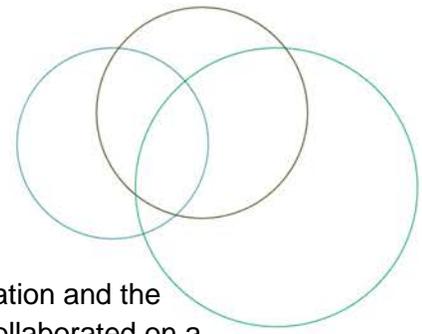


HOSPITAL HARM IMPROVEMENT RESOURCE

# Patient Trauma



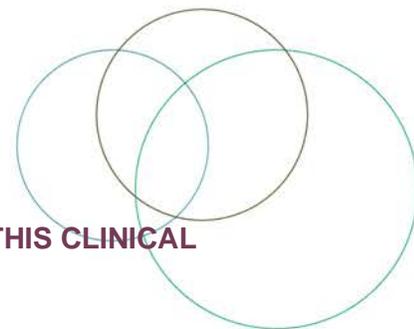
## ACKNOWLEDGEMENTS



The Canadian Institute for Health Information and the Canadian Patient Safety Institute have collaborated on a body of work to address gaps in measuring harm and to support patient safety improvement efforts in Canadian hospitals.

The Hospital Harm Improvement Resource was developed by the Canadian Patient Safety Institute to complement the Hospital Harm measure developed by the Canadian Institute for Health Information. It links measurement and improvement by providing resources that will support patient safety improvement efforts.





## DISCHARGE ABSTRACT DATABASE (DAD) CODES INCLUDED IN THIS CLINICAL CATEGORY:

### C19: Patient Trauma

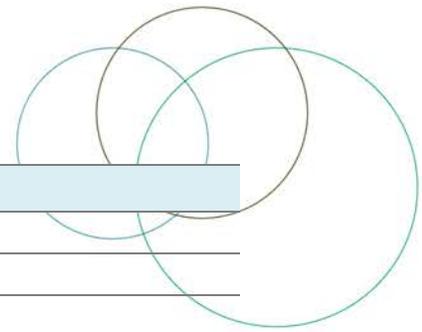
<b>Concept</b>	In-hospital injuries, such as fractures, dislocations, burns, etc., not related to medical or surgical procedures.
<b>Notes</b>	This group does not include injuries associated with a surgical or medical procedure (refer to D19: Patient Trauma).
<b>Selection criteria</b>	
M96.6 S00–T32 T71	Identified as diagnosis type (2) <b>not in a diagnosis cluster AND U98.20*</b>

### D19: Patient Trauma

<b>Concept</b>	<b>Injuries, fractures, dislocations, burns, etc., associated with a medical or surgical procedure identified during the hospital stay.</b>
<b>Notes</b>	Refer to C19: Patient Trauma for injuries, fractures, dislocations, burns, etc., that are not related to medical or surgical procedures.
<b>Selection criteria</b>	
S00–T19 T71	Identified as diagnosis type (2) <b>AND Y60–Y84 in the same diagnosis cluster OR</b> Identified as diagnosis type (3) <b>AND T80–T88 as diagnosis type (2) AND Y60–Y84 in the same diagnosis cluster</b>
M96.6 T20–T32	Identified as diagnosis type (2) <b>AND Y60–Y84 in the same diagnosis cluster</b>
<b>Codes</b>	<b>Code descriptions</b>
M96.6	Fracture of bone following insertion of orthopedic implant, joint prosthesis, or bone plate
S00–S09	Injuries to the head
S10–S19	Injuries to the neck
S20–S29	Injuries to the thorax
S30–S39	Injuries to the abdomen, lower back, lumbar spine and pelvis
S40–S49	Injuries to the shoulder and upper arm
S50–S59	Injuries to the elbow and forearm
S60–S69	Injuries to the wrist and hand
S70–S79	Injuries to the hip and thigh
S80–S89	Injuries to the knee and lower leg

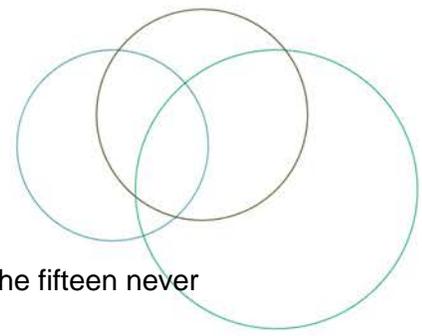


**HOSPITAL HARM IMPROVEMENT RESOURCE**  
**Patient Trauma**



Codes	Code descriptions
S90–S99	Injuries to the ankle and foot
T00–T07	Injuries involving multiple body regions
T08–T14	Injuries to unspecified parts of trunk, limb or body region
T15–T19	Effects of foreign body entering through natural orifice
T20–T32	Burns and corrosions
T71	Asphyxiation
Y98.20	Place of occurrence, hospital
Additional Codes	Inclusions
T80–T88	Complications of surgical and medical care, not elsewhere classified (refer to <a href="#">Appendix A</a> of the <a href="#">Hospital Harm Indicator General Methodology Notes</a> )
Y60–Y84	Complications of medical and surgical care (refer to <a href="#">Appendix A</a> of the <a href="#">Hospital Harm Indicator General Methodology Notes</a> )





## OVERVIEW AND IMPLICATIONS

According to the report [Never Events for Hospital Care in Canada](#), three of the fifteen never events are associated with patient trauma during hospitalization:

- Patient death or serious harm due to uncontrolled movement of a ferromagnetic object in an MRI area,
- Patient death or serious harm due to an accidental burn and
- Patient death or serious harm as a result of transport of a frail patient, or patient with dementia, where protocols were not followed to ensure the patient was left in a safe environment (Canadian Patient Safety Institute 2015)

Additionally, evidence from the Canadian Adverse Event Study, indicates that adverse events classified as ‘Other’, including burns and falls was the sixth leading cause of an adverse event in Canada (Baker, Norton, et al, 2004).

