

## Adult Trauma CT

Issue Date	Review Date	Version
March 2021	March 2024	V1.2

### Purpose

This SOP is intended to provide a common set of standards across the network to provide a consistent approach to imaging major trauma patients

### Who should read this document?

This SOP should be read by the following members of the Peninsula Trauma Network Major Trauma clinical team:

- All Major Trauma Clinical Leads
- All Trauma Radiologists & CT Radiographers
- All Emergency Medicine Doctors and Trauma Team Leaders
- Anaesthetists, ITU Doctors, General Surgeons and Orthopaedic Surgeons

### Key Messages

To provide a common set of standards across the network to help align imaging strategies to provide consistency. This will simplify the imaging strategy both for radiographers, reporting radiologist and clinicians within the Trauma Units and the Major Trauma Centre.

#### **THIS GUIDANCE DOES NOT COVER:**

This guidance is intended for planning the imaging strategy in adult patients only. For guidance on paediatric patients, please refer to:

- [S.W. Paediatric Major Trauma Network & Major Trauma Centre Radiology Policy. 12/2018.](#)
- [BFCR 14\(8\) Paediatric Trauma Protocols, The Royal College of Radiologists. 2014.](#)

### Core accountabilities

<b>Owner</b>	Surgeon Commander Philip Coates
<b>Review</b>	March 2024
<b>Ratification</b>	PTN Clinical Advisory Group
<b>Dissemination (Raising Awareness)</b>	Major Trauma Clinical Leads All Trauma Team Leaders All Trauma Radiologists & CT Radiographers All Emergency Medicine Doctors Anaesthetists, ITU doctors, General Surgeons and Orthopaedic Surgeons
<b>Compliance</b>	All clinicians involved in Major Trauma at the Peninsula Trauma Centre and the following Trauma Units: <ul style="list-style-type: none"> <li>• Northern Devon District Hospital</li> <li>• Royal Cornwall Hospital</li> <li>• Royal Devon and Exeter Hospital</li> <li>• Torbay Hospital</li> </ul>

### Links to other policies and procedures

- PTN Automatic Acceptance & Secondary Transfer Policy
- Guidelines for the Inter- and Intra-Hospital Transfer of Critically Ill Adult Patients (SWCCN)
- PTN Trauma Team Activation Guideline
- SW Paediatric Major Trauma Network Radiology Policy.

### Version History

V1	Philip Coates	Development of first version of SOP
V1.1	PTN	Alterations to front sheet accepted
V1.2	Tony Hudson	Post Damage Control Surgery CT comment added

*The Network is committed to creating a fully inclusive and accessible service. Making equality and diversity an integral part of the business will enable us to enhance the services we deliver and better meet the needs of patients and staff. We will treat people with dignity and respect, promote equality and diversity and eliminate all forms of discrimination, regardless of (but not limited to) age, disability, gender reassignment, race, religion or belief, sex, sexual orientation, marriage/civil partnership and pregnancy/maternity.*

**An electronic version of this document is available on The [PTN website](#).**

**[www.peninsulatraumanetwork.nhs.uk](http://www.peninsulatraumanetwork.nhs.uk)**

**Larger text, Braille and Audio versions can be made available upon request.**

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## **1 Introduction**

Within the footprint of the Peninsula Trauma Network (PTN) a range of different imaging strategies and protocols have been used historically for CT imaging of severely injured patients. By providing a common set of standards across the Network this document will help to align imaging strategies, to provide consistency. This will simplify the imaging strategy both for Radiographers, reporting Radiologists and clinicians within the Trauma Units and the Major Trauma Centre.

A severely injured patient/major trauma patient is defined as having an injury severity score (ISS) of 15 or more. Effective and swift cross-sectional imaging is important in major trauma for rapidly identifying and helping to stratify traumatic injuries. This allows clinical teams to plan effective treatment and in particular to organise the order of surgical interventions. CT scanning is therefore integral to the management of acute trauma patients, but should not delay emergency interventions. Occasionally, a trauma patient will be so haemodynamically unstable and unwell that they will require immediate damage control surgery and will effectively bypass CT, proceeding straight to the operating theatre.

