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Using linked hospitalisation data to detect nursing sensitive outcomes: A retrospective cohort study

Louise Winton Schreuders *, Alexandra P. Bremner, Elizabeth Geelhoed, Judith Finn

The University of Western Australia, Australia

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ABSTRACT

Background: Nursing sensitive outcomes are adverse patient health outcomes that have been shown to be associated with nursing care. Researchers have developed specific algorithms to identify nursing sensitive outcomes using administrative data sources, although contention still surrounds the ability to adjust for pre-existing conditions. Existing nursing sensitive outcome detection methods could be improved by using look-back periods that incorporate relevant health information from patient's previous hospitalisations.

Design and setting: Retrospective cohort study at three tertiary metropolitan hospitals in Perth, Western Australia.

Objectives: The objective of this research was to explore the effect of using linked hospitalisation data on estimated incidence rates of eleven adverse nursing sensitive outcomes by retrospectively extending the timeframe during which relevant patient disease information may be identified. The research also explored whether patient demographics and/or the characteristics of their hospitalisations were associated with nursing sensitive outcomes.

Results: During the 5 year study period there were 356,948 hospitalisation episodes involving 189,240 patients for a total of 2,493,654 inpatient days at the three tertiary metropolitan hospitals. There was a reduction in estimated rates for all nursing sensitive outcomes when a look-back period was applied to identify relevant health information from earlier hospitalisations within the preceding 2 years. Survival analysis demonstrates that the majority of relevant patient disease information is identified within approximately 2 years of the baseline nursing sensitive outcomes hospitalisation. Compared to patients without, patients with nursing sensitive outcomes were significantly more likely to be older (70 versus 58 years), female, have Charleson comorbidities, be direct transfers from another hospital, have a longer inpatient stay and spend time in intensive care units ($p \leq 0.001$).

Conclusions: The results of this research suggest that nursing sensitive outcome rates may be over-estimated using current detection methods. Linked hospitalisation data enables the use of look-back periods to identify clinically relevant diagnosis codes recorded prior to the hospitalisation in which a nursing sensitive outcome is detected. Using linked hospitalisation data to incorporate look-back periods offers an opportunity to increase the accuracy of nursing sensitive outcome detection when using administrative data sources.

* Corresponding author. Tel.: +44 7778697468.
E-mail address: louise.schreuders@uwa.edu.au (L.W. Schreuders).

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What is already known about the topic?

- Researchers have developed specific algorithms which use disease codes in administrative hospital data to identify when nursing sensitive outcomes may have occurred.
- This algorithmic method uses data sources in which multiple hospitalisations for the same individual on different occasions are not linked together.
- Existing chronic or long term medical conditions that affect nursing sensitive outcome risk are not always recorded in the same hospitalisation as a nursing sensitive outcome is detected.

What this paper adds

- Using linked hospitalisation data to incorporate look-back periods offers an opportunity to increase the accuracy of nursing sensitive outcome detection when using administrative data sources.
- Nursing sensitive outcomes rates may be over-estimated using current detection methods.

1. Background

1.1. Introducing nursing sensitive outcomes

In recent decades an international body of literature has emerged addressing the need to quantify the contribution of nursing to quality health care (Aiken et al., 2002; Duffield et al., 2007; Flood and Diers, 1988; Griffiths et al., 2008; Halloran, 1983; Kane et al., 2007; McCloskey and Diers, 2005; Needleman et al., 2001; Twigg et al., 2011). Nursing sensitive outcomes (NSOs) have been developed, which are specific patient health outcomes that have been shown to be associated with the quality and/or quantity of nursing care (Maas et al., 1996). There is a recognised need for NSOs that reflect positive outcomes of high quality and/or adequate quantities of nursing care delivery, but adverse outcomes are often used due to the challenges of data collection, generalisability, and outcome measurement (Griffiths et al., 2008; Savitz et al., 2005). Eleven adverse outcomes, referred to as NSOs, were used in this study: central nervous system complications, surgical wound infection, pulmonary failure, urinary tract infection (UTI), pressure ulcer, hospital acquired pneumonia, deep vein thrombosis, upper gastrointestinal bleeding, sepsis, physiologic or metabolic derangement, and shock or myocardial infarction (Griffiths et al., 2008; Kane et al., 2007; Van den Heede et al., 2007).

1.2. The use of administrative data in determining NSOs

Hospital morbidity data from administrative sources have been utilised to identify and quantify NSOs as they afford the large sample size required for statistical analyses of these relatively rare occurrences. Hospital morbidity data are derived from inpatient discharge summaries and contain demographic characteristics and International Classification of Disease (ICD) codes which represent medical conditions and procedures experienced by individuals during inpatient hospitalisations (National Center for Health Statistics, 1991; National Centre for Classification in Health, 2008; Zhan and Miller, 2003). ICD codes from hospital morbidity data are used to identify NSOs that occur during an inpatient stay; this is explained in greater detail below. Validation studies have reported high accuracy levels in the diagnosis coding of the Western Australian hospital morbidity data (Mnatzaganian et al., 2012; Teng et al., 2008). Adding to their feasibility for use in NSO detection, administrative data sources are usually accessible for research purposes, cost-effective to access and collected over time in a reasonably uniform format (Mitchell et al., 1994; Virnig and McBean, 2001).

Two disadvantages associated with using hospital morbidity data to identify NSOs are: firstly, in addition to nursing care quality, patient outcomes are influenced by the underlying health status of the patient and other factors (i.e. hospital characteristics including number of beds, metropolitan or non-metropolitan location, teaching status) (Griffiths et al., 2008; Irvine et al., 1998; Kane et al., 2007); and secondly, hospital morbidity data does not typically distinguish whether a particular condition was present prior to hospitalisation and thus a comorbidity, or whether it was a complication that developed during hospitalisation (Iezzoni et al., 1994; Lawthers et al., 2000; Miller et al., 2001; Zhan and Miller, 2003). Researchers have aimed to resolve the first of these disadvantages by statistically adjusting for patient characteristics and other factors (Aiken et al., 2002; Needleman et al., 2001). Without access to a reliable present on admission indicator (POA, described below), the second disadvantage has been addressed by designing specific algorithms to classify as NSOs only those cases which were avoidable inpatient complications and not attributable to the patient's underlying health status (Iezzoni et al., 1994; Miller et al., 2001; Needleman et al., 2001).

1.3. NSO identification algorithms

Researchers have developed specific algorithms for each NSO which use ICD codes in the hospital morbidity data to identify when NSOs may have occurred (Iezzoni et al., 1994; Needleman et al., 2001). The NSO algorithms use a combination of inclusion and exclusion criteria to ensure only conditions that cannot be explained by the patient's underlying health status are counted as NSOs. For example, when an ICD code for pressure ulcer is found, the event is only counted as an NSO in the absence of a code for paralysis, since paralysis increases the patient's risk of pressure ulcer independently of the nursing care administered. This method was designed to enhance the specificity of NSO identification even though researchers only had access to data sources in which each hospitalisation is recorded as a discrete event (i.e. multiple hospitalisations for the same individual on different occasions are not linked together) (Needleman et al., 2001). Accurate NSO identification using this unlinked method relies on the assumption that all conditions that affect a patient's risk of NSO occurrence will be recorded in the discharge summary for the same hospitalisation during which the NSO is documented. However, it has been found that existing chronic or long term medical conditions that affect NSO