### Falls

A fall is defined as a sudden, unintentional change in position causing an individual to land at a lower level, on an object, the floor, the ground or other surface (e.g. mat). Injuries sustained by visitor slips, trips, and falls can result in significant harm and costs. Falls can be classified as:

- Anticipatory (patients exhibit clinical signs that contribute to increased falls risk),
- Unanticipated (physiological falls that cannot be predicted before first occurrence) and
- Accidental (result of mishaps)

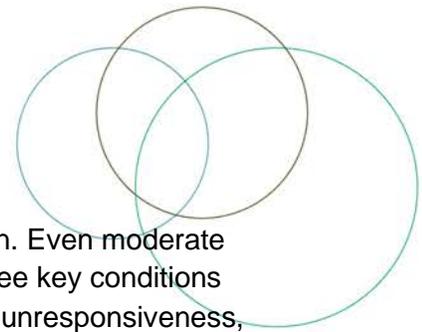
Anticipated falls can be prevented through screening for falls risk factors, communication and in-depth assessment and implementation of targeted prevention strategies (HIROC 2016).

A range of risk factors (>400) have been identified as influencing whether individuals are likely to fall. The BBSE MODEL of fall-related risk factors identifies biological (intrinsic), behavioural, social and economic and environmental (extrinsic) risk factors. The more risk factors an individual has, the greater the risk of falling (*Safer Healthcare Now!* 2013; RNAO 2017).

Falls may cause considerable physical harm, including fractures, soft tissue injuries, haematomas, lacerations and pressure sores due to subsequent immobility; as well as psychological distress such as fear of falling and humiliation and potentially resulting in chronic pain, loss of independence, reduced quality of life, and even death (Johal 2009; Public Health Agency of Canada 2014; Accreditation Canada, CIHI, CPSI 2014).

Studies in acute care settings show that fall rates range from 1.3 to 8.9 falls per 1,000 patient days, with higher rates in units that focus on geriatric care, neurology, and rehabilitation (Oliver 2010). Research shows that close to one-third of falls can be prevented (Ganz, et al. 2013/2018).





## Burns/Scald

Burns to skin (or other organs) is a function of both temperature and duration. Even moderate heat applied for a long duration is capable of producing burns. There are three key conditions that predispose patients to burns including insensitivity to pain/temperature, unresponsiveness, or inability to communicate. In addition, impaired ability for the vasculature to help dissipate heat from the skin may predispose a patient to a burn (Patient Safety Solutions 2010).

Hospital emergency rooms and operating rooms contain the three primary elements needed to ignite a fire:

- An oxidizer (anesthesia products such as oxygen and nitrous oxide).
- Fuel (surgical drapes, alcohol swabs, etc.).
- An ignition source (lasers, electrosurgical devices such as a cautery knife, etc.)

Fires that ignite in or around a patient during surgery are a real danger and are especially devastating if open oxygen sources are present during surgery of the head, face, neck, and upper chest (ECRI 2016).

A search of patient safety reporting/alert systems revealed that the potential causes of accidental burns include:

- A hot towel prepared in a plastic bag coming in contact with patient's body during bed-bath (Japan Council for Quality Health Care 2010).
- Use of a hot water bottle (Japan Council for Quality Health Care 2010).
- Fire and the use of Alcohol-based hand cleansers (New South Wales Department of Health 2007).
- Water temperature too hot during bathing (Japan Council for Quality Health Care 2007).
- Vaseline and treatment with oxygen (European Union Network for Patient Safety 2011).
- Heat therapy such as heating pads or hot packs (Data snapshot 2009).
- Food preparation and hot liquid spills (Data snapshot 2009).
- Burns Caused by the Tip of a Light Source Cable during Surgery (Japan Council for Quality Health Care 2012).
- Risk of skin-prep related fire in operating theatres (National Health Service Commissioning Board 2012).

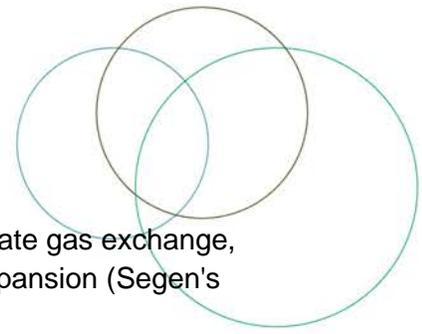
## Asphyxiation

Asphyxia is severe hypoxia leading to hypoxemia and hypercapnia, loss of consciousness, and, if not corrected, death. There are many circumstances that can induce asphyxia; some of the more common causes are drowning, electrical shock, aspiration of vomitus, lodging of a foreign body in the respiratory tract, inhalation of toxic gas or smoke, and poisoning (Mosby's Medical Dictionary 2009). A search of patient safety reporting/alert systems revealed that the potential causes of iatrogenic asphyxia include:



## HOSPITAL HARM IMPROVEMENT RESOURCE

### Patient Trauma



- Restraints; (Registered Nurses' Association of Ontario 2017).
- Positional asphyxia. This occurs when body position prevents adequate gas exchange, such as from upper airway obstruction or a limitation in chest wall expansion (Segen's Medical Dictionary 2012).
- Strangulation (Registered Nurses' Association of Ontario 2012).
- Rail entrapment – when caught, stuck, wedged, or trapped between the mattress/bed and the bed rail, between bed rail bars, between a commode and rail, between the floor and rail, or between the headboard and rail (U.S. Food and Drug Administration 2018).
- Accidental ingestion of fluid/food thickening powder (NHS 2015).
- Traumatic intubation (Pazannin et al. 2008).

### GOAL

To prevent in-hospital patient injury such as fractures, dislocations, burns, asphyxia etc. from occurring in patients.

