Is Your Patient Ready for Transport? Developing an ICU Patient Transport Decision Scorecard

Rosmin Esmail, Deborah Banack, Cheryl Cummings, Judy Duffett-Martin, Dr. Karen Rimmer, Jonas Shultz, Teresa Thurber, Dr. Terrance Hulme and the Patient Safety and Adverse Events Team

Abstract

Transport of patients from the intensive care unit (ICU) to another area of the hospital can pose serious risks if the patient has not been assessed prior to transport. Recently, the Department of Critical Care Medicine, Calgary Health Region, experienced two adverse events during transport. A subgroup of the Department's Patient Safety and Adverse Events team developed an ICU patient transport decision scorecard. This tool was tested through Plan-Do-Study-Act cycles and further revised using human factors principles. Staff, especially novice nurses, found the tool extremely useful in determining patient preparedness for transport.

Introduction

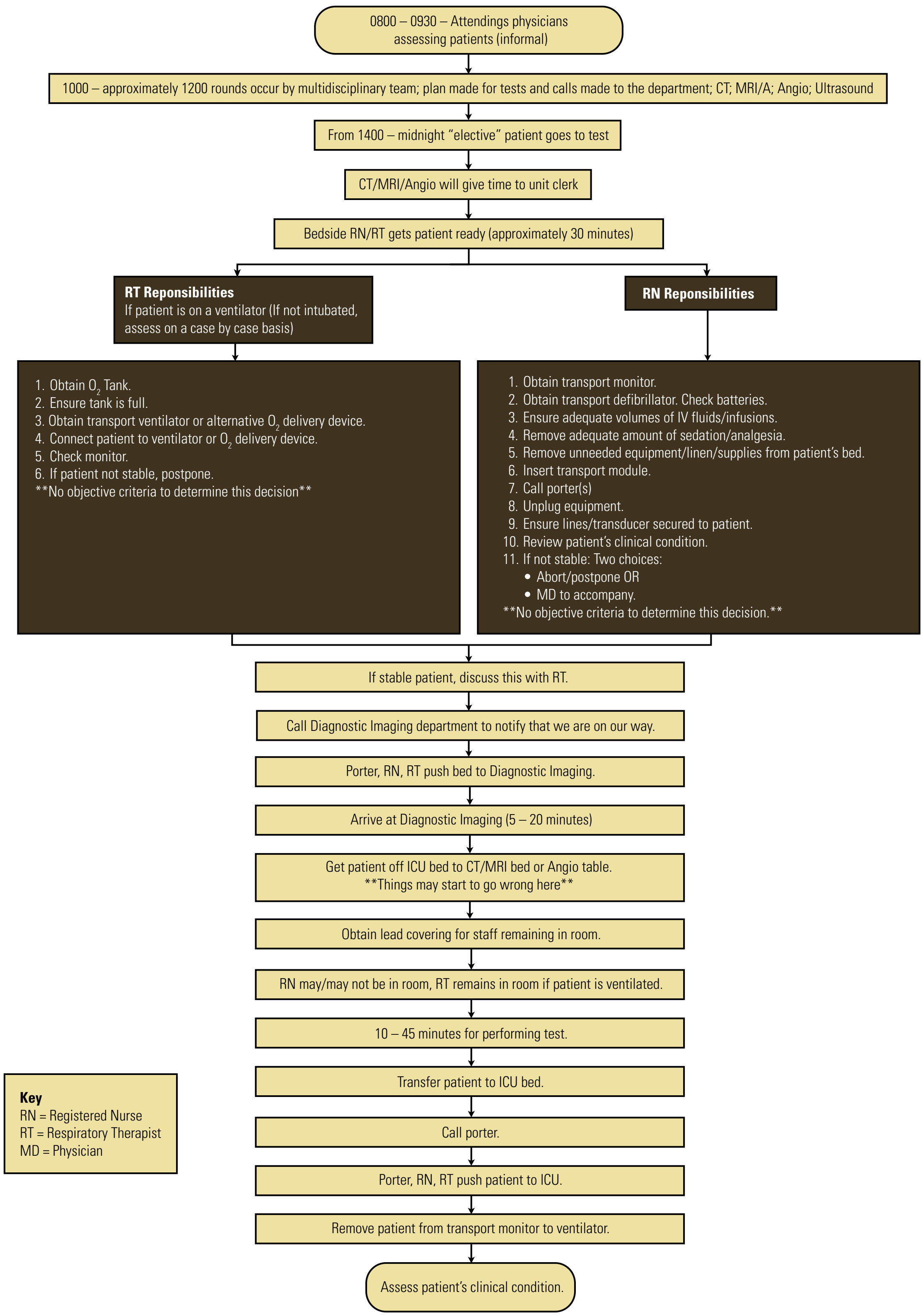
Many medical errors involve loss of information or lack of appreciation of significant patient problems as patients transition from one locus of care to another (Leonard et al. 2004). There are two types of patient transfers: interhospital, referring to the transportation of patients between hospitals, and intrahospital, referring to the transportation of patients within a hospital for the purpose of undergoing diagnostic or therapeutic procedures or transfer to a specialized unit (Martins and Shojania 2001). The critically ill patient being transported is at increased risk of morbidity and mortality during the process (Warren et al. 2004; Durairaj et al. 2003). Intrahospital transport exposes the patient to many of the same risks of an interhospital transport. Intrahospital transport to diagnostic imaging (DI) testing areas is associated with the longest duration a patient spends outside the unit (Venkataraman and Orr 1992). However, transporting critically ill patients within a hospital cannot be avoided when diagnostic tests and procedures cannot be performed in the ICU. The benefits of transporting the patient must be balanced against potential for harm (Warren et al. 2004; Shirley and Bion 2004).

