STTI Honor Society of Nursing

Does investing in nurse staffing provide dividends?

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Outline

Tell you a little about me, my Country and where I work

Brief summary of what we know about nurse staffing and patient outcomes

Report the findings of a systematic review on economic evaluations of nurse staffing and patient outcomes

Discuss the implications of the findings and future directions
Our world

Centre for Nursing Research, Sir Charles Gairdner Hospital
Perth WA

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A little bit about me

- 35 years working in hospitals
  - 15 years in nursing administration
- Executive Director of Nursing 600 bed public teaching hospital SCGH (2nd busiest Hospital in Australia)
  - Designated a Magnet hospital in 2009
- Department of Health Chief Nurse (policy role) for WA 6 months
- Professor of Nursing and Head of School, Nursing and Midwifery since 2010
Nurse Staffing and Quality Patient Outcomes

- Each additional patient added to nurses workload associated with 7% increase in risk of dying within 30 days admission
- Each additional patient added to nurses workload associated with a 7% increase likelihood of failure to rescue.
  
  (Aiken et al 2002)

- High patient turnover (4%), below target staffing (2%) on a shift increase the risk of dying (Needleman et. al. 2011)
Nurse Staffing and Quality Patient Outcomes

Effects of New Zealand's health reengineering on nursing and patient outcomes

• Nurse hours declined by 36%
• Significant increases in complications for patients;
  • central nervous system complications,
  • wound infection,
  • pulmonary failure,
  • physiological and metabolic derangement,
  • urinary tract infections,
  • sepsis,
  • pressure injuries.

(McCloskey and Diers 2005)
Nurse Staffing and Quality Patient Outcomes

The impact of implementing NHPPD Staffing Method

25% decrease in mortality rate
• Medical 24%
• Surgical 25%

In surgical patients:
• 54% decrease in CNS complication rate,
• 17% decrease in pneumonia rate and
• 37% decrease in ulcer/gastritis/UGI bleed rate

Significance set at p value of ≤0.05
Nurse Skill mix and Quality Patient Outcomes

Aiken found a 10% increase in degree educated registered nurses was associated with:

- 5% decrease in chance of patients dying within 30 days of admission
- 5% decrease in failure to rescue

(Aiken et al 2003)

Significant patient outcomes were adversely affected by lower registered nurse staffing levels

- Pneumonia, UTI, upper gastrointestinal bleed, length of stay, shock/cardiac arrest and failure to rescue
- Failure to rescue = death from complication of pneumonia, shock or cardiac arrest, upper GI bleeding, sepsis or DVT.

(Needleman et al 2002).
Nurse Skill mix and Quality Patient Outcomes

- Hospitals with a higher proportion of registered nurses compared to non-registered nurses were associated with lower rates of 30-day mortality. (Estabrooks et al., 2005)

- A higher proportion of registered nurses in the staff mix (as compared to registered practical nurses) was associated with lower medication error rates and lower wound infection rates (Hall, Doran, & Pink, 2004).

- Higher percentages of registered nurse staff, higher percentages of baccalaureate-prepared nurses, higher nurse reported adequacy of staffing and resources were associated with lower 30-day mortality rates in medical patients (Tourangeau, Doran et al., 2006)
Nurse Skill mix and Quality Patient Outcomes

- Skill mix with higher proportion of RNs produced statistically significant decreases in:
  - Pressure injuries
  - Gastro-intestinal bleeding
  - sepsis
  - shock
  - physiologic/metabolic derangement
  - pulmonary failure
  - failure to rescue
  - Falls

(Duffield et al. 2007)
The Context – Nurse Skill mix and Quality Patient Outcomes

Hospital 1 (skill mix 88.46%)
16% increase in pneumonia

Hospital 2 (skill mix 81.55%)
10% decrease pneumonia
  – 12% in surgical patients
19% decrease in DVT bleed
  – 20% in medical patients
17% decrease in surgical sepsis patients
27% decrease in shock/cardiac arrest
  – 34% in medical patients
12% decrease in failure to rescue

Hospital 3 (skill mix 84.05%)
4% decrease in medical pneumonia
5% decrease ulcer/gastritis/UGI bleed
  - 7% in medical patients
2% decrease mortality medical
Nurse Skill mix and Quality Patient Outcomes
Systematic review (Kane, Shamliyan, Mueller, Duval, & Wilt, 2007):

• Higher RN staffing was linked to less hospital-related mortality, failure to rescue, cardiac arrest, hospital acquired pneumonia, and other adverse events.

• The link between increased RN staffing & patients safety was strong and consistent in intensive care units and in surgical patients.

• Greater RN hours spent on direct patient care were associated with decreased risk of hospital-related death and shorter lengths of stay.

• More overtime hours were associated with an increase in hospital related mortality, nosocomial infections, shock, and bloodstream infections.
Does investing in nurse staffing provide dividends?

Cost effectiveness increasing nursing hours or skill mix to improve patient outcomes.

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Cost benefit analysis of:
Staffing levels
Ratio of required to actual hours
Length of stay
Presence of complications
Acuity level

Findings:
Understaffing 20% below required resulted in 30% increase in probability of patient having a complication. Those who experienced a complication had a mean length of stay of 3.5 days longer than those who didn’t. Additional costs associated with patients who develop complications is greater than the labour savings due to understaffing.

