

**Nurses – essential for improving the health of
New Zealanders**

Failure to rescue: A New Zealand nursing perspective 2012

Summary

Twenty years since the term “Failure to Rescue” (FTR) entered the literature as a measureable outcome of too few nursing personnel, inadequate skill mix or omission of care, a synthesis of the many further developments of the ideas and methodologies behind FTR research world wide demonstrates robustly the value of high quality nursing work to patient outcome, healthcare system costs and job satisfaction among nurses. FTR has been firmly and consistently attributed to hospital characteristics and resource management systems rather than to patient characteristics or individual nurse inadequacy. It is significantly costly for patients, health systems and nurses. An evidence base specific to these three areas is presented, with an emphasis where available on New Zealand-specific research.

Methods

A search strategy using the key words: nursing failure to rescue; nursing surveillance; patient safety indicators; outcomes research; preventable deaths; and preventable adverse events was initially conducted via the electronic databases CINAHL, OVID and MEDLINE (Pro Quest) for English language papers in peer reviewed journals from 1992-2012.

Abstracts for 620 papers selected by title were examined for relevance, 102 selected for full text access and 36 key papers chosen for inclusion in this review on the basis of relevance, citation and nursing research focus. Two review articles, one a systematic review and meta analysis (Kane, Shamliyan, Mueller, Duval, & Wilt, 2007), the other a literature review (Schmid, Hoffman, Happ, Wolf, & DeVita, 2007), were taken as starting points, critically evaluated and updated.

Introduction

The measurement of quality and productivity in healthcare is an important (if complex) exercise (O'Connor 2010), necessary to drive improvement and deliver the very best patient outcomes for taxpayer dollars. Nurse sensitive outcomes reflect the contribution nurses make to the quality of care and patient outcomes. The most commonly cited of such outcomes are: decubitus ulcers, deep vein thromboses, pulmonary embolisms, surgical wound infections, falls, CNS complications, metabolic or osmoregulatory derangement, pneumonia, sepsis, shock and cardiac arrest, upper gastrointestinal bleeding and urinary tract infections. Proxy measures of the sequelae of all these can be reduced to average length of hospital stay and mortality (McCloskey & Diers, 2005). Mortality due to preventable complications is termed Failure to Rescue – and represents the ultimate failure of health systems and quality of care.

Part 1: The cost to patients of Failure to Rescue

Failure to Rescue, in the context of nursing care, can be defined as; “a death that occurs after a patient develops a complication in a hospital that was *not present on admission*”. Specifically, the original description (Silber, Williams, Krakauer, & Schwartz, 1992) was limited to cases where the cause of death is one of five preventable complications: sepsis, gastrointestinal bleeding, shock, pneumonia or deep vein thrombosis / pulmonary embolism, all of which are considered both identifiable and remediable by nurses. Its antithesis, “rescue”, a primary nursing responsibility, has variously been ascribed to the combination of surveillance (Clarke & Aiken, 2003) or vigilance (Meyer & Lavin 2005) (the identification of clinically significant signs and symptoms of complications) and action, or mobilisation of necessary resources. It seems self-evident therefore that higher numbers and education or experience of registered nurses and effective RN-physician communication should contribute to better identification and remedy of complications, and indeed much research effort has been expended exploring these hypotheses.

The term ‘Failure to Rescue’ in the context of nursing care, first entered the literature in 1992 (Silber, Williams, Krakauer, & Schwartz, 1992). The study was important in the field of hospital quality indicators, and was one of the first to implicate hospital characteristics (such as bed number, percentages of medical staff with particular qualifications). The size of the study (nearly six thousand patients from over 500 hospitals undergoing specific surgical procedures) was particularly influential as it provided a framework to account for other confounding differences such as patient sickness or hospital socio-economic catchment areas. Their second study (Silber, Rosenbaum, & Ross, 1995) added in the variable of registered nurse staffing – namely ratios of registered nurses to hospital beds, and showed conclusively that higher proportions of registered nurses influenced (reduced) death, adverse event and failure to rescue rates, irrespective of other variables.