### IMPORTANCE TO PATIENTS AND FAMILIES

In hospitals, patient accidents may cause unintended injuries or death. With the right interventions, proper communication with patients and families, and appropriate reporting and related learning, patient accidents can be prevented over the long-term.

### Patient Story

#### When providing care, put the patient into perspective

How did 80-year old Ambrose Wald fall out of a hospital chair specifically designed to stop patients from falls? It's a question to which his daughter Irene Wald, a nurse of almost 35 years, has never received an answer... (Canadian Patient Safety Institute 2013)

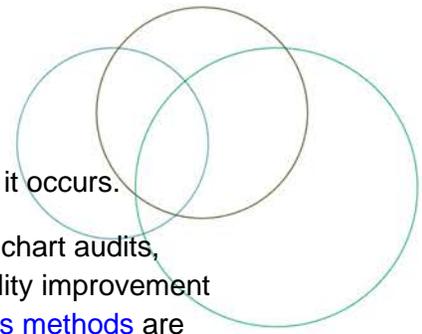
### CLINICAL AND SYSTEM REVIEWS, INCIDENT ANALYSES

Given the broad range of potential causes of complications from patient trauma, clinical and system reviews should be conducted to identify latent causes and determine appropriate recommendations

Occurrences of harm are often complex with many contributing factors. Organizations need to:

1. Measure and monitor the types and frequency of these occurrences.
2. Use appropriate analytical methods to understand the contributing factors.
3. Identify and implement solutions or interventions that are designed to prevent recurrence and reduce risk of harm.





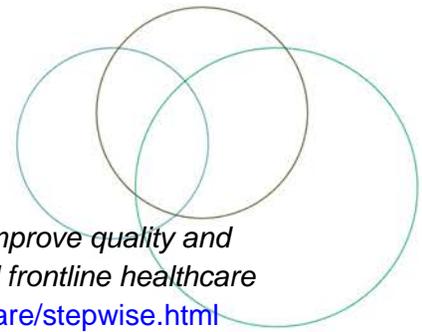
4. Have mechanisms in place to mitigate consequences of harm when it occurs.

To develop a more in-depth understanding of the care delivered to patients, chart audits, incident analyses and prospective analyses can be helpful in identifying quality improvement opportunities. Links to key resources for [conducting chart audits](#) and [analysis methods](#) are included in the [Hospital Harm Improvement Resources Introduction](#).

If your review reveals that your patient trauma related events are linked to specific processes or procedures, you may find these resources helpful:

- Agency for Healthcare Research and Quality (AHRQ). <https://www.ahrq.gov>
  - *Preventing falls in hospitals: a toolkit for improving quality of care*. 2013. <http://www.ahrq.gov/sites/default/files/publications/files/fallpxtoolkit.pdf>
- Canadian Patient Safety Institute <https://www.patientsafetyinstitute.ca>
  - Patient Safety and Incident Management Toolkit. <http://www.patientsafetyinstitute.ca/English/toolsResources/PatientSafetyIncidentManagementToolkit/Pages/default.aspx>
- *Safer Healthcare Now!* Getting Started Kit
  - Reducing Falls and Injury from Falls <https://www.patientsafetyinstitute.ca/en/Topic/Pages/Falls.aspx>
  - Falls Prevention GSK Evidence Update! New for 2018 <https://www.patientsafetyinstitute.ca/en/toolsResources/Documents/Interventions/Reducing%20Falls%20and%20Injury%20from%20Falls/Falls%20Evidence%20Update%202018-01.PDF>
- ECRI Institute [www.ecri.org](http://www.ecri.org)
  - Surgical Fire Prevention. 2016. [https://www.ecri.org/Accident\\_Investigation/Pages/Surgical-Fire-Prevention.aspx](https://www.ecri.org/Accident_Investigation/Pages/Surgical-Fire-Prevention.aspx)
- Healthcare Insurance Reciprocal of Canada (HIROC). <https://www.hiroc.com>
  - Risk Reference Sheets. *Healthcare Acquired Burns*. 2020. <https://www.hiroc.com/resources/risk-reference-sheets/healthcare-acquired-burns>
  - Appendix A: Iatrogenic Burns
  - Appendix B: Healthcare Associated Asphyxia, Entrapment & Entanglement
- National Institute for Health and Care Excellence. [www.Nice.org.uk](http://www.Nice.org.uk)
  - *Falls in older people: Assessing risk and prevention*. NICE guidelines. 2013. <http://www.nice.org.uk/guidance/cg161/chapter/1-recommendations>





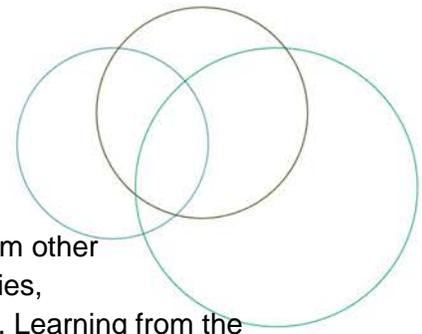
- NHS Institute for Innovation and Improvement. <https://www.nhs.uk>
  - *Stepwise falls guide. How to reduce harm (inpatient falls), improve quality and save costs: A practical step-by-step guide for ward staff and frontline healthcare teams.* 2013. [http://www.institute.nhs.uk/safer\\_care/safer\\_care/stepwise.html](http://www.institute.nhs.uk/safer_care/safer_care/stepwise.html)
- Registered Nurses' Association of Ontario (RNAO). <https://rnao.ca>
  - Preventing Falls and Reducing Injury from Falls, Fourth Edition. 2017. <https://rnao.ca/bpg/guidelines/prevention-falls-and-fall-injuries>
  - Promoting Safety: Alternative Approaches to the Use of Restraints. 2012. <https://rnao.ca/bpg/guidelines/promoting-safety-alternative-approaches-use-restraints>
  - Sustainability and the Prevention of Falls and Fall Injuries in the Older Adult. 2014. <https://rnao.ca/bpg/get-involved/acpf/executive-summaries/giselle-talledo-hastie>
- Royal College of Physicians (UK). <https://www.rcplondon.ac.uk/>
  - FallSafe Resources [https://www.rcplondon.ac.uk/search?keys=fallsafe&sort\\_by=search\\_api\\_relevance](https://www.rcplondon.ac.uk/search?keys=fallsafe&sort_by=search_api_relevance)

