



**CLAHRC Wessex**

Collaboration for Leadership in Applied  
Health Research and Care

UNIVERSITY OF  
**Southampton**

**NHS**

*National Institute for  
Health Research*

# Nurse staffing & patient outcomes

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# Decades of research

- In the 1980's... eg.
  - Hinshaw et al (1981) 'Staff, patient and cost outcomes of all RN staffing'
  - Fagin (1982) 'Nursing as an alternative to high cost care' (review of 51 studies)
  - Hartz et al (1989). Hospital characteristics and mortality rates. *The New England Journal of Medicine*.
- Links to 'magnet' hospital research
  - Aiken, L. H., Smith, H. L., & Lake, E. T. (1994). Lower Medicare mortality among a set of hospitals known for good nursing care. *Medical care*.
  - Scott, J., Sochalski, J., & Aiken, L. (1999). "Review of magnet hospital research: findings and implications for professional nursing practice." *J. of Nursing Administration*
- International Hospital Outcomes Study (5 countries)
  - Aiken, L. H., Clarke, S. P., & Sloane, D. M. (2002). Hospital staffing, organization, and quality of care: cross-national findings. *Nursing outlook*, 50(5), 187-194.
- Twenty years later... RN4Cast
  - Aiken, L. H., Sloane, D. M., Bruyneel, L., et al (2014). Nurse staffing and education and hospital mortality in nine European countries. *The Lancet*

# Kane et al 2007 - systematic review

- 96 studies
- Increased RN staffing was associated with lower hospital related mortality in
  - 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*

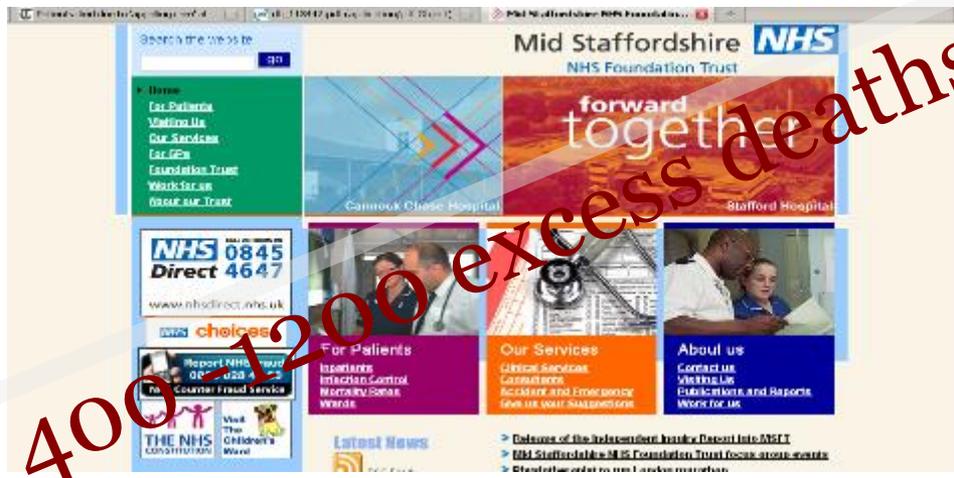
*Lack of staff is often an excuse for poor care.... there is **no direct correlation** between number of staff and good or bad care*



***Harry Cayton, CHRE regulator, HSJ March 2012***

# Context in England: call for new review

- Estimated 400-1,200 deaths beyond the expected level of mortalities at Mid Staffordshire Hospital Trust
- Patient neglect
- Independent inquiry 2010 (led by Robert Francis QC)
- Call for review of evidence and development of guidelines by NICE



# Review of literature (for NICE, 2014)

What patient safety outcomes are associated with nurse and healthcare assistant staffing levels and skill mix?