In a further extension, Aiken, Clarke, Sloane, Sochalski and Silber (2002) refined the methodology of Silber by using direct measures of nurse staffing and nurse education and linking this with patient data, and using odds ratios and confidence intervals to quantify the impact of increased patient load on the incidence of both death and failure to rescue in surgical patients. Needleman, Buerhaus, Mattke, Stewart, and Zelevinsky (2002) further extended this in a study of six million discharges over 799 hospitals, linking death from complications selected due to being identifiable and ameliorable by nurses (i.e. the 5 preventable complications) with nursing staffing levels, patient acuity and nursing case mix per hospital. Increased registered nurse patient hours per day were strongly associated with lower failure to rescue for surgical patients ($P = .008$) and less strongly so for medical patients ($P = .05$). This measure, termed “Failure to Rescue – Nursing” (FTR-N) has since featured in many studies concerned with matching nursing workforce characteristics with patient outcomes, though Silber et al. (2007) demonstrated that this measure was less reproducible or comprehensive than their original definitions. A meta-analysis of 28 published papers by Lang, Hodge, Olson, Romano and Kravitz (2004) using classical methodology, found that total nursing hours and skill mix positively affected important patient outcomes. Though reporting difficulties with standardising nursing hours and deficits in hospital level data, it did not find statistical support for specific, minimum nurse-patient ratios for acute care hospitals (especially in the absence of adjustments for skill and patient mix).

Though the earlier studies involved specific surgical patients (in whom death from pre-existing co-morbidities are less prevalent and therefore mean FTR is most robustly discovered), extensions to other patient groups produce a likely underestimate of FTR or negative outcomes due to care rationing or missed care. Similar methodology has however been used in other contexts (oncology (Friese & Aiken, 2008), neonatal, (Ivory, 2012) and obstetric (Simpson, 2005)) to explore the relationships between registered nurse staffing, patient characteristics and patient outcomes (Bobay, Fiorelli &

Anderson, 2008) and the term “Failure to Rescue “ has been added to the nursing research panel of nurse sensitive patient outcome measures now recognised as quality indicators in American Hospitals (Agency for Healthcare Quality and Research, 2006).

The last decade of further nursing research has consistently and comprehensively delivered evidence that the higher the number of registered nurses per patient (skill mix), (Blegen, Goode, Spetz, Vaughn, & Park, 2011) and the higher their educational level (Kendall-Gallagher, Aiken, Sloane, & Cimiotti, 2011), the better the patient outcomes (Needleman et al., 2011; Park, Blegen, Spetz, Chapman, & De Groot, 2012). In a further extension exploring the impact of care rationing, or missed nursing care, Schubert, Clarke, Aiken and de Geest (2012) reported the results of examination of nearly a million patient discharge abstracts from 79 Swiss hospitals, demonstrating highly significant associations between care rationing, patient to nurse ratios, quality of nurse work environments and risk of patient death (FTR).

Within the New Zealand context, FTR has not featured prominently. A study of adverse events (Davis et al., 2002) though concentrating on medical errors, reported an incidence rate of 11.2% of hospital admissions associated with adverse events, and that just less than 2% resulted in death or disability. The impact on hospital resources and workload (and hence costs) was significant. Davis also highlighted the urgent need for better data and more New Zealand patient safety research. McCloskey and Diers (2005) using data from over three million patient discharges from medical and surgical patients in New Zealand public hospitals, combined with data from Nursing Council nursing records, comprehensively showed that negative clinical outcome rates increased substantially (with statistically significant increases in the rates for CNS complications, decubitus ulcers, sepsis, UTIs, physiological and metabolic derangement, pulmonary failure, and wound infections) following reengineering of the nursing workforce in 1993, and changes to the patterns of discharge (shortening average length of stay).

While patient mortality does not add to health service costs in New Zealand (in the absence of a culture of litigation and compensation), increased morbidity and re-admission to hospitals, most certainly does. New Zealand data sets do not currently allow discrimination between costs from first or repeat admission. Work is currently underway to evaluate initiatives to maximise registered nursing resource with patient load and acuity (Care Capacity Demand Management) and this has required the development of more rigorous data on both staffing, patient load and patient outcomes (Lawless, 2011). Some nurse sensitive critical incidents and adverse events such as hospital acquired infections, patient falls, UTIs, and pressure ulcers are now captured at hospital and unit level (M. Gordon, personal communication, 2011) The findings related to FTR are summarised below.

