Nurse/midwife-to-patient ratios: a scoping review.

TAIT, D., DAVIS, D., ROCHE, M.A. and PATERSON, C.

2024

Contemporary Nurse

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rcnj20

Nurse/midwife-to-patient ratios: A scoping review

Darcy Tait, Deborah Davis, Michael A. Roche & Catherine Paterson

To cite this article: Darcy Tait, Deborah Davis, Michael A. Roche & Catherine Paterson (2024) Nurse/midwife-to-patient ratios: A scoping review, Contemporary Nurse, 60:3, 257-269, DOI: 10.1080/10376178.2024.2318361

To link to this article: https://doi.org/10.1080/10376178.2024.2318361

Contemporary Nurse, 2024
Vol. 60, No. 3, 257–269, https://doi.org/10.1080/10376178.2024.2318361

REVIEW ARTICLE

Nurse/midwife-to-patient ratios: A scoping review

Darcy Tait[a], Deborah Davis [b], Michael A. Roche [b,c*] and Catherine Paterson [b,d]

[a]*Australian Catholic University, School of Nursing, Midwifery and Paramedicine, Faculty of Health Sciences, Watson, Australian Capital Territory, Australia;* [b]*University of Canberra, School of Nursing, Midwifery and Public Health, Faculty of Health & ACT Government Health Directorate, Bruce, Australian Capital Territory, Australia;* [c]*University of Technology Sydney, School of Nursing and Midwifery, Faculty of Health, Ultimo, New South Wales, Australia;* [d]*Robert Gordon University, School of Nursing, Midwifery & Paramedic Practice, Garthdee, UK*

(*Received 4 October 2022; accepted 8 February 2024*)

Background: A significant body of work has linked high nurse or midwife workload to negative patient outcomes. Anecdotal reports suggest that mandated ratio models enhance patient care and improve nurse job satisfaction. However, there is limited focused research.
Objective: To identify key outcomes, implementation processes, and research needs regarding nurse/midwife-to-patient ratios in the Australian healthcare context.
Design: Scoping review.
Methods: Data sources were CINAHL, Open Dissertations, Medline, and Scopus. 289 articles screened, and 53 full text documents independently assessed against criteria by two reviewers and conflicts resolved by a third reviewer, using Covidence™. Three studies were included in this review.
Results: Studies focused on nurse (job satisfaction, burnout), patient (mortality, readmission, length of stay) and system (costs) outcomes with limited information on implementation processes and no midwifery research.
Conclusions: Ratios provide benefits for patients, nurses, and hospitals although there is limited research in Australia. Implementation was poorly reported..

Keywords: nursing; midwifery; implementation; ratios; workload

Impact statement

Ratios have potentially significant benefits, but rigorous research is rare. Particular areas of need include implementation processes and midwife ratios.

Plain language statement

The workload of nurses and midwives is often managed using staffing models, the most well-known of which is nurse- or midwife-to patient ratios. This 'ratios' model specifies the number of patients a nurse or midwife can care for at one time, for example 4 patients per nurse (4:1 ratio). Ratios have been introduced in many hospitals internationally and are linked to greater patient safety and better job satisfaction. In Australia, staffing ratios are required in Victoria, Queensland, Tasmania, and the Australian Capital Territory. The aim of this review

*Corresponding author. Email: michael.roche@canberra.edu.au

was to explore current research in Australia regarding ratios, to identify benefits and challenges, and where research is needed in the future. We found little Australian research into nurse-to-patient ratios, none into midwife-to-mother/baby ratios, and little information on how best to introduce ratios. Of the research we did find, there were positive benefits for patients, nurses, and hospitals. We propose that more research is required to address the gaps in current knowledge.

Introduction

A nurse/midwife-to-patient ratio is a minimum number of nurses or midwives allocated to a specific number of patients for whom they provide care (Lesman et al., 2019). Minimum nurse/midwife-to-patient ratios have been implemented in many jurisdictions internationally, as one of a number of different staffing methods intended to maintain manageable nurse workloads (Australian College of Nursing, 2020; International Council of Nurses, 2019). A substantial body of research has established the association between nurse and midwife workloads missed care (Assaye et al., 2022; Bail et al., 2021; Ball et al., 2018), hospital acquired infections (Mitchell et al., 2018; Oner et al., 2021), and patient outcomes including adverse events and mortality (Duffield et al., 2011; Griffiths et al., 2018; Twigg et al., 2021). International research focused specifically on nurse/midwife to patient ratios has identified increased nurse job satisfaction and retention (Spetz et al., 2013; Tellez, 2012) and fewer occupational injuries (Leigh et al., 2015). Patient outcomes in ratio-specific studies are less well established, for example, Mark et al. (2013) found increased infection and failure to rescue rates and Spetz et al. (2013) noted increased adverse events. While nurse workload studies have been conducted in Australia, there are few ratio-specific studies similar to those undertaken internationally. Further to this gap in the literature, the international research provides no implementation guidance for the Australian context. Based on the current state of research regarding ratios, and the lack of guidance for effective implementation, the objective of this review was to explore current research regarding nurse/midwife-to-patient ratios in the Australian healthcare setting, to identify known outcomes, implementation approaches, and research needs.

Background

Attempts to manage nurse and midwife workload through staffing models are not new. Common approaches include nurse/midwife-to-patient ratios (ratios), nurse/midwife hours per patient day (NHPPD), and nurse/midwife hours per bed day (NHPBD) (Australian College of Nursing, 2020). These approaches vary widely in application by jurisdiction, and the ratio or hours per day are often determined by unit and hospital type (e.g. acute, rehabilitation), shift (day, evening, or night), patient acuity, turnover, and the presence of a designated management position (Australian College of Nursing, 2020). Ratio models typically apply to regulated nurses only and do not incorporate nursing assistant or similar roles (Australian College of Nursing, 2020).

In Australia, mandated nurse/midwife staffing ratios have been implemented in Victoria, Queensland, Tasmania, and the Australian Capital Territory (Lesman et al., 2019). In 2000, Victoria implemented minimum nurse-to-patient ratios that varied by ward type (Australian Nursing and Midwifery Federation Tasmanian Branch, 2016). For example, the emergency department ratio is 1:3 and the acute medical ward is 1:4 (Australian Nursing and Midwifery Federation Tasmanian Branch, 2016). Queensland applies a minimum ratio of 1:4 to acute medical and mental health wards, supported by a detailed framework (Queensland Health, 2021). The model

employed by Tasmania categorises each ward based on the complexity of patients, with some wards therefore having a ratio of 1:2, and others having ratios of 1:3 or 1:4 (Australian Nursing and Midwifery Federation Tasmanian Branch, 2016). South Australia intends to implement ratios in 2024 (Australian Nursing Federation (South Australia), 2023). Other Australian jurisdictions (New South Wales and Western Australia) are in negotiations regarding potential introduction of ratios (Australian Nursing Federation (Western Australia), 2023; New South Wales Nurses and Midwives' Association, 2023) and are presently employing nurse/midwife per patient day models.