- General medical and surgical settings (including older peoples' wards)
- 1993 onwards
- Limited time frame, wide scope of questions
  - Search built on comprehensive searching undertaken for Kane's (2007) systematic review of nurse staffing / outcomes
  - include only those studies that properly controlled for the contribution of the entire nursing team (including HCA)
  - & measured nurse staffing at ward level (not hospital)

*Peter Griffiths, Jane Ball, Jonathan Drennan, Liz James, Jeremy Jones, Alex Recio-Saucedo, Michael Simon. Systematic review for NICE. March 9<sup>th</sup>, 2014*

# Which patient outcomes?

- Mortality
- Failure to rescue (death following complications)
- Serious preventable events
  - *Hospital acquired infections*
  - *'Never events'*  
serious, largely preventable safety incidents  
(e.g. entrapment in bed rails)
  - *'Safety thermometer'*  
including pressure ulcers, falls, UTIs, venous thromboembolism

# Care outcomes – omissions and errors

## Delivery of nursing care

- **Patients receiving assistance** with daily living activities, including missed care events such as help with eating, drinking, washing and other personal needs
- Completion of vital signs observations and other clinical paperwork
- Drug omissions and other nurse associated drug errors

# Reported outcomes

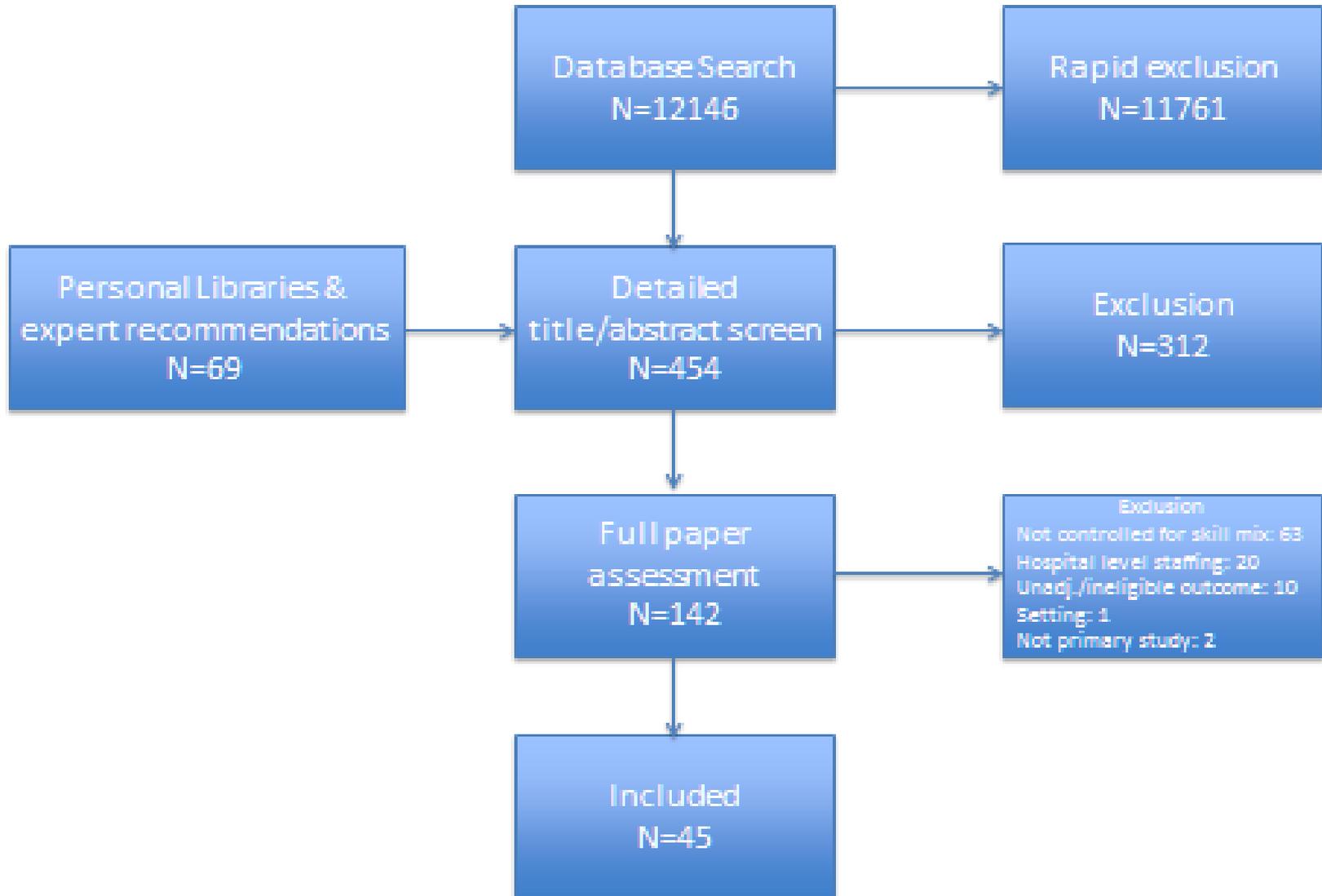
## Patient reported:

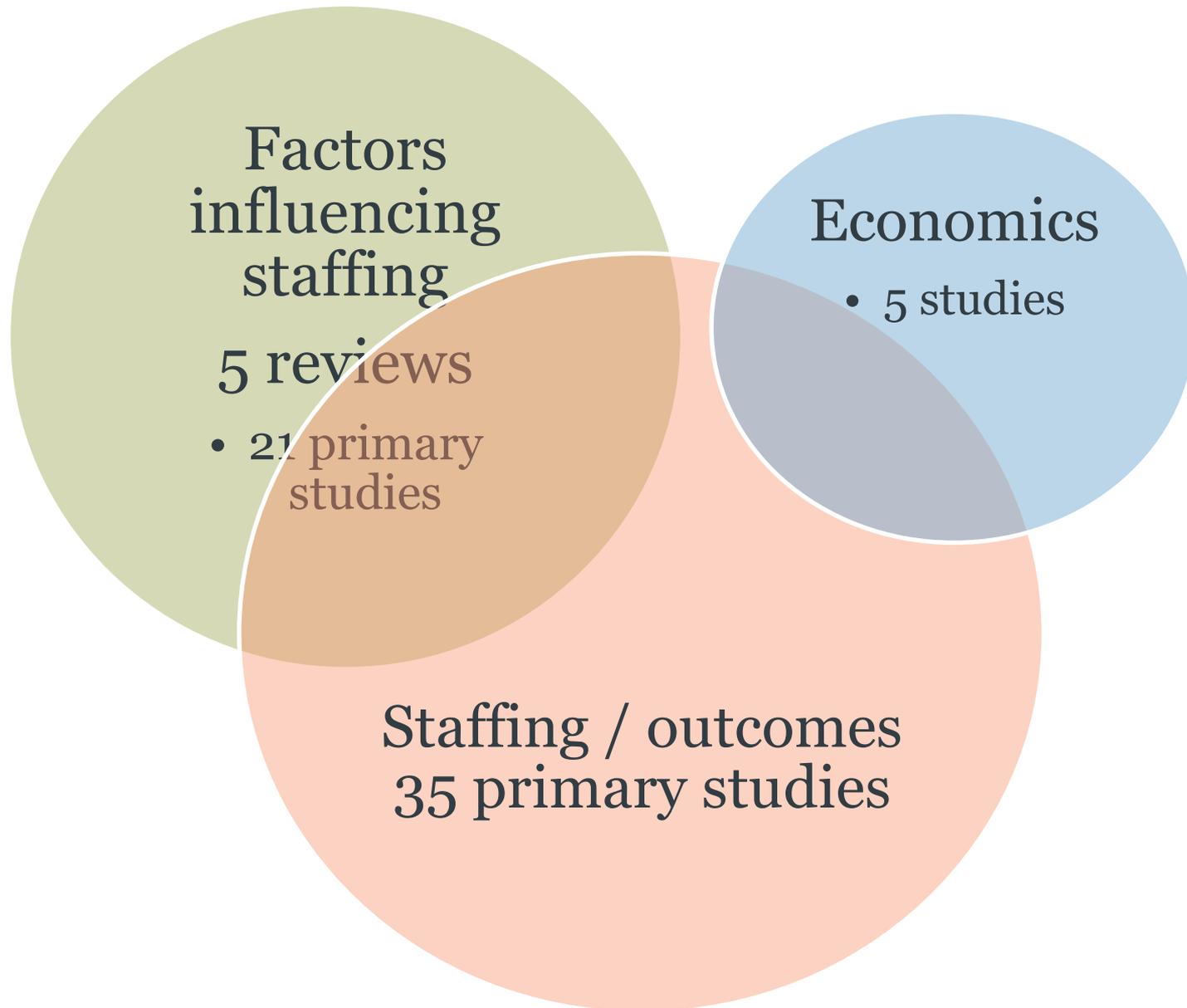
- Patient and/or carer experience and satisfaction ratings related to nursing care
- Patient complaints related to nursing care

