

Patient Safety Tip of the Week

March 31, 2020

Intrahospital Transport Issues in Children

Lots of things can go wrong when hospital inpatients are transported to other areas of the hospital (for example, to radiology, a lab, the OR, physical therapy, etc.). We’ve done many columns (listed below) on the hazards of such intrahospital transports. Our May 22, 2018 Patient Safety Tip of the Week “[Hazardous Intrahospital Transport](#)” summarized the multiple issues encountered in such transports.

But we’ve focused primarily on adult inpatients in our prior columns. A new systematic review looked at adverse events during intrahospital transport of critically ill children ([Haydar 2019](#)). They identified 40 full-text articles with sufficient information about adverse events in children during intrahospital transport. Studies were heterogeneous and the incidence of adverse events varied widely between studies.

Respiratory and airway events were the **most common** type of adverse event. **Hypothermia** was common in infants. They also found instances of emergent tracheostomy, pneumothorax, and cardiac arrest. One transport-associated death was reported.

One hazard we have not commented upon often enough in intrahospital transports is **hypothermia**. We did discuss the risk of hypothermia in **interhospital** transfers (see our October 30, 2018 Patient Safety Tip of the Week “[Interhospital Transfers](#)”). But children, particularly **infants**, are especially prone to hypothermia.

In our January 7, 2020 Patient Safety Tip of the Week “[Even More Concerns About MRI Safety](#)” we discussed a study that showed most children who undergo MRI while under anesthesia experience hypothermia at some point during the procedure ([Cronin 2019](#)). Using MRI-compatible temperature monitoring, the researchers found that 63% of patients less than 8 years of age exhibited hypothermia (median temperature less than 36°C) at some point during MRI. Most instances of hypothermia occurred early, particularly during anesthesia induction and prior to the initiation of the MRI scan, and then improved during the scan. That was ascribed to the fact that the scanning environment is typically kept cool, with a low humidity, and heat loss to the surrounding environment typically occurs after induction of anesthesia. Later, body temperature tends to increase during the MRI scan secondary to MR radiofrequency heating. The

researchers did not find any increase in perianesthetic complications or an impact on PACU length of stay. However, the study was limited to children undergoing outpatient procedures. It is quite conceivable that sicker, more vulnerable inpatients might be impacted by such hypothermia. The authors, therefore, recommend interventions for these patients should be focused on maintaining normothermia during the anesthesia induction and prior to initiation of the MRI scan. MRI-compatible continuous temperature monitoring is important for managing temperature for these anesthetized patients.

A recent study ([Brozanski 2020](#)); focused on keeping infants warm in the perioperative period. While their interventions included prewarming the OR and standardized practice to prevent intraoperative heat loss, they also included establishing euthermia **before transport** to the operating room (OR) and standardized practice for maintaining euthermia **on transport to and from the OR**. Postoperative hypothermia decreased by 48%, from a baseline of 20.3% to 10.5% after implementation of these interventions. And, if your focus is on preventing hypothermia, you obviously need to have a way of monitoring body temperature.

Haydar et al. found that many adverse events during intrahospital transport were deemed potentially preventable. Two strategies stood out to potentially mitigate adverse consequences: use of **checklists** and **double checks**.

Checklists are essential for patient safety during intrahospital transports. Our many columns on the “**Ticket to Ride**” checklist are listed at the end of today’s column. In our August 25, 2015 Patient Safety Tip of the Week “[Checklist for Intrahospital Transport](#)” we discussed many factors contributing to incidents related to intrahospital transports. These include equipment failures, oxygenation issues, battery/power issues, and things like attention to patient hydration. And don’t forget the problems that arise when sending diabetic patients off for substantial periods of time (what to do with their insulin, planning for meals, etc.). We refer you to a Netherlands study ([Brunsveld-Reinders 2015](#)) to actually see a good checklist they created for intrahospital transports. The article also addresses transport team composition (which may vary depending upon whether the patient is ventilated or on pressors or inotropes) and education/training needs for members of the transport team.

A good “Ticket to Ride” type checklist for intrahospital transport should cover all three phases of transport: pre-transport, during-transport, and post-transport ([Jarden 2010](#), [Brunsveld-Reinders 2015](#))

We probably would not put as much weight on double checks as do Haydar et al. Double checks in such situations are often done in a perfunctory manner and the original and second person often assume that any discrepancies will be picked up by the other person. If you rely on double checks, they must be done in a truly independent manner. Probably the two most important items you would want to double check are the oxygen supply and the battery charge on any portable ventilator, ensuring that both are adequate for the anticipated duration of the transport (plus an allowance for unanticipated duration).

