Datasets to support workforce planning in nursing: A scoping review

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A R T I C L E   I N F O

A B S T R A C T

Aim: This review sought to identify and describe evidence regarding the value and benefits of datasets to support nursing workforce planning and quality patient care.
Design: Scoping review.
Data sources: The following data bases were searched Ovid EMCARE, MEDLINE, EMBASE, Scopus, Informit, and ProQuest Dissertations.
Review methods: The Joanna Briggs Scoping review guidelines informed the structure of this review which entailed a stepped search strategy. 3036 records were screened by title and abstract by two independent reviewers for relevance to the aims of the review, with disputes resolved by a third independent reviewer. Following assessment of 44 full-text documents, 18 were included in the review.
Results: There is limited evidence on the attributes or efficacy of workforce datasets. This is linked to the multiple variabilities across clinical settings and jurisdictions, such as education and qualifications, the nomenclature of nursing titles, clinical facility/unit classification, and the quantification of patient acuity, among other factors. A comprehensive workforce dataset was not reported in the literature examined here.
Conclusion: The absence of evidence regarding standardised workforce datasets and their value is impacting on nurse leaders' capacity to proactively plan and develop a viable strategy for sustaining the nursing workforce.
Impact: The lack of standardised national workforce datasets and their efficacy results in inadequate, ad hoc or contradictory approaches to workforce planning.

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1. Introduction

Nursing workforce planning is complex due to the many variables, such as patient acuity and complexity, nursing activities, and staff turnover that can all compound the development and currency of a workforce dataset. Indeed, workforce planning in healthcare is technically difficult with the ever increasing and evolving complexity of health care systems, models of care and patient demographics, i.e., an ageing population that comes with increasing co-morbidities. This is further compounded by two factors. Firstly, as Greaves et al. (2018) highlights, of the workload tools which have been developed none have been found to be superior to the professional judgement and experience of the nurse manager in the context of staffing decisions (p.10). Secondly, both the recent State of the World's Nursing Report (WHO, 2020) and the 2016 Triple Impact Report (All-Party Parliamentary Group on Global Health, 2016) note that nurses are often under-valued and their contribution underestimated. The WHO report also notes that nursing workforce data systems worldwide have considerable limitations. Determining how data can best be integrated into capturing

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Summary of relevance

Problem or issue
Little is known about the efficacy of datasets in supporting workforce planning in nursing.
What is already known
Nursing workforce planning is complex due to wide divergence of variables e.g., patient acuity, staff attrition, that influence the healthcare environment.
What this paper adds
There is no robust evidence of standardised workforce datasets thereby making their value and benefit in workforce planning and quality patient care tenuous. This is impacting on the ability to determine a strategy for sustaining the nursing workforce.

and creating a robust system for the nursing workforce is challenging but essential.

2. Background

Globally, nursing is challenged with a predicted shortfall in the forthcoming decade (Auerbach & Staiger, 2017; Buchan, Twigg, Dussault, Duffield, & Stone, 2015), with consequent challenges in workforce planning, compounded by issues of skill mix, patient acuity and complexity, and organisational unit instability (Duffield, Roche, Dimitrelis, Homer, & Buchan, 2015; Duffield et al., 2018). However, as Britnell (2019) highlights in his text, irrespective of a country's wealth, no country manages its healthcare and workforce well nor, despite the many analyses, is prepared for the predicted shortfall. Healthcare organisations tend to focus reactively on the quick fix solutions without realising the longer-term outcomes. Anecdotally, individual organisations (hospitals, multi-site services, state departments) collate and utilise data for understanding their workforce, but these data are rarely reported. At higher levels (e.g., AHPRA, 2018), data pertaining to the nursing workforce may be publicly reported but these data are subject to limitations including definitional inconsistencies, voluntary participation, and the potential for duplication across jurisdictions (AIHW, 2016).

The healthcare workforce crisis in nursing is perpetuated by a sense of being undervalued (All-Party Parliamentary Group on Global Health, 2016; Britnell, 2019). Healthcare organisations are not good at rewarding and supporting staff through life's transitions. In nursing there is a tendency to churn out new graduates and then spit them out (Darbyshire, Thompson, & Watson, 2019). Consequently, novice staff leave not long after they have completed their training and as Britnell (2019) highlights, these nurses are not easily replaced. Such attrition impacts on staffing levels, the quality of patient care and patient safety as employers struggle to fill the void.

