KU LEUVEN

LEUVEN INSTITUTE FOR HEALTHCARE POLICY

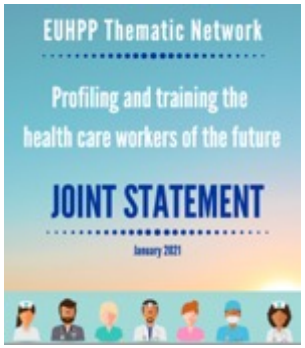
FINE

Relationship of nurse staffing, nurse qualification, work environment and quality of care: what is the evidence?

Thursday December 16, 2021

Prof. Walter SERMEUS
Leuven Institute for Healthcare Policy, KU Leuven
WHO CC for Human Resources in Health Research & Policy

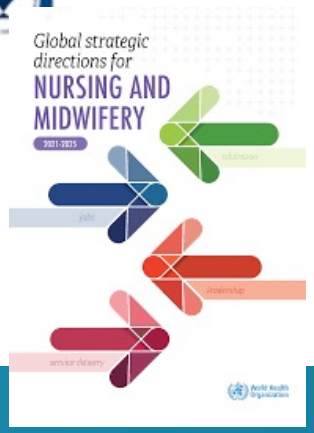
General consensus: Nurses are key for sustainability & resilience of health systems

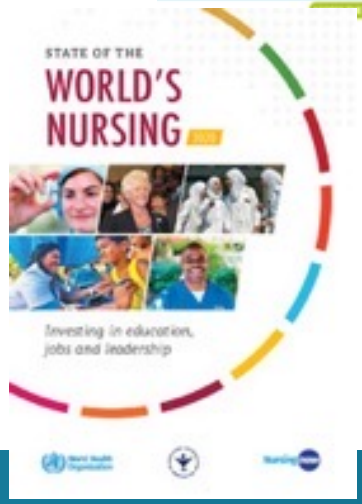


Dublin Declaration on Human Resources for Health:

Building the Health Workforce of the Future

"That further shore is reachable from here"





But 2020-21 …

PTSD

BURNOUT

ANXIETY

DEPRESSION

SICK LEAVE

INTENTION TO LEAVE

JOB SATISFACTION

LEUVEN

LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Chronic hospital nurse understaffing meets covid-19

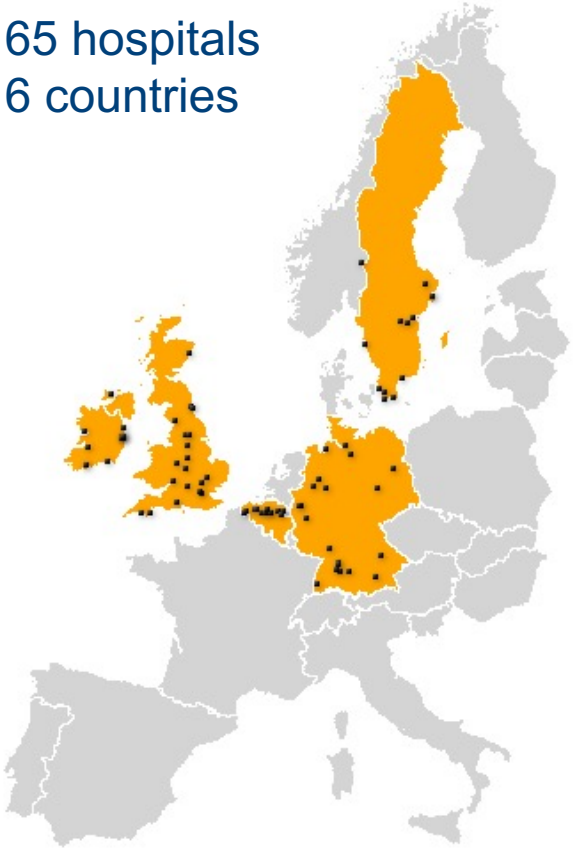
- Survey nurses and patients in 254 hospitals in New York and Illinois, USA in December 2019 - February 2020
- Worst nurse staffing in New Yor City (very badly hit by Covid-19)
- Results from nurses:
  - More than 50% of nurses: high burn-out
  - Two-thirds would not recommend their hospitals
  - One additional patient per nurse increase odds of unfavorable reports
    - On medical-surgical units (ORs varying from 1.2 to 1.5)
    - On intensive care (OR varying from 1.3 to 3.6)
- Results from patients:
  - One-third of patients would not recommend these hospitals
  - One additional patient per nurse increase odds of unfavorable reports (OR 2.7 (lower rating), 2.9 (not recommending)

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Lasater K. et al., BMJ Quality & Safety, 2021

Horizon2020 funded EU project MAGNET4EUROPE (2020– 2023)

65 hospitals
6 countries



Magnet4Europe Attributed Goals

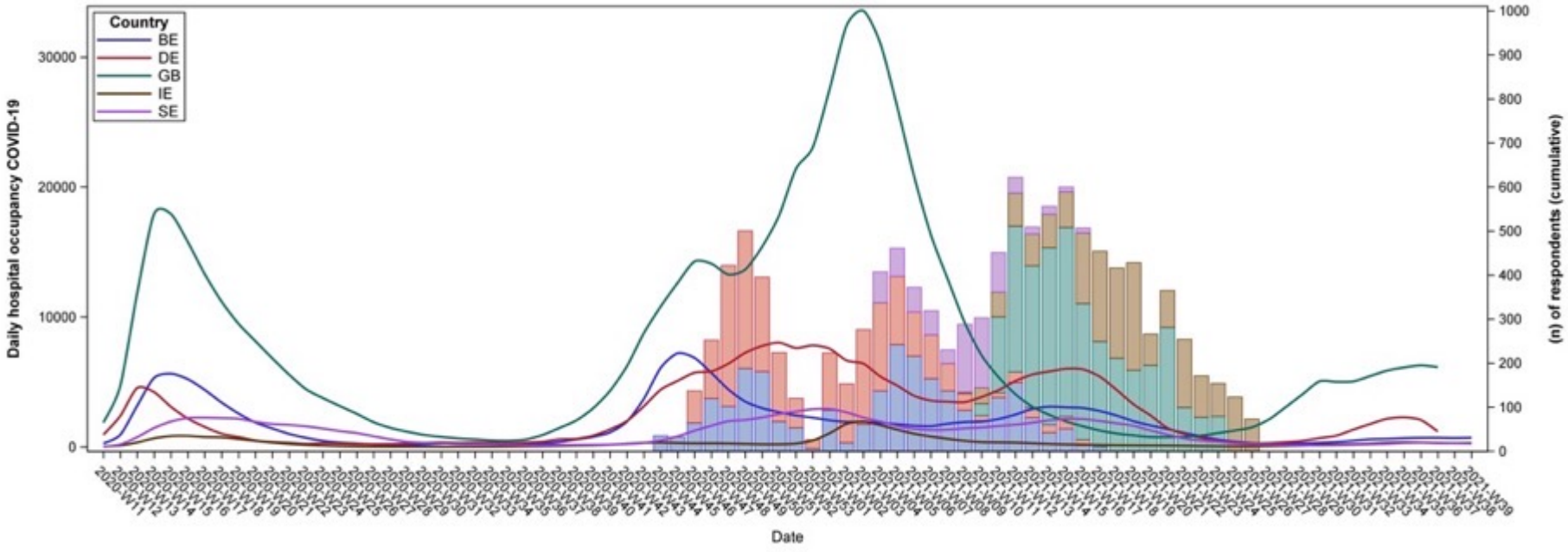
- Improve work environments
- Improve job-related health outcomes of nurses and physicians
- Improve patient outcomes