Reported benefits of nurse-to-patient ratios include enhanced patient safety, reduced missed care, fewer readmissions, and lower mortality (Aiken et al., 2014; Wynendaele et al., 2019), improved job satisfaction and retention of staff (Lang et al., 2004; Tellez, 2012; Wynendaele et al., 2019). Patient outcomes linked to ratios are often measured using nurse-sensitive outcome indicators derived from administrative data, first established by Needleman et al. (2002). These indicators vary across studies but generally include mortality, length of stay, readmission, pressure injury, gastro-intestinal bleeding, pneumonia, sepsis, surgical wound infection, shock/cardiac arrest, urinary tract infection, failure to rescue, central nervous system complications, or deep vein thrombosis (Needleman et al., 2002, 2011). Research has also examined adverse events, such as falls with injury and medication errors, restrictive practice such as restraint, patient satisfaction, violence, or other factors (Cho et al., 2016; Shin et al., 2018; Twigg et al., 2021; Wynendaele et al., 2019).

Few studies have examined nurse staffing methods in the Australian context (Twigg et al., 2021), and there is limited work in mental health, emergency departments, and other specialty areas (Wise et al., 2015). It is suggested that increased midwife workload is linked to missed care (Blackman et al., 2018) but again there is not yet a body of work of a similar magnitude to that in medical and surgical nursing settings. In addition, models or frameworks used to guide the implementation of ratios are not reported. With the implementation of ratios in additional Australian jurisdictions, there is a need to identify and consolidate research pertinent to that context. The aim of this scoping review is therefore to identify and describe evidence regarding nurse/midwife-to-patient ratios in Australia. It will inform jurisdictions considering implementation of nurse/midwife-to-patient ratios and will contribute to future research surrounding ratio models.

Methods

A scoping review was chosen to gain an understanding of the current evidence and research available relevant to the Australian healthcare context. A scoping review allows a broad variety of literature to be analysed meaning a greater extent of diverse research can be covered. The review was undertaken in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR; (Tricco et al., 2018)).

Search strategy

Initial search terms included, but were not limited to, 'nurse', 'midwife', 'patient', 'ratio', and 'implementation'. These terms were applied to a search of research databases and the grey literature, including reports from Australian Government agencies and professional bodies. A total of 47 pertinent articles were identified and their key concepts or keywords used to guide the development of the string search.

String search

The string search was conducted on four databases: CINAHL Complete, Open Dissertations, Medline and Scopus. The search terms used included 'nurse/midwife', 'ratio', 'hospital', 'outcome', and 'Australia' (see supplementary material). Search terms were further refined by descriptively searching the articles for the main categories they addressed. Terms such as 'implementation', 'patient' and 'staff' were not included as they were too broad and did not provide relevancy to the topic. Limiters (2016–2022, English) were utilised to produce the most relevant and up to date articles as possible.

Inclusion and exclusion criteria

The inclusion criteria consisted of original research, literature reviews, and grey literature, studies undertaken in hospital settings that included a description of nurse/midwife to patient ratios, identified methods for evaluation of staffing methods, Australian, and English language. The exclusion criteria were studies not reporting Australian findings, discussion papers, research protocols, population not nurse/midwife, or those that did not describe or evaluate staffing ratios.

Data screening

The screening, full-text review, and extraction processes were undertaken in the online system Covidence™ (Figure 1), with all citations and documents managed within that system. The string search identified 362 articles: 90 from CINALH, 6 from Open Dissertations, 68 from Medline, and 198 from Scopus. Of these 362, 73 were duplicates leaving 289 for screening by title and abstract. Two independent reviewers screened the studies by title and abstract (first and second authors). In case of non-corresponding results, a third reviewer was consulted to reach a consensus (third or fourth author). Following screening, 236 studies were excluded and 53 retained for full-text review. These papers were read independently by two investigators (first and second authors) and differences were then again resolved through discussion with a third investigator (fourth author). Subsequent to meticulous examination, 50 papers were deemed not suitable: 29 studies were the wrong study design, 10 had the wrong intervention, 6 did not investigate ratios, 3 had the wrong outcomes, 1 the wrong setting, and 1 was outside the date range (see supplementary material for details of excluded papers). Hand searching of reference lists yielded no new sources. Three papers were retained for review.

Data extraction and synthesis

Data were extracted using a standardised form based on the format recommended by Peters et al. (2015) that included first author, year, aim, study design, participants, outcomes, and key findings. The literature was categorised based on the main findings and focal points of the studies. The results were synthesised to capture and present all the key components.

Results

Three articles were found to meet the criteria, summarised in Table 1. All were published between the years 2017–2021 and were undertaken in Australia. Key components identified in the reviewed studies were patient outcomes, nurse outcomes, hospital (system) outcomes, and implementation processes. No studies reported midwife-to-mother/baby ratios. Sample sizes varied, depending on the research study design, the focus was on either patient, nurses, or

