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Intrahospital Transport to the Radiology Department: Risk for Adverse Events, Nursing Surveillance, Utilization of a MET and Practice Implications

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Abstract

Nurses providing care in the Radiology Department (RD) are challenged by the broad scope of conditions and varied acuity of patients served by this unit. Nurses must facilitate the required diagnostic testing and simultaneously provide the surveillance necessary to detect physiologic changes signaling the need for rescue interventions. When instability occurs, one method of rescue involves activation of a Medical Emergency Team (MET) to bring an experienced cadre of critical care providers to the unstable patient. Despite recognition that the RD can be a high risk area, there is little in the literature specific to the surveillance of RD patients, risk for and prevention of adverse events, MET activation or the management of patient instability specific to the RD. The purpose of this paper is to examine what is known regarding risk for adverse events during intrahospital transport, utilization of a MET as a rescue intervention, and practice implications.

Keywords

patient safety; intrahospital transport; radiology nursing; medical emergency team

Introduction

Hospitalized patients requiring intrahospital transport to the Radiology Department (RD) range from “stable” patients admitted for elective surgery or non-life threatening medical conditions to unstable critically-ill patients who require a high level of technologic monitoring and physiologic support, including mechanical ventilation and hemodynamic assistance. Nurses providing care in the RD are challenged by the high acuity of many of the patients served by this unit, their complex needs, and the constant surveillance required to

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detect physiologic changes that signal the need for rescue interventions should instability occur.

While undergoing diagnostic testing or therapeutic interventions, patients may remain stable or experience a subtle or abrupt deterioration in status which, in some cases, may progress to cardiorespiratory collapse. Recognizing the onset of instability can be challenging in the RD because patients are transferred from diverse units of origin with a wide spectrum of acuity. Patient instability can be initiated by multiple causes such as sedation, analgesia, contrast dye reaction, invasive procedures and the patient's condition. Prior research suggests that patients admitted to clinical units are at greater risk for missed recognition of adverse events when the nurses caring for them are not familiar with their care (Schmid 2008). Unfamiliarity is "the norm" in the RD where nursing staff are likely to have a single encounter with the patient that may be preceded by an abbreviated or absent handoff. Despite these challenges, it is crucial that nursing surveillance provide timely recognition of changes that signal a deterioration in patient status before decompensation becomes irreversible. Early detection and timely intervention are critical to improve patient safety and patient outcomes (Hillman 2002, Chen 2009).

When instability occurs, one method of early rescue involves activation of a Medical Emergency Team (MET) to bring an experienced cadre of critical care providers to the unstable patient. The literature describing MET activations and outcomes on clinical units within the hospital is fairly extensive. However, little is known about utilization of a MET in the RD. In addition, there is little in the literature specific to the surveillance of RD patients, development of adverse events, and management of patient instability specific to the RD or ways to prevent this outcome. The purpose of this paper is to examine what is known regarding intrahospital transport to the RD, adverse events in the RD, utilization of the MET as a rescue intervention and possible practice implications.

Intrahospital transport to the RD

Transport to the RD has been cited as the most frequent destination for an ICU *road trip* (Day 2010, Warran 2004, Voigt 2009, Szem 1995). Studies have reported that 22% to 52% of ICU patients are transported at least once to departments throughout the hospital to receive care not available in the ICU (Voigt 2009). Over a four year period, the Pennsylvania Patient Safety Authority received 2,390 reports of transport-related reports involving non-ICU patients. Facilities identified "near misses" and "serious events" in 208 or these reports. The causes were multiple but, notably, lapses in communication were cited as the cause in almost half of these events. (PA-PSRS 2009)

Two sets of guidelines, published by Both the Society of Critical Care Medicine (SCCM) and the American College of Critical Care Medicine (ACCCM), establish formal guidelines for the intrahospital transport of critically ill patients (Warren 2004). Intrahospital transport is defined as the time the patient leaves the ICU until his/her return, including time in the RD. According to these guidelines, the level of care should not diminish when critically ill patients are transported to a different location. Continuity of care and safe patient transport requires pre-planning, appropriate transport personnel and equipment, continuous monitoring and documentation of patient status while away from the ICU (Table 1) (Warren 2004). Both sets of guidelines imply that the level of surveillance during transport should be consistent with the level provided in the ICU. No national guidelines have been developed for the transport of non-critically ill acute care patients (Warren 2004, PA-PSRS 2009).