Intervention

- Magnet® blueprint and Gap Analysis Tool
- One-to-one twinning with US Magnet® hospitals
- Learning collaboratives
- Critical mass and network creation
- Actionable feedback report

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Baseline survey in 67 European hospitals during covid-19

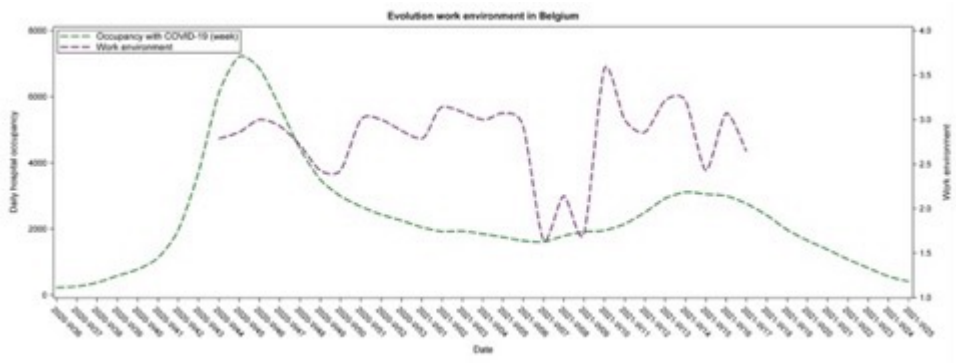


SURVEY: N= 11506 (9338 Nurses; 2168 Physicians)

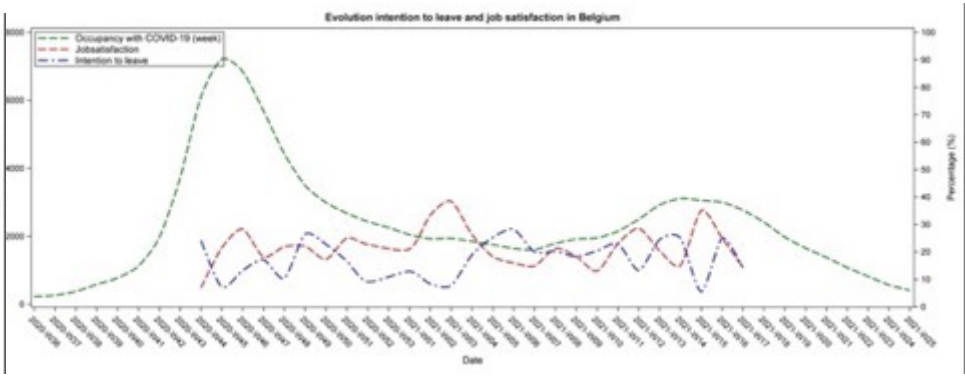
KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Assessments of work environment and staff well-being seem not to be highly related to covid-19

Covid-19 and work environment



Covid-19 and job satisfaction / intention-to-leave



KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Strong correlation between work environment and mental health of care providers (nurses / physicians)

Work environment:
- Staffing adequacy
- Foundations for Quality
- Management & Leadership support
- Nurse-physician relationships
- Involvement in hospital affairs

Nurses (N=9338)

Work environment	Average Job satisfaction (score 1-4)	Percentage burn-out	Percentage intention-to-leave
Poor	2.81	28%	38%
Medium	2.92	24%	30%
Best	3.10	17%	21%

Physicians (N=2168)

Work environment	Average Job satisfaction (score 1-4)	Percentage burn-out	Percentage intention-to-leave
Poor	2.70	35%	47%
Medium	2.92	22%	26%
Best	3.22	16%	15%

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Building Better together:

Roadmap to guide implementation of the Global Strategic Directions for Nursing and Midwifery in the WHO European Region – Launch December 10, 2021

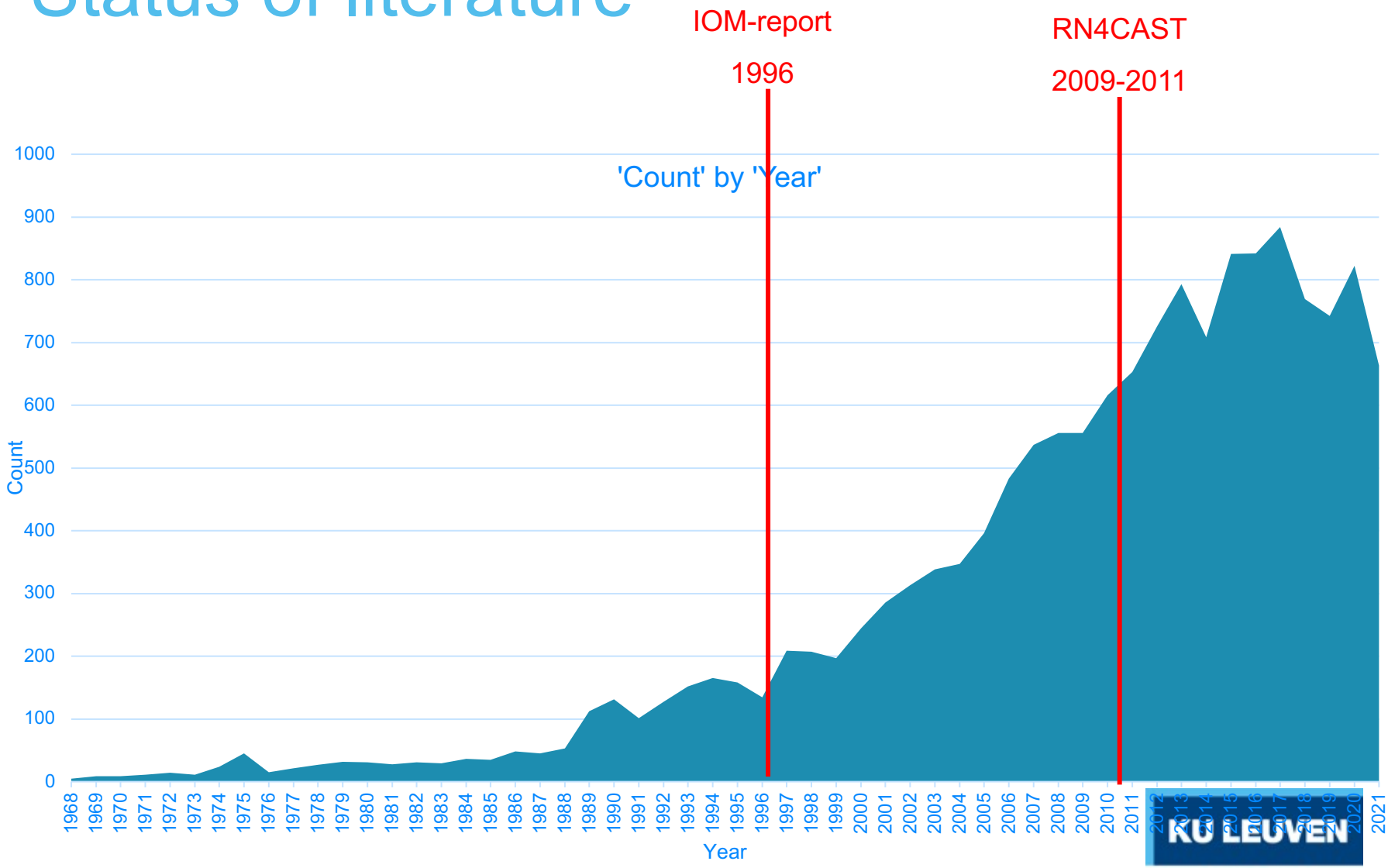
KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