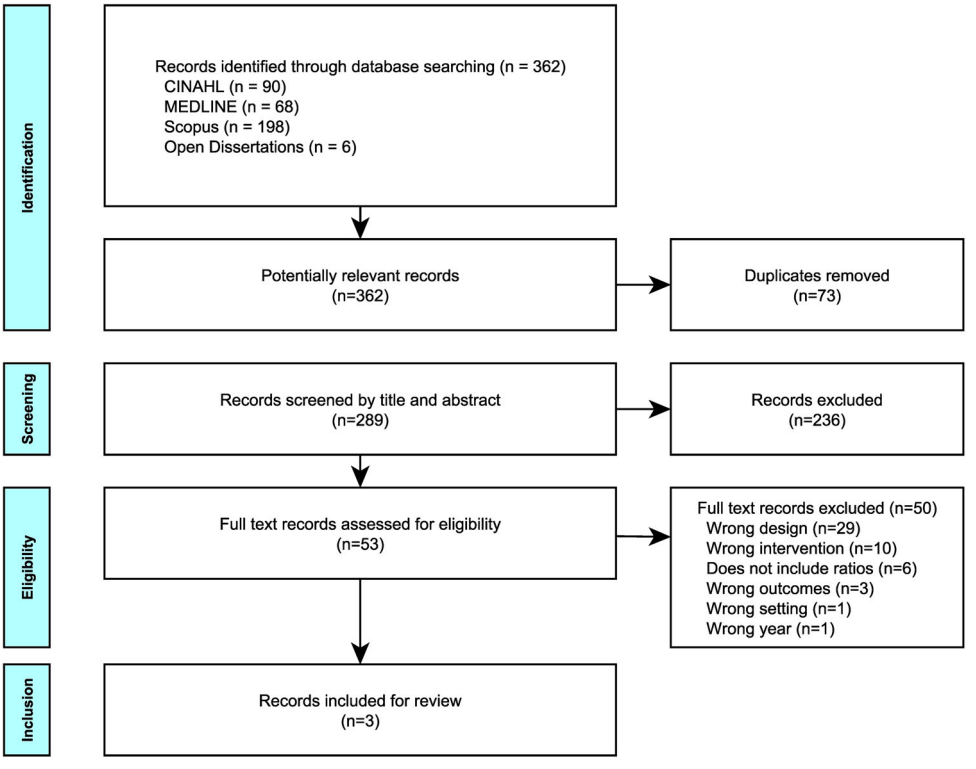

Figure 1. PRISMA diagram.

both. Patient sample sizes ranged from 146,456 patients to 257,253 patients, nurses ranged from 167 to 17,010. The number of hospitals involved in the studies ranged from 1 to 68, and wards ranged from 1 to 2. The wards that the research focused on were medical, surgical, and emergency department. There was a mix of both private and public hospitals. One article was a cross-sectional study, one was a prospective study and one a mixed method study. One study used a quantitative method and two used mixed-methods.

Data was mainly collected through surveys. Two studies utilised quantitative methods via surveys and routinely collected data (death records and patient outcomes) in a cross-sectional (McHugh et al., 2020) or quasi-experimental (McHugh et al., 2021) design. One employed a mixed methods approach which utilised a combination of surveys, routine data (death records and patient outcomes) and focus groups (Millichamp et al., 2017). All studies undertook a descriptive analysis while two added regression modelling and one used thematic analysis as a component of mixed methods.

As noted previously, all studies focused on nurse-to-patient ratios; none discussed midwife-to-mother/baby ratios or included midwives in their research designs. The main focus of these studies was therefore to identify the impact of different levels of nurse-to-patient ratios, either a 1:3 or 1:4 ratio. This research was done by outlining the impacts of changes in ratios to patient, nurse, and organisational outcomes, and in one case by exploring nurses' perceptions. All studies found that the implementation of ratios was a positive step towards improved healthcare for patients and better job satisfaction for nurses. Potential detriments or challenges of a ratio model were not identified. Although not the focus of any of the studies, each include some information on the implementation process.

Table 1. Summary of included studies.

First author (Year)	Design	Setting	Aims	Sample	Measures	Key Findings
McHugh et al. (2020)	Cross-sectional	Medical and surgical wards in public hospitals	To determine whether there was variation in nurse staffing across hospitals in prior to implementation of nurse-to-patient ratios.	4372 nurses and 146,456 patient records, in 68 public hospitals	Patient: 30-day mortality, adjusted for complexity and personal characteristics. Nurse: reported nurse to patient ratio, emotional exhaustion, burnout, fatigue, intent to leave.	Prior to ratio-based staffing implementation, nurse staffing was found to vary widely across public hospital medical and surgical wards. Higher workloads were associated with patient mortality, low quality of care, nurse emotional exhaustion and job dissatisfaction.
McHugh et al. (2021)	Panel, quasi-experimental	Medical and surgical wards in public hospitals	To determine whether staffing improvements occurred at ratio hospitals. To determine whether outcomes improved at ratio hospitals. To determine if staffing improvements explained improved patient outcomes.	17,010 nurse surveys and 489,155 patient records, in 55 public hospitals	Patient: 30-day mortality, 7-day readmission, length of stay, adjusted for complexity and personal characteristics. Nurse: reported nurse to patient ratios.	Ratio-based staffing was linked to improved nurse staffing and better patient outcomes. Enhanced staffing was associated with better patient outcomes, and significant cost savings.
Millichamp et al. (2017)	Convergent parallel mixed-methods	Emergency department	To create a model of emergency nursing care that improves nursing workloads and promotes individual responsibility and accountability for patient care.	167 nurse surveys, 15 nurses in 2 focus groups	Study-specific survey of model of care and workload. Structured focus groups on models of care and workload.	The implementation of a model of emergency nursing care that included ratio-based staffing was linked to improved staff satisfaction, workload, patient care, support and the perception of nurses' ability to provide quality care.

Patient outcomes

Two studies indicated that a nurse-to-patient ratio would result in positive benefits for patients, and one examined only nurse outcomes. The two-patient outcome focused studies adopted different quantitative methods. McHugh et al. (2021) compared hospitals with and without a ratio policy, before implementation and two years after. There was a 0.09% decrease in 30-day patient mortality, a 0.44% decrease in readmissions, and a 0.22% decrease in length of stay. This degree of change would be associated with significant cost savings. The cross-sectional study by McHugh et al. (2020), compared 68 different hospitals patient outcomes in relation to the number of patients per nurse. This study found that for each additional patient to nurse there was a 12% higher chance of 30-day mortality, and greater likelihood of decreased quality of care and patient safety.

Nurse outcomes

All studies identified the potential adverse effects of high ratios. McHugh et al. (2020) found that 42% of nurses experienced burnout, 61% had workload dissatisfaction, 38% were unhappy with their jobs, and 43% experienced emotional exhaustion. Implementation of ratios had a distinct impact with 60% of nurses perceiving an improvement in workload and management, and 65% perceiving greater support and improved consistency and uniformity of care (McHugh et al., 2020; Millichamp et al., 2017).

Organisational outcomes

The researchers did not measure organisational or system outcomes directly, but extrapolated organisational benefits from the findings, including the calculation of potential cost savings (McHugh et al., 2021). Similarly, McHugh et al. (2020) identified cost savings associated with reduced turnover, suggesting that as job satisfaction increased with a ratio model, it is likely that nursing staff will remain in their jobs. This observation was also identified by Millichamp et al. (2017) who noted that 90% of nurses in the emergency department felt that there was improved staff consistency because of the introduction of ratios, and that this was associated with their increased capacity to provide effective and timely care.

