



Queensland  
Trauma Education

**TRAUMA AND THE OLDER PERSON**

# Traumatic brain injury

## Case discussion

Facilitator resource kit



**CSDS**



Clinical Skills Development Service



## Queensland Trauma Education

The resources developed for Queensland Trauma Education are designed for use in any Queensland Health facility that cares for patients who have been injured as a result of trauma. Each resource can be modified by the facilitator and scaled to the learners needs as well as the environment in which the education is being delivered, from tertiary to rural and remote facilities.

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### Queensland Trauma Education

**Trauma and the Older Person – Traumatic brain injury: Case discussion – Facilitator  
resource kit  
Version 1.0**

Published by the State of Queensland (Clinical Skills Development Service), 2021



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## About this training resource kit

This resource kit provides healthcare workers with the knowledge regarding the assessment and management of an elderly patient with a mild traumatic brain injury who is anticoagulated.

### National Safety and Quality Health Service (NSQHS) Standards



### Target audience

Medical and nursing clinicians.

### Duration

30 minutes.

### Group size

4-6 participants.

### Learning objectives

By the end of this session the participant will be able to:

- Identify the older patient risks of injury with low velocity trauma.
- Discuss the challenges associated with using the Australasian Triage Scale (ATS) with geriatric trauma presentations.
- Understand the challenges with assessment in the older population.
- Gain confidence in the safe discharge of patients with mild traumatic brain injury.

### Facilitation guide

1. Facilitator to provide participant resource kit to participants.
2. Facilitator to present case overview to group and utilise the question-and-answer guide to promote discussion.
3. Utilise supporting documents and resources to maximise learning throughout case discussion.

## Overview of geriatric traumatic brain injury

Traumatic brain injury in the elderly has a higher rate of associated morbidity and mortality when compared to younger patients following trauma.<sup>11,12</sup> Additionally, the pre-morbid function, co-morbidities and physiology of the older brain challenge the clinical team to care for this cohort.

In the older patient, the atrophic brain will result in both initial assessment challenges but also can delay time to symptoms as there is more space in the cranial vault to allow blood to collect before symptoms occur.

CT imaging remains the primary investigation for assessment of significant injury however the timing of such in the setting of anticoagulation remains unclear.<sup>12</sup>

### Further reading

#### Guidelines for field triage of injured patients: recommendations of the National Expert Panel on Field Triage, 2011

Publication	MMWR Recommendations and Reports
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Link	<a href="https://pubmed.ncbi.nlm.nih.gov/22237112/">https://pubmed.ncbi.nlm.nih.gov/22237112/</a>
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#### Undertriage of elderly trauma patients to state-designated trauma centers

Publication	Archives of Surgery
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Link	<a href="https://doi.org/10.1001/archsurg.143.8.776">https://doi.org/10.1001/archsurg.143.8.776</a>
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#### Intracranial pathology in elders with blunt head trauma

Publication	Academic Emergency Medicine
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Link	<a href="https://doi.org/10.1197/j.aem.2005.10.015">https://doi.org/10.1197/j.aem.2005.10.015</a>
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#### Mild head injury, anticoagulants, and risk of intracranial injury

Publication	Lancet
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Link	<a href="https://doi.org/10.1016/S0140-6736(00)04163-5">https://doi.org/10.1016/S0140-6736(00)04163-5</a>
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#### Degree of anticoagulation, but not warfarin use itself, predicts adverse outcomes after traumatic brain injury in elderly trauma patients

Publication	The Journal of Trauma
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Link	<a href="https://doi.org/10.1097/TA.0b013e31812e5216">https://doi.org/10.1097/TA.0b013e31812e5216</a>
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**Management of minor head injury in patients receiving oral anticoagulant therapy: a prospective study of a 24-hour observation protocol**

Publication	Annals of Emergency Medicine
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Link	<a href="https://doi.org/10.1016/j.annemergmed.2011.12.003">https://doi.org/10.1016/j.annemergmed.2011.12.003</a>
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**Traumatic brain injury in older adults: do we need a different approach?**

Publication	Concussion
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Link	<a href="https://doi.org/10.2217/cnc-2018-0001">https://doi.org/10.2217/cnc-2018-0001</a>
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**A decade of geriatric traumatic brain injuries in Finland: population-based trends**

Publication	Age and Ageing
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Link	<a href="https://doi.org/10.1093/ageing/afaa037">https://doi.org/10.1093/ageing/afaa037</a>
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**Geriatric Mild Traumatic Brain Injury (mTBI)**