Inextricably linked to patient safety and the quality of patient care is nursing skill mix (Aiken et al., 2016; Wilson, Bremner, & Hauck, 2010). However, determining what is the 'right' skill mix in nursing is a complex issue (Lavander, Meriläinen, & Turkki, 2016) due to the variation in the division of labour across direct patient care, indirect care, documentation, management roles and other duties. (Dahlke & Baumbusch, 2015; Van Bogaert et al., 2014). This is complicated by mechanisms such as mandated nurse-patient ratios, which do not necessarily take into account the acuity of the patient cohort but are based on bed numbers of the clinical unit/ward. In California, whilst the mandating of nurse-patient ratios has seen a reduction in attrition, there are concerns regarding the empirical evidence of improved clinical outcomes along with the associated increase in costs on an already overstretched

healthcare budget (Wynendaele, Willems, & Trybou, 2019). Recent Australian research (Duffield, Roche, Wise, & Debono, 2019) identified the potential impact of such inflexible systems and reinforced the limitations of relying on administrative systems without contextual understanding. Evidence regarding the most appropriate data to plan and implement an effective nursing workforce is not well articulated in the literature, yet given the factors above, the requirement for an understanding of the most beneficial approach to the collection and use of workforce data is vital. Hence a scoping review protocol was designed by JWN with contributions from all authors.

3. The review

3.1. Objective

The objective of this scoping review was to identify and describe evidence regarding the value and benefits of nursing workforce datasets to support planning and quality patient care. Three specific questions were addressed:

- What workforce datasets currently exist in nursing?
- What are the benefits and value of workforce datasets to health services?
- What are the benefits and value of workforce planning in nursing to patient care/outcomes?

3.2. Inclusion criteria

3.2.1. Participants
The review considered studies that referred to nurses, registered nurses, enrolled nurses, or nursing assistants (however named).

3.2.2. Concept
The concept of interest was nursing workforce datasets, including their value and benefit regarding workforce planning and the quality of patient care. Nursing workforce datasets included those systematically and regularly collected. They were comprised of nursing numbers or hours, skill mix, nursing workload, nurse to patient ratios, or nursing hours per patient day. The aim is to explore the benefit and value pertaining to the use of the datasets regarding workforce planning, system, nurse, or patient outcomes.

3.2.3. Context
Any nursing setting including but not limited to acute care, primary health care, community services, or aged care.

3.2.4. Type of sources
This review included English-language studies only. Primary research was included and was not limited to randomised controlled trials, non-randomised controlled trials, quasi-experimental studies, cohort-controlled trials, pre and post-test studies, observational studies, descriptive studies, cross-sectional studies, case studies, ethnography, grounded theory, action research or phenomenology. Reviews of any type were included for consideration, as were narrative or descriptive papers.

3.3. Design

The Joanna Briggs Institute scoping review framework described by Peters and colleagues (Peters et al., 2017) was used as the basis for conducting and reporting this review, supported by the PRISMA statement checklist (Liberati et al., 2009). As the aim of this scoping review was to develop a map of the evidence, quality appraisal was

Table 1
Search terms and approach

1. "best practice" or best?practice or "gold standard*" or "bench mark" or bench?mark or "quality of health?care" or 'quality of health care' or standard*)
2. nurs* or "nurs* ratio*" or "nurse to patient ratio*" or "staff* number" or "work?load model" or "work load model" or "work load" or work?load or "work force" or work?force or "nurs* staff*" or "labo?r force"
3. "human resource* information system*" or "HR information system*" or "human resource* system*" or "HR system*"
4. data?set* or "data set*" or "national data" or data
5. "systematic review*" or meta?analys?s or "meta analys?s" or RCT* or "randomi?ed control trial*" or "observational stud*" or "descriptive stud*" or "case stud*"
6. 2 or 3
7. 1 and 4 and 6
8. 5 and 7
9. UK or "United Kingdom" or US or USA or "united states" or "united states of America" or Canada or "north America" or NZ or "New Zealand" or Australia
10. 8 and 9

not required (Armstrong, Hall, Doyle, & Waters, 2011; Munn et al., 2018).