https://www.euro.who.int/en/health-topics/Health-systems/nursing-and-midwifery/publications/2021/building-better-together-roadmap-to-guide-implementation-of-the-global-strategic-directions-for-nursing-and-midwifery-in-the-who-european-region-2021

What makes the nursing workforce resilient? what is the evidence?

- Education: Training & qualification
- Service delivery / Jobs: Safe nurse staffing
- Leadership: Healthy work environments

Status of literature



Pubmed-results met search-string: (‘nurse staffing’ or ‘nursing skill mix’ or ‘nurse workforce’) and (‘patient safety’ or ‘quality of care’ or ‘patient satisfaction’ or ‘length of stay’)

Effect of nurse staffing on patient mortality

	Nurse staffing (patients to nurse)		Nurse education (% of nurses with bachelor's degrees)	
	Mean (SD)	Range	Mean (SD)	Range
Belgium	10·8 (2·0)	7·5–15·9	55% (15)	26–86%
England	8·8 (1·5)	5·5–11·5	28% (9)	10–49%
Finland	7·6 (1·4)	5·3–10·6	50% (10)	36–71%
Ireland	6·9 (1·0)	5·4–8·9	58% (12)	35–81%
Netherlands	7·0 (0·8)	5·1–8·1	31% (12)	16–68%
Norway	5·2 (0·8)	3·4–6·7	100% (0)	100–100%
Spain	12·7 (2·0)	9·5–17·9	100% (0)	100–100%
Sweden	7·6 (1·1)	5·4–9·8	54% (12)	27–76%
Switzerland	7·8 (1·3)	4·6–9·8	10% (10)	0–39%
Total	8·3 (2·4)	3·4–17·9	52% (27)	0–100%

Means, SDs, and ranges are estimated from hospital data—eg, the 59 hospitals in Belgium have a mean patient-to-nurse ratio of 10·8, and the patient-to-nurse ratio ranges across those 59 hospitals from 7·5 to 15·9. Similarly, the 31 hospitals in Switzerland have, on average, 10% bachelor's nurses, and the percent of bachelor's nurses ranges across those 31 hospitals from 0% to 39%.

Table 2: **Nurse staffing and education in nine European countries**

	Number of hospitals	Mean discharges per hospital (range)	Deaths/discharges (%)
Belgium	59	1493 (413–4794)	1017/88 078 (1·2%)
England	30	2603 (868–6583)	1084/78 045 (1·4%)
Finland	25	1516 (175–3683)	303/27 867 (1·1%)
Ireland	27	738 (103–1997)	292/19 822 (1·5%)
Netherlands	22	1419 (181–2994)	466/31 216 (1·5%)
Norway	28	1468 (432–4430)	518/35 195 (1·5%)
Spain	16	1382 (186–3034)	283/21 520 (1·3%)
Sweden	62	1304 (295–4654)	828/80 800 (1·0%)
Switzerland	31	1308 (158–3812)	590/40 187 (1·5%)
Total	300	1308 (103–6583)	5381/422 730 (1·3%)

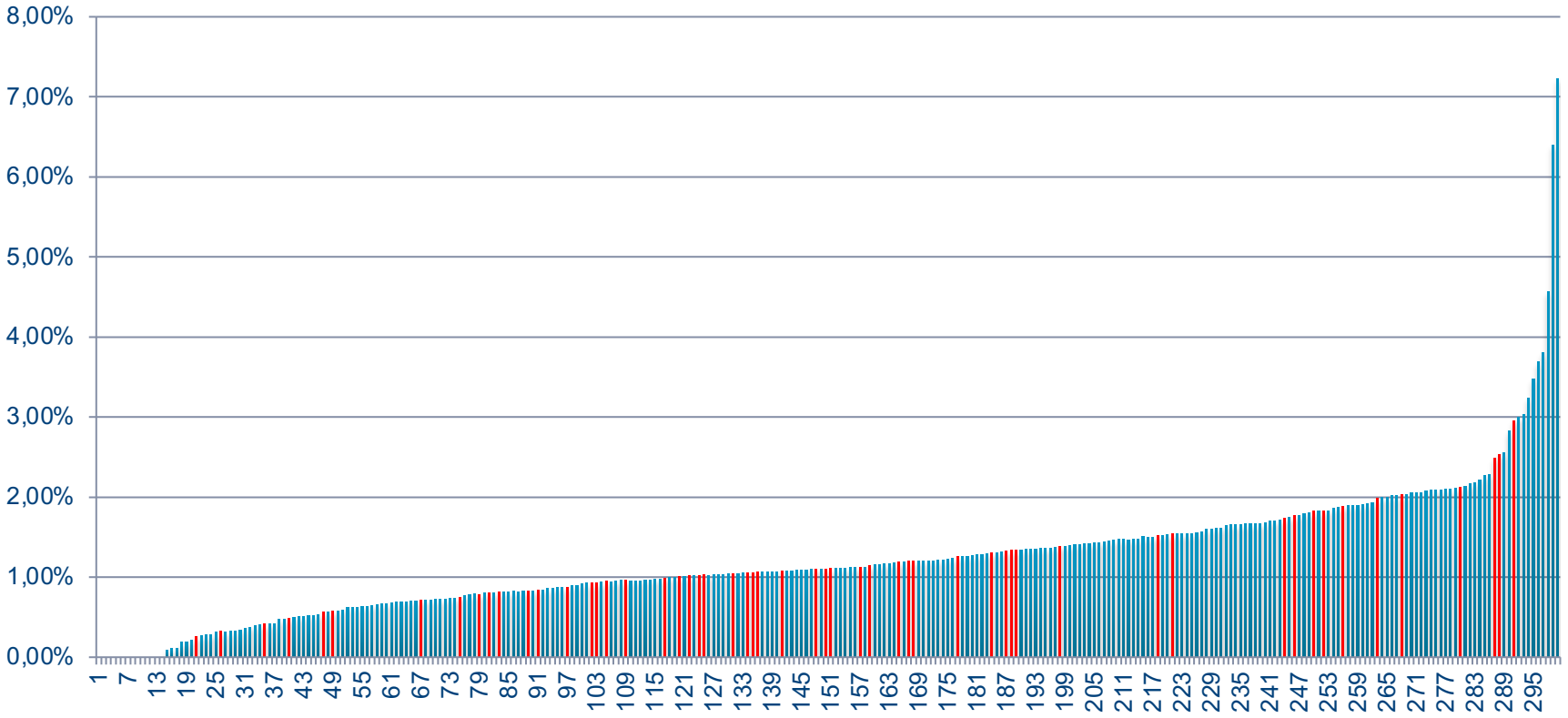
Only hospitals with more than 100 surgical patient discharges were included in the analyses. Data shown are for discharged patients for whom information about 30 day mortality, age, sex, type of surgery, and comorbidities were complete. Data were missing for those characteristics for less than 4% of all patients.