## **2 Purpose**

'Quality indicator: Imaging and reporting protocols should be agreed across referral regions and written protocols'. Royal College of Radiologists. BFCR 15(5)

This document is intended to be read and implemented in conjunction with the current Royal College of Radiologists guidance on trauma imaging (see reference below). This SOP specifically provides local guidance on the implementation of trauma imaging, and in particular CT, for adult trauma patients within the footprint of the Peninsula Trauma Network. The intention of this document is to provide a common standard for CT imaging, and to align CT protocols within the PTN. It is recognised that practice of CT trauma imaging varies within the United Kingdom, with respect to CT protocols. There is good evidence that a biphasic split bolus CT Traumagram is a safe and effective way of quickly identifying life-threatening injuries in trauma patients. This document identifies an effective strategy for imaging such patients and explains the CT imaging protocol and technique.

## **3 Definitions**

**Traumagram:** A trauma CT acquired in polytrauma patients which follows a specific protocol and by definition entails imaging of the Chest, Abdomen and Pelvis as a minimum, and generally on one acquisition

**Scanogram:** Also known as a localiser, this is the initial exposure acquired in CT, usually with an AP and lateral projection, to allow planning of the formal CT. It looks like a plain film, but is of diagnostic value in its own right, and can be extended to the feet to rule in / out lower limb fractures.

## **4 Duties**

It is incumbent upon all staff involved in delivering care to major trauma patients within the PTN to have an understanding of this policy. Local Radiology departments can use this policy to develop local guidance, but this document provides the overarching approach to imaging polytrauma patients within the network.

**5a Radiology referral process:**

The Trauma Team Leader (TTL) (usually an Emergency Medicine Consultant) is in overall charge of damage control resuscitation. The TTL, or nominated individual will be the first to make a referral for trauma imaging. Such referrals must adhere to IRMER guidance, and referrals will usually be made through electronic requesting or paper request card (where still in use). The TTL will liaise with the Consultant Radiologist reporting inpatient CT, or the nominated Radiology Registrar. Out of hours imaging is provided by the Peninsula Radiology On-Call service (PROC) throughout the PTN.

For out of hours referrals to the PROC, the TTL will liaise with the Radiology Registrar on call in the first instance who may be at a remote location. The on-call Radiology team will then immediately prioritise reporting of trauma CT over and above less urgent caseload. When the on-call Radiology Registrar(s) have multiple trauma patients, the team may then request reporting of cases at a local level by the Consultant Radiologist on call for that hospital.

Within the MTC, the Emergency Department physician will liaise with the on call Radiology Registrar in the first instance. Scans and reports will be reviewed by the on call Consultant overnight if required, but usually by the inpatient CT Consultant Radiologist at 09:00 the following day.

**5b Underlying principles of trauma imaging:**

*'Speed is of the essence. Time is tissues, time is organs, time is life. Delay is deterioration, disability and death.'*

There is a strong argument that the more haemodynamically unstable a patient is, the greater the need for accurate diagnosis to guide the targeted surgery or intervention. The major exception is when a polytrauma patient has been admitted in profound shock, is not responding to IV fluids and is actively bleeding from an obvious site. Where the CT scan is located close to or within ED, very few patients should be deemed too unstable for CT.

In some TUs within the PTN, the CT scanner may be some distance from ED, and so there are a small subgroup of grossly unstable patients who may be better served in this instance by immediate transfer to Damage Control theatre for immediate haemorrhage control (aortic cross clamping / proximal control). CT scanning can be performed once control of life threatening haemorrhage has been performed. If a patient does go directly to theatre for Damage Control Surgery (DCS) bypassing CT, then following DCS they should have a CT scan prior to secondary transfer. Where there is a significant distance to CT for transfer, Trauma Teams should regularly rehearse and train for such transfers, to increase the proportion of patients accessing CT.