3.4. Search strategy

A stepped search strategy was utilised in order to find both published and unpublished studies. An initial limited search of EMCARE and MEDLINE Ovid was undertaken followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe the article. A second search using all identified keywords and index terms (Table 1) was then undertaken across all included databases (EMCARE, MEDLINE Ovid, EMBASE, Scopus, Informit, and ProQuest Dissertations). Thirdly, the reference lists of all identified articles were searched for additional studies. Published, unpublished and ongoing studies were eligible for inclusion in this review.

3.5. Search outcomes

The initial search yielded 3767 records across the three databases. Following removal of 731 duplicates, 3036 records were screened by title and abstract by two independent reviewers for relevance to the aims of the review, with disputes resolved by a third independent reviewer. This process led to the exclusion of 2992. The 44 remaining publications were read in full and assessed for eligibility following the same independent review and dispute resolution process. A further 26 publications were thereby excluded, and 18 publications retained for this review (Fig. 1).

3.6. Data extraction

Data were extracted using a standardised instrument developed for scoping reviews (Peters et al., 2017). This instrument included: author, year, country, setting and participants, objective, methods, and key findings. Data from the included articles is presented under each of the three questions described earlier (Table 2).

4. Findings

Of the 18 papers included in this review, 13 were primary research. This included 10 quantitative observational, survey, or combined design (Adomat & Hicks, 2003; Aiken et al., 2018, 2014; Fagerström, Kinnunen, & Saarela, 2018; Hand, Albert, & Sehgal, 2018; Hurst, 2008; Nelson et al., 2007; Pillay, Nightingale, Owen, Kirby, & Spencer, 2012; Possari, Gaidzinski, Lima, Fugulin, & Herdman, 2015; Welton, 2011), two case studies (Harrington & Edelman, 2018; Massey, Esain, & Wallis, 2009), and one mixed-

methods descriptive study (Klaus, Dunton, Gajewski, & Potter, 2013). Four papers were reviews, including one systematic review and meta-analysis (Kane, Shamliyan, Mueller, Duval, & Wilt, 2007), one Cochrane review (Butler et al., 2011), a narrative review (Brand et al., 2012), and a rapid review (Greaves et al., 2018). One discussion paper was included (Rassin & Silner, 2007). Five studies were undertaken in the United States, five in the United Kingdom, two in Europe, and one in Brazil. The four reviews were international and the discussion paper from Israel.

4.1. Nursing workforce datasets

In accordance with the objectives and inclusion criteria all papers referred to nursing workforce data, nursing workload, workforce planning, or quality of care. Ten primary research papers made explicit reference to systematically collected datasets. Both studies by Aiken and colleagues (Aiken et al., 2018, 2014) reported data from the RN4CAST Nurse Survey, a large survey undertaken across medical and surgical wards in the UK and Europe that collected data on nurse characteristics in addition to information on nursing workload (e.g., patients per nurse). Other studies reported annual or biannual nurse surveys (Hand et al., 2018; Welton, 2011), administrative or other routinely collected data (Fagerström et al., 2018; Harrington & Edelman, 2018; Hurst, 2008; Massey, Esain, & Wallis, 2009), unique surveys, collections, or logs (Klaus et al., 2013; Nelson et al., 2007), or a review of workload measures in Intensive Care (Greaves et al., 2018). Data elements were not consistently reported but included nurse classification (e.g., registered nurse, licensed practice nurse, nurse assistant), temporary (pool/casual/agency) or permanent, clinical area, level of education, accreditation, age or age group, experience (generally and in specialty area), nurse role (e.g., 'sitter'/'special', 'floater'/'deployed'), shift, day of week, hours of work, and category of hours (e.g., usual hours, training, overtime). These data indicators were used in the studies to calculate total staff numbers, the number and proportion of each nursing classification, hours and proportion of agency or bank/casual nurses. They were also combined with patient data to calculate nurse to patient ratios or nursing hours per patient day. Most primary studies collected data at individual, ward, or hospital level, and usually reported it at the hospital or ward level.

Challenges in using existing administrative datasets were identified in the merging of disparate datasets (Hurst, 2008; Kane et al., 2007; Klaus et al., 2013; Massey et al., 2009), classification and qualification of nurses (Massey et al., 2009), and standardisation generally (Klaus et al., 2013; Welton, 2011). Even in well-established systems like the National Database of Nursing Quality Indicators (NDNQI) in the USA, ambiguity in data elements was noted, particularly variation between sites (Klaus et al., 2013). Several papers combined administrative data or logs with prospective datasets in order to examine a more complete picture.