Even with intrahospital guidelines in place, studies have reported multiple adverse events during transport to the RD. In a prospective study of 125 intrahospital transports of ICU patients, one third experienced adverse events (defined as an unplanned event potentially

threatening patient stability) although guidelines for intrahospital transport were followed. The majority of the adverse events (75%) occurred in the RD or the operating room prior to or during the procedure (Smith 1990). Examples included interruption in monitoring due to power or lead failure, disconnection of IV lines including vasoactive drug infusions and inadequate ventilation. From a review of literature examining equipment-related adverse events in intrahospital transport, Waydas (1999) reported a range of 6-68% in various types of adverse events during intrahospital transport of adult, surgical, critical care, and trauma patients to the operating room or RD. Life threatening events occurred in 8% of these transports. Other non-equipment related causes included circulatory events (i.e. alterations in blood pressure and heart rate) and respiratory events (i.e. alterations in respiratory rate and oxygenation). The RD was the destination for a minority of patients (11%) in some studies and all (100%) patients in 6 of the studies (Waydas 1999).

The mix of acuity of patients transported to the RD - ranging from stable, awake, alert and oriented, to unstable, comatose and in need of life supportive therapies - precludes one standard of RD care for all patients. Patients who are critically ill often have traumatic injuries or unexplained complications requiring more sensitive radiologic diagnostic procedures or therapeutic interventions that are not available on a clinical unit. For example, a patient may develop respiratory distress with suspected pulmonary emboli or may experience mental status changes of unknown etiology. In both examples transport may be required to establish the correct diagnosis and guide appropriate interventions.

After arrival in the RD, a variety of circumstances may place patients at further risk. First, patients are often sedated for reasons ranging from relief of claustrophobia anxiety to conscious sedation for invasive procedures. A second risk occurs when patients are moved from the transport cart onto a testing device. Patients are commonly moved to narrow, often moveable scanning tables which places them at risk for inadvertent movement or dislodging of an endotracheal or tracheotomy tube, chest tube or other drains, and/or central or peripheral intravenous access lines. This outcome can be life threatening if the device is used to maintain an airway, deliver vasoactive drugs, or volume administration. The transfer may also result in patient injury due to falls. During some scans, patients are not clearly visible to clinicians, making close monitoring difficult. For example, during magnetic resonance imaging (MRI) and computed tomography (CT), nursing personnel remain in a room that is separate from the patient. Finally, patients may be cared for by an intensivist, an ICU nurse who has been providing in-unit care, an on-call nurse unfamiliar with the case, a RD nurse or technician.

Risk for instability in the RD may also vary by testing area. CT has been identified as both the area of highest patient volume and the area where patients are at the greatest risk for adverse events. Few CT scans are performed portably at the bedside (Rumboldt 2009). Therefore, patients who are already physiologically compromised must be transported to a distant area for an extended period of time and isolated from their usual caregivers. (Stevenson 2002, Waydas 1999, PA-PSRS, 2005). Improvements in technology and the wide range of diagnostic capability available with a CT scan make it a frequent choice for imaging. In a review of 8 studies and 650 patients, 50% experienced intrahospital transport to the CT scanner (Stevenson, 2002), usually for head, chest, abdominal or spinal studies. One review reported 62-92 minutes as the average time patients spent away from their units for a CT scan (Stevenson 2002).

Studies have suggested that adverse events occur at the same rate for patients who require intrahospital transport and those who do not, an observation that suggests that adverse events are the result of patient condition, not the transport itself. Hurst et al. (1992) compared 100 transported patients with 100 illness-severity matched controls (APACHE II).

All transports were to the RD and 82% for a CT scan. Similar rates of adverse events rates occurred in both groups. In a subsequent study, Szem et al. (1995) compared adverse events in 175 patients who experienced 203 intrahospital transports with 584 illness-severity matched controls (APACHE II) who did not experience intrahospital transport. The transports were to the RD (61%) and operating room (39%). Although a similar number of adverse events occurred in both groups, patients in the transported group experienced a higher mortality. However, the increased mortality in the transported group was comparable to the predicted mortality for patients with a similar acuity (APACHE II). This finding provided additional evidence that patients experience a similar rate of adverse events, regardless of their location. Thus, caring for the physiologic needs of compromised patients outside of their usual patient care areas was associated with the same clinical challenge for RD nurses as care provided in the ICU. Nurses therefore have to be prepared to recognize and respond to adverse events quickly and effectively.