Of course, staff accompanying the patient need to be familiar with any equipment used during transport. We'd add that hospital personnel on the receiving end also be familiar with the transport equipment. That brings us to another thing we'd emphasize: the need for an appropriate **handoff** prior to the and following the transport. Let's say you are transporting a critically ill child to the Radiology suite for a CT scan. You should discuss with the radiology nurse or radiology staff whether your patient is on oxygen, being ventilated, what sorts of medications are running in various lines, etc. and discuss what events might be anticipated.

The literature suggests that the risk of incidents and adverse events during transports is also related to the **time duration** of the transport. Hence, events such as CT scanning tend to be associated with more incidents because they require more time ([PPSA 2005](#)). For example, the risk of running out of oxygen would be greater on longer transports. You'll recall that the original "Ticket to Ride" checklists were created because of such oxygen depletions during transports.

Two key factors related to the risk of adverse events during transport noted by Haydar et al. are the patient's underlying illness and degree of respiratory support. They noted that mechanical ventilation was superior to manual ventilation in intubated patients. Don't forget that, in addition to checking to make sure the oxygen supply will be adequate for the planned duration of the transport, to also check that the battery charge on any portable ventilator will be sufficient for the duration of the transport.

And Haydar et al. stress the importance of optimizing the patient's physiological status prior to transport. They also recommend having experienced clinicians accompany the patient.

The destination of the transport may also be important. Probably the most common destination for intrahospital transports is the Radiology suite. We refer you back to our October 22, 2013 Patient Safety Tip of the Week "[How Safe Is Your Radiology Suite?](#)" for a comprehensive discussion of all the things that can go wrong when a patient is sent to the radiology suite. With children, you also need to consider they may require **sedation** or anesthesia for their imaging study or procedure and plan for appropriate monitoring. Keep in mind that some effect of sedation may still be present during the trip back to the ICU or floor so you must be prepared for an event such as respiratory depression.

Do you want a parent to accompany the child? That may be a good idea in some cases, since it may help allay any anxiety the child has. But even if a parent is not accompanying the child, it is a good idea to keep the parent(s) in the loop. A checklist for transport of pediatric surgery patients at the Medical Center of Central Georgia ([Nakayama 2012](#)) included an item for verification of family location and actually included their cell phone number and home telephone number on the checklist.

Lastly, there is one question that we see consistently overlooked: **does the patient really need the test/procedure for which you are transporting him/her?** When we do a root

cause analysis on any event related to a procedure, test, imaging, or transport, the first question we usually ask is “Was the procedure necessary?”. You’d be surprised how often we hear waffling on that question. In our August 25, 2015 Patient Safety Tip of the Week “[Checklist for Intrahospital Transport](#)” we noted a commentary by Shirley and Bion ([Shirley 2004](#)) which noted the importance of making the **decision about whether to transport a patient**. They note that such decision “should be made by a senior, experienced and appropriately skilled clinician who remains responsible for the conduct of the transfer”. The **potential benefits** of a transport must be critically weighed against the **potential risks**. Beckmann et al. ([Beckmann 2004](#)) cite studies suggesting that care plans were changed for patients after such transports in only 24-39% of cases. So one really needs to consider how likely the imaging study (or other procedure the patient may be going for) is really going to change patient management.

In our August 25, 2015 Patient Safety Tip of the Week “[Checklist for Intrahospital Transport](#)” we discussed “**the 5 W’s**” of intrahospital transport ([Day 2010](#)). The first “W” is “**Why**” or “Why does the patient need to leave the ICU for the procedure?”. Important questions to ask here are “Are there bedside alternatives for the procedure? And “Is the patient’s condition stable?”. If the patient is considered unstable, the next questions are “Is the transport for a lifesaving intervention?” and “Is the transport to a diagnostic test pivotal to decision for emergent plan?”. Day’s second “W” is “**Who**”. This included both who is the patient and who will be caring for the patient and, importantly, will a handoff be required? The third “W” is “**What**” and refers to equipment, airway, ventilator support, circulatory support, and special considerations (eg. spine stability, intracranial pressure monitors, etc.). Under the fourth “W” for “**When**” Day discusses considerations about coordinating with the timing of the test or procedure (eg. fasting or withholding anticoagulants for procedures), renal protective protocols for contrast-using procedures, and collaborating with other healthcare providers. The last “W” is for “**Where**” which includes details about the route to be taken, issues regarding MRI safety if going for MRI, etc.