Table 1: **Hospitals sampled in nine European countries with patient discharge data, numbers of surgical patients discharged, and numbers of patient deaths (RN4CAST data)**

LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Aiken et al., The Lancet, 2014

30-day inpatient general surgery mortality per hospital
N_h = 300 Hospitals, N_p=422730 patients
(9 European countries: BE, UK, FI, IE, NL, NO, ES, SE, CH)
"One country" hospitals are marked in red



MEAN EUROPE: 1.3%, RANGE: 0.0%-7.2%, N=300
MEAN ONE COUNTRY: 1.2%, RANGE: 0.3%-3,0%, N=59

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Aiken LH et al…. Sermeus W, Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study, The Lancet 26 February 2014

Significant effect

	Partly adjusted models		Fully adjusted model	
	OR (95% CI)	p value	OR (95% CI)	p value
Staffing	1·005 (0·965–1·046)	0·816	1·068 (1·031–1·106)	0·0002
Education	1·000 (0·959–1·044)	0·990	0·929 (0·886–0·973)	0·002

The partly adjusted models estimate the effects of nurse staffing and nurse education separately while controlling for unmeasured differences across countries. The fully adjusted model estimates the effects of nurse staffing and nurse education simultaneously, controlling for unmeasured differences across countries and for the hospital characteristics (bed size, teaching status, technology, and work environment), and patient characteristics (age, sex, admission type, type of surgery, and comorbidities present on admission). OR=odds ratio.

Table 4: **Partly and fully adjusted odds ratios showing the effects of nurse staffing and nurse education on 30 day inpatient mortality**

IMPACT

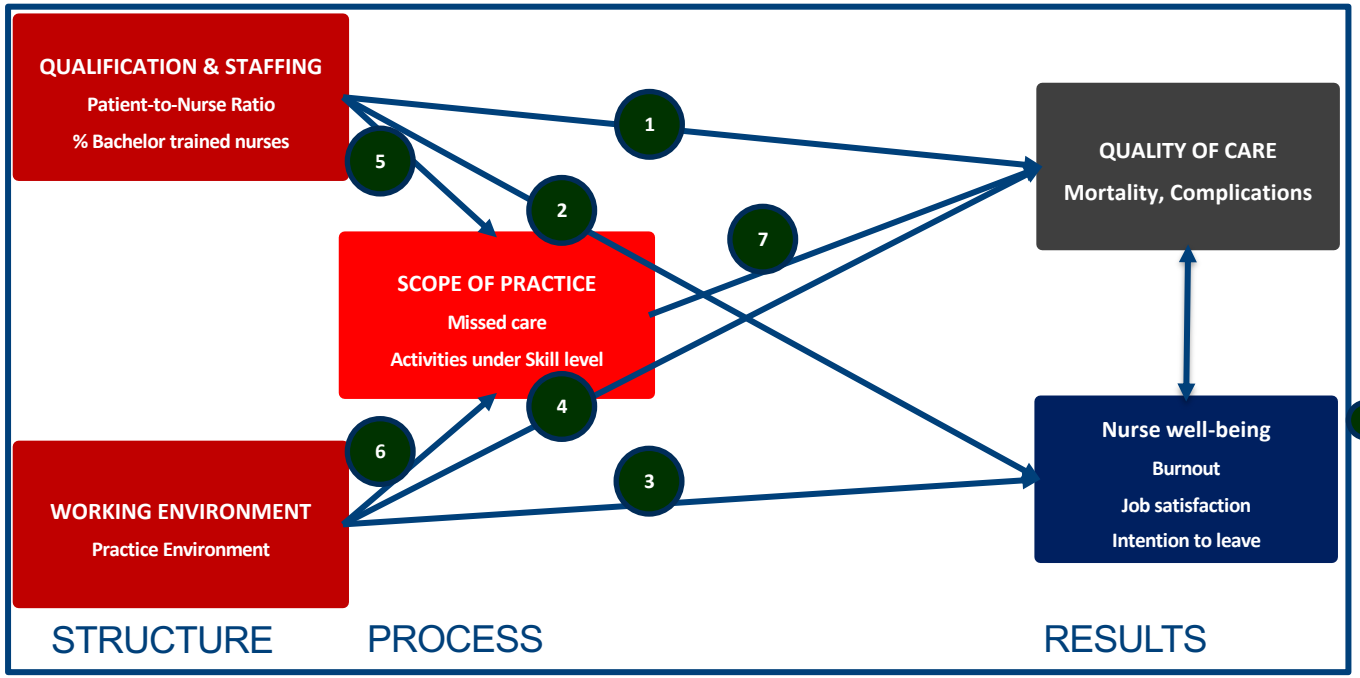
+1 patient/nurse
+7% mortality

+10% Bachelors
-7% mortality

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Aiken et al., The Lancet, 2014

CURRENT EVIDENCE - HOSPITALS



1 Shekelle et al. Nurse–Patient Ratios as a Patient Safety Strategy A Systematic Review. Annals of Internal Medicine 2013

2 Audet et al. Associations between nurse education and experience and the risk of mortality and adverse events in acute care hospitals: A systematic review of observational studies IJNS 2018

2 Shin et al. Nurse staffing and nurse outcomes: A systematic review and meta-analysis. Nursing Outlook. 2018

3 4 Lake et al. A Meta-Analysis of the Associations Between the Nurse Work Environment in Hospitals and 4 Sets of Outcomes. Medical Care 2019