## MEASURES

Vital to quality improvement is measurement, and this applies specifically to implementation of interventions. The chosen measures will help to determine whether an impact is being made (primary outcome), whether the intervention is actually being carried out (process measures), and whether any unintended consequences ensue (balancing measures). In selecting your measures, consider the following:

- Whenever possible, use measures you are already collecting for other programs.
- Evaluate your choice of measures in terms of the usefulness of the final results and the resources required to obtain them; try to maximize the former while minimizing the latter.
- Try to include both process and outcome measures in your measurement scheme.
- You may use different measures or modify the measures described below to make them more appropriate and/or useful to your particular setting. However, be aware that modifying measures may limit the comparability of your results to others.
- Posting your measure results within your hospital is a great way to keep your teams motivated and aware of progress. Try to include measures that your team will find meaningful and exciting (IHI, 2012).





## GLOBAL PATIENT SAFETY ALERTS

[Global Patient Safety Alerts](#) provides access and the opportunity to learn from other organizations about specific patient safety incidents including alerts, advisories, recommendations and solutions for improving care and preventing incidents. Learning from the experience of other organizations can accelerate improvement.

### Recommended search terms:

- Accident
- Asphyxiation
- Bed entrapment
- Bed rail and restraint
- Burns
- Falls
- Healthcare related asphyxiation
- Injury
- Restraint
- Suffocation
- Surgical fires
- Choking

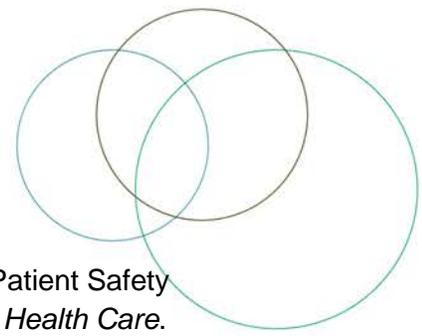
## PATIENT ACCIDENT PREVENTION SUCCESS STORIES

### Why FallSafe?

A quality improvement project that helped frontline staff to reliably deliver evidence based falls prevention.

(Royal College of Physicians)





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**HOSPITAL HARM IMPROVEMENT RESOURCE**  
**Patient Trauma**



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**HOSPITAL HARM IMPROVEMENT RESOURCE**  
**Patient Trauma**

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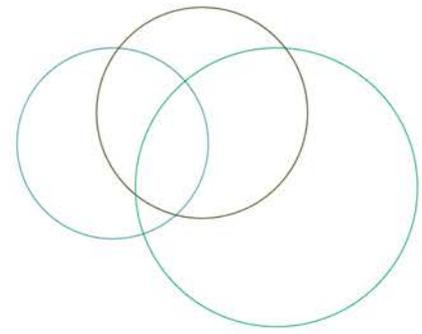
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## APPENDIX A: IATROGENIC BURNS

Prepared by the Healthcare Insurance Reciprocal of Canada (HIROC)

### Involved Procedure

- Laparoscopic ovarian cystectomy and myomectomy<sup>1</sup>
- Double lung transplantation<sup>2</sup>
- Post-operative care<sup>4,17</sup>
- Transesophageal echocardiography<sup>5</sup>
- Haemorrhoidectomy<sup>6</sup>
- Coronary artery bypass grafting<sup>6</sup>
- Orthopaedic surgery<sup>6,8</sup>
- Caesarean section<sup>7,19</sup>
- Cervicomedullary exploration and decompression<sup>9</sup>
- Transillumination<sup>10</sup>
- Excision of papilloma on upper eyelid<sup>11</sup>
- Adhesiolysis of a digital flexion<sup>12</sup>
- Bunionectomy<sup>17</sup>

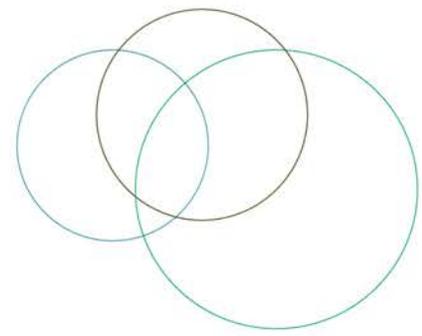
### Type of Fire/Burn

- Chemical<sup>1,5,10,22</sup>
- Thermal<sup>4,7,9,10,11,12,14,15,16,17,20</sup>

### Sources/Causes and Contributing Factors Associated With Fire/Burn

- Alcohol<sup>1,3,10,12,13,19,22</sup>
- Electro-surgical equipment<sup>1,2,6,9,11,13,14,15,16,19</sup>
- Drapes<sup>1,8</sup>
- Sponge<sup>2</sup>
- Endotracheal tube<sup>2</sup>
- Oxygen<sup>2,13</sup>
- Heat Pack<sup>4</sup>
- Anaesthetic<sup>4,17</sup>
- Equipment/environmental disinfectant<sup>5,10</sup>





- Gas system failure<sup>7</sup>
- Pulse lavage system<sup>8</sup>
- Fibre optic light<sup>10</sup>
- Cosmetic products<sup>11</sup>
- Casting<sup>17</sup>
- Pulse oximeter<sup>20</sup>
- Tourniquet<sup>22</sup>

## **RECOMMENDED MITIGATION STRATEGIES**

### **Staff Education**

- All personnel working in the operating room should have an annual fire education complemented with fire drills.<sup>18</sup>

