Nursing Processes Related to Unexpected ICU Admissions

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Abstract

Nurses have the knowledge and skills to recognize and intervene when the condition of patients on medical or surgical units deteriorates. Despite this, deterioration is sometimes missed resulting in unexpected ICU admissions. This study explored the nursing process factors associated with unexpected ICU admissions. A chart audit was undertaken in a large urban hospital and data were collected measuring nursing assessment (vital signs), communication and documentation. Results showed that the most common reason for an unexpected ICU admission was respiratory distress. At the same time, respiratory rate was the least documented vital sign. Communication, documentation and recognition of patient deterioration play a key role in intervening and preventing unexpected ICU admissions. Attention to adequate staffing levels as well as implementation of clinical tools may assist nurses to more readily address patient deterioration and prevent unexpected ICU admissions.

Key words: Nursing processes, Patient deterioration

Résumé

Les infirmières et les infirmiers ont les connaissances et les compétences à reconnaître et intervenir lorsque l'état des patients sur les unités médicales ou chirurgicales se détériore. Malgré cela, la détérioration est parfois manquée, qui entraîne des admissions inattendues à l'USI. Cette étude a exploré les facteurs liés au processus de soins associés aux admissions inattendues en unité de soins intensifs. Un audit des dossiers a été effectuée dans un grand hôpital urbain et des données ont été recueillies pour mesurer l'évaluation des soins infirmiers (signes vitaux), la communication et la documentation. Les résultats ont montré que la raison la plus fréquente d'admission inattendue à l'USI était la détresse respiratoire. En même temps, la fréquence respiratoire était le signe vital moins documenté. La communication, la documentation et la reconnaissance de la détérioration du patient jouent un rôle essentiel dans l'intervention et la prévention des admissions inattendues à l'USI. L'attention portée aux niveaux de dotation adéquats ainsi que la mise en œuvre d'outils cliniques peuvent aider les infirmières et les infirmiers à aborder plus facilement la détérioration du patient et à prévenir les admissions inattendues à l'USI.

Introduction

People are hospitalized for a variety of reasons such as to receive specialized medical testing, to receive expert care in the stabilization of a medical condition, to recover from surgery and more. Not all patients are in a critical state, requiring them to be in the intensive care unit (ICU). However, there are times when a patient's condition deteriorates while they are hospitalized and they require admission, or readmission, to critical care. Patients readmitted to the ICU during their hospitalization have a 19% higher rate of mortality, longer length of stay and a prolonged recovery post discharge (Johns 2014, Garland et al. 2013). A number of health related issues including: cognitive dysfunction, sleep issues, depression, post traumatic distress syndrome or ICU acquired weakness may persist even upon discharge. Collectively called Post Intensive Care Syndrome, these issues may last for a year or more following a critical illness (Elliott et al. 2014, Bradford & Grassi 2009) and unfortunately some patients may never recover (Harvey 2012, Bradford & Grassi 2009).

Remaining on the ward while critically ill has been shown to be an independent predictor of mortality (Johns 2014, Jäderling *et al.* 2013) and one contributor to unexpected ICU admissions is a lack of recognition of the deterioration and delayed care (Mok *et al.* 2015). However, early detection of deteriorating patients on the wards can result in the prevention of an ICU admission (Soar & Subbe 2012). Given the increased risk for negative outcomes or death, it is prudent to prevent patients from requiring the need for unplanned ICU admissions as much as possible, or proactively admit to ICU prior to critical deterioration of the patient's condition. Nurses who work with patients on wards are in an ideal position to identify patient deterioration and implement processes that may prevent further deterioration and the need for ICU admission. This study focused on patients who had been unexpectedly admitted to ICU from a hospital ward. It focused on an evaluation of nursing processes, including vital signs and communication with the critical care response team and physicians, and their relationship to the unexpected ICU admissions.

Background

Early anticipation and prevention of adverse events are critical components of patient safety and central to the role of the nurse within the hospital system (Mok *et al.* 2015, Boyle 2004). Nurses assess, anticipate, intervene and apply clinical judgment (Ashcraft 2004) and are in a key position to detect changes and improve patient outcomes (Mok *et al.* 2015, Mapp *et al.* 2013). Detection of patients who are clinically deteriorating can often be identified hours before an admission to the ICU from the ward becomes necessary. Early recognition and correction of physiological abnormalities can aid in the prevention of the deterioration of patients (Mok *et al.* 2015, Considine 2005) and avoidance of unplanned ICU admissions. Several authors have suggested that failure to recognize, and therefore act, on the deterioration of patients, results in suboptimal care for critically ill patients on wards (Mok *et al.* 2015, Considine 2005). Delayed admission to the ICU has a significant impact on patient morbidity and mortality (Mapp *et al.* 2013, Cuthbertson *et al.* 2007,

Jefferis *et al.* 2005). Deaths have resulted in part from lack of observation, documentation, and recognition of deterioration as well as a lack of communication between health care providers (Mapp *et al.* 2013).