MET utilization in the Radiology Department

While prevention of an adverse event is always preferred, Rapid Response Systems which include a MET can provide rapid access to patients who experience life threatening events in non-ICU settings. These teams typically include a critical care physician, ICU nurse, and respiratory therapist who are called to the presence of the rapidly deteriorating patient. Most institutions use an established set of vital sign parameters and physical examination findings to identify instability and trigger an emergency response. As one example, the MET activation criteria used as the University of Pittsburgh Medical Center (UPMC) are shown in Table 2. At the UPMC, there are approximately 65 inpatient MET activations in the RD annually, half involve patients transported from acute care units and the majority involves patients transported for a CT scan.

Use of the MET as a rescue intervention is dependent on staff recognition of a change in patient status that meets criteria and initiating the call. Both steps require nursing surveillance that includes accurate assessment and close monitoring to recognize changes that meet MET criteria. MET criteria for patients transported to the RD should be consistent with the general hospital patient criteria. However, recognition of changes in patient status can be hampered by limitations in visualizing the patient and their monitoring equipment due to the RD environment such as dark rooms, surgical drapes, and the scanning equipment, and the need for separation between the patient and their caregivers during some tests. Since prior research suggests that heightened surveillance and early recognition of patient instability can improve patient outcomes (Schein 1990, Chein 2007), it is reasonable to hypothesize that heightened surveillance would also improve patient outcomes for patients who experience instability in the RD and may be even more vulnerable for the development and lack of detection of instability.

Factors Associated with Patient Instability

Patients who become unstable and meet MET criteria may have become unstable in the RD or during transport to the RD. It is also possible that they were unstable prior to RD transport or that instability preceded transport but was not recognized. Hravnak et al. (2008) monitored 326 patients using an electronic integrated continuous monitoring system and reported that patients on step-down units became unstable as long as 6 hours prior to a MET call. Such patients may be transferred with underestimated surveillance or support needs.

Schmid et al. (2008) compared the incidence of MET calls in patients admitted to a medical or surgical inpatient unit and found that more MET calls occurred when there was a service-unit mismatch, e.g., patients on a surgical unit whose care was managed by a nurse who

typically worked on a medical unit. These findings suggest that patients may be at greater risk for instability or delay in MET activation when being cared for in areas where the direct care providers are mismatched for their care requirements and diagnosis, i.e., patients are not well known to the nursing staff. The RD is one such care area - direct care providers provide care for a transient patient population whose usual responses are not known to them. Even when an ICU-level staff member accompanies the patient to the RD, the actual individual who accompanies the patient may be a transport resource staff specifically trained for transport (in accordance with suggested guidelines) and not necessarily the patient's primary bedside nurse. The potential for misses or delayed response to adverse events places patients at risk and highlights the need for further inquiry into nursing surveillance, early detection of adverse events, and timely patient rescue in the RD.

Practice Implications for the RD

To improve patient safety the Guidelines for Transport of Critically Ill Patients illustrated in Table 1 can be used for consideration as a framework to establish safe care for all patients transported to and cared for in the RD.

Pre-planning and communication between the sending units and the RD is crucial. Safe patient care in the RD begins prior to transport. The sending-unit should establish that the RD is prepared for the care of the patient. Communication is vital to establish availability of scanning equipment and to decrease patient wait time. It is also important to communicate information about patient status (i.e. stable, unstable, combative), surveillance needs (i.e. ICU nurse, RD nurse, patient care technician), and any patient specific considerations (i.e. allergies, pain management, immobility). Pre-planning includes obtaining a detailed history. The better informed the RD nurse is regarding the history and care needs of the patients, the better prepared the nurse will be to provide appropriate care during the patient's time in the RD.

Personnel needs in the RD should be established prior to transport. Per guidelines, critically-ill patients require a minimum of two people to accompany them to the RD whereas non-ICU patients may be transferred by non-licensed personnel. RD nurses need to be prepared to provide the necessary nursing care for all patients. This will require a hand-off communication at the time of arrival. RD nurses have the challenge of caring for patients with a broad range of specialty-care problems. Keeping current in multiple specialty areas is a specific challenge to the RD nurse that can be met through continuing education and training.