In 2005, the Department of Critical Care Medicine, Calgary Health Region, experienced two critical incidents, both with a theme related to the transport of nonintubated patients to DI. The Department's Clinical Safety and Quality Assurance Council felt a process needed to be in place to improve the safety of both intubated and nonintubated patients leaving the ICU for tests. The following case study describes the development and early testing of an ICU patient transport decision scorecard.

The Two Cases

In a three-month period, two similar incidents occurred in ICU patients sent off the unit for diagnostic testing. In both cases, the patients were not intubated, but had a compromised respiratory status. They were being investigated for intra-abdominal sepsis with a CT scan of the abdomen, which required that the patients receive large volumes of oral contrast and that they lay flat during the test. In each case the patient had cardiopulmonary arrest during the scan.

Figure 1. Steps for transporting an ICU patient for diagnostic test



The two incidents raised the question of the safe transport of nonintubated, critically ill patients – in particular, best monitoring and airway protection practices. Other members of the department cited previous similar incidents and a system issue was identified, initiating a review and development of a solution.

Literature Search

A two-step process was undertaken to determine if there were existing tools that could be used for this purpose. Initially, a literature search was conducted. The review was conducted using CINAHL, MEDLINE databases and other Internet sources. Keywords included: transfer, emergency medical technicians, critical care, ambulances, transportation of patients, professional role, intrahospital, equipment and supplies, quality assurance, patient safety, mechanical ventilation, aero medical transport, flight nursing and adult. This search was updated in May 2006.

Guidelines and recommendations for the safe inter- and intrahospital transport of critically ill patients have been developed (Warren et al. 2004; Australasian College for Emergency Medicine 2003; Intensive Care Society 2002; Ferdinande 1999). Critically ill patients undergoing transport should receive the same level of monitoring and physiologic support as they would in the intensive care unit. Changes during transport should be quickly identified and managed in the same way as in an intensive care unit.

Waydhas reviewed the literature of the intrahospital transport of critically ill patients (Waydhas 1999) and identified the nature and incidence of adverse events. The reported incidence of adverse events or patient harm for intrahospital transports has ranged from 6 to 71%. The severity of these events was often not reported in detail. Life-threatening events may be as high as 8% of intrahospital transports. Waydhas noted circulatory and respiratory complications were most commonly reported and were due to inadequate ventilation during transport. Equipment-related complications occurred in up to one-third of transports. The long-term outcomes were not well studied. The diagnostic yield or benefit of the transport was highest in trauma and surgical patients, ranging from 25% to 70%.