Ongoing monitoring is essential. For example, prior to cardiac arrest events there are often physiological changes present in vital signs for four, eight or more hours (Mapp *et al.* 2013, Ludikhuize *et al.* 2012). It has also been realized that hypotension, tachypnea and tachycardia are the most common precursors to hospital deaths. Recognition of changes in vital signs is paramount in correcting and preventing adverse events from occurring (Buist *et al.* 1999).

Respiratory failure is the most common reason for unplanned ICU admissions (De Meester *et al.* 2013, Jonsson *et al.* 2011). Ratray *et al.* (2011) found that for most nurses the identification of one variable, such as a change in respiratory rate, did not typically trigger the need for further assistance for a patient. Nurses tended to gather multiple data and it was the combination of variables such as changes in heart rate, respiratory rate or blood pressure that led to the realization that the patient was potentially deteriorating and further assistance was sought.

Most studies related to the role of the nurse with respect to patient deterioration have centered on track and trigger systems, such as the modified early warning scoring system (MEWS) or rapid response systems (Ludikhuize *et al.* 2012, Odell *et al.* 2009, Considine 2005). Many issues that potentially influence patient outcomes have been identified including the adequacy of time to provide care, nurse to patient ratio and patient acuity level (De Meester *et al.* 2013, Doran *et al.* 2006). However, these are factors that are most often out of the control of individual nurses. This study focused on processes within the nurses' domain that are related to unexpected ICU admissions.

Theoretical Framework

The Nursing Role Effectiveness Model was used as the framework for this study. The Model helps to describe and understand the role of the nurse and the achievement of patient outcomes (Doran *et al.* 2006) and was used to identify the nursing process variables that would be measured in this study. The Nursing Role Effectiveness Model stems from Donabedian's Quality Framework (1996), which provides a guide in the evaluation of quality of health care. The Nursing Role Effectiveness model includes elements related to the evaluation of quality of nursing care and has helped to guide many research studies focused on quality health care improvement (Mitchell *et al.* 1998). As Donabedian's framework described quality according to three constructs: structure, process and outcomes, so too does the Nursing Role Effectiveness Model (Kelley *et al.* 2011). The Nursing Role Effectiveness Model represents the multidimensional nature of a nursing care situation. This model can be used as a framework to better understand the underlying mechanisms that nursing care has on patient outcomes (Irvine *et al.* 1998).

Figure 1,
The Nursing Role Effectiveness Model (Irvine, Sidani, & Hall, 1998).

The focus of this study was in the evaluation of nursing processes. These include independent, dependent and interdependent actions that a nurse performs on an ongoing basis. Independent nursing actions are those that do not require a physician directive or order such as assessment, monitoring and evaluation of patient outcome. Dependent functions include those interventions that require a medical order such as the administration of medications. Interdependent functions include the collaboration of care that nurses share with other members of the health team to coordinate patient care, such as communication (Doran *et al.* 2002, Sidani & Irvine 1999, Irvine *et al.* 1998).

Assessment is an element within the nurses' independent role. Vital signs are one component of the role of the nurse in all areas of the hospital (Yoost & Crawford 2016) This type of assessment is essential in the recognition of patient deterioration and intervention.

An essential element of the interdependent role of the nurse is communication. Effective communication and sharing of patient information can prevent adverse events from occurring (Jukkala *et al.* 2012). Breaks in communication can lead to inconsistent patient care and lack of information on which to base decisions (Holly & Politeck 2013, Anthony & Preuss 2002). According to the USA's Joint Commission's Sentinel Event Database, communication breakdowns are part of the root cause of almost every event studied (Deering *et al.* 2011). Effective communication strategies can encourage the reporting of subtle signs of patient deterioration prior to the need for rapid intervention (Eberhardt 2014, Classen 2010).

Documentation is another important interdependent role of the nurse and is a critical component of patient care and nursing practice. It allows for effective communication about the patient's condition and response to treatment (Kelley *et al.* 2011). Reasons for lack of documentation include: time constraints, lack of expertise and lack of monitoring equipment. Inadequate documentation may also result from a lack of resources, (Kohle-Ersher *et al.* 2012) workload difficulties, lack of guidelines for completing documentation and ambivalence towards documentation (De Meester *et al.* 2013). The amount of time required for documentation may also play a role in how much information is recorded. When time is a barrier, documentation may be left until much later in the shift which can result in the loss of pertinent patient information and lead to undesirable outcomes, such as lack of recognition of patient deterioration and delayed intervention (De Meester *et al.* 2013).

