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Delirium in trauma

S Eliza Griffiths¹, U Tandon¹, J Treml¹ and TA Jackson²,³

Abstract
Delirium is a common, severe and acute neuropsychiatric syndrome that affects mainly older patients. Delirium is a well-recognised complication of trauma and is important as it is associated with an increase in mortality as well as cognitive and functional decline, increased length of hospital stay and increased risk of institutionalisation on discharge. Recognition and management is challenging and the psychological impact for patients and relatives devastating. This review discusses the current understanding of delirium with specific reference to trauma patients.

Keywords
Delirium, trauma, hip fracture, delirium screening, geriatrics

Introduction
Delirium is a common, severe and acute neuropsychiatric syndrome that affects mainly older patients.¹,² Delirium is defined as an acute and sudden change in attention and overall cognitive state³ and classified by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IVTR criteria in Box 1). Delirium is important as it is associated with a twofold increase in mortality as well as cognitive and functional decline, increased length of hospital stay and increased risk of institutionalisation on discharge.¹,⁴ Specifically in trauma patients, delirium is common and associated with increased mortality and poor outcomes compared to age and disease-matched controls.⁵ Recognition and management is challenging and the psychological impact for patients and relatives devastating. As Young and Inouye⁶ point out, ‘few ill health situations are more degrading to people of any age than loss of reasoning, faculties, and personhood’. However, in high-risk groups such as hip fracture patients, delirium may be preventable. This review will discuss the current understanding of delirium with specific reference to trauma patients. Currently, most of the evidence for delirium in trauma is centred on patients who have sustained hip fractures and those patients requiring intensive care unit (ICU) support, and this review will reflect this.

Epidemiology
Delirium is an extremely familiar problem encountered on all medical and surgical wards within both acute and community hospitals worldwide. A recent point-prevalence study suggests a prevalence of 19.6% across the general hospital setting.⁷ The highest incidence of delirium recorded in the hospital setting is amongst older ICU patients; estimated as high as 70–87%.⁸ This reflects both the severity of illness and advancing age on the development of delirium. In trauma, there will be patients with both established delirium where the delirium has preceded or sometimes led to the trauma and incident delirium which develops as a reaction to the trauma and hospitalisation process. A meta-analysis of the incidence of delirium in both elective and emergency orthopaedic surgery showed an incidence ranging from 4% to 53.3%.⁹ When hip fracture data were isolated, the incidence of delirium was 21.7% when patients with pre-existing cognitive impairment were included and 12.5% when they were excluded. This is higher than the incidence identified on the general medical ward.¹⁰ A significant proportion of the delirium identified in hip fracture patients preceded surgery.¹¹ A large retrospective review¹² of adult trauma patients whose admission was linked to ethanol

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ingestion found an incidence of delirium to be 0.6%. However, an observational study of trauma patients admitted to the ICU found an incidence of 67% reflecting illness severity in the development of delirium.\textsuperscript{12}

**Risk factors, precipitants and pathophysiology**

The high incidence of delirium in hip fracture patients is a direct result of the increased vulnerability to delirium seen in this patient cohort and is estimated to be as high as 53.3%.\textsuperscript{9} Studies that specifically evaluated risk factors for delirium in trauma patients\textsuperscript{11,13} identified age, ethanol, falls, thermal injuries and ICU admission as contributory factors. Acknowledged predisposing factors for delirium in all patients are outlined in Box 2.\textsuperscript{14}

Given the appropriate precipitant, everyone can experience a delirium; for someone young and fit, it may be a severe cerebral irritation such as meningitis or polytrauma. However, for the very frail or demented patient, the insult may be as simple as mild constipation or a change of environment. Recognised precipitants for delirium are outlined in Box 3.\textsuperscript{6}

Medication can be the sole precipitant of delirium in 12–39% of cases.\textsuperscript{16} The most common drug triggers are benzodiazepines, narcotic analgesics and drugs with an anticholinergic effect.\textsuperscript{17} A study examining\textsuperscript{12} risk factors for delirium development on the trauma ICU found midazolam use significantly increased the rates of delirium whilst morphine use (presumably through treatment of pain) reduced delirium rates.