Publication	Current Geriatrics Reports
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Link	<a href="https://doi.org/10.1007/s13670-020-00329-3">https://doi.org/10.1007/s13670-020-00329-3</a>
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**Immediate and delayed traumatic intracranial hemorrhage in patients with head trauma and preinjury warfarin or clopidogrel use**

Publication	Annals of Emergency Medicine
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Link	<a href="https://doi.org/10.1016/j.annemergmed.2012.04.007">https://doi.org/10.1016/j.annemergmed.2012.04.007</a>
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**Mild Traumatic Brain Injury among the Geriatric Population**

Publication	Current Translational Geriatrics and Experimental Gerontology Reports
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Link	<a href="https://doi.org/10.1007/s13670-012-0019-0">https://doi.org/10.1007/s13670-012-0019-0</a>
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**Closed Head Injury (Adult) Clinical Pathway**

Organisation	Queensland Health
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Link	<a href="https://qheps.health.qld.gov.au/_data/assets/pdf_file/0026/2158307/SW214.pdf">https://qheps.health.qld.gov.au/_data/assets/pdf_file/0026/2158307/SW214.pdf</a>
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## Case discussion

Mild traumatic brain injury (TBI) assessment and management in the setting of elderly patient who is taking anticoagulant medications. Decision making based on clinical assessment and radiological studies to plan disposition care.

### Case study

Rose is an 85 year old woman who tripped in the driveway of her house. She was checking the mail when her foot got caught on the cracked pavement. She then remembers lying on the pavement with her neighbour standing over her.

The ambulance officers confirm that the bystander heard her fall, she was dazed but alert on their arrival. She was able to get up with help and mobilise to the stretcher. She has a haematoma to R forehead and superficial abrasions to her R elbow and bilateral knees.

Rose has a PMHx of Atrial fibrillation (AF) on warfarin and digoxin, angina - infrequent episodes, uses Glycerol trinitrate (GTN) PRN, hypercholesterolaemia on atorvastatin and glaucoma.

She has no allergies, is a non-smoker and rarely drinks alcohol.

She has lived alone since her husband died 5 years ago, and has a supportive daughter 1 hour away.



## Question and answer guide

### 1. What injury profile is Rose likely to have sustained?

- Traumatic brain injury
- Spinal injury
- Pelvic injury
- Extremity trauma - fractures and soft tissue injury
- Less likely chest/abdominal trauma

### 2. What factors make Rose at higher risk for significant injury?

#### Physiological response to blood loss

- myocardium stiff, compromising cardiac output
- less sensitive to catecholamines, less tachycardia in response to blood loss
- systemic vascular resistance increased, contributes to baseline hypertension- diagnosis of shock more challenging

#### Increased risk of intracranial bleeding from minor trauma

- Dural adhesion causes bridging veins to stretch with increased risk of SDH, but lower risk of EDH<sup>8</sup>
- Brain atrophy leads to delay in development of symptoms
- Pre-existing dementia can complicate cognitive effects of TBI
- Decline in cerebrovascular autoregulation – higher risk during periods of hypotension

#### Lower bone density

- Increased risk of fractures

#### Medications

- Increased bleeding with anti-platelet agents/anticoagulants
- Altered drug metabolism from change to volume of distribution and elimination- can prolong drug effects

### 3. On arrival to the emergency department Rose is allocated an ATS category 3 and triaged to the acute area of the department. What issues are recognised when caring for geriatric patients in the emergency department who have sustained potential injury?

#### Under triage

- Physiological parameters used to identify at risk geriatric trauma patients are blunted and shock is under recognised<sup>2</sup>
- USA CDC suggests trauma centre review for patients age >65 with SBP < 110mmHg and HR > 90bpm<sup>1</sup>

#### Standard trauma cares

- Geriatric patients are more likely to sustain injury from low velocity trauma

- Cervical spine management may worsen spinal cord injury

### Primary and secondary survey

- Dentures and limited mouth opening may complicate airway management
- Increased risk for hypoxia with limited respiratory reserve
- Haemodynamic response to medications may be altered with a reduction in medication dosing often required
- Recognising shock is more challenging, 'normal vital signs' may represent significant hypovolaemia- look for subtle vital sign abnormalities- mental states (confusion, somnolence, agitation), tachypnoea, delayed cap refill, low urine output
- Medications alter response to shock states
- Delayed cognitive effects despite TBI
- Older patients may have decreased pain perception and difficulty localising pain- need systemic assessment strategy to avoid missing injury

### Long term effects

- Mortality and morbidity following TBI higher in older adults <sup>9</sup>
- Often slower and more unfavourable recovery
- Pre-injury cognitive status and challenge in diagnosing concussion vs normal cognitive decline in aging can lead to mis diagnosis following TBI
- Limited specific management strategies for older patients with concussion <sup>10</sup>

## 4. Following close clinical examination during the primary and secondary survey no additional injuries are identified. Rose remains GCS 15, orientated and with no neurological deficits. What investigations should be performed?