Implementation process

Implementation frameworks or processes were not reported, although some techniques to support the transition to ratios were described. All were nurse orientated and included: education sessions, effective communication, enhancements to the practice environment including strengthened nurse autonomy, the adoption of team nursing models, and ongoing consideration of skill mix and experience (McHugh et al., 2020; Millichamp et al., 2017).

The education session described by Millichamp et al. (2017) was used to teach staff about the ratio model and explain its aims, how it works in practice, and to provide guidance on the available support structures. They suggested that these sessions should be augmented by effective communication approaches, and nurse-to-nurse communication should be emphasised to enable effective teamwork.

The importance of a supportive culture was also noted, as positive environment facilitates effective team functioning (McHugh et al., 2021). Other factors in the practice environment such as nurse autonomy, opportunities for advancement, support, trust, and improved collegial relationships have significant impact on outcomes for nurses and patients (McHugh et al.,

2020). Team nursing is supported by an appropriate skill mix; ensuring that there is a suitable mix of registered and enrolled nurses, that experience is also considered, and that both are mapped to the care needs of patients (McHugh et al., 2021).

All studies emphasised the importance of multi-faceted evaluation of ratios, while some reported findings that reflect aspects of implementation. Suggestions include before and after surveys that assess understanding of and concordance with the ratios model, examination of routinely collected data or file audits for patient outcomes, or qualitative methods for nurse and/or patient perceptions. Where some of these approaches were reported (Millichamp et al., 2017), 83% of nurses identified that they could understand and explain the model, and 65% felt supported after implementation.

Challenges to the implementation of ratios were not central to the papers identified and therefore not widely discussed. All studies did suggest that staff shortages impeded introduction, suggesting that simply designating ratios without careful planning for appropriate staff numbers is insufficient.

Discussion

Given the length of time since the introduction of ratios in some Australian jurisdictions, the number of research papers identified was fewer than what might be expected, although the research which has been undertaken is rigorous. The studies demonstrated significant positive nurse, system, and patient outcomes linked to ratios, and potential cost savings for the health system. Consistent with some international research (Aiken et al., 2014; Lang et al., 2004; Wynendaele et al., 2019), the findings summarised here identified improved nurse workload and job satisfaction, and reduced emotional exhaustion, burnout, fatigue, and intent to leave (McHugh et al., 2021; Millichamp et al., 2017). Adverse patient outcomes were reduced with fewer adverse events and readmissions, lower mortality, shorter lengths of stay, and better quality and safety of care (McHugh et al., 2021). These results are in contract with existing research, specifically studies reported by Spetz et al. (2013) and Mark et al. (2013) that found significant deterioration in patient outcomes. The reason for this difference is not apparent in the literature but it may be speculated that consistent implementation or the close involvement of industrial unions had some part to play. A potentially important aspect missing from the research is consideration of other factors that impinge on nursing workload, including skill mix, patient movement, and acuity. For example, Duffield et al. (2020) report that even after nurse staffing has been adjusted to address an increase in patient numbers and acuity, lean skill mix can lead to significant increases in workload.

This scoping review did not identify any midwife-to-mother/baby ratio research. This ignores a major population of health care professionals and is consistent with the dearth of international research in the field. While there is some work identifying the impact or potential impact of workload, for example on missed care (Blackman et al., 2018; Verrall et al., 2015), very little work explicitly examines ratios (Dani et al., 2020). There is some evidence that higher midwifery staffing levels, results in improved clinical outcomes though staffing levels are not quantified in most studies (Turner et al., 2021). Legislated ratios in Victoria, Australia require a minimum midwife/patient ratio of one midwife to four women on day shift in antenatal and postnatal wards (Matthews et al., 2023). There is contention however regarding ratios in the postnatal period regarding whether the mother and baby should be considered two patients. The Queensland Government has recently announced that mothers and babies will be counted as separate patients, introducing a ratio of one midwife to every six patients (Queensland Government, 2023). There is a clear need for systematic research in this arena.

Similarly, no specifically developed or adapted implementation models were identified, so the 'how-to' and 'do's and 'don'ts' of the process remain unknown. There is therefore limited specific guidance available on how to create and implement a ratio policy, although several potentially useful aspects can be distilled from the research examined here. Building the practice environment by articulating autonomous nurse and midwife roles (McHugh et al., 2020), providing supportive education and emphasising clear and effective communication during the transition (Millichamp et al., 2017), and consideration of the team's skills and experience (McHugh et al., 2021), were all identified as important factors to consider in implementation. However, these were not incorporated into a defined approach, so it is difficult to ascertain how to best apply them.

Strengths and limitations

The primary limitation of this review is the lack of ratio research available in the Australian context. This may have been addressed by widening the search terms further, but this would then have violated the aims of the review. Another potential approach would have been to open the time period. However, the authors believed it important to remain contemporary and all studies reported here were conducted in the last 5 years. Another issue that applies to research broadly in this area is some inconsistency in the measurement and calculation of outcomes. While McHugh et al. (2020, 2021) adopted metrics consistent with international work, Millichamp et al. (2017), by virtue of their mixed-methods approach, used some well-known factors but also drew themes from quantitative data that were not readily comparable with the other reviewed studies. McHugh et al. (2020, 2021) received funding from Queensland Health, the United States National Institutes of Health, and the United States National Institute of Nursing Research, and note that the funders had no role in the conduct of the study or dissemination of findings. Millichamp et al. (2017) report no funding sources. It should be noted that no research was located reporting the impact of COVID-19 on ratios. Anecdotally, this is a significant issue placing significant pressure on health services to maintain ratios with limited staff. Finally, it is acknowledged that expansion of the date range may have located earlier research on ratios in Australia.

Impact and recommendations for future research

There was no research identified on midwife-to-mother/baby ratios and on specialty areas such as mental health. Future research should examine midwife-to-mother/baby ratios, particularly the derivation of consistently measurable outcomes that are empirically associated with midwives' work and transferable across jurisdictions, to permit larger scale studies. This priority will involve replication and potential expansion of existing work that has examined neonatal outcomes, such as Dani et al.'s (2020) study that found links between low midwife staffing, increased admission to neonatal care units, and decreased exclusive breastfeeding rates. It also requires undertaking studies focused specifically on midwives to consolidate the evidence base related to missed care (Blackman et al., 2018; Verrall et al., 2015). Further considerations include the impact of ratios on mothers, and the examination of the impact of including both mothers and babies in postnatal ratio calculations. Similarly, mental health outcomes that are empirically associated with nursing work are yet to be consistently identified (Ngune et al., 2023), a situation that would also apply in other specialist clinical settings, such as specialist cancer nursing. Another area for development is the process behind a ratio implementation. Evaluations of ratio implementation were not found, and this would be central valuable contribution to knowledge going forward. While change process models with general applicability abound (Moullin et al., 2015), they do not provide specific guidance regarding ratios. Future

research should therefore evaluate the processes and actions taken during the introduction of a ratio model. This implementation information will inform and assist other jurisdictions wanting to apply a ratio model and provide guidance on the processes involved. Finally, ratios do not yet fully incorporate patient acuity, patient movement, and skill mix. These are important factors that have been found to impact nurse, system, and patient outcomes in Australia (Blay et al., 2017; Duffield et al., 2020). Consideration of how these can be effectively integrated into ratio-based staffing may benefit future ratio implementations.

