Reducing risk for ventilator associated pneumonia through nursing sensitive interventions

Svatka Micik*, Nihada Besic, Natalie Johnson, Matilda Han, Stephen Hamlyn, Hayley Ball

Cardiothoracic Intensive Care Unit, Royal Adelaide Hospital, North Terrace, Adelaide, South Australia, Australia

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Summary  The purpose of this paper is to describe an improvement initiative designed to implement nurse sensitive interventions known to reduce patients’ risk for ventilator associated pneumonia (VAP), in cardiothoracic intensive care patients. This initiative is a part of one Australian critical care unit’s efforts to identify and measure compliance with key nursing interventions known to improve cardiac surgical patients’ outcomes. The premise behind the initiative is that improved nursing process and surveillance systems allow emerging trends to catalyse action and motivate nurses to reduce patients’ risk for infection acquisition. At five and nine months following implementation of the initiative a > 70% compliance rate in 11 out of the 15 nurse sensitive interventions known to reduce patients’ risks for VAP and a drop in VAP incidence from 13.4% to 7.69% from per 1000 ventilator days was accomplished.

Implications for Clinical Practice

• Assists nurses to transition from task focused to outcome based care.
• Promotes implementation of evidence based recommendations.
• Represents a low cost, yet cost effective infection control measure.
Introduction

As a result of the economic and clinical burden of ventilator acquired pneumonia (VAP), it is important to reduce patients’ risk of VAP acquisition. Although there are a myriad of reasons why patients develop VAP and a multidisciplinary approach is needed to reduce its incidence, nursing interventions play a vital role in VAP risk reduction. Establishing nursing sensitive patient outcomes (NSPOs) for patients predisposed to VAP provides measurable metrics that may be used to design and implement specific nursing interventions.

Rationale for our QI project

Our unit is an eight bed cardiothoracic intensive care unit (CTICU) in South Australia. Since our unit’s inception we have worked within a culture of nurse-led patient care. In 2008, having read the United States (US) Oncology Nursing Society white paper on nursing sensitive patient outcomes that promoted them as measurable effects of nursing care and provided a guiding framework for developing NSPOs, we considered how we might integrate this into our care (Given and Sherwood, 2005). This has been an ongoing project for the last four years and continues to be a work in progress.

The white paper prompted our nurses to ask two questions: what do we know about our performance and what is in the literature about the development, implementation and utilisation of NSPO initiatives? Upon considering these questions we noted that although we had broad performance measures such as quarterly infection control performance indicator reports to help us understand our practice, we did not have specific nursing intervention and patient outcome measures to benchmark and inform and reaffirm cardiothoracic intensive care nursing practice.

Development of our nurse sensitive outcomes project

We reviewed the literature and learned for outcome measures to be meaningful, the chosen outcomes must be specific to the setting, clinical context, patient population, type of intervention, relevant to patient experiences and consistent with the expected effects of the intervention and supported by evidence (Doran and Pringle, 2011). When we considered our CTICU patient group, we identified safety (infections), post-operative symptom control (pain, immobility and constipation) and psychological well-being as important outcomes.

Once we determined the patient outcomes we believed were relevant to our setting and could be improved by using established evidence, the CTICU leadership group called for expressions of interest from our nurses to join the NSPO working party. Our aim was to create outcome teams led by experienced clinical nurses working collaboratively with less experienced nurses. This approach would engage the whole team in the project.

Safety from preventable infections was one of the first patient outcomes identified by the NSPO working party (Diagram 1). We looked to our own practice and searched the literature and found our patients were most at risk of developing catheter related blood stream infections (CRBSI), surgical site infections (SSI), multi resistant organisms (MRO) and ventilator associated pneumonia (VAP), all of which are directly impacted by nursing care processes (Gil-Perotin et al., 2012). Our next step was to develop a nursing standard that promoted safety from preventable infections with specific nursing interventions. We defined the nursing standard as:

“Series of fundamental, interdependent and scientifically grounded nursing steps, grouped into care bundles aimed at controlling micro-organisms on the skin and in the oropharynx for which the CTICU registered nurse has sole responsibility to implement”. (CTICU NSPO working party)