4.2. Benefits and value of workforce datasets to health services

The value of a nursing workforce dataset to health services was not discussed explicitly in most of the papers reviewed here. However, the benefits of understanding workforce planning as it pertains to design and cost, and its association with quality of care was apparent. At the national level Rassin and Silner (2007) espoused the benefits of a workforce model for planning services; particularly the capacity to predict likely education needs. Welton (2011) identified significant differences in skillmix between rural and metropolitan hospitals and across states, with non-statistically significant but suggestive differences between hospitals with different funding structures. The value of data in understanding the use of bank/casual or agency nurse utilisation was noted in several papers (Massey et al., 2009; Nelson et al., 2007). Patient and nurse

Table 2
Summary table of reviewed documents

Author (year), country	Setting/context	Participants/sources	Type of study	Design	Aims/purpose	Key findings
Adomat and Hicks (2003), UK	Intensive care	21 patients; 77.5 FTE nurses	Quantitative	Observational	To determine the accuracy of the Nursing Workload Patient Category scoring system in measuring nurse workload	Assumption of 1:1 staffing does not represent actual need for some patients; RNs undertake tasks not commensurate with their training and skills; team-oriented nursing and leaner skillmix that includes HCAs may be more efficient.
Aiken et al. (2018), UK	Adult Acute Care Hospital	66,348 patients; 2963 nurses	Quantitative	Cross-sectional survey	To inform healthcare workforce policy decisions by showing how patient perceptions of hospital care are associated with confidence in nurses and doctors, nurse staffing levels and hospital work environments.	High level of confidence and trust in nurses. Lower satisfaction with hospital care is less favourable when they perceive there are not enough nurses available. 60% of patients considered nurse staffing to be adequate. Missed care ranged from 7% (pain) to 63% (comfort) and was linked to workload.
Aiken et al. (2014), Belgium, England, Finland, Ireland, the Netherlands, Norway, Spain, Sweden, and Switzerland	Adult Acute Care Hospital	422,730 patients; 26,516 nurses	Quantitative	Observational & survey	To assess whether differences in patient-to-nurse workloads and nurses' educational qualifications are associated with variation in hospital mortality after common surgical procedures.	Increasing nursing workload by 1 patient increased likelihood of patient mortality by 7%. Bachelor prepared registered nurses decreased likelihood of mortality by 7%.
Brand et al. (2012), N/A	Hospital	57 studies	Review	Narrative review	To critically appraise the literature relating to associations between high-level structural and operational hospital characteristics and improved performance.	Association between high level hospital characteristics and hospital performance outcomes is weak. Relationship between nursing workload and adverse events is moderate. High workload linked to negative nurse outcomes. Increased staffing decreased LOS.
Butler et al. (2019), N/A	Hospital	15 studies	Review	Systematic review	To explore the effect of hospital nurse staffing models on patient and staff-related outcomes.	Limited findings except that evidence is weak. Limited relationship between nurse specialist roles and some patient outcomes. Relationship between nurse staffing and nurse outcomes.
Fagerström et al. (2018), Finland	Acute Care Hospital	12,475 data points	Quantitative	Observational	To investigate whether daily nurse workload correlates with patient safety and mortality.	Daily workload per nurse is associated with patient safety incidents and mortality; Odds of patient safety incidents increase by 10–30% and mortality by 40% if workload is above optimal. Traditional ratios may not be appropriate.

Table 2 (*Continued*)