Conclusion

This scoping review identified positive outcomes for patients, nurses and hospitals that implemented a ratio model. It demonstrated benefits in nurse mental health and job satisfaction. Patient mortality rates, length of stay, readmission and adverse events were improved after a ratio implementation, and hospitals saw benefits financially in the Australian context. However, further research is needed regarding the impact of midwife to mother/baby ratios, the addition of calculation of babies to the ratios specifically, the integration of acuity, skill mix, and patient movements into workload/ratio calculations, and techniques for an effective implementation of ratios.

Acknowledgements

The authors would like to acknowledge the support and guidance of the ACT Health Ratios Implementation Team, particularly Mark Gaukroger and Catherine McGrory.

Funding

This research was supported by the Australian Capital Territory Health Directorate Vacation Study Program.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Credit author statement

Darcy Tait: Conceptualisation, literature search, formal analysis, interpretation, writing original draft, writing – reviewing and editing.

Deborah Davis: Conceptualisation, methodology, validation, formal analysis, interpretation, writing – reviewing and editing, supervision.

Michael Roche: Conceptualisation, interpretation, writing original draft, writing – reviewing and editing, supervision.

Catherine Paterson: Conceptualisation, methodology, validation, writing – reviewing and editing, supervision.

All authors have given final approval of the version to be published and agree to be accountable for all aspects of the work.

Ethical statement

Ethical review was not required for this review of existing research.

Supplemental data

Supplemental data for this article can be accessed at https://doi.org/10.1080/10376178.2024.2318361.

ORCID

Deborah Davis http://orcid.org/0000-0002-2041-1064
Michael A. Roche http://orcid.org/0000-0002-3831-537X
Catherine Paterson http://orcid.org/0000-0002-1249-6782

References

Aiken, L. H., Sloane, D. M., Bruyneel, L., Van den Heede, K., Griffiths, P., Busse, R., Diomidous, M., Kinnunen, J., Kózka, M., & Lesaffre, E. (2014). Nurse staffing and education and hospital mortality in nine European countries: A retrospective observational study. *The Lancet*, *383*(9931), 1824–1830. https://doi.org/10.1016/S0140-6736(13)62631-8

Assaye, A. M., Wiechula, R., Schultz, T. J., & Feo, R. (2022). Missed nursing care, nurse staffing levels and patient safety outcomes in low-income country acute care settings: An observational study. *International Journal of Nursing Practice*, *28*(1), e13031. https://doi.org/10.1111/ijn.13031

Australian College of Nursing. (2020). *A national minimum dataset for nursing workforce planning and decision making – A White Paper by ACN* 2020 (978-1-925913-25-5).

Australian Nursing and Midwifery Federation Tasmanian Branch. (2016). *Ratios save lives - Ratio model*. Australian Nursing and Midwifery Federation Tasmanian Branch. https://anmftas.org.au/wp-content/uploads/2016/10/20161003-ANMF-Tasmanian-Branch-Proposed-Nurse-Patient-Ratio-Model.pdf

Australian Nursing Federation (South Australia). (2023). Nurse/ Midwife to Patient (NMTP) Ratios to be implemented. https://www.anmfsa.org.au/Web/News/2023/Nurse__Midwife_to_Patient__NMTP__Ratios_to_be_implemented.aspx

Australian Nursing Federation (Western Australia). (2023). Heal WA Campaign. https://www.anfiuwp.org.au/heal-wa-campaign.php

Bail, K., Willis, E., Henderson, J., Blackman, I., Verrall, C., & Roderick, A. (2021). Missed infection control care and healthcare associated infections: A qualitative study. *Collegian*, *28*(4), 393–399. https://doi.org/10.1016/j.colegn.2020.11.007

Ball, J. E., Bruyneel, L., Aiken, L. H., Sermeus, W., Sloane, D. M., Rafferty, A. M., Lindqvist, R., Tishelman, C., & Griffiths, P. (2018). Post-operative mortality, missed care and nurse staffing in nine countries: A cross-sectional study. *International journal of nursing studies*, *78*, 10–15. https://doi.org/10.1016/j.ijnurstu.2017.08.004

Blackman, I., Lye, C. Y., Darmawan, I. G. N., Henderson, J., Giles, T., Willis, E., Toffoli, L., Xiao, L., & Verrall, C. (2018). Modeling missed care: Implications for evidence-based practice. *Worldviews on Evidence-Based Nursing*, *15*(3), 178–188. https://doi.org/10.1111/wvn.12285

Blay, N., Roche, M. A., Duffield, C., & Lu, X. (2017). Intra-hospital transfers and adverse patient outcomes: An analysis of administrative health data. *Journal of Clinical Nursing*, *26*(23-24), 4927–4935. https://doi.org/10.1111/jocn.13976

Cho, E., Lee, N.-J., Kim, E.-Y., Kim, S., Lee, K., Park, K.-O., & Sung, Y. H. (2016). Nurse staffing level and overtime associated with patient safety, quality of care, and care left undone in hospitals: A cross-sectional study. *International Journal of Nursing Studies*, *60*, 263–271. https://doi.org/10.1016/j.ijnurstu.2016.05.009

Dani, C., Papini, S., Iannuzzi, L., & Pratesi, S. (2020). Midwife-to-newborn ratio and neonatal outcome in healthy term infants. *Acta Paediatrica*, *109*(9), 1787–1790. https://doi.org/10.1111/apa.15180

Duffield, C., Diers, D., O'Brien-Pallas, L. L., Aisbett, C., Roche, M. A., King, M., & Aisbett, K. (2011). Nursing staffing, nursing workload, the work environment and patient outcomes. *Applied Nursing Research*, *24*(4), 244–255.