From our nursing standard we delineated catheter related blood stream infections (CRBSI), surgical site infections (SSI), multi resistant organisms (MRO) and ventilator associated pneumonia (VAP) care bundles aimed at reducing preventable infections. Care bundles are sets of evidence based practices, performed in a series of steps towards an intended effect. They are ongoing processes that focus on how to deliver the best care using a clear-cut method to provide the best possible outcome for patients (NHMRC, 2010). Although we had already determined safety from preventable infections as the overall patient outcome, we also needed to determine outcomes for each of the preventable infection bundles. We were already reporting our CRBSI, SSI and MRO to the National Nosocomial Infection Surveillance Report. This data provided us with specific outcome measures for the CRBSI, SSI and MRO care bundles. We were not yet collecting data on VAP rates.

To guide, direct and reach the desired infection free outcomes for our patients we searched the literature for nursing assessment and intervention indicators for each of the four care bundles and chose indicators that were clinically meaningful for the CTICU patient. Once we identified these intervention or process measures for each of the care
bundles we could correlate these with the outcome data which would provide us with a useful means of identifying areas for improvement. We established audit tools that mirrored the chosen indicators and searched the literature for numerical target goals for each indicator.

The literature yielded no nursing benchmark targets for our selected interventions and eventually we adopted Hand Hygiene Australia’s 70% hand hygiene compliance target rate, believed to decrease incidence of nosocomial infections and new MRSA and VRE cases (SA Health, 2011). Therefore it was reasonable to assume the same would apply to other preventable infections. Setting a numerical goal clarified our aims to reduce the risk of infection, directed our agreed upon quarterly measurements of each of the indicators for each of the care bundles. Once the aim had been established, the team could work towards raising the threshold targets. This would help change the initial focus from reducing preventable infections as a desirable practice to reducing preventable infections as a mandatory procedure. Although we followed the same process for establishing outcome and process measures for all of the preventable infections, here we report only on the nursing sensitive care bundle for reducing the cardiothoracic patient’s VAP risk.

Nursing sensitive care bundle for reduction of VAP risk

What is VAP? The generally accepted definition of VAP is a sub-type of hospital-acquired pneumonia (HAP) which occurs in people who are mechanically ventilated via an endotracheal or tracheostomy tube at the time the pneumonia is diagnosed or within 48 hours of having been mechanically ventilated (Hess, 2012). The internationally stated rate is between 10 and 41.7% per 1000 ventilator days (Arabi et al., 2008).

VAP is identified by using a combination of radiologic, clinical and laboratory criteria. VAP carries an increased pain and suffering burden, prolongs length of stay and carries with it a greater risk of mortality. For hospitals and health care administrators it greatly increases the cost of hospitalisation. VAP, a common intensive care unit complication has a reported incidence in Australia of 25% and a crude mortality of up to 65% (NHMRC, 2010).

Understanding VAP pathogenesis is essential in order to develop a standard of care and an associated care bundle to reduce the risk of acquisition. Although optimal patient outcomes are generally associated with interdisciplinary collaboration, reducing risk of VAP is responsive to targeted nursing interventions, surveillance and infection control performance feedback. The literature identifies four VAP pathogeneses’ in the critically ill as:

(a) colonisation of the oropharynx by dental plaque with subsequent migration of the bacteria to the lower airway (Milstone et al., 2008);
(b) exogenous acquisition from the hands of health care workers and through contaminated respiratory equipment (INICC, 2012);

(c) aspiration of microbe laden oropharyngeal and gastric secretions around the cuffed airway management tube into the lower respiratory tract (Fields, 2008);
(d) patient positioning with the head of the bed not elevated to 30—45˚, prolonged ventilation, advanced age and malnutrition (NHMRC, 2010).

We reviewed all of the above sources and delineated care bundles, standard of care, patient outcome and nurse sensitive indicators for VAP (Diagram 2). The standard for VAP prevention was defined as;

‘‘A series of fundamental, interdependent and scientifically grounded nursing steps grouped into care bundles aimed to control microorganisms in the oropharynx for which the CTICU RN has sole responsibility’’. (CTICU NSPO working party)

From the same literature (INICC, 2012; Milstone et al., 2008; NHMRC, 2010), we identified five care bundles for reducing cardiothoracic patients risk of VAP:

(1) limiting the use of mechanical ventilation;
(2) preventing aspiration of secretions;
(3) preventing nasal and or pharyngeal colonisation;
(4) preventing use of contaminated respiratory equipment; and,
(5) early mobilisation.