Data collected in this study reflected the independent nursing role (vital signs) as well as the interdependent role (communication and documentation) and were used to determine nursing process factors that were associated with unexpected ICU admissions. The Nursing Role Effectiveness Model identifies that nursing staffing levels may impact nursing processes (see Figure 1), and since nursing staffing levels change on different times and days of the week, we also tracked the day of the week that the patient was admitted to ICU. In this study communication between the nurses and physicians and, or critical response team was identified in the nurses' documentation in the patient charts.

Methods

This study was a descriptive retrospective cohort design, which was a chart audit of patients admitted unexpectedly from the general wards to the medical surgical ICU of a large, urban hospital. Ethical approval for the study was received from Laurentian University and the hospital where the study took place.

The setting was a large teaching hospital in an urban centre in Canada. The hospital provides acute adult services with just over 460 inpatient beds. Many different specialties are part of the services provided to patients including neurosurgery, trauma, cardiovascular, orthopaedic and medical care. The hospital maintains a large roster of just over 6,000 staff members including 800 physicians and 1600 nurses. It is also a very active research facility with over 200 scientists and associate scientists. The hospital maintains four critical care units including a neurosurgical, cardiovascular, medical surgical and coronary care ICUs. It also has a critical care response team which serves all wards within the hospital.

Chart Audit Tool

An extensive review of the literature did not reveal any chart audit forms that focused specifically on the nursing processes targeted in this study that related to unplanned ICU admissions. A chart audit tool was created using the Nursing Role Effectiveness Model as a framework drawing items

from the related literature as well as the nursing expertise of the research team. The final chart audit tool was used to collect information about communication and assessment for patients with unplanned ICU admissions. Communication was measured by the presence of documentation between the nurse and the most responsible physician (MRP) or to the critical care response team (CCRT). Assessment was reflected in the frequency of vital signs taken including pulse, respiratory rate, heart rate and oxygen saturation.

The chart audit tool also included patient demographic and health information including age, gender, co-morbidities, medical diagnosis and whether there was a previous ICU admission during the current hospitalization. In addition, the service that patients were admitted to, the ICU, the day of the week admission took place and the time that the patient was admitted were also collected.

Figure 2.

Chart Audit Tool - Nursing Processes Related to Unplanned ICU Admissions

Demographics	
Coded Identifier Number	
Time Admitted (24 hour time)	
Day of Week Admitted	
Reason for admission	
Co morbidities	
Service admitted to	

Demographics	Scores
Age	
Gender Male = 1 Female = 2	
Previous Admission to ICU Yes = 1 No = 2	

Communication and Documentation Questions	Scores	Notes
Was there documentation of communication with MRP Yes = 1 No = 2		
Was there documentation of communication with RRT Yes = 1 No = 2		
If there was communication with the MRP or RRT is there documentation of intervention in nursing notes Yes = 1 No = 2		
Was there documentation of LOC (either GCS or narrative words alert, confused, unresponsive or similarities) Yes = 1 No = 2		
Was there documentation of urine output Yes = 1 No = 2		
Was any information other than alert and oriented documented Yes = 1 No = 2		
Data to be collected		
Is there data missing from vital signs Yes = 1 No=2		
If any data is missing from vital sign collection what is it Temp = 1 Pulse = 2 Respiratory Rate = 3		

Blood pressure = 4		
Oxygen saturation = 5		

Systematic sampling was utilized by selecting the first 12 charts from each month over a 12-month time span that met the inclusion criteria. Inclusion criteria included patients over the age of 18 at the time of admission to hospital, who had subsequently been admitted, or readmitted to the medical surgical ICU. The sample was obtained by reviewing the admission book from the medical surgical ICU and determining what participants met the inclusion criteria. Data were collected by one researcher who scheduled time at the hospital in the medical records department to review the electronic medical records. A convenience sample of 144 charts was retrospectively analyzed. This number was chosen after it was determined to have sufficient power to address the planned statistical analysis (Faul, Erdfelder, Lang & Buchner, 2007). The charts were reviewed in the order that they appeared in the admission book. Vital signs and documented and nursing narrative notes were reviewed. The researcher reviewed the charts and entered data into a separate excel file, indicating whether or not each specific nursing action was completed. The electronic charting system allowed for nurses to add as much detail about nursing care as required, such as multiple vital signs. The researcher added notes to identify such things as frequency of each vital sign that was taken.

