

## Guiding principles

### Collaboration and Excellence

1. Informed and respectful collaboration by the treating physician and radiologist helps to ensure that the medical imaging of the severely injured patient is appropriate and informative.
2. The mission of Trauma Services BC is to foster optimal performance of the trauma system across British Columbia. TSBC and the Medical Imaging Advisory Council of British Columbia jointly promote a standardized approach to high quality imaging and reporting in all provincial facilities that manage trauma patients.
3. Quality assurance and performance improvement with respect to the medical imaging of trauma is the purview of local hospital radiology departments and site trauma programs. Regional Trauma Programs, in collaboration with TSBC and the provincial Medical Imaging Specialty Advisory Group, are to provide oversight to ensure that provincial performance standards, where established, are adhered to. Appropriate indications for specific imaging, diagnostic yield, and management efficiency should, in general, be audited regularly.

### Patient Safety and Efficiency

4. Definitive imaging should not be delayed by other less accurate investigations. Imaging studies that do not directly assist clinical decision-making are discouraged because they unnecessarily expose patients to the risks of transport and radiation and divert important resources from other patients.
5. Radiation exposure should be limited in all patients, particularly in the pediatric and pregnant population. A reasonable risk-benefit assessment must guide all imaging investigations in trauma patients. Consultation with attending radiologists to determine the preferred approach to imaging in complex situations is encouraged.
6. In the physiologically unstable or potentially unstable trauma patient, it is critical to complete and report required imaging with speed and efficiency as undue delays can lead to preventable disability and even death.

### Imaging Principles

7. Standardized whole-body computed tomography (WBCT) imaging is appropriate in most patients injured by a major mechanism. WBCT extends imaging from head to pelvis in order to identify a wide range of clinically important occult injuries which are material in appropriate triage and disposition planning. Early WBCT can currently be accomplished rapidly with a minimum of radiation exposure and frequently obviates the need for repeat imaging.

8. Standard Whole Body CT (WBCT) includes: head (non-contrast), cervical spine (non-contrast), CT chest with angiogram of the thoracic aorta (with intravenous contrast), and abdomen and pelvis (with intravenous contrast). Standard WBCT does not include: CT angiography (CTA) of COW, CT facial bones, CTA of carotid arteries, CT cystogram, rectal contrast, or CTA or CT of extremities. These are additional CT protocols that can be requested based on findings from initial imaging or clinical examination.
9. CT imaging for trauma should be performed using dedicated trauma protocols on a multidetector computed tomography (MDCT) scanner. CT acquisition should comply with the [Ionising Radiation Regulations Safety Code 35](#) as set out by Health Canada.<sup>1</sup> Image reconstruction and reformatting techniques should be optimized to detect vascular, musculoskeletal and organ injury. CT scans that are incomplete, not properly formatted, or not transferred with the patient in the case of interfacility transfer create the need for repeated studies that are frequently unnecessary and wasteful.<sup>2,3,4</sup>
10. Intravenous contrast should always be administered when imaging the vascular system and/or abdomen and pelvis. There is a low risk for contrast-induced nephropathy in patients with history of pre-existing renal insufficiency, diabetes mellitus, nephrotoxic or diuretic drug administration. However, in major trauma setting where the clinical scenario warrants the use of contrast, renal function tests should be avoided as they introduce unnecessary delays in diagnostic imaging.
11. It is now widely accepted that CT imaging of the unstable trauma patient who has responded, even transiently, to resuscitation is appropriate and facilitates better clinical decision-making. This is only advisable when imaging studies can be completed within a reasonable delay with appropriate monitoring and medical supervision of the patient.
12. While awaiting transport, it is appropriate for sufficiently stabilized patients to undergo basic imaging (WBCT) at the referring site, provided this can be achieved with acceptable quality. If such imaging is pursued, it should be upon collaborative discussion between sending and receiving physicians.
13. Radiography and point of care ultrasound should be available in the trauma bay for hemodynamically unstable patients.
14. Magnetic resonance imaging (MRI) when available should have safe access for trauma patients with suspected spinal injuries and/or pancreatic injuries. Expedited access to MRI should be available for pediatric and pregnant trauma patients in an attempt to avoid other modalities which employ ionizing radiation.

### **Communication and Logistics**

15. Prompt verbal and/or written preliminary and final reporting is essential for optimal management of patients. Standard template reporting helps to improve communication and consistency. Transfers from a referring site should include reports on imaging obtained at that site.
16. As soon as it is considered likely that an acutely injured patient will be transferred to a higher level of care, or that external specialist consultation will be required, all imaging studies should be expeditiously transferred to the provincial PACS system for shared viewing

to assist joint decision making. The B.C. Patient Transport Network (PTN) must be aware of available imaging and its availability for remote viewing when facilitating a clinical discussion between physicians.

17. The department where imaging is acquired requires monitoring and care capabilities appropriate for patients that are potentially unstable. Layout and design of imaging facilities for trauma patients must allow visual and electronic monitoring of patients by the responsible staff physician and treating team.
18. While imaging should never delay urgent transport of acutely injured patients to an already determined destination, it may be beneficial to delay transport to complete imaging at referring sites when results will materially influence determination of the preferred destination. However, transfers to a site for imaging only (i.e. not the site for definitive care) are to be minimized and, preferably, audited as a system-level performance measure.

## References

- <sup>1</sup> Health Canada. Safety Code 35: Safety Procedures for the Installation, Use and Control of X-ray Equipment in Large Medical Radiological Facilities [Internet]. aem. 2009 [cited 2017 Oct 5]. Available from: <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/safety-code-35-safety-procedures-installation-use-control-equipment-large-medical-radiological-facilities-safety-code.html>
- <sup>2</sup> Emick DM, Carey TS, Charles AG, Shapiro ML. Repeat imaging in trauma transfers: a retrospective analysis of computed tomography scans repeated upon arrival to a Level I trauma center. *J Trauma Acute Care Surg.* 2012 May;72(5):1255–62.
- <sup>3</sup> Gupta R, Greer SE, Martin ED. Inefficiencies in a rural trauma system: the burden of repeat imaging in interfacility transfers. *J Trauma.* 2010 Aug;69(2):253–5.
- <sup>4</sup> Amis ES, Butler PF, Applegate KE, Birnbaum SB, Brateman LF, Hevezi JM, et al. American College of Radiology white paper on radiation dose in medicine. *J Am Coll Radiol.* 2007 May;4(5):272–84.