on unplanned readmissions and ED visits within 30 days of discharge from 16 adult medical-surgical units (1,660 patients). They found that the odds of an unplanned (related to initial admission) ED visit decreased by 45% with a 0.71 hours increase of RN NHPPD and by 32% with a 0.66 hours increase in non-RN NHPPD. Additionally, it was found that a 0.88 hour/RN increase in overtime worked increased the odds of an unplanned ED visit by 33%.

TABLE THREE

Affordability of additional nurse staffing

STUDY	FINDING
Needleman <i>et al.</i> (2006)	This US study using data from 799 hospitals provides a business and social case for investing in nurse staffing. It analysed the costs of increasing nurse staffing to the 75th percentile for hospitals below this level to calculate cost benefits achieved by reduced length of stay and decreased adverse outcomes. It found that increased nurse staffing could have prevented 6,700 in-hospital patient deaths in these hospitals.
Rothberg <i>et al.</i> (2005)	This US study found that a staffing level of one nurse to 8 patients was the least expensive ratio but associated with highest patient mortality. Increasing staffing to 1:4 would save additional lives at a cost of \$131,795 per life saved. The study posited that this is a considerable saving compared to the cost of thrombolytic therapy in acute myocardial infarction at \$176,373 per life saved, or routine cervical cancer screening at \$418,645 per life saved.
Shamliyan <i>et al.</i> (2009)	In this US study, researchers analysed the savings-cost ratio of increased RN-to-patient ratios for patients in ICUs and patients in surgical and medical wards based on a meta-analysis of published observational studies. They estimated that an increase by one RN FTE in ICUs would save 327,390 years of life in men and 320,988 in women with a productivity benefit (present value of future earnings) of US\$ 4-5 billion. The productivity benefit from increased staffing in surgical units would be US\$8-10 billion.
Dall <i>et al.</i> (2009)	Discharge data from 610 hospitals (5.4 million patient discharges) was analysed to estimate patient risk of hospital-acquired complications, relationship with nurse staffing and LOS. It was estimated that in 2005 in the US, adverse events were associated with 251,000 in-hospital deaths, 22.6 million hospital in-patient days, and US\$41.8 billion in medical costs. The net present value of future productivity would average US\$222,400 per life saved. 34% of projected deaths averted would be in the 18-64 age group.



REFERENCES

- Aiken, L. H., Clarke, S. P., Sloane, D. M., Sochalski, J., & Silber, J. H. (2002). Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *JAMA*, *288*(16), 1987-1993.
- Aiken, L.H., Clarke, S.P., Cheung, R.B., Sloane, D. M. & Silber, J.H. (2003). Educational levels of hospital nurses and surgical patient mortality. *JAMA*, *290*(13), 1617-1623.
- Aiken, L.H. (2008). The economics of nursing. *Policy, Politics, and Nursing Practice*, *9*(2), 32-6.
- Aiken, L.H., Sloane, D.M., Cimiotti, J.P., Clarke, S.P., Flynn, L., Seago, J.A., Spetz, J. & Smith, H.L. (2010). Implications of the California nurse staffing mandate for other states. *Health Services Research*, *4*(4), 904-921.
- Blegen, M. A., Goode, C. J., Spetz, J., Vaughn, T., & Park, S. H. (2011). Nurse staffing effects on patient outcomes. Safety-net and non-safety-net hospitals. *Medical Care*, *49*(4), 406-414.
- Bobay, K.L., Yakusheva, O. & Weiss, M. (2011). Outcomes and cost analysis of the impact of unit-level nurse staffing on post-discharge utilisation. *Nursing Economic\$, 29*(2), 69-78.
- Carrier, J. & Budge, C. (2010). *Calculating Outcomes Potentially Sensitive to Nursing. A literature review.* Report for the New Zealand Ministry of Health. Wellington: Ministry of Health Available: www.moh.govt.nz
- Chan, T.C, Killeen, J.P., Vilke, G.M., Marshall, J.B. & Castillo, E.M. (2010). Effect of mandated nurse-patient ratios on patient wait time and care time in the emergency department. *Academic Emergency Medicine*, *17*, 545-552.
- Cho, S-H., Ketefian, S., Barkuaskas, V.H. & Smith, D.G. (2003). The effects of nurse staffing on adverse events, morbidity, mortality, and medical costs. *Nursing Research*, *52*(2), 71-9.
- Cook, A., Gaynor, M., Stephens Jr., M. & Taylor, L. (2012). The effect of a hospital nurse staffing mandate on patient health outcomes: Evidence from California's minimum staffing regulation. *Journal of Health Economics*, *31*, 340-348.
- Dall, T.M., Chen, Y.J., Sifert, R.F., Maddox, P.J. & Hogan, P. F. (2009). The economic value of nursing. *Medical Care*, *47*(1), 97-104.
- Duffield, C, Diers, D., O'Brien-Pallas, L., Aisbett, C., Roche, M., King, M. & Aisbett, K. (2011). Nursing staffing, nursing workload, the work environment and patient outcomes. *Applied Nursing Research*, *24*, 244-255.
- Eastabrooks, C.A, Midozi, W.K., Cummings, G.G., Ricker, K.L. & Giovannetti, P. (2005). The impact of hospital nursing characteristics on 30-day mortality. *Nursing Research*, *54*(2), 74-84.
- Esparza, S. J., Zoller, J. S., Weatherby White, A., & Highfield, M. E. F. (2012). Nurse staffing and skill mix patterns: Are there differences in outcomes? *Journal of Healthcare Risk Management*, *31*(3), 14-22.
- Hinno, S., Partanen, P., & Vehviläinen-Julkunen, K. (2012). Nursing activities, nurse staffing and adverse patient outcomes as perceived by hospital nurses. *Journal of Clinical Nursing*, *21*(11/12), 1584-1593.
- International Neonatal Network Scottish Neonatal Consultants, Nurses Collaborative Study Group (2000). Risk adjusted and population based studies of the outcome for high risk infants in Scotland and Australia. *Arch Dis Child Fetal Neonatal Ed*, *82*, F118-F123.