## Reported hospital 'usage':

- Length of admission
- Hospital re-admission
- Accident and emergency rates following discharge

# From search → Review





Factors  
influencing  
staffing

5 reviews

- 21 primary studies

Economics

- 5 studies

Staffing / outcomes  
35 primary studies

Study	Internal validity	External validity
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Ausserhofer 2013	-	++
Ball et al 2013	+	++
Blegen 2011	++	+
Blegen and Goode 1998	-	-
Blegen and Vaughn 1998	+	+
Chang 2011	-	++
Cho 2003	++	+
Donaldson 2005	+	++
Duffield 2011	-	+
Estabrooks 2005	++	+
Frith 2010	-	-
Frith 2012	+	-
Hart 2011	-	-
He 2013	++	++
IBE 2008	-	+
Kutney lee 2013	++	+
Lake 2010	+	+
Manojlvich 2011	-	-
McGillis Hall 2004	-	+
Needleman 2011	++	+
O'Brien Pallas 2010	+	-
O'Brien Pallas 2010 b	-	-
Park 2012	++	+
Patrician 2011	++	++
Potter 2003	+	-
Sales 2008	++	++
Seago 2006	-	-
Shever 2005	-	-
Sochalski 2008	++	+
Spetz 2013	++	++
Staggs 2012	+	+
Tschannen 2010	+	++
Twigg 2013	++	+
Unruh 2007	-	-
Weiss2011	+	-

# Overview - findings

- 28 studies reported associations between nurse staffing levels and the outcomes considered for the review
- Strong evidence from several large observational studies that LOWER nurse staffing levels associated with HIGHER rates of **death and falls**
- Strong evidence that HIGHER nurse staffing is associated with LESS hospital use - **length of stay** or **readmission** associated
- Similar but less consistent evidence re **infections**
- Contradictory evidence re **pressure ulcers**.
- No evidence of an association with **VTE**

# Mortality and Failure to Rescue - findings

For death (9 studies) and failure to rescue (7 studies), a relatively clear picture emerges.

Significant associations in six studies

- 4 (all rated ++ for validity): **LOW staffing & HIGHER Mortality**  
*(Blegen et al., 2011, Needleman et al., 2011, Sales et al., 2008, Sochalski et al., 2008)*
- 2 (rated ++ for validity): **LOW staffing & HIGHER Failure to Rescue**  
*(Park et al., 2012, Twigg et al., 2013)*

No study showed a significant adverse relationship.

# Falls and pressure ulcers - findings

## Falls (12 studies)

3/12 (+ or ++) sig. association: HIGH staffing with LOWER rates of falls  
(*Donaldson et al., 2005, Patrician et al., 2011, Potter et al., 2003*).