Beckmann and colleagues, using data from the Australian Incident Monitoring study (AIMS-ICU), analyzed 191 incidents, reported anonymously, occurring during intrahospital transports to or from 37 ICUs (Beckmann et al. 2004). Equipment problems were found in 39% of cases; patient- or staff-related problems were identified in 61%. Significant adverse events occurred in 31% of the reports analyzed, including four deaths and six cardiac arrests. The cause of most of these incidents was multifactorial, with human-based factors contributing to the 191 incidents. Human factors included inadequate preparation, failure to follow protocol and errors of judgment and of problem recognition.

Staff orientation and training improved patient outcomes during transport (Wilson 1998; Boyko 1994). A transport team might include nurses, paramedics, respiratory therapists and physicians, depending on the stability of the patient.

Proper documentation and communication were vital for both referring and receiving departments to be prepared for the transport (Warren et al. 2004).

An environmental scan was conducted by asking critical care units in the United States and Canada whether there had been such a tool developed. The Barnes-Jewish Hospital has developed the transport stability scale (© R. Corcoran and M.J. Barnes, Barnes-Jewish Hospital, St. Louis, MO). The scale has three colour-coded areas and identifies the patient's appropriate level of transport accompaniment. The colours of traffic lights are used: *green* – May travel with patient transporter; *yellow* – Required higher level of oversight, must travel with nurse or physician; *red* – Unstable, must travel with nurse and physician. We used this scale as the foundation for our tool.

Intervention

A subgroup of the Department's Patient Safety and Adverse Events team (PSAT) was formed, consisting of a respiratory therapy supervisor, two registered nurses, a critical care physician and the department's quality improvement and patient safety leader. The group determined 29 steps involved in transporting an ICU patient for diagnostic tests, from the time the decision was made for testing, to when the patient returned to the ICU, making it a complicated process (Figure 1). Two options were determined if the patient was unstable: abort/postpone the test or have a physician accompany the patient. It was determined by the group that there were no objective criteria to make this decision. The group agreed to develop an ICU transport decision scorecard to assist the bedside nurse in determining the stability of the patient being transported.

The team decided that the scorecard should be considered from the point of view of the novice staff member to ensure that conditions were not missed due to lack of experience or ability to recognize potentially critical sequelae. The team walked through the process for preparing for an intrafacility transport using a "systems" approach and identified endpoints that would require reassessment by the critical care physician. The tool led the nurse to determine whether a physician should accompany the transport or suggest delaying or cancelling the test.

These items were then inserted into a draft scorecard. Initially, we used "*green-yellow-red*" columns: *green* identifying those who were safe to travel with an RN; *yellow* identifying the need for a RRT to accompany the patient; and *red* identifying the need for further assessment by a critical care physician and inclusion in the transport team. Nurses, respiratory therapists and physicians have a role in the completion of the scorecard prior to the transport (Figure 2).