Equipment needs must be established in RD transport pre-planning. Patients should not arrive in the RD until the proper equipment is confirmed to be in place and in working order. Having all necessary equipment ready will decrease wait times, patient risk and improve safety. Resuscitation equipment needs to be easily accessible. RD nurses need to be proficient in its use, as well as, in the MET call criteria.

Monitoring needs to be maintained at the same level as provided in the sending unit. Non-ICU patients may or may not arrive on a cardiac monitor. In some situations, transport personnel may be a non-licensed technician trained in reading monitors. These monitor transport technicians as well as the RD nurses need to have extensive training and undergo competency evaluations to ensure that skills remain current.

Documentation of RD patient care, medications, procedures, and patient response is important to not only chronicle the patient experience but for continuity of care after the RD experience and return communication with the sending-unit staff. Without documentation of the care given, inappropriate measures may be taken on the patient care unit. For example, if

pain medications are not properly documented and reported in hand-off, a medication error can occur resulting in patient overmedicated. If vital signs are not documented then evidence that a patient is becoming unstable may go unnoticed. The patient's experience in the RD should not be viewed as an interruption in usual patient care but rather as a continuation of care and needs to be documented accordingly.

Conclusion

Patients are often transported during their hospitalization and the RD is a common transport destination. Nursing surveillance of patients during their hospitalization is necessary to detect adverse events early and intervene in a timely manner. Specific information about nursing surveillance needs in the RD is under-reported in the literature. It is known that patients often become unstable and require support and rescue care, including the MET, while in the RD. To improve patient safety, RD nurses should consider developing and following procedures for pre-planning and communication, and insure that personnel, equipment, monitoring and documentation are complete and clearly understood by all individuals involved. Future studies are needed to more specifically identify modifiable risk factors that precede MET calls and ways to improve practice to decrease the frequency of adverse events.

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Table 1

Intrahospital Transport Guidelines for the Critically-Ill patient*

Intrahospital Transport Guideline	Examples
Pre-planning	Coordination and communication between the sending and receiving units, establish appropriateness of the procedure, scheduling personnel, establish procedural risks for patient such as MRI scanning, contrast dye allergies
Personnel	Minimum of two people trained in intrahospital transport , at least one certified in resuscitation, respiratory therapy for all ventilated patients, physician for all unstable patients
Equipment	Equipment to maintain the same level of care as in the unit such as monitors, ventilators, drug infusions, airway management , knowing the location of all carts en route, proper equipment maintenance
Monitoring	Maintain the same level of physiologic monitoring as was being received in the ICU, blood pressure, pulse oximetry, cardiac monitoring, arterial lines
Documentation	Maintain a record of patient data such as vital signs, procedures, medications and patient response

* adapted from Warren J., Fromm R., Orr R., Rotello L., Horst M., & American College of Critical Care Medicine. (2004) Guidelines for the inter- and intrahospital transport of critically ill patients. *Critical Care Medicine*, 32(1), 256-262.

Table 2

University of Pittsburgh Medical Center Medical Emergency Team call criteria*

Cardiovascular
Heart Rate <40 or >140 with new symptoms or any rate >160
Blood pressure <80 or >200 systolic or 110 diastolic with symptoms (neurologic changes, angina, dyspnea)
Respiratory
Rate <8 or >36
New onset of difficulty breathing
New pulse oximeter reading <85% for >5 without known chronic hypoxia
New oxygen requirement to keep SpO2>85%
Acute Neurologic Change
Acute loss of consciousness
New onset lethargy
Sudden collapse
Seizure (outside of seizure monitor unit)
Sudden loss of movement or weakness in the face, arm or leg
Other
>1 STAT page required to assemble team needed to respond to a crisis
Patient complaint of chest pain (unresponsive to nitroglycerine or MD unavailable)
Color change (patient or extremity): Pale, dusky, gray or blue
Unexplained agitation of >10 min.
Narcan use without immediate response
Suicide attempt
Uncontrolled bleeding
Bleeding into airway
Large acute blood loss
Crash cart must be used for rapid delivery of meds

* adapted from DeVita, M.A., Braithwaite, R.S., Mahidhara, R., Stuart, S., Foraida, M., & Simmons, R. (2004). Use of medical emergency team responses to reduce hospital cardiopulmonary arrests. *Quality & Safety in Health Care*, 13, 251-254.