Author (year), country	Setting/context	Participants/sources	Type of study	Design	Aims/purpose	Key findings
Greaves et al. (2018), N/A	Critical care	32 studies	Review	Rapid review	To review current methods for informing nurse workforce decisions in critical care.	No consensus on a universal tool for ICU staffing. Substantial variations in unit types and patient acuity are a challenge to a consistent framework.
Hand et al. (2018), USA	Dialysis	4035 facilities	Quantitative	Observational	To explore the relationship between patient to staff ratios and dialysis outcomes.	Patient to nursing staff ratios did not explain variation in dialysis facility outcomes.
Harrington and Edelman (2018), USA	Residential care	1 service with 12 facilities	Quantitative	Case study	To examine a litigation case regarding staffing levels, resident rights, and quality outcomes.	Under staffing and missed care reported. Increased patient acuity did not lead to increased staffing.
Hurst (2008), UK	Hospital	375 Wards	Quantitative	Observational	To explore the relationships between ward design, staffing, workload, and quality.	Nursing workload varied little in relation to ward design although Bay wards were linked to higher workload.
Kane et al. (2007), N/A	Acute Care Hospitals	28 studies	Review	Systematic review	To examine the association between registered nurse staffing and patient outcomes in acute care hospitals.	Increasing RN staffing levels is associated with lower mortality rates. One additional RN per shift decreased levels of pneumonia, adverse cardiac events, and length of stay. Recognised variation in acuity and challenges in matching staffing to rapid change.
Klaus et al. (2013), USA	Hospital	714 hospitals	Mixed-methods	Descriptive	To examine the processes used by hospitals to generate nursing care hour data and to evaluate inter-rater reliability and guideline compliance with NDNQI standards.	Links between nursing hours and quality indicators. Patient and nurse data not routinely linked presenting difficulty in ongoing processes. Identified challenges in categorisation of staff types.
Massey et al. (2009), UK	Acute Care Hospital	1 hospital	Mixed-methods	Case study	To analyse bank and agency nursing staffing patterns and factors that impact on these patterns.	Increased patient acuity linked to agency/bank staff use. More agency/bank nurses used on weekends, evenings and nights. Demonstrates utility of administrative data to understand staffing.
Nelson et al. (2007), USA	Rehabilitation	54 facilities	Quantitative	Observational & survey	To describe rehabilitation nurse staffing patterns, to validate the impact of rehabilitation nursing on patient outcomes, and to test whether existing measures of severity and outcomes in rehabilitation could be used for staffing requirements.	Few validated outcomes in rehabilitation nursing. Limited links between staffing, other variables, and rehabilitation outcomes. Two variables identified: nurse manager's rating of non-RN staff predicted one positive patient outcome, and the percentage of RNs certified in rehabilitation decreased LOS.

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Table 2 (*Continued*)

| Author (year), country	Setting/context	Participants/sources	Type of study	Design	Aims/purpose	Key findings
Pillay et al. (2012), UK	Neonatal	6 Wards; 244 neonates; 84 nurses	Quantitative	Observational	To measure nursing workload and timely completion of essential tasks in relation to staffing levels.	Understaffing leads to measurable problems including delays to essential treatment and reduced clinical care. Substantial (28%) time reduction for care with increased nursing workload. Delayed care for 17% of neonates. Suggests that in NICU, ratios are minimum standard only.
Possari et al. (2015), Brazil	Perioperative	1 hospital	Quantitative	Observational	To analyse nursing workload distribution, interventions and activities, by workload classification in the transoperative period.	Identified that nurses of all classifications mainly undertake direct patient care activities in the perioperative environment, with some variation between categories. Identifies very high productivity that may be suggestive of work overload.
Rassin and Silner (2007), Israel	Hospital	2 exemplars	Discussion paper	N/A	To examine international trends in nurse-to-patient ratios and nursing staff mix as they pertain to Israel.	Describes a national workforce model derived from ratio-based approaches. Identifies the utility of a workforce dataset to inform high-level planning.
Welton (2011), USA	Acute Care Hospital	3129 hospitals	Quantitative	Observational	To better understand how hospitals use different types of RNs, LPNs, and nurse aides in for-profit, non-profit, and government-owned hospitals and to estimate the wages, cost, and intensity of nursing care using a national data set.	Differences in skill mix reflected state-level licensing ratios. Skillmix differed across hospital types and significantly between rural and metropolitan settings.
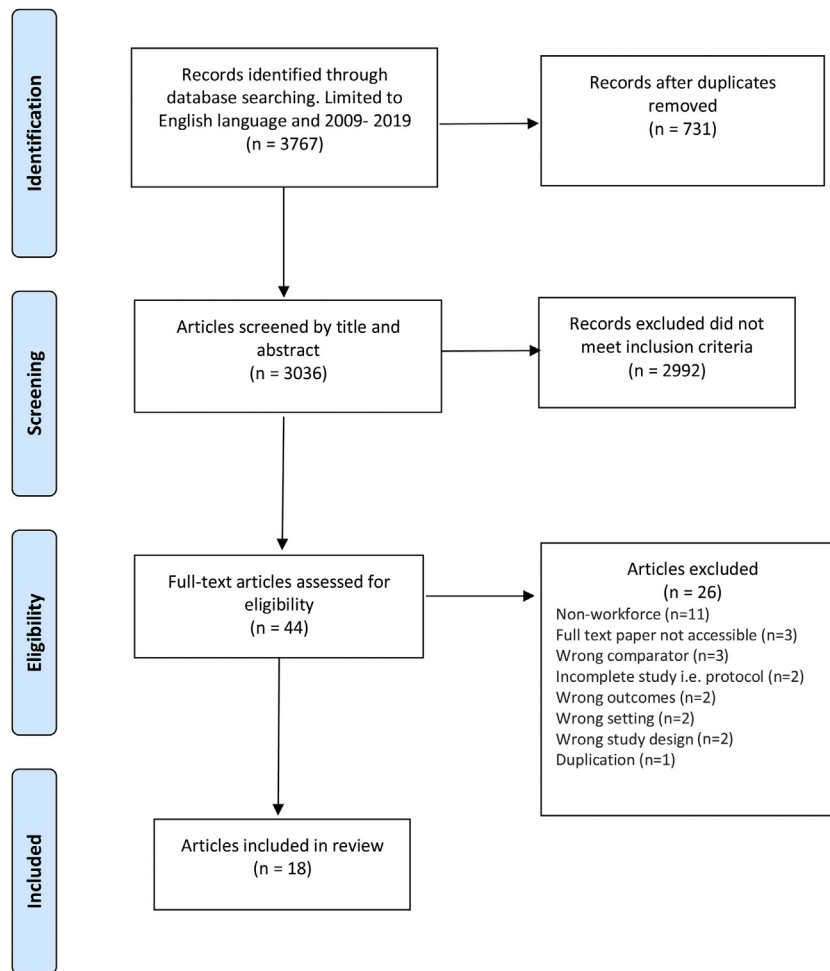
Fig. 1. PRISMA diagram.