Results

The sample was composed of 79 (54.9%) male and 65 (45.1%) female participants with a range of 20 to 91. The mean age of people with an unplanned ICU admission was 58.8. Table 1 shows a breakdown of the age groups of patients in the study admitted to ICU.

Table 1

Age Breakdown of Patients Admitted to ICU

Age Group	Frequency	Percentage
20 to 30	9	6.25%
31 to 40	12	8.3%
41 to 50	26	18.05%
51 to 60	24	16.6%
61 to 70	29	20.1%
71 to 80	29	20.1%
81 to 100	15	10.4%

Although admissions occurred every day of the week in the ICU, participants were most frequently admitted on Tuesdays with 26 (18.06%) admissions. Mondays were the day of the week with the fewest admissions 16 (11.11%) (See Figure 3). Time data showed that most admissions 50 (34.72%) occurred between the hours of noon and 1800 hours. This was followed by 39

(27.08%) admissions between 1800 and midnight, 34 (13.19%) between midnight and 0600 hours and lastly 21 (14.58%) occurred between 0600 and 1200 hours.

Figure 3

Day of Week of Admissions

The most common reason for unplanned ICU admission was respiratory distress 76 (52.7%). This included an admission diagnosis of pneumonia, cystic fibrosis exacerbation, chronic obstructive pulmonary disease (COPD), asthma exacerbation, respiratory arrest and bronchiectasis. Admitted participants had an average number of 3.5 co morbidities. The most common co morbidities documented in the chart were hypertension, diabetes mellitus and chronic obstructive pulmonary disease.

Patients from all services may be admitted to the medical surgical ICU. The frequencies of the admitted patients are explained in Figure 4.

Figure 4

Department Prior to ICU Admission

Communication with the most responsible physician was documented in the 12 hours prior to ICU admission in 119 (82.6%) of the time while communication with the critical care response team was documented in 97 (67.3%) of the charts reviewed prior to ICU admission. There was a significant medium negative correlation between the number of times that vital signs were taken in the 12 hours prior to ICU admission and communication with the most responsible physician ($r_s = -0.291$, $p = .001$) or the critical care response team ($r_s = -0.254$, $p = 0.002$).

The average number of times vital signs taken in the 12 hours prior to ICU admission was 3.4. There was no significant association between the frequency of vital signs ($r_s = 0.026$, $p = 0.759$), previous ICU admission ($\chi^2(1) = 12.841$; $p = 0.460$), age ($\chi^2 = 684.995$; $p = 0.871$), gender ($\chi^2 = 14.681$; $p = 0.328$) and a diagnosis of respiratory distress. There was also no correlation between the frequency of vital signs taken for each patient and admission to the ICU for those with a diagnosis of respiratory distress ($r_s = 0.026$, $p = 0.759$).

The documentation of the respiratory rate was missing in one or more sets of vital signs 56 (76%) with an admitting diagnosis of respiratory distress and 51 (73%) in patients admitted with diagnosis of other illnesses. However, no significant association was found between an admitting diagnosis of respiratory distress and documented respiratory rates ($\chi^2(1) = .112$; $p = 0.738$), or whether oxygen saturations had been documented.

Discussion

The greatest number of participants who experienced an unplanned ICU admission while in hospital were between the ages of 61 to 80. This is not surprising given that the average age of the population is increasing globally and people over the age of 80 are projected to make up 6.5% of the population in North America by the year 2050 (Bagshaw *et al.* 2009). Additionally, as people age the number of co morbidities increases which can lead to a significant health burden. People with multiple conditions have a lesser quality of life and require a greater number of health care resources (Canadian Institute for Health Information 2011). It is estimated that the need for ICU resources for those 80 and above will increase by 72% in the coming years (Bagshaw *et al.* 2009). Given the aging population with higher health care needs, it is increasingly important that ward nurses remain diligent in their assessments, documentation and communication to identify deterioration and prevent unexpected ICU admissions.

This study found that the most frequent day of admission was Tuesday and the most frequent time was between 1200 and 1800 hours. Nurse to patient ratios tend to decrease on night shifts (de Cordova *et al.* 2014). It is postulated that there is a higher level of surveillance present on wards during the weekdays and in the middle of the day when there are typically a higher percentage of nurses on duty as well as allied health staff. This could result in more timely identification of patient deterioration, resulting in the decision for admission to intensive care.

Perhaps the most interesting finding in this study was related to the frequency of vital signs. This study demonstrated that issues of the respiratory system were the most likely cause for urgent unplanned ICU admission. In fact, respiratory distress accounted for 53% of all unplanned ICU

admissions. Respiratory distress or symptoms of respiratory failure have also been the leading cause of unplanned ICU admissions in other research studies (Mohr *et al.* 2013, Jonsson *et al.* 2011).