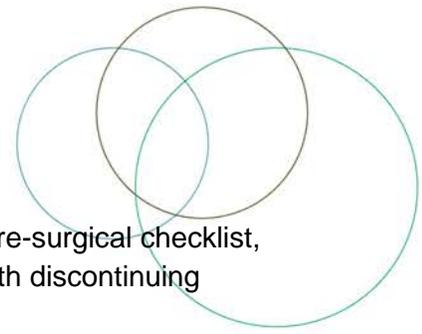
### **Skin Preparation Solutions**

- Avoid the use of 10 per cent povidone-iodine in alcohol solution, thimerosal in 50 per cent alcohol solution, 70 per cent chlorhexidine hand rub, and methanol or ethanol for skin cleaning in the operative field.<sup>1</sup>
- The use of undiluted isopropyl alcohol should be avoided in the care of neonatal patients; when used, isopropyl alcohol should not be left on the skin of a neonate for a prolonged period of time.<sup>10</sup>
- Alcohol-based skin preparation solutions should be applied using a purpose built applicator that allows the dissipation of vapour, minimizes pooling and excess application of solution, and controls the flow of solution.<sup>3</sup>
- When alcohol-based skin preparations have been used, wait for at least three minutes for the solution to dry and wipe the skin with a cotton swab before draping the operative field.<sup>1,3,6,12,16,19</sup>
- Remove any materials (e.g. swabs), drapes or gowns that have been soaked with alcohol-based skin preparations prior to commencing surgical procedures.<sup>3,8,12,19</sup>
- Use water-soluble lubricants (e.g. K-Y Jelly) as opposed to petroleum-based ointments.<sup>19</sup>

### **Disinfectants**

- Adherence to disinfection procedures and strict compliance with equipment-related technical information instructions.<sup>5</sup>
- The use of benzethonium chloride should be avoided in neonatal care environments.<sup>10</sup>
- When using disinfectant products within neonatal care environments, healthcare workers should allow adequate time for drying and appropriate ventilation of any fumes.<sup>10</sup>





### Pre-Operative Preparation

- Surgical team communication of fire risk and prevention during the pre-surgical checklist, as well as intraoperatively (e.g. timing of the use of electrocautery with discontinuing supplemental oxygen).<sup>13,18,21</sup>
- Drape the patient with a clear plastic adhesive drape to prevent the collection of flammable vapours beneath the drapes.<sup>1,6,14</sup>
- Drapes fabricated from cellulose should be avoided.<sup>8</sup>
- During ophthalmic procedures involving electro-surgical equipment, measures should be taken to ensure a make-up free ophthalmic field.<sup>11</sup>

### Intraoperative Period

- When a fire breaks out in the OR, extinguish it using fire extinguishers; surgeons must know the location of a fire extinguisher and all surgeons and members of the operating team should be well-informed regarding the fire safety protocol.<sup>1,2,8,13,16,18,21</sup>
- Sources of ignition (e.g. electrosurgical units, lasers, fiberoptic light sources, defibrillators) must be readily identified and controlled to optimize fire safety.<sup>8,13,19,21</sup>
- Surgical staff should maintain a continuous awareness about the presence and removal of potential fuels (e.g. prepping agents, dressings, linen, equipment, bodily tissues).<sup>19,21</sup>
- Avoid dry sponges when cauterizing near the airway.<sup>2</sup>

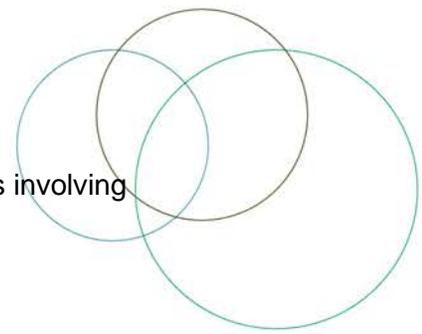
### Post-Operative Period

- When providing care to post-operative, casted or splinted patients, any complaint of pain should be thoroughly investigated, with special consideration given to avoiding thermal injuries – temperature measurements of skin should be done prior to the administration of opioids and additional touch-up nerve blocks should not be done without a thorough evaluation of the plaster cast and underlying skin.<sup>17</sup>

### Oxygen Precautions

- Lowest percentage of  $FIO_2$  should be used while operating on the airway.<sup>2,13,19</sup>
- If an open  $O_2$  source is used during the course of a head and neck procedure, the oxygen concentration should be less than 30 per cent.<sup>16</sup>
- Use a sealed gas delivery device, such as an endotracheal tube or laryngeal mask airway, if deep sedation is required during a procedure.<sup>13</sup>
- Ensure that there is no air leak from the endotracheal tube in the operative field.<sup>2,13</sup>
- Prevent oxygen from collecting under drapes by creating a venting system using IV poles or other attachments to tent drapes.<sup>13</sup>
- Colour coding of gas cylinders.<sup>7</sup>





- Capnography or gas analysis should be employed during procedures involving anaesthesia.<sup>7</sup>

### Procedures Involving Electro-Surgical Instruments

#### *Grounding Pads*

- During procedures involving electro-surgical equipment, ensure that the grounding pad is adequately applied with firm contact to the skin over an adequate surface area; non-adhesive grounding pads should be secured with bandage; and the position of all pad should be re-checked if the patient's position is changed intra-operatively.<sup>6,14,15</sup>
- Grounds pads should not be placed on the following areas: areas with little muscle, such as bony prominences (e.g. elbow joint, lower forearm); areas with a lot of body hair (e.g. hairy forearm, unshaved thigh); areas with soft tissue (e.g. lower legs).<sup>14,15</sup>
- Placement of grounding pads should take into account existing indwelling hardware; avoid grounding pad placement immediately adjacent to or overlying indwelling hardware.<sup>9</sup>
- During craniofacial procedures involving electro-surgical equipment, the grounding pad (i.e. indifferent electrode) should ideally be placed on the following locations – the mid-sternum, thoracic spine at T6, lateral chest wall mid-way between the axilla and 12<sup>th</sup> rib, or lower anterior abdominal quadrant; placement at the sites listed previously may reduce the risk of alternate-site burns – indifferent electrode placement on the thigh and forearm should be avoided.<sup>9</sup>