Plain films are still of value in the initial assessment and resuscitation of patients but should not delay transfer to CT. A Chest Film is useful for excluding immediate life threatening injuries such as tension pneumothorax, and a pelvic film may also be of value depending on the mechanism of injury and clinical suspicion.

FAST scanning (Focused Abdominal Sonogram in Trauma) is of limited value given its poor negative predictive value, and should certainly never delay transfer to CT. It may have some value in triaging multiple trauma patients.

### **5c Quality Indicators:**

The Major Trauma Centre / Trauma Unit will need to convene regular multi-disciplinary team meetings to review trauma cases and review cases with potential learning outcomes. This allows teams to reflect on cases, adjust patient pathways for the future and disseminate learning across the network. This should be attended by a Consultant Radiologist, usually designated as 'Trauma Lead Radiologist', but other Radiologists are encouraged to attend. The Radiologist adds value to this meeting by reviewing the imaging strategies used for cases, coordinating imaging findings and demonstrating findings to the Emergency Department, as well as taking back governance concerns about imaging to Radiology. Attendance at such a meeting should be reflected in a Radiology Consultant's job plan, attracting around 0.25 PAs on an annualized job plan.

The service monitors Radiology /ED departmental performance through the TARN database, key performance indicators being time to CT and time to report. There needs to be an established mechanism for reviewing this data, and a weekly Trauma meeting is the best mechanism for maintaining oversight.

Regular Radiology departmental audits of performance are also encouraged, in particular image quality of CT Traumagrams.

### **5d CT Scanner Location**

The Trauma Unit needs to plan the location of future CT scanners with respect to the Emergency Department. Moving patients long distances to CT results in delays in scanning and can worsen blood loss and further endanger life. A remote CT scanner on a different level in the hospital is a hostile environment to be in for a trauma team out of hours, and represents a threat to patient care. Future planning for CT scanner location must take account of this, and should aim for a co-located CT scanner within or immediately adjacent to the Emergency Department. This will require a sufficient footprint to allow the safe entry and exit of patients on beds with a full trauma team and resuscitative equipment (eg rapid infusers).

### **5e Preparation for CT**

The Emergency Department will need to have clear protocols in place for making referrals to Radiology for urgent CT. Out of hours, most Radiology Departments in Trauma Units within the PTN are served by remote Radiology reporting delivered by the PROC (Peninsula Radiology On Call service). Some TU Radiology Departments have agreed protocols in place for Radiographer vetting and justification of CT Traumagram requests. This practice is to be commended.

The Radiology Department will need to ensure that appropriate arrangements are in place to receive polytrauma patients. This will include suspending inpatient CT scanning lists and clearing the scanner as soon as practicable to await arrival of the Trauma Team.

Intravenous access will be necessary and is accomplished via the RIGHT antecubital fossa. Left sided injection is associated with streak artifact which obscures head and neck vessel interpretation. Pregnancy should be considered in women of childbearing age. The overriding priority is the health of the mother, but early liaison is recommended between the Radiologist, Radiographer, Consultant Obstetrician and ED Physician to determine the optimal imaging approach.

## 5f MDCT: PTN Imaging Protocol

This document is intended to harmonise approach to Trauma CT imaging across the PTN, to provide an easily reproducible approach with predictable and reliable results. As stated in the current RCR Standards of Practise for Trauma Radiology document:

Standard 9: Whole-body contrast-enhanced MDCT is the default imaging procedure of choice in the SIP. Imaging protocols should be clearly defined and uniform across a regional trauma network.'

The following protocol is the recommended CT Traumagram Protocol for the PTN;