Figure 2. ICU patient transport decision scorecard

System	**Green** Patient to be accompanied by IV direct & defibrillation certified RN	**Yellow** Checkmark in ANY box indicates patient to be accompanied by RN & RRT. **MD/RRT to assess items as indicated below**	**Red** Checkmark in ANY box indicates patient to be accompanied by RN & RRT and may include MD assistance. **MD to assess items as indicated below**
CNS	☐ Riker 1 – 4 or GCS 13-15 ☐ PRN sedative orders & adequate supply ☐ Cleared/stable C-spine		☐ Unexplained change in Riker &/or GCS. ☐ Riker > 4 ☐ Unstable/uncleared C-spine ☐ Paralysed (with orders for sedative/paralytics & adequate supply of drugs) ☐ Seizures ☐ ICP unresponsive to ongoing therapy ☐ Active warming or cooling
CVS	☐ Chest pain relieved & no new ECG changes ☐ Stable or decreasing vasopressor requirements ☐ Stable dysrhythmias ☐ Hemodynamic goals ordered & met ☐ Ensure adequate supply of IV fluids & meds to complete transport		☐ New onset or chest pain unrelieved &/or ECG changes ☐ Increasing vasopressors ☐ New onset or hemodynamically unstable dysrhythmias (i.e. VT/VF/Afib/PSVT) ☐ Active fluid resuscitation in progress ☐ Active bleeding ☐ No hemodynamic goals ordered
Resp	☐ FiO2≤ 0.5 & unchanged ☐ Nasal prongs ≤ 6L/min & unchanged or decreased ☐ Regular nasal prongs ☐ RR 10 – 24 ☐ Ensure oxygen tank is full	☐ Intubated & tube position confirmed by CXR or bronchoscopy **MD to confirm** → ☐ Suctioning ≥ Q1H required ☐ FiO2 > 0.5 or increasing ☐ **RRT to assess** → ☐ High flow nasal prongs ☐ **RRT to assess** → ☐ Presence of a Tracheostomy or Cricothroidostomy tube	☐ PEEP > 10 &/or FiO2>0.6 ☐ Change in RR <10 or >24 ☐ pH < 7.25 ☐ Ventilation mode: IRV, APRV, HFOV ☐ Hemoptysis ☐ Non-invasive ventilation (BiPAP, CPAP) ☐ FiO2 > 0.5 or increasing (non-ventilated pt) ☐ Known or suspected difficult airway, difficult intubation, or traumatic intubation
GI/GU	☐ Vomiting controlled with meds ☐ Orders for anti-emetic & adequate supply ☐ Quantity of contrast given per order & OG/NG clamped ☐ Insulin infusion off & chemstrip > 4.0		☐ Open ABD cavity with exposed viscera ☐ Insulin infusion off & Chemstrip ≤ 4.0 ☐ Active treatment of life threatening electrolyte abnormalities ☐ Active uncontrollable vomiting ☐ Active GI bleed or bleeding from surgical wound or drain
Lines	☐ All lines dressed & secured per policy ☐ Lumbar subarachnoid drain levelled & secured as per policy ☐ Chest tubes that can be clamped or to straight drainage during transport ☐ Transvenous pacemaker with good capture ☐ ICP monitoring device secured		☐ Chest tubes that need suction during transport ☐ Transvenous pacemaker with poor capture ☐ Intracranial pressure monitoring device secured ☐ Unsecured vascular access
MISC	☐ Isolation patient with transport precautions as per CHR infection control policy		

Methodology/Change Process/Results

The draft tool was developed (Figure 2) and tested using the Plan-Do-Study-Act (PDSA) cycle (Langley et al. 1996). Numerous PDSA cycles were undertaken at two of the three major hospitals in the city, focusing on novice bedside nurses and respiratory therapists. The bedside RN reviewed and completed the transport tool prior to leaving the unit. A delay in departure from the unit that exceeded two hours resulted in a reassessment of the patient's status.

Results from testing the transport tool were fairly consistent despite the variety of patients from the two distinctly different participating ICUs. Anecdotally, nursing staff agreed that the tool allowed them to pause and evaluate the patient immediately prior to leaving the controlled and well-supported ICU.

Figure 3. Revised ICU patient transport decision scorecard

calgary health region
Critical Care Medicine

ICU PATIENT Transport Decision Scorecard

To be used for patient assessment prior to transport within the hospital

IF IN DOUBT, ALWAYS ASK FOR HELP

Patient addressograph:

Read instructions on back of page and start here → Order received and all supplies available → Full O_2 tank (s) → Lines & Tubes secured & position verified by MD → Adequate IV drip and infusions → Emergency medication/ sedation, analgesia → Discontinue IV insulin (if applicable) unless otherwise ordered by MD → Does patient require IV contrast? If yes, consent signed: ☐Yes ☐ No → Assess Each System Below