### Bedside

- ECG: given history of AF, may be precipitating event
- Urinalysis: if concern regarding precipitating event

### Laboratory

- Unless specific indications, or concern about complications from the traumatic injuries or treatment, no indication for 'routine blood tests'
- INR check: warfarinised
- UEC may be useful prior to CT imaging with contrast studies

### Radiological

- Plain Xray: if clinically indicated
- CT Brain: non-con, at risk for severe occult injury. Less concern for radiation exposure (Facilitator to utilise Canadian CT head rule Prop)
- Other CT imaging: if clinical concern



**5. Rose has been compliant with her prescribed medications, her last INR check 1 week ago was 2.5. What is the risk of intracranial bleeding for Rose?**

Rate of intracranial bleeding approaches 15% in asymptomatic patients on warfarin.<sup>5</sup>

ICH can occur following seemingly minor trauma and therapeutic anticoagulation.<sup>6</sup>

Increased risk with higher INR (>3)

6% rate of delayed ICH in patients on anticoagulation.<sup>7</sup> Other studies showed this rate to be 0.6% with warfarin and 0% with clopidogrel.<sup>11</sup>

Additionally 11% patients in the warfarin (and 18% of clopidogrel group) group had no injury above the clavicles, despite 70/1000 having an ICH on initial CTB.<sup>11</sup>

**6. Rose has a CT brain non-contrast performed. What does it show?**

*Facilitator to use CT brain supporting document for discussion.*

Normal CT brain, nil intracranial haemorrhage.

**7. Rose remains well, GCS 15, no neurological deficits. She has tolerated a cup of tea, mobilised independently with the physio /nursing staff and is keen to go home. What discharge advice will you provide to Rose?**

- Risk of ICH with warfarin therapy- may be delayed up to 1 week.<sup>7</sup>
- Need to represent if neurological features: headache, visual changes, balance disturbance, weakness/sensory changes, speech deficits, slowed cognition.
- Safety net- stay with family given rate of delayed bleeding, regular review, Local Medical Officer Follow Up in one week.
- Regular INR check.

### Considerations

- Routine head CT in head-injured patients with previous warfarin or clopidogrel use should be performed, even in well-appearing patients regardless of lack of clinical findings.
- Delayed traumatic ICH in patients on therapeutic warfarin and clopidogrel is very rare and these patients may be discharged home after a negative initial head CT, but with explicit discharge instructions and close follow up.
- 24 hour observation of patients with poor functional capacity, long travel times to get to a hospital, and/or patients with no one at home to watch them would also be an acceptable alternative.
- Patients with therapeutic anticoagulation, blunt head trauma, and a negative initial head CT **DO NOT** need to have their anticoagulation aggressively reversed.
- Patients with supratherapeutic anticoagulation, blunt head trauma, and a negative initial head CT should have a low threshold to admit them for frequent neuro checks, repeat measurement of INR (while holding anticoagulation), and possibly repeat head CT if any change in exam.