1. **Scanogram / Localiser** (see appendix A)
  - ❖ AP/Lateral scout – above apex of skull to the toes.
  - ❖ Patients arms on abdomen.
2. **Non Contrast CT Head** (depending on mechanism of injury and clinical discussion)
  - ❖ Coverage: Skull vertex to skull base, helical slices.
  - ❖ Slice thickness:
    - ❖ soft tissue reconstructions at 5mm (standard recons for quick review)
    - ❖ 1.25mm (or less) standard reconstructions
    - ❖ 0.625mm bony reconstructions
3. **Then Biphasic Contrast injection** (see contrast protocol below):
  - ❖ Coverage: Above circle of willis to lesser trochanters, OR extending distally to knees or toes as indicated by Scout / Localiser image if distal trauma/ lower limb fractures.
  - ❖ Smart prep / bolus tracking, monitor aortic arch. (some centres used a fixed delay of 70 seconds with equally successful results, and providing this is backed up by regular audit of image quality, this is an acceptable alternative approach).
  - ❖ Fast rotation speed (<0.5secs).
  - ❖ mA modulation if available
  - ❖ Slice thickness & reconstructions:
    - ❖ soft tissue: 5mm initial slices, then 1.25mm thin slices (or less, depending on scanner)
    - ❖ bone: 1.25mm (or less) slices, then 0.625mm thin slices.
4. **Contrast Protocol:**
  - ❖ Contrast: Optiray 350, or equivalent.
  - ❖ Volume: 125ml
  - ❖ Biphasic injection at:
    - ❖ 80mls injected at 3ml/sec, then;
    - ❖ 25 second delay, before;
    - ❖ 40mls injected at 4ml/sec (for arterial opacification).
    - ❖ and a 30ml saline flush if available.

## **6 Overall Responsibility for the Document**

The Peninsula Trauma Network Advisory Group is responsible for developing, implementing and reviewing this SOP.

## **7 Consultation and Ratification**

The review period for this document is set as a default of one year from the date it was created and then every 3 years after it is last ratified, or earlier if developments within or external to the Peninsula Trauma Network (PTN) indicate the need for a significant revision to the procedures described.

This document will be reviewed by the PTN Advisory Group and ratified by the PTN Clinical Director and Clinical Governance Lead or Executive Board as deemed appropriate. Non-significant amendments to this document may be made, under delegated authority from the PTN Clinical Director, by the nominated owner. These must be ratified by the PTN Director.

Significant reviews and revisions to this document will include a consultation with named groups, or grades across the Peninsula Trauma Network. For non-significant amendments, informal consultation will be restricted to named groups or grades who are directly affected by the proposed changes.

## **8 Dissemination and Implementation**

Following approval and ratification, this SOP will be published on the PTN website (public facing or secure as deemed appropriate) and all staff will be notified through the PTN normal notification process, currently via email to Trauma Clinical Leads.

Document control arrangements will be noted and kept current on the PTN SOP list maintained by the PTN management team.

The document owner will be responsible for agreeing the training requirements associated with the newly ratified document with the named PTN Clinical Director to arrange for the required training to be delivered.

## **9 Monitoring Compliance and Effectiveness**

Monitoring and compliance will be reviewed via the PTN Governance form submissions and discussion at the monthly PTN Governance teleconference.

This is a requirement of the NHSE Major Trauma Quality Indicators and compliance will be reviewed via the annual Network Peer Review process and/or National Quality Surveillance Team (QST) peer review for MTCs. If concerns are raised, these will be notified to the relevant Chief Executive and Trauma Leads who will be required to provide timely action plans to resolve the concerns. These concerns will be reviewed by the PTN Management Team and fed back to relevant parties. Concerns raised by the National QST peer review for MTCs will be fed back through the appropriate channels.

This is a National Major Trauma Network standard and will be monitored via the annual Network Peer Review process directly to relevant Trauma Leads.

- Standards of practice and guidance for trauma imaging in severely injured patients, Royal College of radiologists. 2nd edition. BFCR 15(5). [www.rcr.ac.uk](http://www.rcr.ac.uk)
- NICE guidelines [NG 39]. Major Trauma: assessment and initial management. February 2016.

## Appendix A:

### Scanogram / Localiser in Trauma:

- ❖ The scanogram should extend down to the toes. If lower limb injuries are visible, this will guide the subsequent protocolling and coverage of the CT Traumagram.



(above): AP and Lateral localisers of a trauma patient, extending to the toes. Following Radiologist assessment, the imaging volume of the CT can then be extended further distally to include the lower limbs if there is evidence of a more distal injury. Images reproduced with patient's consent.