5/12: same direction of association but results not significant

## Pressure ulcers (12 studies)

- 3/12 (+, -, -) sig. negative assoc.: LOW staffing & LOW rates of ulcers (*Donaldson et al., 2005, Duffield et al., 2011, Hart and Davis, 2011*)
- 2/12 studies (both ++), significant POSITIVE association – HIGH staffing associated with LOWER incidence  
(*Cho et al., 2003, Twigg et al., 2013*).

# Gaps in the research

- The outcomes measured generally represent failures of care, not positive ‘quality’.
- Current measures of quality in research do not reflect contributions of health care assistants.
- Relatively little evidence derived from the EU/UK
- “Risk adjustment” for pressure ulcers and other outcomes

## But whilst there are some gaps...

- The evidence that there is an association between staffing and patient outcomes is substantial
- Number of good quality, large scale, multi site observational studies have consistently found:

**HIGHER nurse staffing is associated with LOWER hospital mortality and LOWER risk of harms**



# An increase in a nurses' workload by one patient increased the likelihood of an inpatient dying within 30 days of admission by 7%

(odds ratio 1.068, 95% CI 1.031–1.106, p= 0.0002)

Linda H Aiken et al. (2014). *'Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study'*  
Lancet. published online 26 Feb 2014.

## Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study

Linda H Aiken, Deborah Stone, Johanna Haerlin, Lisa Fort, Josephine Rafferty, Barbara Oberlin, Johanna Wasth, David L. Needham, Lucie Lapeere, David L. Needham, Catherine Fort, Barbara Rafferty, Jennifer W. Evans, Peter G. Cox, Silke Schneider, Lucie Lapeere, Johanna Wasth, Barbara Oberlin, Lisa Fort, Josephine Rafferty, Johanna Haerlin

### Summary

**Objective:** To determine the relationship between nurse staffing and education and hospital mortality in nine European countries. **Design:** Retrospective observational study. **Setting:** Nine European countries. **Participants:** 427 702 patients aged 50 years or older who underwent cardiac surgery in 300 hospitals in nine European countries. **Measurements and Main Results:** We used generalised estimating equations to assess the effects of nursing factors on the likelihood of inpatient dying within 30 days of admission, before and after adjusting for other hospital and patient characteristics. **Conclusions:** An increase in the number of nurses per patient was associated with a decrease in the likelihood of inpatient dying within 30 days of admission. An increase in the number of nurses per patient was associated with a decrease in the likelihood of inpatient dying within 30 days of admission.

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**Conclusion:** An increase in the number of nurses per patient was associated with a decrease in the likelihood of inpatient dying within 30 days of admission. An increase in the number of nurses per patient was associated with a decrease in the likelihood of inpatient dying within 30 days of admission.