Intrahospital transports, whether involving critical care patients or others, need to be undertaken with considerable planning. You need to ensure that you have systems in place to ensure the safety of the patients and tools like the “Ticket to Ride” checklists to facilitate safe transports.

Do you know the rate of adverse events during intrahospital transports is in your hospital? What sorts of issues have you found in your RCA’s (root cause analyses) of such events? Do you have formal policies and procedures for intrahospital transports? Do you utilize a “Ticket to Ride” type checklist before, during and after such transports? Do you have ones that specifically apply to pediatric patients? If not, that’s another great topic for FMEA (Failure Mode and Effects Analysis).

Some of our prior columns on the “Ticket to Ride” concept:

- April 8, 2008 [“Oxygen as a Medication”](#)
- November 18, 2008 [“Ticket to Ride: Checklist, Form, or Decision Scorecard?”](#)

- August 11, 2009 [“The Radiology Suite...Again!”](#)
- March 13, 2012 [“Medical Emergency Team Calls to Radiology”](#)
- August 25, 2015 [“Checklist for Intrahospital Transport”](#)
- September 1, 2015 [“Smarter Checklists”](#)
- November 2016 [“Oxygen Tank Monitoring”](#)
- February 2018 [“Oxygen Cylinders Back in the News”](#)
- May 22, 2018 [“Hazardous Intrahospital Transport”](#)
- October 30, 2018 [“Interhospital Transfers”](#)

Some of our prior columns on patient safety issues in the radiology suite:

- October 16, 2007 [“Radiology as a Site at High-Risk for Medication Errors”](#)
- February 19, 2008 [“MRI Safety”](#)
- September 16, 2008 [“More on Radiology as a High Risk Area”](#)
- October 7, 2008 [“Lessons from Falls....from Rehab Medicine”](#)
- October 2008 [“Preventing Infection in MRI”](#)
- March 17, 2009 [“More on MRI Safety”](#)
- March 2009 [“Risk of Burns during MRI Scans from Transdermal Drug Patches”](#)
- August 11, 2009 [“The Radiology Suite...Again!”](#)
- January 2010 [“Falls in the Radiology Suite”](#)
- August 2010 [“Sedation Costs for Pediatric MRI”](#)
- January 25, 2011 [“Procedural Sedation in Children”](#)
- February 1, 2011 [“MRI Safety Audit”](#)
- October 25, 2011 [“Renewed Focus on MRI Safety”](#)
- March 13, 2012 [“Medical Emergency Team Calls to Radiology”](#)
- August 2012 [“Newest MRI Hazard: Ingested Magnets”](#)
- October 22, 2013 [“How Safe Is Your Radiology Suite?”](#)
- February 25, 2014 [“Joint Commission Revised Diagnostic Imaging Requirements”](#)
- July 2014 [“New MRI Risks: for Staff!”](#)
- July 1, 2014 [“Interruptions and Radiologists”](#)
- November 2014 [“More Radiologist Interruptions”](#)
- October 21, 2014 [“The Fire Department and Your Hospital”](#)
- June 23, 2015 [“Again! Mistaking Antiseptic Solution for Radiographic Contrast”](#)
- August 25, 2015 [“Checklist for Intrahospital Transport”](#)
- March 22, 2016 [“Radiology Communication Errors May Surprise You”](#)
- August 2016 [“Guideline Update for Pediatric Sedation”](#)
- October 2016 [“MRI Safety: There’s an App for That!”](#)
- January 17, 2017 [“Pediatric MRI Safety”](#)
- August 8, 2017 [“Sedation for Pediatric MRI Rising”](#)
- November 14, 2017 [“Tracking C. diff to a CT Scanner”](#)
- March 2018 [“MRI Death a Reminder of Dangers”](#)

- March 2018 “[Cardiac Devices Safe During MRI But Spinners!?](#)”
- April 2018 “[Radiologists Get Fatigued, Too](#)”
- May 2018 “[Cost of Interrupting a Radiologist](#)”
- November 2018 “[OMG! Not My iPhone!](#)”
- December 11, 2018 “[Another NMBA Accident](#)”
- April 2, 2019 “[Unexpected Events During MRI](#)”
- September 2019 “[New MRI Hazard: Magnetic Eyelashes](#)”
- October 15, 2019 “[Lots More on MRI Safety](#)”
- November 5, 2019 “[A Near-Fatal MRI Incident](#)”
- November 12, 2019 “[Patient Photographs Again Help Radiologists](#)”
- November 26, 2019 “[Pennsylvania Law on Notifying Patients of Test Results](#)”
- January 7, 2010 “[Even More Concerns About MRI Safety](#)”

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