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Identifying nurse-sensitive indicators for stand-alone high acuity areas: A systematic review

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ARTICLE INFO

Article history:

Received 12 January 2017

Received in revised form 6 October 2017

Accepted 9 October 2017

Available online xxx

Keywords:

Systematic review

Nursing

Nurse sensitive outcomes

High acuity settings

Acute care

ABSTRACT

Background: Nurse-sensitive patient outcomes that are suitable for general medical and surgical settings are well developed. Indicators developed for general ward settings may not be suitable for stand-alone high acuity areas; therefore, a different set of indicators is required.

Aim: The aim of this review was to identify suitable indicators for measuring the impact of nurse staffing and nurse skill mix variations on patient outcomes in stand-alone high acuity areas.

Methods: A systematic review of the literature was undertaken for studies published between January 2000 and November 2016. Suitable indicators were identified based on simple criteria. That is, if there were at least three studies that found a significant relationship between the outcome and staffing variables and at least 50% of all the studies that investigated that outcome reported a significant association, that variable was included in the list of potential outcomes.

Findings: This review identified eight indicators from 44 eligible research articles. These were: mortality, length of stay, central-line-associated bloodstream infection, ventilator-associated pneumonia, sepsis, falls with injury, reintubation, and medication errors.

Discussion: Further work is needed to clarify the definitions for each of the indicators. Standard definitions should be developed using algorithms linked to International Classification of Diseases codes to ensure consistency and comparability across studies. The majority of these outcomes could be measured using administrative patient datasets. Reintubation and medication errors may be difficult to measure with available datasets requiring specialised data collections.

Conclusion: This comprehensive review identified a number of indicators that could be developed for further testing to monitor the quality of nursing care in Intensive Care Units.

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Problem or issue

Monitoring patient outcomes associated with the quality of nursing care in stand-alone high acuity areas is required; however, suitable indicators have not been identified.

What is already known?

Indicators for general ward settings are well developed in the research literature; however, the transferability of these indicators to other settings is not known.

What this paper adds

The best available evidence is summarised to produce a set of eight indicators for further testing and development in stand-alone high acuity areas. The indicator set includes new indicators not used for general ward settings.

1. Introduction

Monitoring the quality of patient care in hospitals is an important component of hospital quality assurance and accreditation processes. The overall quality of patients' experiences in Australian hospitals is monitored through a number of mechanisms such as the [Australian Council on Health Care Standards \(2015\)](#) accreditation process, which includes the National Safety and Quality Health Service Standards ([Australian Commission on Safety and Quality in Health Care, 2012](#)) and State-based initiatives such as the Health Service Performance Reports Indicators ([Department of Health, 2016](#)). These systems assess the overall quality of patient care within health care institutions rather than the contribution of different health professions toward achieving quality patient outcomes. From a nursing perspective, it is important to quantify the contribution of nursing care toward patient outcomes, as this provides the background for measuring the effect of any changes to

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nurse variables such as nurse staffing levels, nurse skill mix, or nurses' work environment on patient outcomes.

The development of indicators that measure patient outcomes associated with the quality of nursing care are at the forefront of nursing research (National Quality Forum (NQF), 2004) and are commonly known as nurse-sensitive outcomes (NSOs), a term first coined by Maas, Johnson, and Moorhead (1996) in their paper outlining the development of the Nursing Outcomes Classification system. An NSO is defined as 'a variable patient or family caregiver state, behaviour, or perception responsive to nursing intervention... [that] can be measured and compared to a baseline over time' (Maas et al., 1996, p. 296). This definition was used in the landmark report commissioned by the United States Department of Health and Human Services – Health Resources Services Administration, which demonstrated the link between nurse staffing levels and patient outcomes (Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2001). Since the early work of Needleman et al. (2001) and Aiken, Clarke, Sloane, Sochalsi, and Silber (2002), many studies have been conducted in the acute care setting to measure the nursing contribution to patient care – to the point where there has now been a systematic review of reviews of the relationship between nurse staffing and patient outcomes (Brennan, Daly, & Jones, 2013). Patient outcomes commonly studied include central nervous system complications, deep vein thrombosis, pulmonary embolus, pressure ulcers, gastrointestinal bleeding, pneumonia, sepsis, shock, cardiac arrest, urinary tract infection, failure to rescue, physiologic/metabolic derangement, pulmonary failure, wound infections, mortality, and length of stay in hospital (Kane, Shamliyan, Mueller, Duval, & Wilt, 2007; Lankshear, Sheldon, & Maynard, 2005; Thungjaroenkul, Cummings, & Embleton, 2007; Twigg, Duffield, Thompson, & Rapley, 2010; Unruh, 2008), all of which are influenced by the quality of nursing care. However, outcomes that are suitable for general medical and surgical settings may not be suitable for other settings such as stand-alone high acuity areas. The authors sought to determine if indicators previously developed for general ward settings (Twigg, Pugh, Gelder, & Myers, 2016) could be used in stand-alone high acuity areas, or if a different set of indicators were required. This involved a systematic review of the research literature.

