Investigating The Impact Of Nurse Staffing Ratios On Patient Safety Outcomes In Hospital Settings

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Abstract

Adequate nurse staffing is crucial for patient safety, yet optimal ratios remain debated. This mixed methods study examined the impacts of differing nurse-patient ratios on safety outcomes across 165 inpatient units at 15 Saudi hospitals. Staffing and outcome data were analyzed for relationships to identify thresholds influencing falls, infections, ulcers, and satisfaction. Units with ratios ≥1:4 showed significantly lower adverse events versus those with ≥1:5 ratios. Interviews with 25 nurses described unsafe workloads, burnout, and rationing of care below 1:4 staffing. Integrated results suggest ratios between 1:3 to 1:4 optimize safety balanced with costs. Findings can inform minimum mandated staffing levels and acuity-based adjustments to improve Saudi patient outcomes. Nurse perspectives highlighted the need to address understaffing while pursuing wider safety reforms.

Keywords: nurse-patient ratios, nurse staffing, patient safety, mixed methods, Saudi Arabia.

Introduction

Safe nurse staffing is a global priority. Yet determining appropriate minimum ratios balancing safety, quality, and costs remains intensely debated. Mandated minimums between 1:4 to 1:6 are common internationally (Marshall et al., 2022; Twigg et al., 2021).

In Saudi Arabia, generic standards suggest 1:3 or 1:4 ratios for general wards (MOH Portal, 2022). However, large variations exist locally in how policies translate into practice (Aldossary et al., 2008). Recent expansion of the Saudi healthcare system further challenges staffing capacity.

Growing evidence links improved nurse-patient ratios to better patient outcomes, including lower mortality, complications, readmissions, and higher satisfaction (Ball et al., 2018; Griffiths et al., 2018; Law et al., 2018). But what constitutes optimal minimum ratios across different acuity levels requires refinement. Little data currently quantifies the impact of varying staffing ratios in Saudi hospitals specifically. Examining associations in local settings coupled with nurses' experiential perspectives can provide data to inform ratio policies to enhance patient safety.

This concurrent embedded mixed methods study analyzed relationships between differing nurse-patient ratios and safety outcomes using administrative data across 165 units at 15 Saudi hospitals. Additionally, 25 nurse interviews illuminated frontline staffing challenges and recommendations. Integrated results provide insights to guide minimum ratio standards locally and in comparable contexts balancing safety, quality, and resource constraints.

Background

Nurse Staffing and Patient Outcomes

Evidence conclusively shows adequate nurse staffing is fundamental for patient safety and care quality (Aiken et al., 2022; Griffiths et al., 2016). Lower ratios allow nurses to be more vigilant in monitoring, performing frequent assessments, adhering to best practices, coordinating care, and providing patient education (Recio-Saucedo et al., 2018). Insufficient staffing forces nurses to ration care, with adverse impacts on morbidity, mortality, and satisfaction (Ball et al., 2018; Dall'Ora et al., 2020).

However, defining optimal minimum ratios remains debated, varying internationally from 1:5 up to 1:1 or 2:1 for ICUs (Marshall et al., 2022; Twigg et al., 2021). Mandated minimums seek to balance safety with costs. Acuity-based adjustments are also common (Butler et al., 2019). Higher ratios proposed by nurses' advocacy groups are often deemed prohibitively expensive by budget-minded administrators, perpetuating understaffing (Pappas, 2022). Nonetheless, evidence indicates improvements

with ratios up to 1:4 on medical-surgical floors and 1:2 in ICUs (Griffiths et al., 2016; Lasater et al., 2020).

As healthcare systems in Saudi Arabia and the Gulf expand access, safe staffing acquired heightened importance (Tawfik et al., 2017). Yet local evidence is limited. One study in a Saudi ICU found high patient mortality above 1:1.5 staffing ratios (Amrin et al., 2014). Another indicated insufficient nurses for rising demands (Aldossary et al., 2008). This study helps address the evidence gap through analysis of staffing-outcome relationships across multiple hospitals to inform safe minimums.

Nurse Perspectives

Quantitative analysis of staffing ratios must be augmented with nurses' experiential insights at the bedside (Johnson et al., 2019). Interviews offer crucial understandings of how insufficient ratios impact safety and care in nurses' views. Studies globally show understaffing erodes practices, heightens fatigue, and forces rationing of care despite nurses' efforts (Jones & Fitzpatrick, 2009; Wynne et al., 2022). Exploring Saudi nurses' challenges provides vital context alongside staffing-outcome data to shape policies balancing safety, wellbeing, and realities.

Theoretical Framework

Donabedian's Structure-Process-Outcome model informed this study (Donabedian, 1988). Structural elements like nurse staffing levels influence care processes that consequently impact patient outcomes. Examining relationships between staffing structures and outcomes is therefore essential to identify ratios enabling safe care delivery processes. Integrating nurse interview data further enriches structural understandings. The model has underpinned numerous nursing workforce studies (Lasater et al., 2020; Twigg & Duffield, 2009). This pragmatic framework guided analysis.

Methods

Study Design and Settings

This concurrent embedded mixed methods study was conducted across 15 hospitals under the Ministry of Health in Riyadh, Saudi Arabia.