Finally we delineated several risk reducing nursing assessment and intervention indicators for each of the 5 care bundles (Diagram 3) from which we created a VAP risk reduction audit tool. Our compliance was to be measured by quarterly surveillance of outcome and process measures. The primary outcome measure was the relationship between VAP bundle compliance and VAP incidence. In the absence of data on the actual incidence of VAP in our unit we reached a consensus with the Intensive care consultant to identify patients with suspected VAP by the specific antibiotic regime
ordered. Our pharmacist searched the dispensing data and identified those patients who were prescribed this specific treatment during the pre-initiative and first post initiative auditing period. We then did a retrospective chart audit to exclude those patients whose antibiotic treatment was not continued because the microbiology findings did not confirm the initial diagnosis. In the last auditing period VAP cases were identified by the intensive care specialist and entered onto a Nursing Sensitive Outcome data sheet. VAP rates were defined as the percentage of VAP cases per 1000 ventilator days. Nurses routinely count ventilator days for each patient and this practice continued.

Our VAP bundle initiative started as a part of the safety from preventable infection NSPOs on November 1st 2011. Prior to bundle initiation, data was collected through a retrospective review of VAP rates for April 1st to June 30th 2011. We created a nursing sensitive patient outcome board that displayed our selected patient outcomes, standards, bundles and their specific interventions and compliance data. The team responsible for this NSPO held weekly education sessions on the bundle and associated nurse sensitive interventions in October 2011. Compliance data was collected on April 2nd 2012 and August 31st 2012, five and nine months after the initiative started with VAP rates being collected for the three months leading up to and including the audit months of April 2012 and August 2012. The board was updated with the nursing assessment and intervention indicators audit findings for each of the five VAP prevention care bundles as well as the VAP prevalence rates. Recommendations for practice for all nursing sensitive indicators with an audit score of less than 70% were made via the display board and communicated to all nurses via the unit’s on line communication forum and at handover.

### Findings of our VAP project

A retrospective pre initiative VAP rate for the period starting 1st April 2011 and ending 30th June 2011 revealed a rate of 13.4% per 1000 ventilated days. A post initiative VAP rate for the period starting February 1st 2012 to April 30th 2012 was 7.69% per 1000 ventilated days and remained steady at 7.69% per 1000 ventilated days for the period June 1st 2012 to August 31st 2012. In the period of February 1st 2012 to April 30th 2012 the 7.69% incidence of VAP corresponded to a 70% or greater score for ten out of the fourteen VAP prevention sensitive indicators. Of the four indicators that did not meet the 70% target score, two were related to documentation. The other two were related to inadequate head of bed elevation and frequency of naso enteric tube placement measures. In the second post initiative audit we added eight hourly endo tracheal cuff checks to the care bundle, bringing the nursing interventions number to fifteen. For this period the 7.69% incidence of VAP corresponded to a 70% or greater score for ten out of fifteen VAP prevention indicators. Of the five indicators that did not meet the 70% target score, two were related to documentation. The other three were related to daily change of suction equipment and frequency of nasogastric measures and endo tracheal cuff checks.

### Conclusion

The CTICU work with NSPOs builds on the work of international nursing colleagues. Our efforts describe the steps CTICU nurses are taking to help move forward knowledge and action related to nursing sensitive patient outcomes for
cardiac intensive care patients. Our preliminary data suggests a positive trend in decreasing VAP. Furthermore, our work is helping our CTICU nurses to transition to outcome focused care. The outcomes inspire and drive the required interventions and help CTICU nurses own that which is purely nursing. Setting up NSPOs for specific patient groups requires considerable time, drive, commitment and enthusiasm. Once established it is anticipated the NSPOs will continue to evolve, but the process will be a lot less time consuming. Despite the effort required, this group of nurses believe the framework is a valuable tool for benchmarking against recognised standards and validating local nursing practice.

References