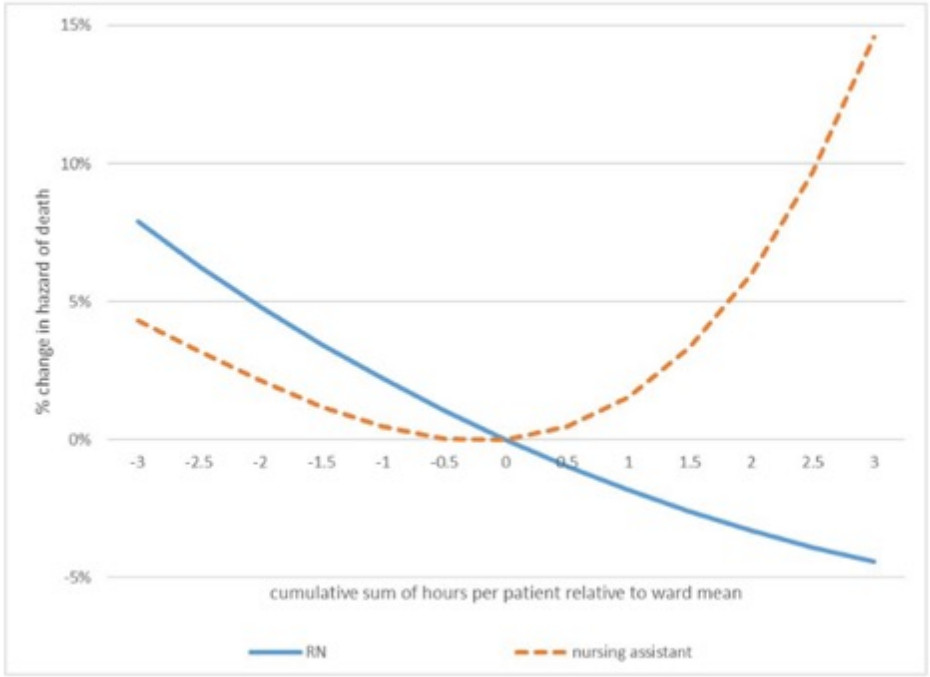
5 Griffiths et al. The association between nurse staffing and omissions in nursing care: A systematic review. J Adv Nurse 2018

6 Zhao et al. Associations between work environment and implicit rationing of nursing care: A systematic review. J Nurs Manag. 2019

7 Recio-Saucedo et al. What impact does nursing care left undone have on patient outcomes? Review of the literature. J Clin Nurse 2018

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Percentage of support staff – healthcare assistants



A delicate balance:

- More nurses: reduction in mortality
- More HCA: a reduction of mortality until a point
- From that point: more HCA leads to higher mortality
- Proabably related to support role and substitution role of HCA to nurses

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Griffiths et al. BMJ Q&S 2019

MISSED CARE

DESCRIPTIVE FINDINGS

	BE	CH	DE	...	12 countries
1. Comfort/talk with patients	58.7 (15.9)	51.8 (17.1)	81.0 (11.6)		**52.6 (18.5)**
2. Develop or update nursing care plans/care pathways	43.4 (11.3)	38.3 (13.6)	55.2 (11.3)		**41.7 (13.8)**
3. Educating patients and families	44.0 (12.6)	30.9 (11.6)	51.3 (14.0)		**40.6 (17.1)**
4. Oral hygiene	43.3 (12.9)	24.1 (11.8)	30.2 (14.3)		**34.4 (14.5)**
5. Adequately document nursing care	36.3 (12.5)	19.4 (9.4)	40.7 (13.7)		**27.5 (13.2)**
6. Adequate patient surveillance	28.6 (12.5)	16.3 (10.5)	37.7 (12.6)		**27.2 (13.6)**
7. Planning care	26.5 (11.8)	19.2 (9.4)	43.7 (12.3)		**25.8 (14.9)**
8. Frequent changing of patient position	31.8 (19.5)	18.0 (11.8)	22.4 (13.1)		**24.7 (15.5)**
9. Skin care	26.5 (11.8)	16.4 (7.2)	28.5 (14.2)		**24.5 (12.8)**
10. Prepare patients and families for discharge	26.6 (9.5)	16.4 (5.9)	23.5 (9.5)		**22.4 (11.0)**
11. Administer medications on time	22.6 (10.4)	15.3 (7.9)	20.2 (10.6)		**19.4 (10.5)**
12. Pain management	15.7 (8.6)	8.3 (6.3)	19.7 (10.1)		**10.0 (9.2)**
13. Treatments and procedures	12.3 (7.7)	2.8 (3.6)	14.2 (9.4)		**9.2 (9.0)**
14. Composite score	**4.1 (1.1)**	**2.8 (0.8)**	**4.7 (0.9)**		3.6 (1.2)

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Ausserhofer et al. 2014 BMJ Q&S

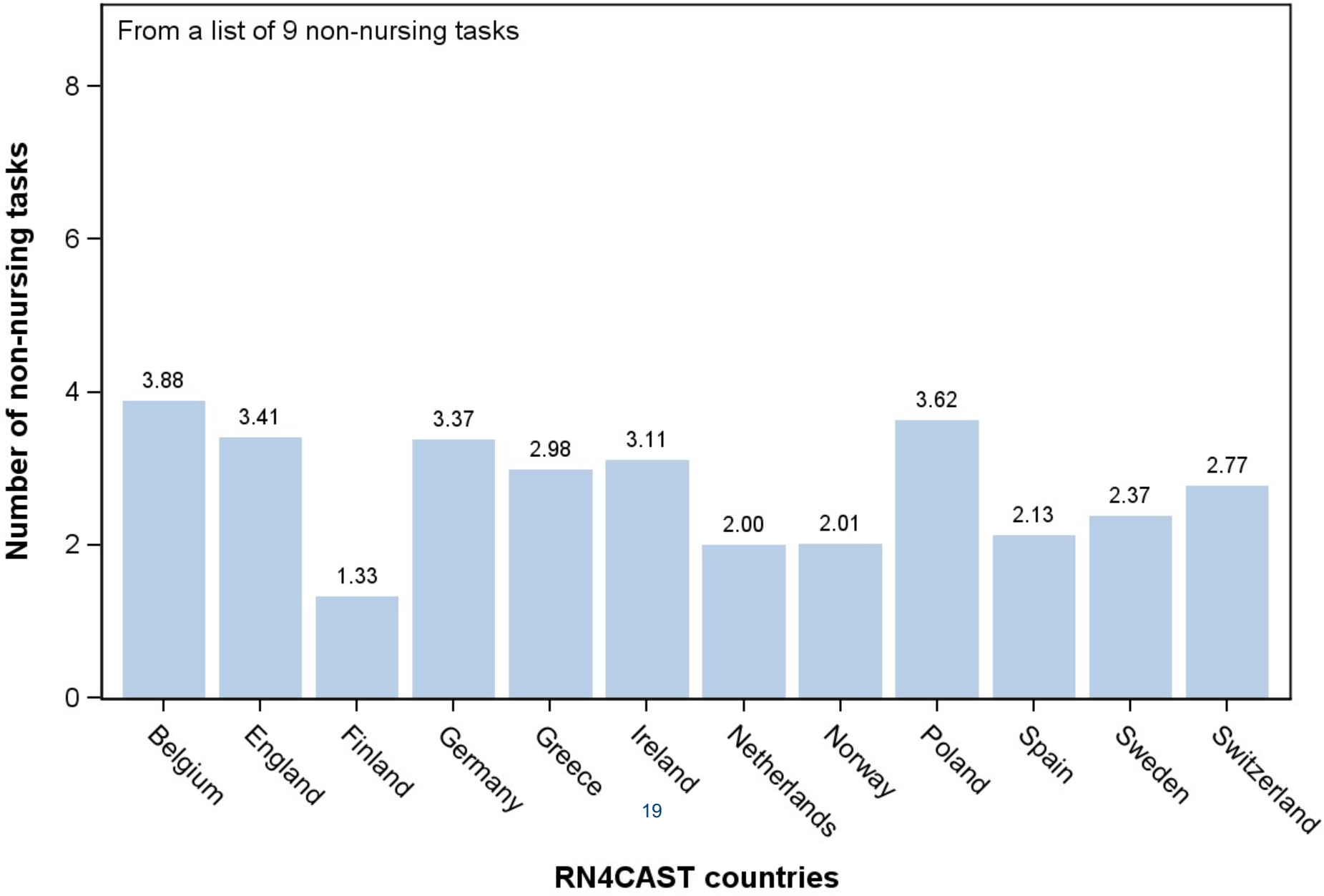
Tasks below skill level

Tasks "never", "sometimes", "often" performed during last shift:

1. Delivering and retrieving food trays
2. Performing non-nursing care
3. Arranging discharge referrals and transportation (including to long term care)
4. Routine phlebotomy/blood draw for tests
5. Transporting of patients within hospital
6. Cleaning patient rooms and equipment
7. Filling in for non-nursing services not available on off-hours
8. Obtaining supplies or equipment
9. Answering phones, clerical duties

Aiken et al., IJNS, 2013

Nurses' reports of the number of non-nursing tasks they often performed during their last shift: RN4CAST countries



Scope of practice: Nursing Care Left Undone because of Lack of Time

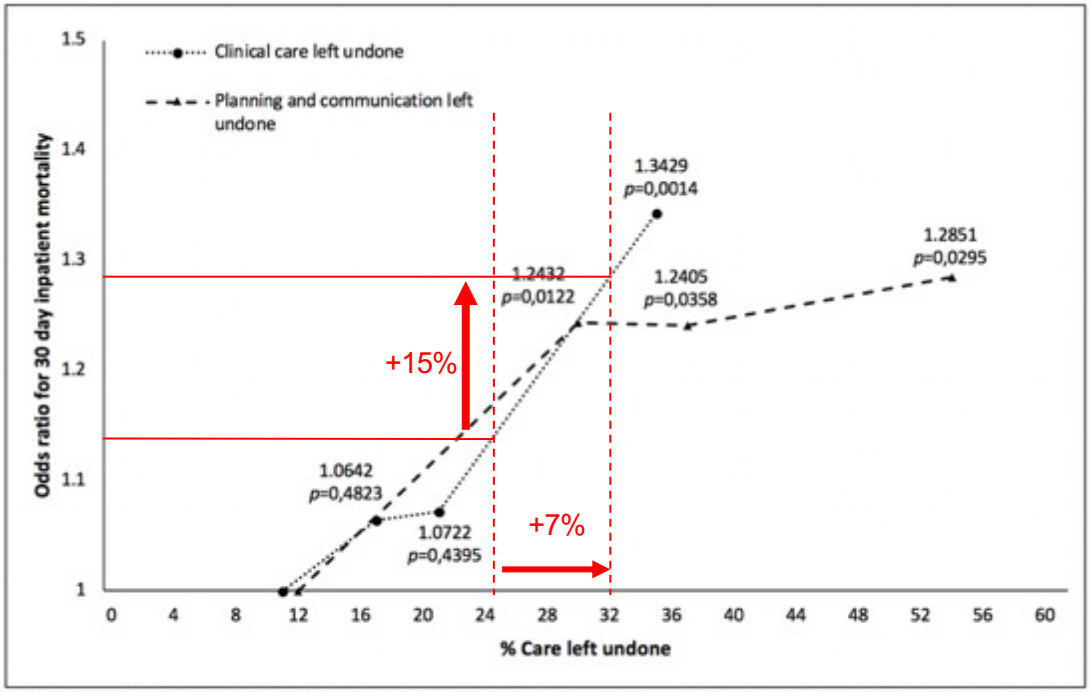
	Estimate	Standard error	p Value
Organisational context of nursing			
Nurse staffing	0.09109	0.01413	<0.0001
Nurse work environment	−2.1901	0.1758	<0.0001
Non-nursing tasks during last shift	2.1780	0.1922	<0.0001
Nurse factors			
Gender F < M	0.2483	0.06567	0.0002
Education BA < VET	0.1951	0.04244	<0.0001
Employment PT < FT	0.1708	0.03905	<0.0001
Professional experience in the hospital More < less	−0.01727	0.001995	<0.0001
Hospital characteristics			
Number of beds	−0.00008	0.000124	0.5198
Technology level	−0.07750	0.09712	0.4249
Teaching status	0.1148	0.1078	0.2869

Multiple multilevel linear regression model with hospital-level as random and country-level as fixed effects, accounting for the hierarchical structure of the data (nurses nested within hospitals within countries).

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Ausserhofer et al. 2014 BMJ Q&S

Mediation role of missed care



Models are adjusted for hospital characteristics (bed size, teaching status, technology), and patient characteristics (age, sex, admission type, type of surgery, and comorbidities present on admission).

- We see in Belgium between 2009-2019 an increase in missed care from 25% to 32% (KCE study)
- "canary in the Coal Mine" role
- In Ireland: Care Left Undo Events (CLUE)

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Ball J., Bruyneel L., IJNS, 2018

KCE report 325A (2019)

Impact of working environment on patient outcomes

Work environment:
- Staffing adequacy
- Foundations for Quality
- Management & Leadership support
- Nurse-physician relationships
- Involvement in hospital affairs

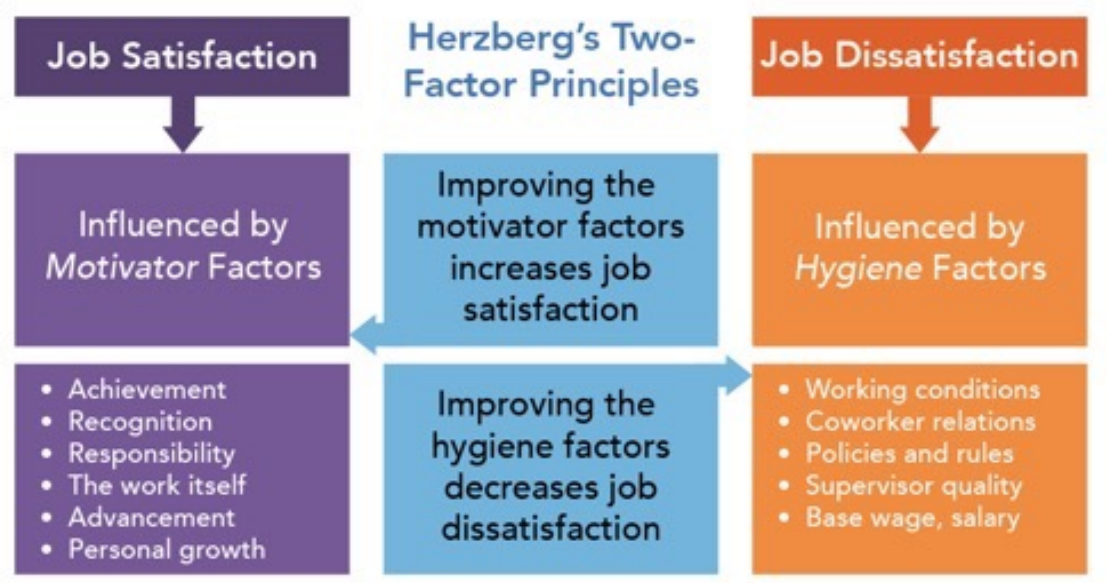
(a) When the Hospitals Nurse Work Environment is:	The Odds Ratio Indicating the Effect of Staffing is:	
	On Mortality	On Failure-to-Rescue
Two standard deviations below the mean	0.982	0.969
One standard deviation below the mean	1.010	1.004
At the mean	1.039*	1.039*
One standard deviations above the mean	1.070*	1.076*
Two standard deviations above the mean	1.101*	1.115*