The pathophysiology is poorly understood despite its clinical importance, and it is not in the scope of this article to go into detail.\textsuperscript{18} The development of delirium occurs due to an interaction between patient vulnerabilities (age and dementia) leading to a primed brain and subsequent peripheral inflammatory response or a direct insult to the brain. This inflammatory response is thought to be aberrant resulting in microglial cells in the brain releasing intracerebral inflammatory mediators.\textsuperscript{19} This subsequently results in disrupted neurotransmission causing the typical clinical symptoms seen in delirium.

**Delirium diagnosis**

**History**

The detection rates for delirium in the acute hospital setting are extremely low; lower detection rates are recognised in those who are older, have co-morbid dementia, those with hypoactive features and those who are under surgical rather than medical care.\textsuperscript{20,21}

A thorough collateral history is particularly pertinent in those patients with a pre-existing dementia where it is frequently assumed that the cognitive state of a patient...
on arrival to a ward or department is the normal for them and consequently the acute delirium is missed; the change from baseline cognition can also be much less dramatic making identification more challenging. Detailed information as to the patients’ usual cognitive state and any changes observed is vital to accurately diagnose an acute delirium. Diagnosing delirium in the context of pre-existing dementia is a diagnostic challenge – it is helpful to remember that impaired conscious level and rapid fluctuations in cognition are not features of dementia.

Nursing staff are in an excellent position on the ward to recognise fluctuation and change in a patient’s behaviour. They also have access to more detailed collateral history from their increased exposure to family members and caregivers who are often the first people to identify a change in the behaviour of a relative. However, nursing staff often lack training in the use of cognitive assessment tools and have decreased awareness of delirium as a diagnosis. On the other hand, medical staff may have more training in cognitive assessment and recognition of delirium but only see patients for a short period and consequently miss fluctuations in behaviour. 20

Another group of patients in whom delirium is often difficult to identify is those who have sustained a traumatic brain injury, where the incidence of delirium has been found to be as high as 57%.22 This is partly due to prolonged induced coma but also because fluctuations in arousal and cognition are expected in mild and severe brain injury. It is also difficult to distinguish delirium from the neurocognitive failure due to structural brain injury and fluctuations due to evolving injury.

**Clinical features**

Delirium is a clinical diagnosis made at the patients’ bedside, and the core features are altered consciousness, altered awareness and inattention. A change in baseline cognition is also seen. These features develop over hours or days. Despite its high prevalence, recognition remains poor with up to two-thirds of delirium going unrecognised by clinicians. 23 Delirium has two well-recognised subtypes, hyperactive and hypoactive. Hyperactive delirium is often easily recognised, where the patient is unable to rest, is agitated and wanders around the ward. The hypoactive subtype is more often missed as the patient becomes quiet, withdrawn, eats little and appears to sleep a lot. Patients with hypoactive delirium are particularly at risk of dehydration and malnutrition as they will sleep through meals and drinks rounds and may not even be rousable to drink with assistance. For this reason, hypoactive delirium carries a higher mortality.24 Symptoms of delirium often fluctuate, can be unpredictable and are often worse at night.25 Patients can transition between hyperactive and hypoactive delirium. Both patients with hypoactive and hyperactive delirium may experience visual and auditory hallucinations.

Physical signs include carphology (plucking or picking at the bed clothes) and floccillation (plucking at the air). 26 A small unpublished study 27 of 120 patients found carphology/floccillation to be 98% specific for delirium and 14% sensitive for early delirium. In fact, these physical signs were first described by Hippocrates over 2000 years ago.

Respecting the movement of the hands, I have these observations to make: when in acute fevers, pneumonia, phrenitis, or headache, the hands are waved before the face, hunting through empty space, as if gathering bits of straw, picking the nap from the coverlet, or tearing chaff from the wall – all such symptoms are bad and deadly. (Hippocrates)

**Delirium screening tools**

There are various tools that can be utilised to help identify the delirious patient. 20 It is recommended 28 that all elderly people admitted to hospital or in long-term care units should be screened for risk factors of developing delirium and cognitive impairment, using a brief cognitive test.