Table 1. Failure to Rescue key publications and relationship to nursing FTR

Team	Date	Sample	Methodology	Nursing relationship
Silber	1995	73,174 surgical patients in 137 US hospitals	Logit model fitting Spearman correlation	FTR negatively correlated with ratio of registered nurses to beds R= -0.45; P<0.01
Silber	2000	217,440 orthopaedic surgical patients from 245 US hospitals	Odds Ratio (OR) Logistic regression	FTR significantly related to registered nurse to patient ratios OR 0.95; P <.001
Silber	2002	144,883 general surgical and	Odds Ratio (OR)	FTR significantly related to

		orthopaedic patients	Logistic regression	registered nurse to patient ratios OR 0.84; P <.0001
Aiken	2002	Staff nurse suveys and linked surgical discharge data from 168 Pennsylvania hospitals	Odds Ratio (OR) Logistic regression	7% increase in FTR linked to each additional patient per nurse OR 1.07 P < 0.01
Needleman	2002	6 million medical/surgical discharges from 799 US hospitals	Logistic regression	Lower FTR linked to higher registered nurse hours (Surgical P=0.008, medical P= 0.05)
Kane	2007	Meta analysis / Systematic review	Odds Ratio (OR) 28 studies	Increased RN staffing of additional FTE per patient per day led to Lower FTR OR 0.84 P < 0.001 Length of stay (LOS) was shorter by 24% in ICU and 31% in surgical patients (OR 0.76 and 0.69 respectively, both P< 0.0001)
Blegen	2011	1.1 million patients 54 US hospitals	Adjusted multi variate analysis	RN skill mix in general units was associated with reduced FTR (P<0.01) and in ICU FTR reduced with higher RN skill mix (P<0.05)
Needleman	2011	197,961 admissions in 43 US hospitals	Cox proportional hazard ratio (HR)	Increased patient mortality and RN staffing 8 hours or more below staffing HR 1.02; P <0.001 Increased patient mortality and high patient turnover HR 1.04; P <0.001
Kendall-Gallagher	2011	1,283,241 patients from 652 hospitals and 28.5k nurses	OR and multi variate analysis	FTR and post surgical mortality highly correlated (P = 0.001) with baccalaureate nurse education
Park	2012	1 million patients, 42 US hospitals	Descriptive correlation. Multivariate regression	Using regression estimation, statistically significant association was demonstrated between higher RN staffing and lower FTR. An additional demand effect due to high patient turnover was identified.

Part 2: The financial costs of FTR and missed nursing care

In a tightening financial environment, escalation of health care costs world wide has yet again put a spotlight on the financial costs and benefits of the largest cost centre; nursing. There has been a flourishing of research identifying the costs and contributions of nursing care, and the costs of registered nurse staffing reduction, care rationing or omitted nursing tasks.

Private and public hospitals in America have long used accounting systems that show in great detail the costs consumed by patients during their stay. Pappas (2008)

analysed financial and clinical data from 3,200 Canadian inpatient stays where any of five nurse sensitive avoidable complications had occurred. Rigorous regression analysis concluded that significant costs accrued (for example over a thousand Canadian dollars per UTI or pneumonia, and over two thousand dollars per pressure ulcer or cardiac arrest). Costs of falls were highlighted as an organisational financial risk; resulting as they frequently do in hip replacement averaged two thousand dollars plus operating costs and implants. (Current New Zealand costs of hip replacement can vary from around \$15K - \$25K.) The use of this sort of analysis in the development of business cases for improved staffing, and of accurately measuring cost and quality outcomes using large administrative databases which usually include non patient related costs is useful (Pappas, 2008).

In 2009, an extensive review (Virkstis et al., 2009) revealed wide variations in the types and costs of the additional treatments of two common nurse sensitive adverse events: falls and pressure ulcers. For pressure ulcers, (at 2008 prices, \$US) these ranged between \$3.5K and \$15.5 K per case. With Medicaid and Medicare Services moving to withholding of payments where hospital acquired conditions (HAC) could be demonstrated, Virkstis et al. concluded: "When using conservative estimates, the strongest business case for quality is the case for investment in the prevention of HAC. For pressure ulcers and patient falls, this means investing in nursing" (page 353). Hospital acquired infections too, especially pneumonias and UTIs, are considered nursing-sensitive indicators, and in New Zealand, additional days hospital stay due to hospital acquired infections is estimated to cost between NZ\$50 - \$85 million annually (Burns, Bowers, Pak, Wignall & Roberts, 2010).