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Study in 665 US hospitals;1,2 million patient data, 39000 nurses

What is the rational behind it?

Frederick Herzberg, 1959



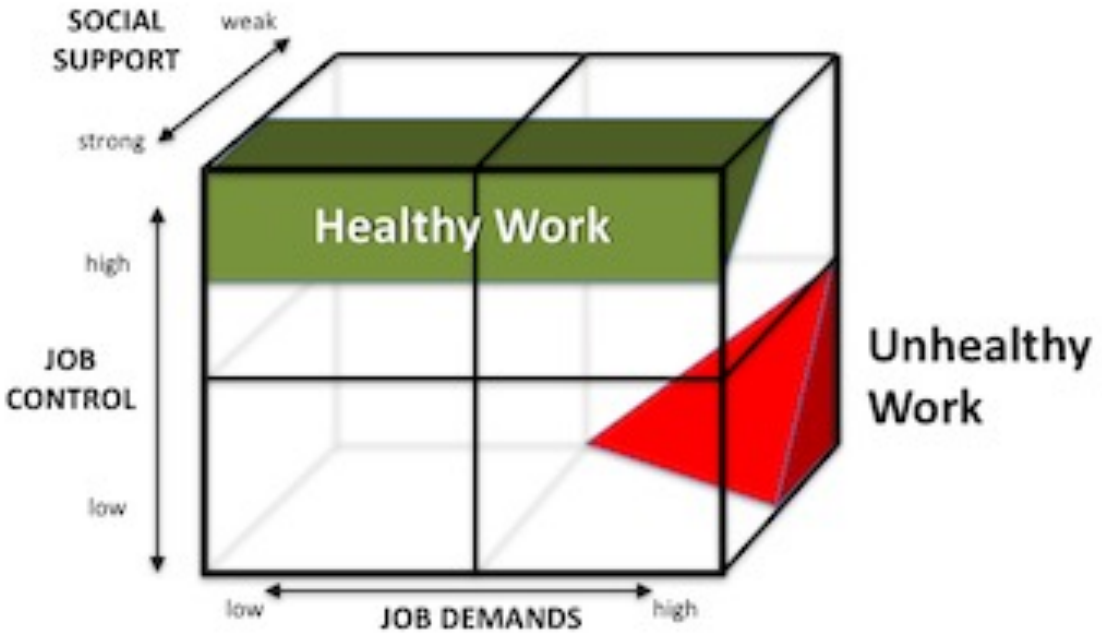
"Work Engagement" "Burn-out"

Vigor	ENERGY	Emotional Exhaustion
Dedication	IDENTIFICATION	Depersonalization
Absorption	CONFIDENCE	Reduced Personal Accomplishment

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Job demand Control Support model

Karasek & Theorell
1990



Beyond med-surgical care in hospitals?

ICU

Rae PJL, Pearce S, Greaves PJ, Dall'Ora C, Griffiths P, Endacott R. Outcomes sensitive to critical care nurse staffing levels: A systematic review. Intensive Crit Care Nurs. 2021 Dec;67

RESULTS

55 studies
Lower levels of critical care nurse staffing leads to higher mortality (OR: 1.24-3.5), higher infection rates, higher costs, lower family satisfaction.

LONG-TERM CARE

Clemens S, Wodchis W, McGilton K, McGrail K, McMahon M. The relationship between quality and staffing in long-term care: A systematic review of the literature 2008-2020. Int J Nurs Stud. 2021 Oct;122

RESULTS

34 studies
Higher Staffing levels and Higher skill-mix lead to better outcomes
Fewer pressure ulcers, hospitalizations, UTI

MENTAL HEALTH

Moyo N, Jones M, Kushemererwa D, Pantha S, Gilbert S, Romero L, Gray R. The Association between the Mental Health Nurse-to-Registered Nurse Ratio and Patient Outcomes in Psychiatric Inpatient Wards: A Systematic Review. Int J Environ Res Public Health. 2020 Sep 21;17(18)

RESULTS

0 studies
Empty review

ACUTE CARE LOW, MIDDLE INCOME COUNTRIES

Assaye AM, Wiechula R, Schultz TJ, Feo R. Impact of nurse staffing on patient and nurse workforce outcomes in acute care settings in low- and middle-income countries: a systematic review. JBI Evid Synth. 2021 Apr;19(4):751-793

RESULTS

27 studies
Low nurse-to-patient ratio was associated with higher mortality, infection rates, medication errors, falls, abandonment of treatment

FINDINGS ARE CONSISTENT WITH CURRENT EVIDENCE

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

More advanced research

- Most nurse staffing research is observational and based on large databases connecting hospital characteristics (organisational level) with patient outcome data (patient level).
- More recent refined methods:
  - Within one hospital: day to day nurse staffing on nursing wards related to (day-related) patient outcomes
    - E.g. Shang et al., JONA, 2019: relating understaffed shifts (11-19%) to hospital-acquired infections in a large urban hospital system. Result: understaffing is related to HAI-onset 2 days later.
  - Direct link of nurses and patients
    - E.g. Yakusheva O., Medical Care, 2014: patient level data in US Medical center: 8526 patients matched with 1477 nurses. Results: Patients receiving more than 80% BSN care had: Lower mortality (OR 0,89); lower odds of readmission (OR 0,81) and 2% shorter length-of-stay

Economic evaluation

ORIGINAL ARTICLE

Economic Evaluation of the 80% Baccalaureate Nurse Workforce Recommendation

A Patient-level Analysis

Olga Yakusheva, PhD, Richard Lindrooth, PhD,† and Marianne Weiss, DNSc, RN‡*

JAN

Informing Practice and Policy Worldwide through Research and Scholarship

ORIGINAL RESEARCH: EMPIRICAL RESEARCH – QUANTITATIVE

The economic burden of nurse-sensitive adverse events in 22 medical-surgical units: retrospective and matching analysis