Duffield, C., Roche, M. A., Wise, S., & Debono, D. (2020). Harnessing ward level administrative data and expert knowledge to improve staffing decisions: a multi-method case study. *Journal of advanced nursing*, *76*(1), 287–296. https://doi.org/10.1111/jan.14207

Griffiths, P., Maruotti, A., Saucedo, A. R., Redfern, O. C., Ball, J. E., Briggs, J., Dall'Ora, C., Schmidt, P. E., & Smith, G. B. (2018). Nurse staffing, nursing assistants and hospital mortality: retrospective longitudinal cohort study. *BMJ Quality & Safety*, *28*(8), 609–617. https://doi.org/10.1136/bmjqs-2018-008043

International Council of Nurses. (2019). ICN International Workforce Forum calls for urgent action from governments to address global nursing shortage. https://www.icn.ch/news/icn-international-workforce-forum-calls-urgent-action-governments-address-global-nursing

Lang, T. A., Hodge, M., Olson, V., Romano, P. S., & Kravitz, R. L. (2004). Nurse–patient ratios: A systematic review on the effects of nurse staffing on patient, nurse employee, and hospital outcomes. *JONA: The Journal of Nursing Administration*, *34*(7), 326–337. https://doi.org/10.1097/00005110-200407000-00005

Leigh, J. P., Markis, C. A., Iosif, A. M., & Romano, P. S. (2015). California's nurse-to-patient ratio law and occupational injury. *International archives of occupational and environmental health*, *88*, 477–484. https://doi.org/10.1007/s00420-014-0977-y

Lesman, B., Aroozoo, M., & Petrie, A. (2019). *Safe patient care (nurse to patient and midwife to patient ratios) amendment bill: Bill brief*. Department of Parliamentary Services Parliament of Victoria. https://apo.org.au/sites/default/files/resource-files/2019-02/apo-nid224936.pdf

Mark, B. A., Harless, D. W., Spetz, J., Reiter, K. L., & Pink, G. H. (2013). California's minimum nurse staffing legislation: results from a natural experiment. *Health services research*, *48*(2), 435–454. https://doi.org/10.1111/j.1475-6773.2012.01465.x

Matthews, R. P., Hyde, R. L., McLachlan, H. L., Llewelyn, F., & Forster, D. A. (2023). Midwifery workforce challenges in Victoria, Australia. A cross-sectional study of maternity managers. *Women and Birth*. https://doi.org/10.1016/j.wombi.2023.07.130

McHugh, M. D., Aiken, L. H., Sloane, D. M., Windsor, C., Douglas, C., & Yates, P. (2021). Effects of nurse-to-patient ratio legislation on nurse staffing and patient mortality, readmissions, and length of stay: A prospective study in a panel of hospitals. *The Lancet*, *397*(10288), 1905–1913. https://doi.org/10.1016/S0140-6736(21)00768-6

McHugh, M. D., Aiken, L. H., Windsor, C., Douglas, C., & Yates, P. (2020). Case for hospital nurse-to-patient ratio legislation in Queensland, Australia, hospitals: An observational study. *BMJ Open*, *10*(9), e036264. https://doi.org/10.1136/bmjopen-2019-036264

Millichamp, T., Bakon, S., Christensen, M., Stock, K., & Howarth, S. (2017). Implementation of a model of emergency care in an Australian hospital. *Emergency Nurse: The Journal of the RCN Accident and Emergency Nursing Association*, *25*(7), 35–42. https://doi.org/10.7748/en.2017.e1741

Mitchell, B. G., Gardner, A., Stone, P. W., Hall, L., & Pogorzelska-Maziarz, M. (2018). Hospital staffing and health care– associated infections: a systematic review of the literature. *The Joint Commission Journal on Quality and Patient Safety*, *44*(10), 613–622. https://doi.org/10.1016/j.jcjq.2018.02.002

Moullin, J. C., Sabater-Hernández, D., Fernandez-Llimos, F., & Benrimoj, S. I. (2015). A systematic review of implementation frameworks of innovations in healthcare and resulting generic implementation framework. *Health Research Policy and Systems*, *13*(1), 1–11. https://doi.org/10.1186/s12961-015-0005-z

Needleman, J., Buerhaus, P., Mattke, S., Stewart, M., & Zelevinsky, K. (2002). Nurse-staffing levels and the quality of care in hospitals. *New England Journal of Medicine*, *346*(22), 1715–1722. https://doi.org/10.1056/NEJMsa012247

Needleman, J., Buerhaus, P., Pankratz, V. S., Leibson, C. L., Stevens, S. R., & Harris, M. (2011). Nurse staffing and inpatient hospital mortality. *New England Journal of Medicine*, *364*(11), 1037–1045. https://doi.org/10.1056/NEJMsa1001025

New South Wales Nurses and Midwives' Association. (2023). Ratios in the Public Health System. https://www.nswnma.asn.au/workplace/phs_ratios/

Ngune, I., Myers, H., Cole, A., Palamara, P., Redknap, R., Roche, M. A., & Twigg, D. (2023). Developing nurse-sensitive outcomes in acute inpatient mental health settings—A systematic review. *Journal of Clinical Nursing*, *31*(17-18), 6254–6267.

Oner, B., Zengul, F. D., Oner, N., Ivankova, N. V., Karadag, A., & Patrician, P. A. (2021). Nursing-sensitive indicators for nursing care: A systematic review (1997–2017). *Nursing open*, *8*(3), 1005–1022. https://doi.org/10.1002/nop2.654

Peters, M. D. J., Godfrey, C. M., Khalil, H., McInerney, P., Parker, D., & Soares, C. B. (2015). Guidance for conducting systematic scoping reviews. *JBI Evidence Implementation*, *13*(3), 141–146. https://doi.org/10.1097/xeb.0000000000000050

Queensland Government. (2023). Queensland to introduce nation-leading midwife ratios for mums and bubs. https://statements.qld.gov.au/statements/99278

Queensland Health. (2021). *Business planning framework* (6th Ed.). State of Queensland. https://www.health.qld.gov.au/__data/assets/pdf_file/0022/1103773/bpf-2021.pdf

Shin, S., Park, J.-H., & Bae, S.-H. (2018). Nurse staffing and nurse outcomes: A systematic review and meta-analysis. *Nursing Outlook*, *66*(3), 273–282. https://doi.org/10.1016/j.outlook.2017.12.002

Spetz, J., Harless, D. W., Herrera, C. N., & Mark, B. A. (2013). Using Minimum Nurse Staffing Regulations to Measure the Relationship Between Nursing and Hospital Quality of Care. *Medical Care Research and Review*, *70*(4), 380–399. https://doi.org/10.1177/1077558713475715

Tellez, M. (2012). Work satisfaction among California registered nurses: A longitudinal comparative analysis. *Nursing Economics*, *30*(2), 73.