outcomes were considered the most strongly supported indicator as described below, although any impact of alterations to nurse staffing on hospital finances was not considered lightly (Brand et al., 2012).

Studies that incorporated a prospective observational component (Adomat & Hicks, 2003; Fagerström et al., 2018; Hand et al., 2018; Nelson et al., 2007; Pillay et al., 2012; Possari et al., 2015) measured tasks or the ward design (Hurst, 2008). They estimated workload linked to nurse and patient type or to the physical structure of the ward. However, a noted limitation of these types of studies is that nursing cannot be considered a solely task-orientated profession, and considering workload without accounting for obtaining assessment information and clinical reasoning is potentially counter-productive (Possari et al., 2015).

4.3. Benefits and value of workforce planning in nursing to patient care/outcomes

Similar to the consideration of the benefit of a dataset to health services, the value of workforce planning to patient care or outcomes was not overt, although the association between the nursing workforce and quality of care was apparent. Indeed, this was a focus of several papers and was considered in the background of many. Reviews found an evidence base for the impact of nurse staffing and skill mix on patient adverse events (Brand et al., 2012; Kane et al., 2007) and on nurse outcomes such as job satisfaction (Brand et al., 2012; Butler et al., 2011) although the strength of the impact varied between reviews. Aiken et al. (2014) reinforced the

link between nursing workload and patient outcomes, with a one-patient increase in workload increasing the likelihood of mortality by 7% and an increased proportion of bachelor-qualified registered nurses linked to a decrease in adverse patient events. Similarly, Fagerström et al. (2018) noted an increased likelihood of negative patient outcomes including mortality, when nurse workload was not optimum. Whilst Greaves et al. (2018) acknowledge the time nurses spend, interaction with patient families and carers, and the outcomes of these interactions, is rarely included in workload tools.

5. Discussion

The complexity of determining a nursing workforce dataset is evident from the wide variation and limited number of empirical studies identified in this review. The diverse nature of the studies, and their use of administrative or bespoke data collections provided little consistency in terms of the key data elements and how they are best structured or obtained. Indeed, many studies adopted methods that used multiple sources of data, partly to incorporate factors consistent with a focus on generating new knowledge, but also to alleviate the limitations of the different sources. Papers that analysed data, or were aimed at, the national or state level (Aiken et al., 2018, 2014; Klaus et al., 2013; Rassin & Silner, 2007; Welton, 2011) demonstrated both the utility and the limitations of current datasets, and highlighted the need for greater standardisation and more detailed examination of the data elements currently collected. Those papers prepared at the service level (Fagerström et al., 2018; Greaves et al., 2018; Hurst, 2008) underscored the

need for locally relevant datasets with a broader range of variables, although others temper this potential expansion of elements with the challenges in training and support of those responsible for the datasets (Klaus et al., 2013). The workforce datasets that have been developed are limited in their transferability given the variation in nomenclature of nursing roles, across different countries and clinical contexts. Data collected at the hospital level may be subject to aggregation or averaging (Kane et al., 2007) and may contain an unknown amount of measurement error (Klaus et al., 2013).

