Post-operative mortality, missed care & registered nurse staffing in nine countries: a cross-sectional study

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Background

RN Staffing

Risk of patient death in hospital
Systematic review - 2007

➢ 96 studies ➢ meta-analysis of 28

Increased RN staffing associated with lower hospital related mortality

• intensive care units (OR 0.91 CI 0.86–0.96)
• surgical units (OR 0.84; 95% CI, 0.80–0.89)
• medical patients (OR 0.94; 95% CI, 0.94–0.95)

*Kane et al (2007) Medical Care 45: 12, 1195-1204*
Griffiths, Ball, Drennan et al (2014) 'The association between patient safety outcomes & nurse/healthcare assistant skill mix & staffing levels and factors that may influence staffing requirements'.
Nurse staffing & patient outcomes
Missed care - a mediator?

- Do hospitals with higher levels of missed care have higher levels of hospital related mortality?
- Does ‘missed care’ mediate the relationship between RN staffing and mortality in acute hospitals?
RN4Cast study

Sample

- 9 Countries: Belgium, England, Finland, Ireland, the Netherlands, Norway, Spain, Sweden, Switzerland
- 300 general acute hospitals
- 422,730 patients who had undergone a common surgical procedure

Analysis

a) Generalized estimation models (model 1-3)
b) Bayesian model to test for a mediating effect (model 4)

All models adjusted for hospital characteristics (bed size, teaching status, and technology), practice environment, patient characteristics (age, sex, admission type, type of surgery, and comorbidities present on admission).
Data Sources

Nurse Survey
26,516
Registered Nurses (RNs)
Medical/Surgical wards

Patient data
422,730
Surgical patients
- Patient characteristics
- Mortality

General Acute Hospital characteristics
RN4Cast nurse survey

- Work environment & job satisfaction
- Quality & safety
- Your most recent shift
- About you
- Where you work
Nurse staffing levels

- Patients per RN
- Patients per other nursing support staff
- Skill-mix – RNs as % of total nursing staff
Care left undone

C12 On your most recent shift, which of the following activities were necessary but left undone because you lacked the time to complete them? Please tick all that apply.

- Adequate patient surveillance
- Skin care
- Oral hygiene
- Pain management
- Comfort/talk with patients
- Educating patients and family
- Treatments and procedures
- Administer medications on time
- Prepare patients and families for discharge
- Adequately document nursing care
- Develop or update nursing care plans/care pathways
- Planning care
- Frequent changing of patient position

- Any aspect of care undone (binary)
- Number of items of care undone
- Percentage of items undone (13 = 100%)

Case mix adjusted mortality

Predicted likelihood of death calculated based on patient risk factors. Administrative data on discharge:

- Admission type (emergency or elective)
- Diagnosis
- Length of stay (<30 days)
- Patient age & sex
- Comorbidities
<table>
<thead>
<tr>
<th>Model</th>
<th>Variable</th>
<th>Odds ratio</th>
<th>Lower 2.5% CI</th>
<th>Upper 2.5% CI</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>Nurse staffing</td>
<td>1.068</td>
<td>1.031</td>
<td>1.106</td>
<td>0.0002</td>
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<td></td>
<td>Nurse education</td>
<td>0.929</td>
<td>0.886</td>
<td>0.973</td>
<td>0.0019</td>
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<td>Model 2</td>
<td>Missed care</td>
<td>1.159</td>
<td>1.039</td>
<td>1.294</td>
<td>0.0084</td>
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<td>Model 3</td>
<td>Missed care</td>
<td>1.125</td>
<td>1.006</td>
<td>1.258</td>
<td>0.0392</td>
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<td>Nurse staffing</td>
<td>1.056</td>
<td>1.018</td>
<td>1.095</td>
<td>0.0036</td>
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<tr>
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<td>Nurse education</td>
<td>0.928</td>
<td>0.885</td>
<td>0.972</td>
<td>0.0018</td>
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</tbody>
</table>
Key findings

• An increase in a nurses’ workload by one patient was associated with a 7% (OR 1.068) increase in the odds of a patient dying (as per Aiken 2014, Lancet)

• A 10% increase in the percent of missed nursing care was associated with 16% (OR 1.159) increase in the odds of a patient dying
### Study 4 Results (2)

<table>
<thead>
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<th>30-day Inpatient mortality</th>
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<tbody>
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<td></td>
<td>Estimate</td>
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<td><strong>Model 4</strong></td>
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<td>Missed care</td>
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<tr>
<td>Nurse staffing</td>
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<td>Indirect effect</td>
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</table>

*SD = Standard Deviation CI = Credibility Interval (Bayesian estimator).*

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**Note:**
- The table above presents the results of the study, including estimates and their uncertainties in terms of posterior standard deviation and credibility intervals.
- The indirect effect is not quantified in the same manner as the direct effects.

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**References:**
- [Study 4 Results](#)
Implications for Policy & Practice

• Reinforces need for careful planning to ensure RN staffing adequate for safe & complete care
• Specificity – increase utility for application to practice
• Care left undone as an indicator of staffing adequacy/insufficiency
Limitations

- Cross-sectional design
- Self report measures (staffing, care left undone)
- Absence of mortality ≠ quality (other outcomes?)
- Limitations of quantitative methods – the what, not the how or why
Conclusion

• Higher RN staffing levels associated with lower risk of fatal harm to patients

• Care left undone sits on a causal pathway

• The correlation between RN staffing and mortality is likely to be causal.
Thank you!

Any questions?

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