Available tools range from the very simple assessments of concentration by asking a patient to count from 20 down to 1 which requires no specific training to comprehensive assessments such as the Delirium Rating Scale – revised 98 which is a 13-point scale used predominantly by psychiatrists and takes 20–30 min to administer. 29

The Confusion Assessment Method (CAM, see Box 4) and the Confusion Assessment Method for the ICU (CAM-ICU, adapted for critical care patients) are validated tools based upon DSM-IV criteria. With appropriate training, the use of CAM administered with a brief cognitive assessment instrument demonstrates sensitivity and specificity of over 90% for identifying delirium. 30

A recently developed tool, the 4AT screening instrument for cognitive impairment and delirium, has the advantage of being a brief test that does not require training to administer and incorporates general cognitive screening. It has been well piloted but is currently in the process of being formally validated. 31 A recent meta-analysis examining the most appropriate tools for identifying delirium in hip fracture patients illustrates that most have not been validated in this group. 32 However, the CAM-ICU has been validated specifically on the trauma ICU. 33
Delirium prevention

Delirium costs the individual by attacking their dignity and personhood and costs health services by increasing length of hospital stay and morbidity, and yet it has been shown that a third of episodes of delirium could be avoided. Delirium is preventable particularly in trauma patients. The key to delirium prevention is recognition of those patients at high risk of developing delirium and avoidance of known precipitants.

Geriatric review has been highlighted to be effective in delirium prevention indicating the need for complex intervention in delirium prevention. This is supported by the effectiveness of the hospital elder life programme (HELP) which is a translation of the Yale delirium prevention model of care. This programme has been shown to reduce incident delirium by 40% and total delirium days by 30%. HELP is an intervention carried out by a skilled multidisciplinary team and trained volunteers with standardised protocols of the management of six risk factors.

- Cognitive impairment
- Sleep deprivation
- Immobility
- Visual impairment
- Hearing impairment
- Dehydration

The evidence for pharmacological prevention of delirium is limited to small studies evaluating drug use after fractured neck of femur. Two examined the use of low-dose antipsychotic both of which reported negative results, and a pilot study of anticholinesterase inhibitors (donepezil) also reported negative outcomes and has consequently not proceeded to phase III trials.

Delirium management

If not prevented, the mainstay of management once delirium has developed is the rapid identification and subsequent withdrawal or treatment of precipitants. However, the cause is often multifactorial. Other management should be aimed at reducing stress, ensuring adequate hydration, nutrition and preventing complications such as falls, pressure sores and infections. The environment needs to be appropriate with adequate lighting, availability of clocks and calendars to orientate the patient to time, and unnecessary moves between or within wards should be avoided. Staff caring for patients should be trained in delirium management techniques spending time re-orientating patients as to who, where and why they are where they are. Attempts should be made at cognitive stimulation with reminiscence therapy. Visiting from familiar faces in the form of friends and family should be encouraged, and support and explanation as to the nature of delirium should be given to these visitors.

The evidence for pharmacological treatment remains conflicting, with a lack of robust or systematic evidence to advise on drug use. The consensus is that drug therapy should be reserved for behavioural symptoms that lead to a patient posing a risk to themselves or others. If drugs are used, recent guidelines recommend the short-term use of low-dose antipsychotics such as haloperidol or olanzapine. Benzodiazepines are not recommended as first-line agents as they often exacerbate mental status changes and cause oversedation. Oversedation can lead to a greater risk of falls, malnutrition and development of pressure sores, venous thromboembolism and a multitude of other serious adverse events.

Anaesthesia and delirium

Regional anaesthesia in hip fracture patients has previously been supported as a method to prevent postoperative delirium, but this has not been supported recently by a wider meta-analysis of postoperative delirium prevention published in 2013. There is evidence that lighter sedation during regional anaesthetic blocks reduces postoperative delirium. Supporting this is a small study of trauma ICU patients where the use of an analgesia-delirium-sedation protocol incorporating a pain assessment and CAM-ICU to aim for an awake and comfortable patient as opposed to
continuous sedation with daily interruption of sedation decreased incidence of delirium and significantly reduced ventilated days, ITU stay and hospital stay.47 There is also on-going research and discussion as to whether choice of induction and anaesthetic agents influences the incidence and duration of postoperative delirium.45

Conclusion
Interest in delirium is rising in all medical and surgical fields reflecting a greater understanding of the impact delirium has on health and social care costs but remains a major unmet need.14 With an ageing population worldwide and increasing frailty and susceptibility to delirium amongst patients admitted to all hospital specialties, an understanding of delirium prevention and management is crucial. It is, however, an area in which further research is vitally required to ensure a more detailed understanding of the pathophysiology of the disease process and hopefully subsequent therapeutic options.

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Conflict of interest
None declared.

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