Quantitative Methods

Secondary analysis examined 2020 data on nurse staffing and patient outcomes from 165 inpatient units. Monthly staffing ratios

were calculated using unit-level registered nurse full-time equivalents and average patient census. Quarterly outcome data included falls, pressure ulcers, infections, and satisfaction rates. Correlations and comparisons assessed relationships between differing ratios and outcomes.

Qualitative Methods

Individual semi-structured interviews with 25 conveniently sampled clinical nurses explored experiences with safe staffing. Participants came from 10 participating hospitals with 5-15 years' experience. Thematic analysis identified perceptions of ratio impacts and recommendations. Quantitative and qualitative strands were integrated during analysis.

Results

Unit Characteristics

Among the 165 units analyzed, bed sizes averaged 48 (range 20-100). Specialties included general medicine/surgery (34%), pediatrics (26%), ICU (22%), and obstetrics (18%). Average monthly staffing ratios ranged from 1:2.8 to 1:7.2, with a median ratio of 1:4.3. Lower ratios of ≤1:4 predominated in ICUs, while medical-surgical units commonly had ≥1:5 ratios.

Table 1: Distribution of Nurse-Patient Ratios

Ratio	Frequency	Percentage
≤1:3	12 units	7%
1:3.1-1:4	59 units	36%
1:4.1-1:5	49 units	30%
≥1:5	45 units	27%

Quantitative Outcomes Analysis

Adverse event rates were significantly higher in units with ratios ≥1:5 compared to those with ≤1:4 (Table 2). For example, falls occurred 3.2 times more often with ≥1:5 ratios versus ≤1:4. Pressure ulcers and infections showed over twice the frequency with higher ratios. Satisfaction was 10 percentage points lower below the 1:4 threshold. Units with ≤1:3 ratios did not show additional statistically significant improvements versus 1:3.1-1:4.

Table 2: Outcomes by Nurse-Patient Ratio

Outcome	Ratio ≤1:4	Ratio ≥1:5	Relative Difference	P value
Falls	2.3%	7.4%	3.2 times more	<0.001
Ulcers	5.1%	12.8%	2.5 times more	<0.001
Infections	4.2%	9.7%	2.3 times more	<0.001
Satisfaction	87%	77%	10% lower	<0.001

Qualitative Thematic Analysis

Interviews uncovered four major themes: 1) Workload strains with understaffing 2) Impacts on care processes 3) Burnout and fatigue 4) Suggestions for improving ratios.

Workload Strains

Nurses described unmanageable workloads below 1:4 ratios: "Caring for 7-8 patients at once makes you feel frenzied, like constantly putting out fires." – Layla, ICU nurse

Impacts on Care

Rationing care was required with insufficient staff: "You have to prioritize and only address urgent issues, skipping important prevention and education." – Faisal, medical nurse

Burnout and Fatigue

Understaffing exponentially increased exhaustion: "The workload makes you feel utterly overwhelmed and depleted by the end of each shift." – Aisha, pediatrics nurse

Suggestions for Improvement

Smaller ratios, workload balancing, and acuity models were recommended: "Mandated minimums of 1:3 would help...and adjusting for patient needs could prevent unsafe situations." – Tariq, surgical nurse

In summary, understaffing seriously compromised safe processes and nurse wellbeing. Participants felt minimum ratios of 1:3 or 1:4 were needed to deliver quality care.

Discussion

Key Findings

This study found significantly higher rates of adverse safety events along with lower satisfaction in units with ≥1:5 nurse-patient ratios compared to ≤1:4. Interviews described how understaffing jeopardizes care delivery and fosters burnout. Consistent with wider literature, these integrated findings suggest nurse-patient ratios significantly influence patient outcomes (Ball et al., 2018; Griffiths et al., 2018). Locally, they provide data to guide minimum staffing standards balancing safety and resources.

Practice and Policy Implications

Results suggest locally mandating minimum ratios not exceeding 1:4 for medical-surgical floors and 1:2 or 1:3 for ICUs could optimize safety balanced with costs. These align with international evidence on effective minimums (Butler et al., 2019; Lasater et al., 2020). Implementing acuity-based adjustments is additionally advisable to align staffing with patient needs (Marshall et al., 2022).

Participants' accounts of care breakdowns, exhaustion, and rationing underscore that ratios alone will not remedy understaffing. Widening the workforce pipeline and nursing role development are critical. Still, implementing minimum ratio legislation can provide a crucial safeguard on ward and unit levels. Ongoing assessment is key to refine ratios enhancing outcomes while considering nurses' wellbeing.

Limitations

This observational analysis could not prove causality. Using secondary data limited variables examined. Longer-term pre-post designs could strengthen causal inference. However, the mixed methods approach enriched understanding of nurse ratios' impact on safety outcomes.

Conclusion

This study found that nurse-patient ratios above 1:4 significantly increased adverse events and dissatisfaction in Saudi hospitals compared to ratios of 1:4 or below. Integrating nurse interview data clarified safety and care delivery challenges wrought by

understaffing. The findings can inform policies and legislation around minimum ratios to improve Saudi patient outcomes, balancing safety and resources. Additional workload balancing and nurse role expansion will remain essential to address understaffing holistically. Further implementation research can refine acuity models and identify long-term impacts on care quality.

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