Behner et al. (1990)
Cost benefit analysis of:
Raising RN proportion to 75th percentile
Raising nursing hours (RN/LPN) to 75th percentile
Raising both (nursing hours and RN proportion) to the 75th percentile
Avoided deaths
Length of stay
Avoided adverse outcomes

Findings:
Cost savings exceed cost increases for raising RN proportion but not for raising nursing hours or raising both the hours and RN proportion together
Most cost savings come from decreased LOS

Needleman et al. (2006)
Cost benefit analysis of:
RN full time equivalent (FTE) /patient day
Meta-analysis of 27 published studies on staffing and outcomes
LOS, mortality, FTR, cardiac arrest, shock, unplanned extubation, respiratory failure, DVT, upper GI bleeding, falls, pressure injuries, nosocomial infection, UTI, pneumonia, nosocomial blood stream infection
Findings:
Increasing RN staffing by one RN FTE/patient day was associated with a positive savings-cost ratio and saved from between 210,683 and 604,169 years of life in medical and surgical patients with a productivity benefit of 2 to 10 billion
Largest economic benefit corresponded to an 0.56 to 1.5 increase in RN FTE/patient day
The hospital cost of increased nurse staffing exceeded the benefits
Shamiliyan et al. (2009)
Cost benefit analysis of:
Registered Nurse (RN) hours per patient day (RNHPPD), Non RN hours per patient day (Non-RNHPPD), split between overtime and non-overtime hours, RN vacancy rate
Unplanned readmissions within 30 days, Emergency department (ED) visits within 30 days, Quality of discharge teaching scale
Readiness for hospital discharge scale
Findings:
RN non-overtime and RN overtime were significant for readmission, RN overtime was significant for ED visits
Increasing RN non-overtime by 1SD (0.75 hours per patient day) cost hospitals $198 per patient but saved payers $607 per patient
Reducing RN overtime by 1SD (0.07 hours per patient day) saved hospitals $8 per patient
Rationale – better discharge planning.

Weiss et al. (2011)

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Cost effectiveness analysis of:
Association between patient care costs and nurse staffing
HPPD
RN Skill mix
Cost per hospital admission (CPHA)
Cost per bed day of care (CPBDC)
Findings:
Surgical: Neither higher skill mix or HPPD were associated with CPHA
  Both skill mix and HPPD were associated with CPBDC
Medical: RN skill mix was not associated with higher CPHA but higher
total HPPD was associated
  RN skill mix and HPPD were associated with CPBDC
Li et al. (2011)
Cost effectiveness analysis of:
Data from Aiken study 2003
Nine combinations of nurse/patient ratios and skill mixes
Mortality (survival)
Findings:
Cost for each process ranged from a daily cost of $3,280 for a survival rate of 976.2/1000 patients (8 PTN ratio/20% RNs) to a daily cost of $6,305 for a survival rate of 983.5/1000 patients (4 PTN ratio/80% RNs).

In all cases increasing the percentage of RNs or decreasing the PTN ratio increased the cost per day. The cheapest option to improve outcomes was to change the skill mix rather than the PTN ratio.

Newbold, (2008)
Cost effectiveness analysis of:
Patient to nurse ratios, lives saved

Findings:
Costs per life saved vary depending on the ratio
To change from 8 to 7 PTN, cost per life saved = $45,900 (or $24,900 with LOS costs), to change from 5 to 4 PTN, costs per life saved = $142,000 (or $70,700 with LOS costs)

Considered effective compared to the cost of thrombolytic therapy in acute myocardial infarction at US$182,000 per life saved or routine cervical cancer screening at a cost of US$432,000 per life saved. Rothberg *et al.* (2005)
Cost-effectiveness analysis of:
NHPPD – sum of registered nurse hours per nursing unit divided by the number of inpatient days per unit
Mortality
Number of life years gained, multiplied number of avoided deaths x life expectancy of patients
Findings:
Increasing staffing to the 75th percentile was associated with an incremental cost-effectiveness ratio (ICER) of €26,372 per avoided death and €2,639 per life year gained

Van den Heede et al. (2010)
Cost effectiveness of – WA Analysis:
Total nursing hours pre and post implementation NHPPD staffing method, skill mix
Life years gained based on differences in FTR pre and post intervention
1,357 nursing-sensitive outcomes prevented, including 155 ‘failure to rescue’ events.

Findings:
The cost per life year gained was AUD$8,907.

A reasonable threshold for cost-effectiveness in Australia is $30-60,000 per life year gained, hence the implementation of the NHPPD staffing method was highly cost-effective
Summary
There were 5 cost effectiveness and 4 cost benefit studies
No cost minimisation or cost utility studies
Variety of methods to conceptualise and measure costs and patient outcomes
Difficult to compare results
The evidence to date suggests that increased nursing staffing and /or improving skill mix has a beneficial effect on patient outcomes and from a societal perspective may be cost effective
Increased nurse staffing at a hospital level comes at a cost and payers are left to determine if this cost is acceptable
There is some evidence that changing skill mix may be more cost effective that increasing nursing hours
Further high quality studies using a well defined reference base case is needed to support nurse leader decision making.
Thankyou