As part of the systematic review process seven previous reviews were identified that summarised the literature pertaining to NSOs in stand-alone high acuity areas (Carayon & Gürses, 2005; Coombs & Lattimer, 2007; Kane et al., 2007; McGahan, Kucharski, & Coyer, 2012; Numata et al., 2006; Penoyer, 2010; West, Mays, Rafferty, Rowan, & Sanderson, 2009). Most of these reviews were literature reviews (Carayon & Gürses, 2005; Coombs & Lattimer, 2007; McGahan et al., 2012; Penoyer, 2010); one was a systematic review (West et al., 2009), and two were systematic reviews combined with meta-analysis (Kane et al., 2007; Numata et al., 2006). Four of the reviews focused on Intensive Care Unit (ICU) settings (Carayon & Gürses, 2005; Kane et al., 2007; McGahan et al., 2012; West et al., 2009), while the other three focused on critical care settings (Coombs & Lattimer, 2007; Numata et al., 2006; Penoyer, 2010). These prior reviews were accessed to determine if they provided sufficient information for the development of an indicator suite of NSOs or if a new review was warranted.

The earliest literature review by Carayon and Gürses (2005), who examined the literature in order to develop a conceptual framework of nursing workload and patient safety in ICUs, was not useful as the identification of NSOs was not the main purpose of their review and, therefore, they were not reviewed in a systematic way. This made it difficult to draw conclusions about the precise relationship between included patient outcomes and nursing workload.

The other three reviews of NSOs in the ICU setting (Kane et al., 2007; McGahan et al., 2012; West et al., 2009) identified a number

of potential indicators for this setting with only one of the systematic reviews including a meta-analysis (Kane et al., 2007). Morbidity indicators with significant relationships with nurse staffing variables were bloodstream infection (McGahan et al., 2012; West et al., 2009), transmission of pathogens (McGahan et al., 2012), delays in weaning from mechanical ventilation (West et al., 2009), nosocomial infections (McGahan et al., 2012), major complications such as cardiac arrest and respiratory distress (West et al., 2009), pulmonary failure (Kane et al., 2007), pressure ulcers (McGahan et al., 2012), increased length of stay (Kane et al., 2007; West et al., 2009), cardio-pulmonary resuscitation (Kane et al., 2007), pneumonia (Kane et al., 2007; McGahan et al., 2012; West et al., 2009), reintubation (West et al., 2009), unplanned extubation (Kane et al., 2007), and post-operative complications (West et al., 2009). The evidence for an association between these indicators and nurse staffing variables was not consistent; for example, ventilator-associated pneumonia (McGahan et al., 2012), central-line associated bloodstream infections (McGahan et al., 2012), and pressure ulcers (McGahan et al., 2012) had a mix of studies that found significant and non-significant associations between the variables.

Kane et al. (2007) noted consistent significant associations between nurse staffing and patient mortality, with their meta-analysis of five studies showing that an increase of one registered nurse (RN) full-time equivalent (FTE) per patient day was associated with a 9% reduction of the odds of dying. The link between nurse staffing and mortality was mixed in those reviews not including a meta-analysis. West et al. (2009) found that only three of the 10 studies reviewed showed a significant association between nurse staffing and mortality. Similarly, McGahan et al. (2012) found that only three of seven studies that measured mortality showed a significant association with nurse staffing variables. McGahan et al. (2012) noted methodological limitations among the reviewed articles including observational designs, lack of consistency in how nurse staffing was conceptualised, variations in data sources and the level of analysis and, therefore, advised caution in interpreting the results of these studies.

The critical care setting was the focus of a further three reviews (Coombs & Lattimer, 2007; Numata et al., 2006; Penoyer, 2010). Numata et al. (2006) conducted a systematic review and meta-analysis of nurse staffing levels and hospital mortality in critical care settings. They reviewed nine studies, all of which were observational. Five studies were included in the meta-analysis. Four of these showed a significantly reduced mortality risk for patients with high nurse staffing. Numata et al. (2006) reported an overall risk ratio of 0.65, which was significant. However, this significant reduction in risk disappeared for all but one of the reviewed studies after adjustment for other factors. They therefore concluded that hospital mortality might not be sensitive enough to measure the impact of variations in nurse staffing levels in critical care settings. Similarly, Penoyer (2010) also examined the relationship between mortality and nurse staffing in their literature review, including eleven studies that measured mortality with only five showing a significant association with nurse staffing.

Coombs and Lattimer (2007) focused on the organisation of work in critical care settings and looked at a broader range of outcomes than did Numata et al. (2006) reviewing 55 studies of which 21 were concerned with nurse staffing variables. Penoyer (2010) also reviewed a wider range of outcomes when considering the relationship between patient outcomes and nurse staffing in critical care settings, including 26 studies, although two of these were reviews of other studies. These two reviews concluded there were significant associations between nurse staffing and medication errors (Coombs & Lattimer, 2007), bloodstream infections (Penoyer, 2010), transmission of pathogens (Penoyer, 2010), nosocomial infections (Penoyer, 2010), respiratory complications (Coombs & Lattimer, 2007), urinary tract infections (Penoyer,

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