Davis et al. (2002) estimated that adverse events in New Zealand (bearing in mind an incidence of an adverse event occurring in over 11% of hospital admissions) as adding an average of nine days to the expected hospital stay. Financially, this has been calculated at at least NZ\$38 million, plus the ACC costs associated with injury and rehabilitation due to medical misadventure (Bryant, 2004). This did not include the costs to patients of lost income, or to the treasury in lost tax.

Another medical error in which nurses have roles in surveillance and prevention, as well as contributing to errors is the area of medication errors (O'Shea, 1999). Internationally, this is estimated to cost in the region of US \$ 60 billion (Alvez de Rezenade, Or, Com-Ruelle & Michel, 2012). In New Zealand this cost has been estimated at NZ\$60 million in the public hospital sector, and many initiatives to reduce this important cost to the health system have been undertaken. The extent and nursing contribution (including driving patient safety initiatives) to this issue in New Zealand was reviewed by McBride-Henry and Foureur in 2006. It is important to bear in mind that costs attributed to FTR miss similar risks to patients with more complex pre-existing conditions or co-morbidities *present on admission*: arguably therefore, this measure is extremely conservative when looking at the health system as a whole.

Part 3: The cost to the nursing workforce of FTR

There have been many studies of the issues that contribute to job satisfaction, high productivity and low rates of burn out and turnover, and predicted workforce shortages world-wide means nurse retention is once more a topical issue (Carter & Tourangeau, 2012; Lu, Barriball, Zhang, & While, 2012). Specific to Failure to Rescue, Rafferty et al. (2007) examined the effects of hospital-wide nurse staffing levels on patient mortality, failure to rescue and nurse job dissatisfaction, burnout and nurse-rated quality of care. As with the previous section, the hospitals with the highest patient to nurse ratios showed higher mortality and the nurses in those hospitals were approximately twice as likely to be dissatisfied with their jobs, to show high burnout levels, and to report low or deteriorating quality of care in their wards and hospitals. Concerns about the impact of decreased nurse staffing and skill mix on the abilities of nurses to deliver quality care in

many Western countries have been reported (Aiken et al., 2002). In addition, nurse distress caused by care rationing, or missed care due to inadequate staffing or patient overload has been highlighted as contributing to problems with nurse retention related to the quality of working environments (Kalisch, Landstrom & Williams, 2009).

Other studies (Aiken, Sloane & Klocinski, 1997) link nurse burnout, needle stick injury and retention to quality of working environments (especially autonomy and control over nursing processes). In New Zealand, Budge, Carryer and Woods (2003) also found significant correlations between nurses' health status and these aspects of the working environment'.

A recent New Zealand survey (Woods, in press) examined moral distress in nurses and explained that moral distress occurs when professionals cannot carry out what they believe to be ethically appropriate actions because of internal or external constraints. The study found that concerns over the delivery of less than optimal care due to pressures from management to reduce costs, and watching patient care suffer because of a lack of resources or continuity was contributing to nearly half of all New Zealand nurses considering leaving the profession.

Other New Zealand research has consistently found links between nurse morale and intention to stay in nursing with perceptions of workload and ability to deliver high quality care: whether the participants of the research were younger nurses (Clendon & Walker, 2011), late career nurses (Walker & Clendon, 2012), or surveys of members of NZNO in the biennial Employment Surveys (Walker 2009; 2011) These findings, combined with the age demographics of New Zealand's nursing workforce, have important implications for nurse retention and workforce planning, if the negative patient outcomes due to workforce re-engineering in the 90's are to be avoided (McCloskey & Diers, 2005). This review reports robust research over many years, countries and health settings demonstrating the crucial role that ensuring adequate numbers of registered nurses in relation to the numbers and acuity of patients has in delivering safe patient care. It is imperative for patients, nurses and health funders that evidence based policy making in nurse staffing is supported (Kurtzman, 2010).

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Mission statement

NZNO is committed to the representation of members and the promotion of nursing and midwifery. NZNO embraces Te Tiriti o Waitangi and works to improve the health status of all peoples of Aotearoa/ New Zealand through participation in health and social policy development.

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