Vital signs provide essential information about how the body is functioning and coping with illness. Alterations in vital signs can be indicative of the body's inability to cope with changes brought on by acute or chronic illnesses. Changes in vital signs may be present well before a patient acutely deteriorates (Mapp *et al.* 2013, Ludikhuizen *et al.* 2012). The respiratory rate can be highly sensitive to changes in a patient's condition. Many studies have found that changes in vital signs, particularly respiratory rate, are present 8 hours prior to either cardiac arrest or unplanned ICU admission (Mapp *et al.* 2013, Cuthbertson *et al.* 2007). Clues to patient deterioration may be subtle early on but the respiratory rate is one that tends to increase prior to other vital signs (Curry & Jungquist 2014).

Despite the importance of monitoring changes in respiratory rates, it was the least documented vital sign. There are a number of possible reasons that respiratory rate documentation was not associated with unplanned ICU admission. The importance of the respiratory rate is often under recognized by nurses and it receives a much lower priority than other vital signs (Cooper *et al.* 2012). In this study setting, vital signs are often taken by automated machines rather than by traditional observation and palpation. Automated machines typically do not count respiratory rates. Nurses may then quickly estimate respiratory rates based on previous documentation or expected norms (Cooper *et al.* 2012). It is quite possible that nurses inaccurately assess the respiratory rate by not actually counting the breaths per minute (Yuan *et al.* 2013). It has been found that when health care personnel have estimated the respiratory rate, the measured rate is often much higher than documented on reassessment (Philip *et al.* 2015). Despite this evidence, factors related to unexpected ICU admissions are complex and we express caution in consideration of respiratory rate alone.

The lack of adequate communication has been associated with many adverse events within the hospital setting (Manojlovich *et al.* 2015). Communication amongst health care professionals is essential for patient care. Effective communication skills and strategies allow for timely intervention when a patient is beginning to deteriorate (Classen 2010). As communication with the most responsible physician increased in this study, the number of times vital signs were taken decreased. The same held true for communication with the critical care response team. The reasons for these findings are not known. Nurses contact physicians or the critical care response team for direction when something changes in the patient's condition to obtain advice, or treatment orders. One interpretation of this finding is that nurses contacted the most responsible physician for consultation when they were concerned about the patient's condition. Once the physician or critical care response team was involved, the nurses may have felt the need for further evidence of vital sign deterioration was not necessary.

There are many limitations to retrospective chart audit research. A simple count of the frequency of communication with the most responsible physician or critical care response team

and the frequency for which vital signs are taken, doesn't provide insight into the how this information influenced the care of the patients. Future research should focus on the nature of the communication between the nurse and most responsible physician or the critical care response team, follow up from either the nurse or the physician and prescription of medical interventions. Additional research should focus on the signs that nurses utilize to determine when a patient is deteriorating and which than prompts them to communicate with either the physician or the rapid response team.

Relevance to Clinical Practice

Nurses continuously gather information about their patient's health. The understanding and ability to further improve their patient's health can be obtained by further appreciating the importance of vital sign data, in particular the respiratory rate. One strategy to improve the detection of patient deterioration is to support the assessment of accurate respiratory rate counts. In understanding the value of abnormalities in vital signs more patients could be identified earlier which could lead to earlier intervention and therefore prevent the need for an ICU admission.

Communication, documentation and recognition of patient deterioration play a key role in preventing deterioration to the point of an unexpected ICU admission. Hospital management should be dedicated to improving these processes. One strategy may be to ensure adequate staffing, particularly on night shifts, so that ongoing assessments can be maintained. Staff inservices could focus on the importance of accurate vital sign assessments and a review of lines of communication. Tools to strengthen communication such as early warning scoring systems or SBAR (Situation, Background, Assessment and Recommendation) could be employed to empower nurses to communicate with physicians and the critical care response team earlier in regards to a patient's changing condition (Albert & Huesman 2011). SBAR can help to improve the communication between nurses and physicians by providing a common way of organizing thinking in urgent situations. It can make the message that the nurse is attempting to convey more readily understood due to the preciseness of the information that is being delivered (Cornell *et al.* 2014).

Conclusion

In appreciating and critically appraising the vast amount of information that can be obtained from the collection of vital signs such as the respiratory rate nurses play a key role in helping to prevent patient deterioration. A stronger appreciation of and understanding of the nursing processes of communication, documentation and recognition of patient deterioration will aid in preventing unplanned intensive unit admissions and ultimately improve the outcomes of patients.

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