#### *Electro-Surgical Instrument*

- When using electro-surgical equipment, minimize the time it is used and use non-flammable equipment.<sup>1,2,19</sup>
- Use of bipolar electrocautery to minimize the amount of leakage of current.<sup>2,6,19</sup>
- Effort should be taken to limit the use of electro-surgical equipment at high currents for prolonged periods of time without interruption.<sup>15</sup>
- Avoid close proximity of an activated electro-surgical device on tissue immediately adjacent to vulnerable tissue such as bowel, ureter, and blood vessels.<sup>16</sup>
- Surgical teams should inspect electro-surgical instruments prior to procedures for any defects in insulation, with particular attention to the active electrode.<sup>16</sup>
- Employ the use of porosity detectors in sterile processing before electrosurgical instrument sterilization to detect insulation failure.<sup>16</sup>
- Laparoscopic ports should be placed so that the shafts of electro-surgical instruments do not lie adjacent to vulnerable tissue.<sup>16</sup>
- Avoid contact of monopolar active electrodes with other conductive instruments or materials while energy is being delivered to the active electrode.<sup>16</sup>
- Avoid close proximity of monopolar active electrodes to instruments that do not have insulation along their shafts.<sup>16</sup>



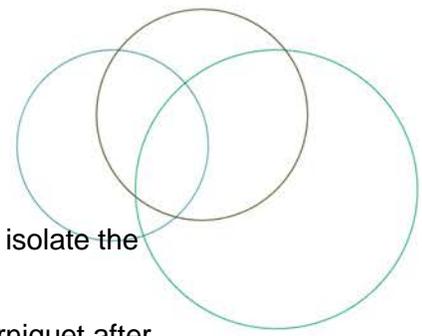
### Patient Trauma

- Ensure that laparoscopic port placement does not allow the shafts of instruments to touch vulnerable tissues.<sup>16</sup>
- Avoid the use of combined (or “hybrid”) metal and plastic laparoscopic trocars when using the monopolar instruments (e.g. “bovie” instrument).<sup>16</sup>
- Use alternative energy-based surgical devices instead of the monopolar “bovie” instrument, such as traditional bipolar, ultrasonic instruments, and advanced bipolar devices.<sup>16</sup>
- Avoid inadvertent activation injuries by: (1) utilizing a “bovie” pencil holder, (2) avoid placing energy-based devices on drapes adjacent to where surgical team members might lean, and (3) have instrument activation tones loud enough to be heard by the surgical team.<sup>16</sup>
- Avoid electro-surgical instrument interaction with other electronic devices by: (1) decreasing generator power setting, (2) using cut mode in preference to coagulation mode, (3) employing the desiccation technique rather than the fulguration technique, and (4) orienting the active electrode cord from the patient’s feet to avoid proximity of the active electrode cord to electronic devices.<sup>16</sup>
- Activate the electro-surgical unit only when the tip is in view and deactivate it before it leaves the surgical site.<sup>16</sup>
- Electro-surgical “bovie” pencils or laparoscopic devices should be in holsters when not in use and rubber sleeves should never be used over electro-surgical equipment.<sup>16,19</sup>

### Pulse Oximeters

- Standardize the makes and models of organizational pulse oximeters to avoid mixing of equipment.<sup>20</sup>
- Label pulse oximeter monitors and sensors with warnings regarding incompatibility; avoid reuse of disposable probes.<sup>20</sup>
- Engage in regular inspection of pulse oximetry equipment to exclude damaged sensors or protective covers, defective insulation, or exposed electronics.<sup>20</sup>
- When utilizing pulse oximetry, engage in frequent assessment of monitor sites; special attention should be paid to high-risk patient groups, such as neonates, the elderly, and the critically unwell.<sup>20</sup>
- Engage in frequent relocation of pulse oximetry probes during prolonged use and review the underlying skin.<sup>20</sup>
- Avoid taping pulse oximetry probes to an extremity; alternate extremities used.<sup>20</sup>
- Engage in regular review of insensate limbs during anaesthesia where prolonged pulse oximetry may be used.<sup>20</sup>





### **Tourniquets**

- When applying a tourniquet, a waterproof barrier is recommended to isolate the tourniquet to prevent pooling and impregnation of the padding.<sup>22</sup>
- When a tourniquet is applied, engage in routine inspection of the tourniquet after surgery, particularly after a spinal anesthetic, where sensation may be absent for several hours after surgery.<sup>22</sup>

### **Heat Packs**

- Heat packs are not to be heated in microwaves and should only be warmed in warm storage cabinets (e.g. warm blanket storage units or fluid warming units).<sup>4</sup>
- Caution should be employed when applying a heat pack to potentially anesthetised skin.<sup>4</sup>

### **Fiber Optic Light Sources**

- When utilizing fiber optic light sources in the care of neonatal patients, a filter to block out light with a wavelength less than 570nm should be employed.<sup>10</sup>

### **Transillumination**

- Caution is advised when employing transillumination in the care of neonatal patients.<sup>10</sup>

## **IATROGENIC BURNS CASE STUDIES**

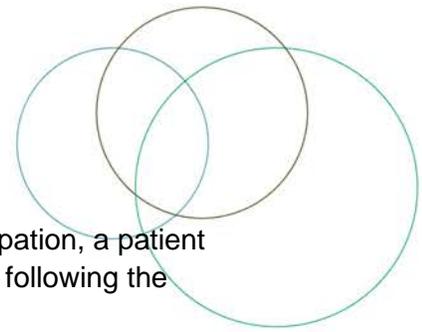
### **Claim File – 2xxx4-01**

During the course of a one-hour inter-hospital transfer via ambulance to investigate a potential severe urinary tract infection and suspected sepsis, a geriatric patient with paraplegia sustained third degree burns to his legs. The cause of the burn was determined to be related to the interaction of an in-ambulance heater with the patient's stretcher.