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., … Straus, S. E. (2018). Prisma extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine*, *169*(7), 467–473. https://doi.org/10.7326/M18-0850

Turner, L., Griffiths, P., & Kitson-Reynolds, E. (2021). Midwifery and nurse staffing of inpatient maternity services–a systematic scoping review of associations with outcomes and quality of care. *Midwifery*, *103*, 103118.

Twigg, D. E., Whitehead, L., Doleman, G., & El-Zaemey, S. (2021). The impact of nurse staffing methodologies on nurse and patient outcomes: A systematic review. *Journal of Advanced Nursing*, *77*(12), 4599–4611. https://doi.org/10.1111/jan.14909

Verrall, C., Abery, E., Harvey, C., Henderson, J., Willis, E., Hamilton, P., Toffoli, L., & Blackman, I. (2015). Nurses and midwives perceptions of missed nursing care–A South Australian study. *Collegian*, *22*(4), 413–420. https://doi.org/10.1016/j.colegn.2014.09.001

Wise, S., Fry, M., Duffield, C., Roche, M. A., & Buchanan, J. (2015). Ratios and nurse staffing: The vexed case of emergency departments. *Australasian Emergency Nursing Journal*, *18*(1), 49–55. https://doi.org/10.1016/j.aenj.2014.08.001

Wynendaele, H., Willems, R., & Trybou, J. (2019). Systematic review: Association between the patient–nurse ratio and nurse outcomes in acute care hospitals. *Journal of Nursing Management*, *27*(5), 896–917. https://doi.org/10.1111/jonm.12764

SUPPLEMENTARY MATERIALS

SEARCH TERMS AND SEARCHES

TABLE S.1 CINAHL

CINAHL				
Date	**Set**	**Concept**	**Search string**	**Results**
16/12/21	1	Nurse/Midwife	"nurs*" OR "midwife*" OR "nurs* staff*" OR "midwifery staff*" OR "registered nurs*" OR "registered midwife*" OR "enrolled nurs*" OR "enrolled midwife*"	1,016,864
16/12/21	2	Ratio	"ratio*" OR "hour* per patient* day" OR "NHPPD" OR "personnel staffing and scheduling" OR "staff* method*" OR "workforce plan*"	463,202
16/12/21	3	Hospital	"hospital*" OR "ward"	633,881
16/12/21	4	Outcome	"Patient satisfaction" OR "patient safety" OR "quality of care" OR "clinical outcome*" OR "length of stay" OR "missed care" OR "adverse events" OR "job satisfaction" OR "treatment outcome" OR "personnel turnover"	436,665
16/12/21	5	Australia	"Australia*"	134,865
16/12/21	6		1 AND 2 AND 3 AND 4 Limiters 2016-2022, English	1567
16/12/21	7		1 AND 2 AND 3 AND 4 AND 5 Limiters 2016-2022, English	90

TABLE S.2 MEDLINE

Medline				
Date	**Set**	**Concept**	**Search string**	**Results**
16/12/21	1	Nurse/Midwife	"nurs*" OR "midwife*" OR "nurs* staff*" OR "midwifery staff*" OR "registered nurs*" OR "registered midwife*" OR "enrolled nurs*" OR "enrolled midwife*"	1,016,864
16/12/21	2	Ratio	"ratio*" OR "hour* per patient* day" OR "NHPPD" OR "personnel staffing and scheduling" OR "staff* method*" OR "workforce plan*"	1,717,873
16/12/21	3	Hospital	"hospital*" OR "ward"	6,001,418
16/12/21	4	Outcome	"Patient satisfaction" OR "patient safety" OR "quality of care" OR "clinical outcome*" OR "length of stay" OR "missed care" OR "adverse events" OR "job satisfaction" OR "treatment outcome" OR "personnel turnover"	1,659,622
16/12/21	5	Australia	"Australia*"	741,337
16/12/21	6		1 AND 2 AND 3 AND 4 Limiters 2016-2022, English	2,886
16/12/21	7		1 AND 2 AND 3 AND 4 AND 5 Limiters 2016-2022, English, Geography (Australia)	68

TABLE S.3 SCOPUS

Scopus				
Date	**Set**	**Concept**	**Search string**	**Results**
16/12/21	1	Nurse/Midwife	"nurs*" OR "midwife*" OR "nurs* staff*" OR "midwifery staff*" OR "registered nurs*" OR "registered midwife*" OR "enrolled nurs*" OR "enrolled midwife*"	939,546
16/12/21	2	Ratio	"ratio*" OR "hour* per patient* day" OR "NHPPD" OR "personnel staffing and scheduling" OR "staff* method*" OR "workforce plan*"	4,495,970
16/12/21	3	Hospital	"hospital*" OR "ward"	2,580,515
16/12/21	4	Outcome	"Patient satisfaction" OR "patient safety" OR "quality of care" OR "clinical outcome*" OR "length of stay" OR "missed care" OR "adverse events" OR "job satisfaction" OR "treatment outcome" OR "personnel turnover"	2,369,832
16/12/21	5	Australia	"Australia*"	572,108
16/12/21	6		1 AND 2 AND 3 AND 4 Limiters 2016-2022, English	2,156
16/12/21	7		1 AND 2 AND 3 AND 4 AND 5 Limiters 2016-2022, English, Geography (Australia)	198

TABLE S.4 OPEN DISSERTATIONS

Open Dissertations				
Date	**Set**	**Concept**	**Search string**	Results
16/12/21	1	Nurse/Midwife	"nurs*" OR "midwife*" OR "nurs* staff*" OR "midwifery staff*" OR "registered nurs*" OR "registered midwife*" OR "enrolled nurs*" OR "enrolled midwife*"	15, 061
16/12/21	2	Ratio	"ratio*" OR "hour* per patient* day" OR "NHPPD" OR "personnel staffing and scheduling" OR "staff* method*" OR "workforce plan*"	63, 638
16/12/21	3	Hospital	"hospital*" OR "ward"	21,980
16/12/21	4	Outcome	"Patient satisfaction" OR "patient safety" OR "quality of care" OR "clinical outcome*" OR "length of stay" OR "missed care" OR "adverse events" OR "job satisfaction" OR "treatment outcome" OR "personnel turnover"	8,851
16/12/21	5	Australia	"Australia*"	14, 525
16/12/21	6		1 AND 2 AND 3 AND 4 Limiters 2016-2022, English	36
16/12/21	7		1 AND 2 AND 3 AND 4 AND 5 Limiters 2016-2022, English	6