Eric Tchouaket, Carl-Ardy Dubois & Danielle D'Amour

Accepted for publication 2 January 2017

Received: 7 April 2020 | Revised: 20 January 2021 | Accepted: 30 March 2021

DOI: 10.1111/jan.14860

ORIGINAL RESEARCH: EMPIRICAL RESEARCH – QUANTITATIVE

JAN WILEY

Estimating the economic cost of nurse sensitive adverse events amongst patients in medical and surgical settings

Aileen Murphy[1] | Peter Griffiths[2] | Christine Duffield[3,4] | Noeleen M. Brady[5] | Anne Philomena Scott[6] | Jane Ball[7] | Jonathan Drennan[8]

Summary of the evidence:

- Impact of qualification is related to adverse events, complications, readmissions, mortality
- Impact of nurse staffing ratios is stronger related to reduction in length-of-stay, cost-per-life year saved
- Stronger economic impact of qualification than nurse staffing
- General return-on-investment: 75%

KU LEUVEN

LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Griffiths, 2014; Dall et al., 2009; Needleman et al., 2006)

Value of Nurse Practitioner Inpatient hospital Staffing

- Design of the study:
  - RN4CAST-US nurse survey 2015-16: 579 US hospitals
  - Survey among 22,273 RNs
  - Discharge data for 1,4 Million surgical patients
  - Measure: >3 NP/100 beds vs <1 NP/100 beds
- Results:
  - 30-day mortality (OR: 0,76)
  - 7-day readmissions: OR: 0,90)
  - Shorter length of stay (-8%)
  - Reports of better care quality, lower burnout, higher job satisfaction, greater intention-to-stay in the job

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Aiken et al., Medical Care, Oct. 2021

Developments in European Professional Qualifications Directive: from free movement to Quality and patient safety

1977
9 countries

Directive 77/452/EEC
Aim: free movement of People
How: mutual recognition of formal qualifications of nurses responsible for general care

2005
25 countries

Directive 2005/36/EC
Bologna Declaration 1999
+ Aim: Harmonization
How: from practice discipline to a profession

WHO Munich Declaration 2000
ILO – ISCO 88 to 08

2013
27 countries

Directive 2013/55/EU
+ Aim: Quality & Patient Safety

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Nursing Education Level in EU/EEA 2020
Requirements for entry into the profession

22 (71%)

University Training

U/HE Training

9 (29%)

HE / Vocational Training

(Own compilation of data)

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Countries take action on stabilizing nurse staffing in hospitals

California (2004 -)

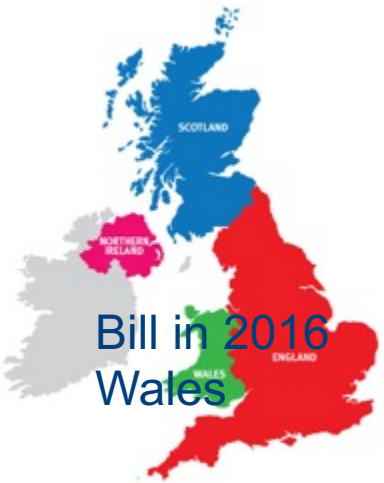
California Ratios	
Intensive/Critical Care	1:2
Neo-natal Intensive Care	1:2
Operating Room	1:1
Post-anesthesia Recovery	1:2
Labor and Delivery	1:2
Antepartum	1:4
Postpartum couplets	1:4
Postpartum women only	1:6
Pediatrics	1:4
Emergency Room	1:4
ICU patients in the ER	1:2
Trauma patients in the ER	1:1
Step Down	1:3
Telemetry	1:4
Medical/Surgical	1:5
Other Specialty Care	1:4
Psychiatric	1:6

All ratios are minimums. Hospitals must increase staffing based upon individual patient needs.

Victoria (2002 -)

Hospital Type	AM shift	PM shift	Night shift
1	1:4 + in charge	1:4 + in charge	1:8
2	1:4 + in charge	1:5 + in charge	1:8
3	1:5 + in charge	1:6 + in charge	1:10
4	1:6 + in charge	1:6 + in charge	1:10
5	1:6 + in charge	1:7 + in charge	1:10

UK (2014-)



Bill in 2016 Wales

Ireland (2018)

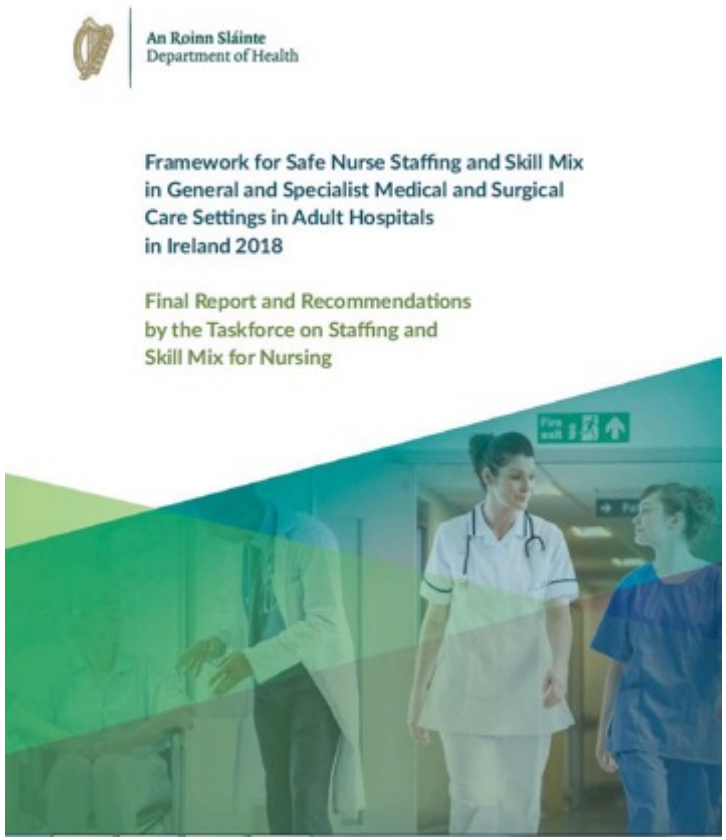
NICE Guidance

Framework for safe Nurse Staffing and Skill Mix 2018

KU LEUVEN

LEUVEN INSTITUTE FOR HEALTHCARE POLICY

Framework for Safe Nurse Staffing and Skill Mix in General and Specialist Medical and Surgical Care Settings in Ireland 2018



- Stabilized staffing
  - According to workload
  - 80/20 BA/HCA ratio
- Lower sickness absence<5%
- Safety CLUEs from 75% to 32%
- Missed meal breaks 50% to 23%
- Lower agency staff
- Lower complications
- Cost reductions
- Higher patient experience

https://health.gov.ie/blog/publications/framework-for-safe-nurse-staffing-and-skill-mix-in-general-and-specialist-medical-and-surgical-care-settings-in-ireland-2018/

Conclusion

A resilient workforce needs better workforce planning and improved working conditions

"Greater investment in skill-mix innovations, improved working conditions and investments in training and education will be key ingredients of successful health workforce strategies"

KU LEUVEN
LEUVEN INSTITUTE FOR HEALTHCARE POLICY

https://ec.europa.eu/health/state/companion_report_en