Investigations into the incident revealed that while an assessment was completed upon the patient's return following the transfer, the patient's burns were not identified and reported until 8-hours post-transfer. The aforementioned assessment was noted to have included the taking of the patient's temperature, as well as the completion of a flow sheet which charted the patient's pain levels. A head-to-toe assessment of the patient was not completed – nurse management within the involved facility later confirmed that full assessments of patients presenting as stable were generally postponed following evening transfers until the subsequent morning.

Following the sustainment of previously described burns, the patient underwent an above-the-knee amputation. The patient alleges that the amputation was necessitated due to the injuries sustained as a result of the burns.





### Claim File – 1xxx5-01

After presenting to the emergency department for concerns related to constipation, a patient sustained severe, full thickness burns to the anal, rectal and perineum area, following the delivery of a fleet enema.

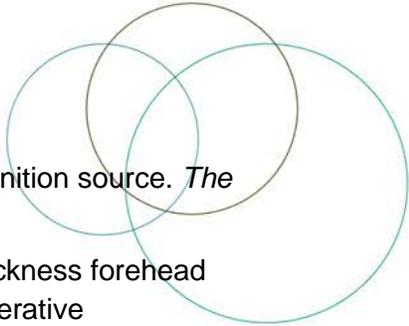
Investigations into the incident revealed that prior to the delivery of the enema, the involved nurse had filled the enema bag with scalding tap water. During the course of the administration of the enema, the patient reported experiencing a burning sensation which caused him to scream in pain, thus prompting the nurse to immediately halt the delivery of the enema.

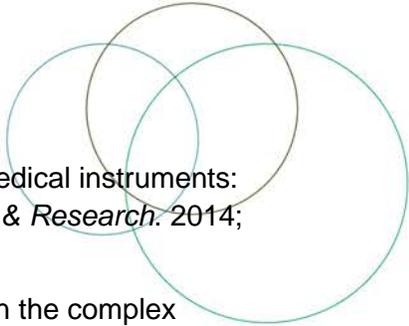
The patient's burns were discovered following the patient's presentation to a follow-up appointment related to a prior hernia repair. Once identified, the patient's burns were initially treated with Sitz baths and antibiotic ointment. The patient experienced complications during the course of his recovery, including the development of a perianal abscess that required draining, debridement and prolonged treatment.

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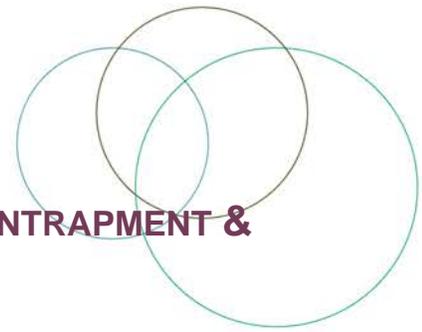
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## APPENDIX B: HEALTHCARE-ASSOCIATED ASPHYXIA, ENTRAPMENT & ENTANGLEMENT

Prepared by the Healthcare Insurance Reciprocal of Canada (HIROC)

### Patient Population

- Adult<sup>1,2</sup>
- Geriatric<sup>2,3</sup>
- Paediatric<sup>5,6,7,8,9,10,13,14</sup>

### Injury

- Asphyxia associated with restraint use<sup>1,2,3,7,10,11,15</sup>
- Asphyxia associated with bed-related entrapment<sup>5,12</sup>
- Strangulation associated with hospital equipment<sup>5,6,8,13,14</sup>

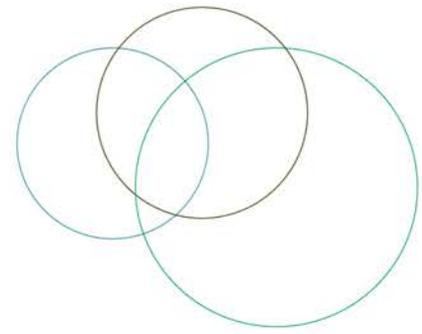
### Equipment Contributing to Injury

- Nursing bedcover<sup>3</sup>
- Restraint waist belt<sup>3</sup>
- Patient bed/crib<sup>4,5,12</sup>
- Medical lines<sup>5,6,8,9,13,14</sup>
- Apnea monitor lead<sup>5</sup>

### Conditions Contributing to Adverse Event

- Mental illness<sup>1,7,10,11</sup>
- Substance abuse<sup>1</sup>
- Obesity<sup>1</sup>
- Developmental disorders<sup>7</sup>
- Inadequate patient assessment<sup>10,14</sup>
- Inadequate care planning<sup>10</sup>
- Inappropriate room or unit assignment<sup>10</sup>
- Lack of patient observation procedures and practices<sup>3,6,10,11</sup>
- Staff issues in training<sup>3,10,12,15</sup>
- Inadequate staffing levels<sup>10</sup>
- Staff competency and credentialing problems<sup>10</sup>