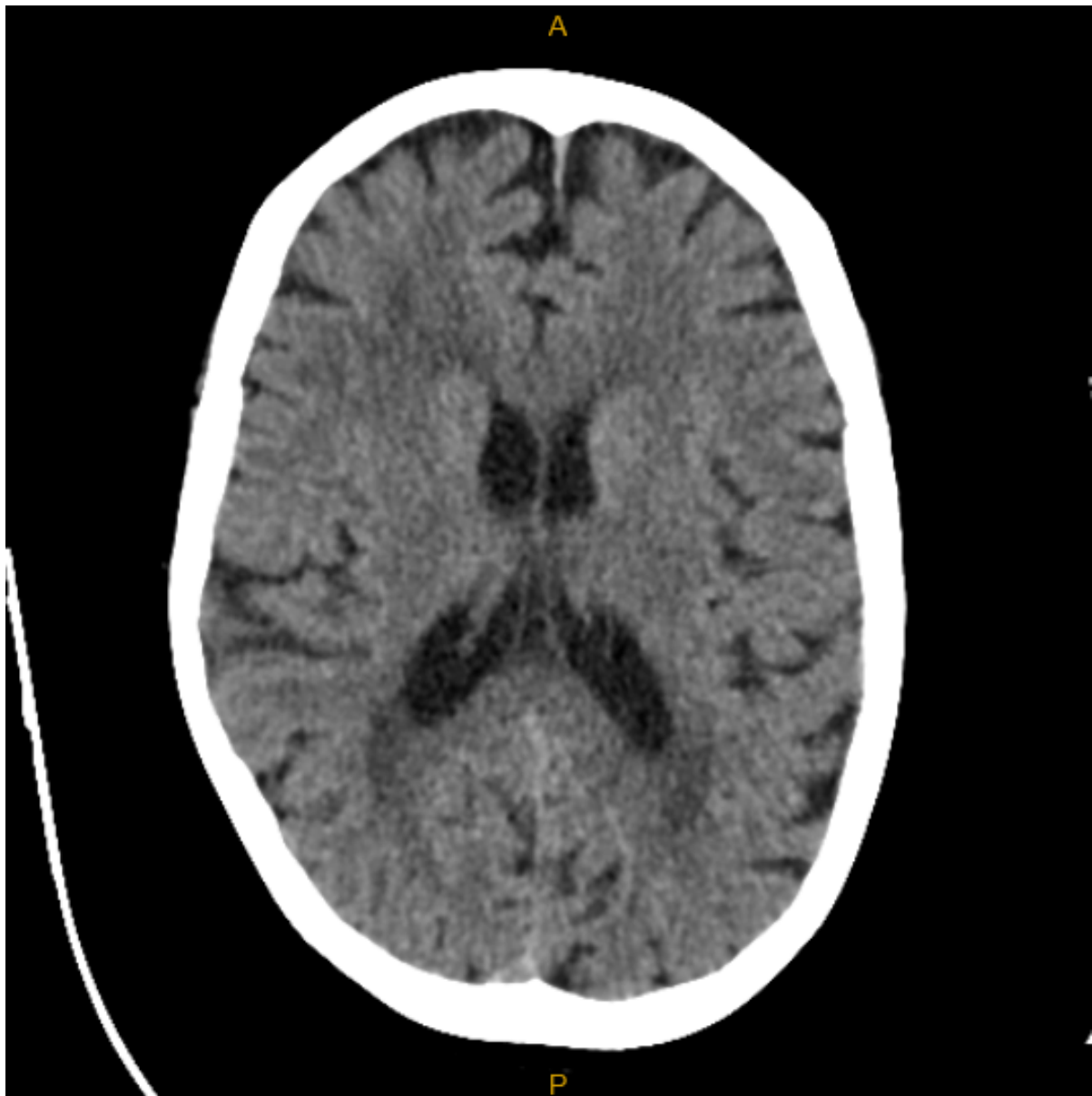
Source: Minor Head Trauma in Anticoagulated Patients: Admit for Observation or Discharge? - REBEL EM - Emergency Medicine Blog - <https://rebelem.com/minor-head-trauma-in-anticoagulated-patients-admit-for-observation-or-discharge/>

## Supporting documents

The following supporting documents are provided for this case discussion:

1. CT brain
2. Canadian CT head rule

## CT brain





## TRAUMATIC BRAIN INJURY

# Canadian CT Head Rule

CT head is only required for minor injury patients with any one of these findings:

### High risk (for neurological intervention)

1. GCS score  $< 15$  at 2 hours after injury
2. Suspected open or depressed skull fracture
3. Any sign of basal skull fracture\*
4. Vomiting  $\geq 2$  episodes
5. Age  $\geq 65$  years

### Medium risk (for brain injury on CT)

6. Amnesia before impact  $\geq 30$  min
7. Dangerous mechanism\*\*  
(pedestrian, occupant ejected, fall from elevation)

#### \*Signs of basal skull fracture

- Hemotympanum, 'raccoon' eyes, CSF otorrhea/rhinorrhea, Battle's sign.

#### \*\*Dangerous mechanism

- Pedestrian struck by vehicle.
- Occupant ejected from motor vehicle.
- Fall from elevation  $\geq 1$  metre or 5 stairs.

#### Rule not applicable if:

- Non-trauma cases.
- GCS  $< 13$ .
- Age  $< 16$  years.
- Coumadin or bleeding disorder.
- Obvious open skull fracture.

## Acronyms and abbreviations

Term	Definition
CTB	computed tomography brain
INR	international normalised ratio
GCS	Glasgow Coma Scale
UEC	urea electrolyte count
ECG	electrocardiogram
SDH	subdural haematoma
EDH	extradural haematoma



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