- Kane, R.L., Shamliyan, T., Mueller, C., Duvall, S. & Witt, T.J. (2007). Nurse staffing and quality of patient care. In: *Agency for Healthcare Research and Quality Publication No. 07-E005*. Rockville, MD: Agency for Healthcare Research and Quality.
- Marcin, J.P., Rutan, E., Rapetti, P., Brown, J., Rahnamayi, R. & Pretzlaff, R. (2005). Nurse staffing and unplanned extubation in the pediatric intensive care unit. *Pediatric Critical Care Medicine*, 6(3), 254-257.
- Mark, B. A., Harless, D. W., & Berman, W. F. (2007). Nurse staffing and adverse events in hospitalized children. *Policy, Politics and Nursing Practice*, 8, 82-92.
- Needleman, J., Buerhaus, P., Mattke, S., Stewart, M., & Zelevinsky, K. (2002). Nurse-staffing levels and the quality of care in hospitals. *New England Journal of Medicine*, 346(22), 1715-1722.
- Needleman, J. Buerhaus, P., Stewart, M., Zelevinsky, K., & Mattke, S. (2005). Nurse staffing in hospitals: is there a business case for quality. *Health Affairs*, 25(1), 204-11.
- Pappas, S.H. (2008). The cost of nurse-sensitive adverse outcomes. *Journal of Nursing Administration*, 38(5), 230-6.
- Rafferty, A. M., Clarke, S. P., Coles, J., Ball, J., James, P., McKee, M., & Aiken, L. H. (2007). Outcomes of variation in hospital nurse staffing in English hospitals: Cross-sectional analysis of survey data and discharge records. *International Journal of Nursing Studies*, 44(2), 175-182. doi: 110.1016/j.ijnurstu.2006.1008.1003.
- Rochman, M.F. (2012). The impact of nurse staffing on in-hospital cardiac arrest patient outcomes. A dissertation submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy. The University of Michigan.
- Rothberg, M. B., Abraham, I., Lindenauer, P. K., & Rose, D. N. (2005). Improving nurse-to-patient staffing ratios as a cost-effective safety intervention. *Medical Care*, 43(8), 785-791.
- Rothschild, J.M., Bates, D.W., Franz, C., Soukup, J.R. & Kaushal, R. (2009). The costs and savings associated with prevention of adverse events by critical care nurses. *Journal of Critical Care*, 24(3), 471.e1-7.
- Shamliyan, T. A., Kane, R. L., Mueller, C., Duval, S., & Witt, T. J. (2009). Cost savings associated with increased RN staffing in acute care hospitals: simulation exercise. *Nursing Economics*, 27(5), 302-314.
- Twigg, D., Duffield, C., Thompson, P.L., & Rapley, P. (2010). The impact of nurses on patient morbidity and mortality – the need for a policy change in response to the nursing shortage. *Australian Health Review*, 34(3), 3122-316.
- Twigg, D., Duffield, C., Bremner, A., Rapley, P., & Finn, J. (2010). The impact of the nursing hours per patient day (NHPPD) staffing method on patient outcomes: A retrospective analysis of patient and staffing data. *International Journal of Nursing Studies*, 48(5), 540-548.
- Tourangeau, A. E., Doran, D. M., McGillis Hall, L., O'Brien Pallas, L., Tu, J. V., & Cranley, L. A. (2006). Impact of hospital nursing care on 30-day mortality for acute medical patients. *Journal of Advanced Nursing*, 57(1), 32-40.
- Wiltse Nicely, K.L., Sloane, D.M. & Aiken, L.H. (2012). Lower mortality for abdominal aortic aneurysm repair in high-volume hospitals is contingent upon nurse staffing. *Health Services Research*, doi: 10.1111/1475-6773.12004



NSW
NURSES &
MIDWIVES'
ASSOCIATION



THE BENEFIT OF MORE NURSES

NSW Nurses and Midwives' Association

50 O'Dea Avenue, Waterloo NSW 2017

T 8595 1234 (metro)

1300 367 962 (non-metro)

www.nswnma.asn.au

Authorised by B.Holmes,
General Secretary