- Equipment failures<sup>10,12</sup>

## RECOMMENDED MITIGATION STRATEGIES

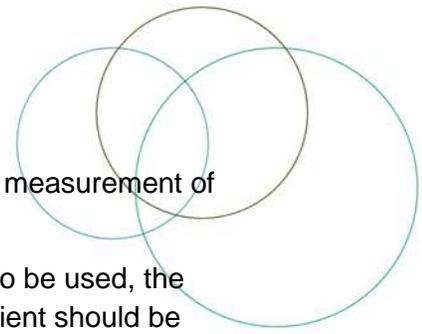
### Restraints

- Revise organizational policies to prohibit the use of higher-risk forms of restraint, including: (1) any form of restraint that involves compression of the patient's chest; (2) prone restraint, (3) supine restraint, (4) any type of technique that obstructs airways or impairs breathing, (5) any technique that obstructs vision, and (6) any technique that restricts a patient's ability to communicate.<sup>11</sup>
- Restraints should be applied strictly in accordance with policies and procedures, using an approved method, and according to the patient's behavior support plan.<sup>7,15</sup>
- Consider age and gender in writing therapeutic hold policies.<sup>10</sup>
- Discontinue the use of high neck vest and waist restraints.<sup>10</sup>
- Mandate the recording and reporting of restraint.<sup>2</sup>
- Avoid restraint use by actively promoting alternative intervention and management strategies that focus on primary and secondary intervention.<sup>2,10,15</sup>
- Clear medical documentation of the restraint device including indication, during and method.<sup>3,11</sup>
- Promote staff training in alternatives to physical restraint and in the proper use of holding and restraint.<sup>3,10,15</sup>
- Engage in close monitoring of patients under restraints, with special attention to paediatric patients, as well as those who exhibit dementia or apractic disorders.<sup>3,10,11</sup>
- When restraints have been employed, monitor vital signs (pulse, respiration, blood pressure, and oxygen saturation) to help determine how the patient is responding to the restraint.<sup>15</sup>
- With prone restraint, ensure that the airway is unobstructed at all times and that the patient's lungs are not restricted by excessive pressure on the patient's back.<sup>10</sup>
- With supine restraints, allow the patient's head to rotate freely. Do not cover the patient's face with a towel, bag, etc., during therapeutic holding.<sup>10</sup>

### Entrapment – Beds

- Ongoing monitoring and maintenance of bed rails.<sup>4,12</sup>
- Consider compliance with dimensional guidelines when engaging in bed procurement decision-making.<sup>4,12</sup>
- 'Retrofit' older bed models to eliminate gaps.<sup>4</sup>





- Develop guidelines on avoiding bedrail entrapment gaps; the routine measurement of gaps may be a consideration for residential care settings.<sup>4</sup>
- Ensure that bedrails are only used when appropriate; if bedrails are to be used, the appropriateness of the bed, rail and mattress combination for the patient should be considered.<sup>4,12</sup>

### **Entanglement and Entrapment – Medical Lines**

- Children who are at risk for entanglement should be placed under continuous observation.<sup>6,14</sup>
- Within the paediatric setting, oral treatment or use of a heparin-locked needle should be considered in place of intravenous therapy.<sup>6,14</sup>
- Within a paediatric setting, if intravenous tubing is used, excess amounts should be coiled to prevent entanglement.<sup>6</sup>
- Implement a routine, standardized process that focuses on the prevention of entanglement of therapeutic tubing, cords and cables.<sup>8,14</sup>

## **ASPHYXIATION CASE STUDIES**

### **Claim File – 2xxx8-01**

Geriatric patient was found at 0550 hours, entrapped by a bed rail. Upon discovery, the patient's body was found positioned on his knees, facing down, with his head toward the top of the bed, his feet toward the end of the bed and his neck caught by the side of the bed rail. The resident was unresponsive, with fixed pupils. The bed rails were noted to be up, with the bed locked in the lowest position. The patient had last been checked at 0500, where he had been observed to be asleep. Prior to entrapment incident, the patient was described as being "independent with transfers".

Emergency services were called and the patient was transferred to a tertiary care facility and admitted to intensive care.

Subsequent investigations determined that the patient's bed passed entrapment testing in all four areas. Attempts to recreate the position of the patient upon entrapment were unsuccessful.

CT scans conducted following the incident revealed no acute hemorrhage. The patient was later discharged and returned to assisted living.



Claim File – 2xxx9-01

Geriatric patient suffocated following the ingestion of an inappropriately prepared meal.

Prior to the patient's death, the patient had been identified as "high risk" for choking. On the day of the patient's death, the patient received double portions of food. Shortly after consuming her meal, the patient was found lying in her bed, unresponsive and cyanotic with an obstructed airway. Emesis was noted on the floor.

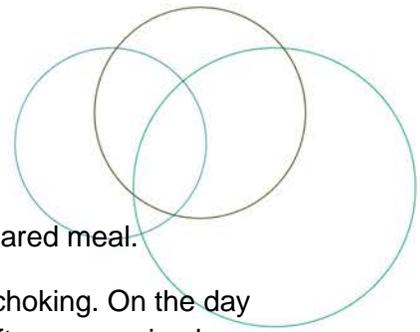
Upon discovery, the attending nurse attempted the Heimlich maneuver but was unsuccessful in clearing the patient's airway. CPR was subsequently initiated and emergency services were called. Following admission to the ER, the patient was found to have a "large food bolus" obstructing her esophagus. The aforementioned obstruction was promptly removed and the patient was then intubated and medicated. However, the patient ultimately expired after the withdrawal of life sustaining measures.

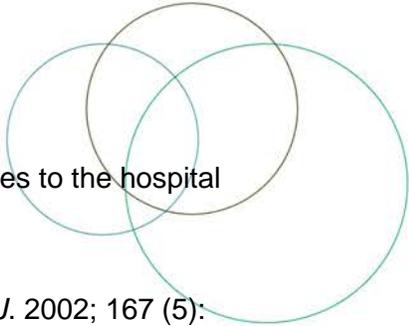
Investigations into the patient's death revealed that the patient had a history of dementia and was noted to have suffered repeated esophageal obstructions following the consumption of food. In addition, the patient was observed to engage in the stealing of food from other patients and would often hoard food in her mouth and gorge until the point of emesis. As such, it was ordered that all of the patient's meals be diced and delivered under close monitoring.

Prior to patient's death, the patient had undergone a facility transfer. Upon admission to patient's new long-term care residence, a communication error amongst facility staff resulted in the omission of the inclusion of the patient's dietary restrictions into the patient's care plan. As a result, facility staff failed to monitor the patient during meal times and proceeded to feed the patient double portions. The aforementioned errors directly contributed to the patient's eventual expiration.

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