



Hospital mortality and optimality of nursing workload: A study on the predictive validity of the RAFAELA Nursing Intensity and Staffing system



Jaana K. Junttila^{a,b,*}, Aija Koivu^b, Lisbeth Fagerström^d, Kaisa Haatainen^{b,c},
Pirkko Nykänen^a

^a Center for Information and Systems, School of Information Sciences, University of Tampere, Tampere, Finland

^b Kuopio University Hospital, Kuopio, Finland

^c University of Eastern Finland, Kuopio, Finland

^d Nursing Science, Faculty of Health Sciences, Buskerud and Vestfold University College, Drammen, Norway

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ABSTRACT

Background: Patient classification systems have been developed to manage workloads by estimating the need for nursing resources through the identification and quantification of individual patients' care needs. There is in use a diverse variety of patient classification systems. Most of them lack validity and reliability testing and evidence of the relationship to nursing outcomes.

Objective: Predictive validity of the RAFAELA system was tested by examining whether hospital mortality can be predicted by the optimality of nursing workload.

Methods: In this cross-sectional retrospective observational study, monthly mortality statistics and reports of daily registrations from the RAFAELA system were gathered from 34 inpatient units of two acute care hospitals in 2012 and 2013 ($n = 732$). The association of hospital mortality with the chosen predictors (hospital, average daily patient to nurse ratio, average daily nursing workload and average daily workload optimality) was examined by negative binomial regression analyses.

Results: Compared to the incidence rate of death in the months of overstaffing when average daily nursing workload was below the optimal level, the incidence rate was nearly fivefold when average daily nursing workload was at the optimal level (IRR 4.79, 95% CI 1.57–14.67, $p = 0.006$) and 13-fold in the months of understaffing when average daily nursing workload was above the optimal level (IRR 12.97, 95% CI 2.86–58.88, $p = 0.001$).

Conclusions: Hospital mortality can be predicted by the RAFAELA system. This study rendered additional confirmation for the predictive validity of this patient classification system. In future, larger studies with a wider variety of nurse sensitive outcomes and multiple risk adjustments are needed. Future research should also focus on other important criteria for an adequate nursing workforce management tool such as simplicity, efficiency and acceptability.

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* Corresponding author at: Medical Center, Kuopio University Hospital, P.O. Box 100, FI 70029 KYS, Finland. Tel.: +358 44 717 5624; fax: +358 17 172683.
E-mail address: jaana.junttila@kuh.fi (J.K. Junttila).

What is already known about the topic?

- The adequacy of nursing resources is associated with the safety and quality of patient care, job satisfaction and health of nurses, shortage and turnover of qualified nursing staff and overall cost-effectiveness of health services.
- Patient classification systems estimate the need for nursing resources through the identification and quantification of an individual patient's care needs.
- There is in use a diverse variety of patient classification systems, but most of them lack a scientific evidence base.

What this paper adds

- Hospital mortality can be predicted by comparing the daily nursing workload with the optimal workload of the unit using the RAFAELA patient classification system.
- This study renders additional confirmation of the predictive validity of the RAFAELA system.
- A reliable and valid patient classification system can be based on nurses' professional judgement in assessing their patients' care needs as well as in setting the standard for the optimal nursing workload of a unit.

1. Introduction

How to optimize nursing workload is a question that relates to many controversial current issues in health care all over the world: the safety and quality of patient care, job satisfaction and health of nurses, shortage and turnover of qualified nursing staff and overall cost-effectiveness of health services. A high workload seems to have meaning to nurses' well-being at work largely through its impact on the quality of care (Koivu, 2013; McGillis Hall and Doran, 2007; McGillis Hall et al., 2008; Poghosyan et al., 2010). Nurses' assessments of the adequacy of resources and the quality of care are associated with their experience of work (e.g., job satisfaction or burnout symptoms) as well as with patient safety and mortality (Aiken et al., 2002, 2008, 2012, 2013; Tourangeau et al., 2007).

There exists today a critical mass of studies showing that hospitals with more staffing and greater proportions of Registered Nurses (RNs) tend to have lower rates of patient complications and mortality (e.g., Aiken et al., 2014; Kane et al., 2007; Lankshear et al., 2005; Needleman et al., 2011; Twigg et al., 2012). However, a growing consensus is building around the notion that staffing levels do not make sense as indicators of nursing workload without including controls for the amount of care that each patient needs and for daily or even shift-by-shift variation in staffing within a unit (Duffield et al., 2011; Needleman, 2015; Sales et al., 2008; Welton et al., 2006; West et al., 2014).

For day-to-day staffing at the unit level, time and motion studies have traditionally been the gold standard of the measurement of nursing workload. However, designed to measure stable and isolated nursing tasks, this approach minimizes the differences in nursing interventions related to patients' varying care needs (Fagerström et al., 2000; Malloch, 2015). As an alternative approach, patient

classification systems (PCs), also known as patient acuity or nursing demand systems have been developed to manage workloads. They estimate the need for nursing resources through the identification and quantification of an individual patient's care needs (Fagerström, 2009; Twigg and Duffield, 2009).

A diverse variety of PCs are currently in use that have differing descriptions and definitions of nursing work and measures of nursing workload. A problem with most PCs is their lack of a scientific evidence base, i.e., a lack of consistent validity and reliability testing and evidence on the relationship to nurse-sensitive outcomes (Fasoli and Haddock, 2010). In this respect, one of the few exceptions is the PCS implemented since the late 1990s in more than 90% of Finnish hospitals. The implementation process has also been underway in Iceland, Norway and Sweden.

The theoretical foundations of the RAFAELA Nursing Intensity and Staffing system¹ rest on holistic nursing science, which encompasses the importance of meeting patients' physical, psychological, social and spiritual care needs. The complexity of nursing with regard to the science of human resource management emphasizes the importance of a bottom-up management approach and belief in staff competence and the importance of a strategic and engaged leadership (Fagerström, 1999; Rauhala, 2008). In Finland, untrained employees do not take part in patient care. In the inpatient units of acute care hospitals, approximately 80% of the nurses are RNs or of a similar competence level (e.g., midwives) and the rest are Licensed Practical Nurses (LPNs), or of a similar competence level (e.g., children's nurses). All nurses are educated in Universities of Applied Sciences (polytechnics). The length of full-time studies is 3.5 years for RNs and 2.5 years for LPNs.

The RAFAELA differs from most PCs in many respects (Fagerström et al., 2014). Instead of assessing nursing demand by classifying all care needs of patients, daily nursing supply is assessed by classifying patients' care needs met by nurses each day. This daily nursing supply is equivalent to daily nursing workload. The underpinning assumption of the RAFAELA is that the nature and characteristics of nursing care differ between units and the optimal nursing workload is unit-specific. The optimal nursing workload of each unit is determined by surveying nurses over a 4–8 week period every second year. All nurses on every shift are asked whether the workload was optimal, i.e., sufficient for meeting patients' care needs and providing good quality care (Fagerström et al., 2000; Rauhala and Fagerström, 2004).

The feasibility, reliability and internal validity of the RAFAELA have been studied thoroughly (Fagerström, 1999; Frilund, 2013; Kaustinen, 2011; Pusa, 2007; Rauhala, 2008). However, apart from one observational cohort study showing a linear trend between increasing patient-associated workload and sick leave among nurses (Rauhala et al., 2007) the predictive validity of the RAFAELA has not

¹ The RAFAELA system is owned by the Association of Finnish Local and Regional Authorities, and its use is managed by the noncommercial Finnish Consulting Group Ltd (FCG).

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