A comprehensive dataset was judged to have significant application at various levels. For example, evaluating nursing competence and the associated skill mix needed to meet the individual patient's problems and provide a good standard of safe care can be facilitated at the ward-level or hospital-level if appropriate and timely data are available. This could have a significant effect on service provision as both skill mix and staffing (e.g., ratios or NHPPD) were linked to outcomes, albeit with variation (Butler et al., 2011; Hand et al., 2018; Kane et al., 2007). Some studies (Hand et al., 2018; Hurst, 2008; Massey et al., 2009) reported inconclusive results whilst others were able to demonstrate an association with the qualification of the nurses on patient outcome (Aiken et al., 2018; Kane et al., 2007; Nelson et al., 2007). Regardless, staffing however quantified, does not take into account the clinical context or facility characteristics which are important predictors of patient outcomes (Duffield, Roche et al., 2019; Hand et al., 2018), nor the time nurses spend in critical thinking (Possari et al., 2015). Often the evidence to support staff ratios is left to expert opinion alone. (Hand et al., 2018). Nursing is not just about tasks; it is about person-centred care 'being with the patient and their family', an essential aspect of nursing practice that is difficult to quantify. In this sense, datasets provide a foundation but local application and context is still essential (Duffield, Roche et al., 2019; Duffield, Twigg, Roche, Williams, & Wise, 2019).

With the increasing shortage of nurses pending, variation in nursing roles is under the spotlight with a push for greater flexibility in scope of practice of registered nurses (All-Party Parliamentary Group on Global Health, 2016) along with increasing the use of the unregulated worker (e.g., assistant in nursing).This latter aspect is also perceived as a possible cost containment in an economically stretched health service. Yet, Butler et al. (2011) in their systematic review on hospital nurse-staffing models and patient and staff-related outcomes, found that the use of nursing assistants did not reduce costs. This is further emphasised by large, single, studies that found increased adverse events were associated with leaner skill mix (Aiken et al., 2016; Twigg et al., 2016).

6. Limitations

This scoping review has allowed an examination of what is known about workforce datasets in relation to supporting nursing workforce planning and quality patient care. However, the papers included were only English language, and so some relevant studies may have been missed. It was difficult to make comparisons from the included studies and papers due to the variation and lack of standardisation of workforce datasets utilised in those that reported empirical studies. Hence, it is not feasible to make consistent conclusions.

7. Conclusion

This review has identified a dearth of nursing workforce datasets that facilitate both high- and low-level applications. The consequences of this sparsity and the lack of standardisation in developing and maintaining comprehensive nursing datasets are potentially significant. For example, the under-reporting of tem-porary staffing arrangements could compromise nursing workload calculations (Klaus et al., 2013; Massey et al., 2009), while not understanding the educational level of clinical staff (Massey et al., 2009) sets a challenge for safe ward staffing. The capacity to understand nursing turnover rates and costs is compromised without the foundation of a solid and consistent dataset (Duffield, Roche, Homer, Buchan, & Dimitrelis, 2014; Hayes et al., 2012; Roche, Duffield, Homer, Buchan, & Dimitrelis, 2015). Crucially, with nurse staffing and skill mix so closely linked to patient outcomes, the absence of a standardised but locally relevant datasets precludes the development of tools that can enhance the service and clinical management. The requirement to meet national or state requirements while staying locally relevant is challenging. However not meeting this challenge is having a current impact on the management of nursing, leading to inadequate, contradictory, or ad hoc approaches that do not provide the solid foundation that such fundamental matters require. Future nursing workforce data systems should adopt consistent definitions and terminology, measures derived from research evidence, such as skill mix, staffing hours, and educational level, and be readily 'linkable' to other pertinent datasets such as electronic medical records, to assess the outcomes of nursing care. Importantly, these data should be collected routinely to support timely access and utilisation in addition to long-term review and planning.

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