System	Criterion	Green	Red
CNS	Riker	3-4	< 3 or > 4
	GCS	13-15	< 13
	C-spine fracture	Stable	Unstable
	Consciousness	No change	Unexplained change
	ICP	Controlled	Uncontrolled
	Paralyzed/sedated	No	Yes
	Seizing	Controlled	Uncontrolled
	Active Warming/Cooling	No	Yes
CVS	Goals	Met	Unmet
	Chest pain	Relieved	New pain or ECG changes
	Pacemaker		Pacer with poor capture (exclude MRI)
	Pressors	Stable	Increasing
	Dysrhythmia	Stable	New or unstable
	Fluid resuscitation	No	Active
RESP	RR	10-24	< 10 or > 24
	Oxygen	< 40% or ≤ 6 Lpm	40% or > 6Lpm or increasing
	Artificial Airway	Not present	Present
	Difficult Airway	Not suspected	Difficult Airway anticipated or confirmed
	pH	≥ 7.30	< 7.30
	Ventilator setting	N/A	Non-conventional mode of ventilation (IRV, APRV, HFOV)
	PEEP	N/A	☐ ≥ 10 cm H_2O
GI/GU	Abdomen	Closed	Open
	Electrolyte abnormalities	Not life threatening	Life threatening
OTH	Bleeding	No	Active
	Vascular access	Secure	Unsecured
	Lines/tubes	Standard	Complex
	Isolation	Contact	Droplet/Airborne
		IF ANY CRITERIA MET IN GREEN, RN TO ACCOMPANY A PER ICU PRACTICE	IF ANYCRITERIA MET IN RED, MD AND RRT TO RE-ASSESS, RN AND RRT TO ACCOMPANY AND MAY INCLUDE MD AND ANOTHER RN

RT MUST RE-ASSESS (RR through Abdomen, Red column)

Staff felt empowered to present their patient to the attending physician as being stable or unstable for transfer from the unit. It also helped them to identify and minimize the risks associated with removing a critically ill patient from the ICU environment. Comments arising from these PDSA cycles led to further revisions of the scorecard.

At the third site, there was resistance to using the tool. One reason was that PSAT did not have any members from this site. DI was immediately adjacent to the ICU, and staff did not feel it necessary to go through the checklist. However, they did feel it would be useful for tests that were performed further away.

In total, 80 forms were obtained through the testing. Frequency of responses from each item on the scorecard was entered into an Excel spreadsheet. In an effort to shorten the scorecard, the team collectively reconsidered each of these items and removed those that had not been considered in the assessment.

Further PDSA cycles revealed the tool was too complex and not user-friendly. There was resistance from senior nurses and physicians to using the tool. The tool was further modified to include items that are clear decision points or "show stoppers." This would ensure the physician accompanied the transport or the transport was aborted (Figure 3).

Outcome measures have been added to record cancelled transports, physician presence and any problems during the transport. The ultimate goal will be to ensure that incidents such as those described in our section "The Two Cases" above will be prevented.

Application of Human Factors

Effective forms accommodate two streams of information: instructions for the person completing the form and collection of specific information from that person. When successful, the information flows in both directions between the form and the form filler. While it sounds simple, it can be particularly challenging in light of estimates suggesting that form fillers read less than 50% of relevant information such as instructions (Frohlich 1986).

A variety of formats (i.e., directed forms and checklists) have been designed to change typical behaviours to increase the likelihood that users will more effectively complete the form because they have read the instructions and the questions. Directed forms incorporate forced choices or decision points (i.e., yes/no) whereby users must read the question in order to make a decision. Data from Frohlich's observational study confirmed the benefits of directed forms to effectively alter form completion behaviours. Checklists, on the other hand, permit users to scan through a list in search of relevant points. Critical information perceived to be irrelevant can be skipped.

As applied to the ICU patient transport decision scorecard, decision points were created for each criterion to ensure form fillers considered all points. In other words, the successful completion of this form required users to allocate (and consider) one checkmark for each criterion. The utilization of a traditional checklist would permit users to scan through the criterion list, increasing the likelihood that some points would be missed.