TABLE S.5 LIST OF EXCLUDED FULL-TEXT ARTICLES

Author	Title	Reason for exclusion
Alsharari et al. 2021	Impact of night shift rotations on nursing performance and patient safety: A cross-sectional study	Wrong intervention
Arachchi et al. 2016	Clinical outcomes in a high nursing ratio ward setting for children with obstructive sleep apnea at high risk after adenotonsillectomy	Wrong setting
Assaye et al. 2020	Nurse staffing models in medical-surgical units of acute care settings: A cross-sectional study	Wrong study design
Assaye et al. 2018	Impact of nurse staffing on patient and nurse workforce outcomes in acute care settings in low- and middle-income countries: A systematic review protocol	Wrong study design
Bail et al. 2021	Missed infection control care and healthcare associated infections: A qualitative study	Wrong intervention
Bell et al. 2019	Emergency department models of care in Queensland: a multisite cross-sectional study	Does not include ratios
Blackman et al. 2018	Modeling Missed Care: Implications for Evidence-Based Practice	Wrong outcomes
Bragadóttir et al. 2020	The association of missed nursing care and determinants of satisfaction with current position for direct-care nurses—An international study	Does not include ratios
Burmeister et al. 2019	Determinants of nurse absenteeism and intent to leave: An international study	Wrong outcomes
Butler et al. 2019	Hospital nurse-staffing models and patient-and staff-related outcomes (Review)	Wrong study design
Chapman et al. 2017	Impact of teamwork on missed care in four Australian hospitals	Wrong intervention
Drennan et al. 2018	A protocol to measure the impact of intentional changes to nurse staffing and skill-mix in medical and surgical wards	Wrong study design
Driscoll et al. 2018	The effect of nurse-to-patient ratios on nurse-sensitive patient outcomes in acute specialist units: a systematic review and meta-analysis	Wrong study design
Duffield et al. 2016	A protocol to assess the impact of adding nursing support workers to ward staffing	Wrong study design
Duffield et al. 2018	Adding unregulated nursing support workers to ward staffing: Exploration of a natural experiment	Wrong intervention
Duffield et al. 2020	Harnessing ward-level administrative data and expert knowledge to improve staffing decisions: A multi-method case study	Wrong intervention
Forrester et al. 2016	Nurse-to-patient and midwife-to-patient ratios	Wrong study design
Gathara et al. 2020	Missed nursing care in newborn units: a cross-sectional direct observational study	Wrong intervention
Glette et al. 2018	Nursing home leaders' and nurses' experiences of resources, staffing and competence levels and the relation to hospital readmissions - A case study	Does not include ratios
Henderson et al. 2016	The impact of rationing of health resources on capacity of Australian public sector nurses to deliver nursing care after-hours: a qualitative study	Does not include ratios
Henderson et al. 2020	Why do nurses miss infection control activities? A qualitative study	Wrong outcomes
Holmes et al. 2017	NSW can afford improved ratios	Wrong study design
Knight et al. 2016	Staffing Ratios and Patient Outcomes: Looking beyond Nurses, Doctors, and Survival at ICU Discharge	Wrong study design
Lamp et al. 2016	Shoalhaven wins more midwives	Wrong study design
Lamp et al. 2016	Ratios now law in Queensland	Wrong study design
Lamp et al. 2017	Stand together for safer staffing	Wrong study design
Lamp et al. 2018	Rallies for ratios	Wrong study design

Author	Title	Reason for exclusion
Lamp et al. 2018	Changing the rules includes hospital staffing	Wrong study design
Lamp et al. 2019	Nursing home sanctioned after staff cut: Complaints by NSWNMA members have led the aged care regulator to impose sanctions on an understaffed nursing home	Wrong study design
Lamp et al. 2021	Queensland's ratios save lives and money	Wrong study design
Lamp et al. 2022	More nurses for Blacktown ED	Wrong study design
Mitchell et al. 2017	A review of safe-staffing models and their applicability to care homes	Wrong study design
Montgomery et al. 2018	Effect of an evidence-based quality improvement framework on patient safety	Does not include ratios
Moyo et al. 2020	The association between the mental health nurse-to-registered nurse ratio and patient outcomes in psychiatric inpatient wards: A systematic review	Wrong study design
Moyo et al. 2020	The association between mental health nurse to registered nurse ratio and patient outcomes in psychiatric inpatient wards: Protocol for a systematic review	Wrong intervention
Olley et al. 2019	Systematic review of the evidence related to mandated nurse staffing ratios in acute hospitals	Wrong study design
Parker et al. 2021	Consumer experiences of community-based residential mental health rehabilitation for severe and persistent mental illness: A pragmatic grounded theory analysis	Wrong intervention
Plummer et al. 2017 (2005)	An analysis of patient dependency data, utilizing the TrendCare system	Wrong year
Polis et al. 2017	Factors contributing to nursing team work in an acute care tertiary hospital	Wrong intervention
Rae et al. 2021	Outcomes sensitive to critical care nurse staffing levels: A systematic review	Wrong study design
Reynolds et al. 2021	Mandated nursing ratios decrease mortality and costs in the hospital, and what about the ICU?	Wrong study design
Shin et al. 2020	Improvement Plan of Nurse Staffing Standards in Korea	Wrong study design
Sim et al. 2019	Development of a data registry to evaluate the quality and safety of nursing practice	Wrong study design
Stone et al. 2019	Benchmarking nurse outcomes in Australian Magnet® hospitals: cross-sectional survey	Wrong intervention
Twigg et al. 2016	Foundations of a nursing-sensitive outcome indicator suite for monitoring public patient safety in Western Australia	Wrong study design
Twigg et al. 2016	The impact of adding assistants in nursing to acute care hospital ward nurse staffing on adverse patient outcomes: An analysis of administrative health data	Does not include ratios
Twigg et al. 2019	A quantitative systematic review of the association between nurse skill mix and nursing-sensitive patient outcomes in the acute care setting	Wrong study design
Unknown	Minimum staffing ratios save lives, reduce costs	Wrong study design
VandenHeede et al. 2020	Safe nurse staffing policies for hospitals in England, Ireland, California, Victoria and Queensland: A discussion paper	Wrong study design
Wolfe et al. 2020	Integrated Care Models and Child Health: A Meta-analysis	Wrong study design