**Keywords:** nurse staffing, education, hospital mortality, observational study

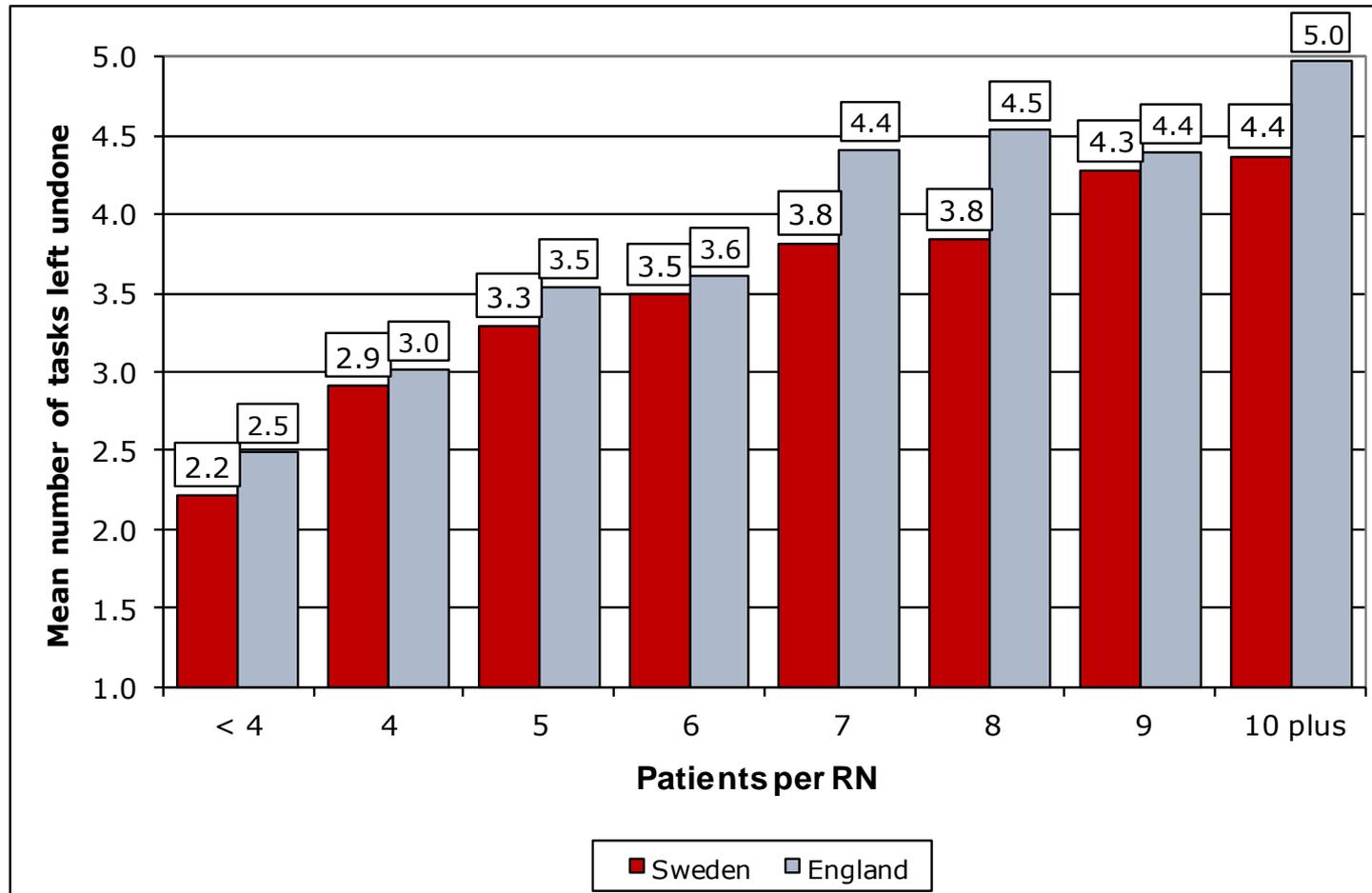


1. Aiken LH, Stone D, Haerlin J, Fort L, Rafferty J, Oberlin B, Wasth J, Needham DL, Lapeere D, Fort C, Rafferty B, Evans J, Cox P, Schneider S, Lapeere D, Wasth J, Oberlin B, Fort L, Rafferty J, Haerlin J  
2. Aiken LH, Stone D, Haerlin J, Fort L, Rafferty J, Oberlin B, Wasth J, Needham DL, Lapeere D, Fort C, Rafferty B, Evans J, Cox P, Schneider S, Lapeere D, Wasth J, Oberlin B, Fort L, Rafferty J, Haerlin J  
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# Talking numbers - what ratio?

- Most studies do not give staffing levels
  - Rather coefficients that allow calculation of differences associated with *change*
  - Linear relationships are modelled
- NHS study (Ball et al., 2013) reported levels:  
**Risk of care being left undone was only significantly reduced on the best staffed shifts**  
**(6 pts or fewer per RN on a day shift)**

# Care left undone by pts per RN (day shifts)



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# Thank you

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