Although directed forms require form fillers to read the questions, the same cannot be assumed about the instructions. In an effort to reduce the reading effort and general memory requirements, attempts were made to incorporate instructions into the form where required by users. To illustrate, instructions previously located on the cover page of the tool (Figure 2) read:

> Patient should score in the Green zone to be stable for transport. If there are any checkmarks in the yellow or red zone the MD needs to reassess patient for transport (please read instructions below).

To successfully carry out these directions, users are required to read the instructions, store this information in their short-term memory, conduct the assessment and then recall (or reread) the instructions. The subsequent version of the tool has the checkboxes inside coloured columns with subsequent actions required when boxes within the column are checked. In this way, the instructions are available when required by the user.

The final version of the tool now has only two colours: green and red. Feedback from PDSA cycles suggested further simplification of the tool by having two columns only. The yellow column only had items specific to the respiratory therapist's assessment. Incorporating human factors principles to reinforce decision points, these items were refined and moved into the red column.

Discussion/Conclusions

The transport of the ICU patient is a complicated process and can lead to patient harm. In the Department of Critical Care Medicine, Calgary Health Region, staff underestimated the risks of intrahospital transport, which led to the two adverse events mentioned above. This article has described the development of an ICU patient transport decision scorecard to support the safe transport of ICU patients for diagnostic testing.

The scorecard is a visual assessment tool. Each item on it is a decision point and a simple reminder to ensure that appropriate resources are available prior to transport. Outcome measures have been added to begin to measure the effectiveness of the tool.

Several lessons were learned from the development of this tool: the need to form a subgroup with team members from all sites and disciplines to ensure early buy-in; the involvement of a human factors expert to make the tool easier to use; and the need to continuously retest the tool using PDSA cycles.

One concern identified was the resistance to using the tool when DI is close to the ICU. Proximity may provide a false sense of safety for staff transporting the patient. As Kalisch et al. (1995) have identified, the monitoring of patients can decrease significantly during transport, and important physiologic changes may not be identified. This might lead to an adverse event regardless of where DI is located. The tool provides an initial step in training and orienting staff to the complexities of transport.

Continuous monitoring of the scorecard will be necessary to ensure it is being used to assist with the decision to transport. As one source has stated, "although standard documents and 'pre-flight' checklists are important in developing safe practice, they are of limited value unless the practitioner at the bedside translates them into effective action" (Shirley and Bion 2004).

The tool will be further adapted for all critically ill patients going to DI or the operating room, or patients coming from the emergency department to the ICU. The principles used in the development of this tool will be applied in revision of the Department's ICU interfacility transfer checklist. The tool may be applicable for the transport of non-ICU patients and may be modified by other clinical departments.

Finally, to our knowledge, no such tool has been developed or is currently being used in other ICUs across Canada. We hope to share it with teams from the Canadian Collaborative to Improve Patient Care and Safety in the ICU (www.improvementassociates.com).

Instruction pages are available online. See Appendix at http://www.longwoods.com/product.php?productid=18376&cat=452

About the Authors

Rosmin Esmail, MSc, is the Quality Improvement and Patient Safety Leader for the DCCM, Calgary Health Region (CHR).

Deborah Banack, RN, NZRCpN, is an ICU nurse at the Peter Lougheed Centre, CHR.

Cheryl Cummings, RN, BScN, was an ICU nurse at the Peter Lougheed Centre, CHR.

Judy Duffett-Martin is the Respiratory Therapy Supervisor at the Peter Lougheed Centre, CHR.

Karen Rimmer, MD, FRCPC, is an intensivist at the Peter Lougheed Centre and Clinical Safety and Quality Assurance Chair, CHR.

Jonas Shultz, MSc, is the Human Factors Consultant, CHR.

Teresa Thurber, RN, was a Nurse Clinician at the Rockyview General Hospital, CHR.

Terrance Hulme, MD, FRCPC, is an intensivist at the Rockyview General Hospital, CHR.

Please direct correspondence to: Rosmin Esmail, Calgary Health Region, Foothills Medical Centre, Critical Care, Room EG23, 1409 – 29th Street NW, Calgary, AB T2N 2T9. Tel: 403-944-2593. Fax: 403-283-9994. E-mail: rosmin.esmail@calgaryhealthregion.ca.

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