Emergency care and management of patients with stab wounds


Summary
This article discusses the assessment, management and treatment of patients with stab wounds on arrival in the emergency department. It describes the immediate approach to assessment. The assessment of stab wounds to the chest, abdomen and limbs is also examined.

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Aims and intended learning outcomes
This article aims to equip nurses working in emergency departments with the knowledge and skills required to care for and manage patients who have been stabbed. Initial assessment is aimed at identifying, treating and managing potentially life-threatening complications associated with stab wounds. After reading this article you should be able to:

› Identify penetrating trauma and associated complications.

› Summarise the systematic ABCDE (airway with cervical spine control, breathing and ventilation, circulation and haemorrhage control, disability and neurological assessment, exposure and environmental control) approach to assessment and management of trauma patients.

› Recognise the need for a thorough examination of patients who present with a stab wound.

Introduction
Attacks in which a knife was used in a successful mugging rose from 25,500 in 2005 to 64,000 in 2007 (Leppard 2007). Patients with stab wounds usually require urgent assessment and stabilisation in an emergency department, with prompt operative management, if necessary, to ensure a successful outcome. These patients will have different needs as they progress through their hospital stay.

To stab is to ‘thrust a knife or other pointed weapon into’ (Compact Oxford English Dictionary 2009). A stab wound is a penetrating trauma or injury caused by a sharp object, such as a knife, blade or broken glass. The sharp object pierces the patient’s skin and enters the body, creating a wound track through which it has passed and causing localised tissue damage along the wound track. By comparison blunt trauma, such as a fall from a height or sudden deceleration in a motor vehicle causing internal chest and abdominal injury, is caused by energy transfer through body tissues, which results in injury (Eaton 2005).
significant damage to internal body tissues. The ambulance service and police, who often accompany patients to the emergency department, can provide useful information about the weapon used. The handling of any weapons should be left to the police, where possible, and nurses should be familiar with forensic issues about the handling of evidence (Pepper and Brompton 2002).

If a single stab wound has been sustained, patients should be carefully examined to exclude any other injuries (Greaves et al 2000). Common sites for missed wounds include the back, buttocks, axilla, groin and perineum. It is also important to consider stab wounds in patients who present with other trauma or conditions. For example, patients presenting with severe head injuries might also have a small axillary stab wound that could be missed while the main injury is treated. Consideration should also be given to the likelihood of stab wounds in an unconscious patient.

A large proportion of injuries caused by stabblings are the result of acts of criminal violence (Wilson et al 2006). Nurses should consider not only patient safety, but also their own. In some instances violence can occur in the hospital as the perpetrator tries to attack the victim again. In such cases it is advisable to ensure that hospital security staff and/or the police are present. In some circumstances it might be necessary to treat patients in an area of the hospital where access can be easily controlled.

Pathophysiology of trauma

The extent of the trauma caused by penetrating injury depends on the energy of the object used. The principles of kinetic energy, which are most commonly used in reference to blunt trauma, are also important when considering penetrating trauma. This is commonly expressed in the following equation: \( E = \frac{1}{2} mv^2 \), where \( E \) is the kinetic energy, \( m \) is the mass (kilograms), and \( v \) is the speed (metres per second). This means that the velocity at which the knife strikes a person, not the size or shape of the knife, determines the severity of the injury (Dickinson 2004).

The size of the impact area will also play a part in determining the amount of damage sustained. If all the energy of the impact enters the body’s tissues through a single point, as is typical in a stab wound, it will produce more damage to the tissues of the wound track, in comparison to a blunt object which spreads the impact force more widely.

The damage caused by penetrating trauma depends on the underlying body structures. The knife travels in a straight line from the point of entry, creating a wound track and damaging body structures in its path. The weapon might have been moved once inside a person, and the wound track might not appear straight, making it difficult for healthcare professionals to view where the wound ends. It is important to note that there is the potential for an upturned conical shaped area to develop below the entry point in which there can be underlying damage (National Association of Emergency Medical Technicians 2003).

With a few exceptions, such as the trachea, the body’s structures are not fixed in location and can move into and away from the wound track at the time of injury and post-injury. Like all traumas a penetrating injury can cross anatomical boundaries, for example an epigastric wound that lacerated the contents of the abdomen may also puncture the diaphragm and cause injuries to either of the lungs or the heart.

Assessment of penetrating trauma

Patients with trauma injuries are best managed by a multidisciplinary trauma team. A trauma team typically consists of at least three doctors, three nurses and a radiographer (Driscoll and Skinner 2000). The trauma team should be given adequate time to assemble and prepare for patients before their arrival. If patients are being brought to hospital by ambulance, paramedics and ambulance staff usually alert the hospital to the approximate time of their arrival and each patient’s condition. However, if a patient self-presents to the emergency department, this will not be possible and early resuscitation may need to be started as the trauma team assembles.
Primary survey is undertaken immediately on the patient’s arrival at hospital and involves a structured approach to identify and treat any life-threatening conditions promptly (Driscoll and Skinner 2000). Systematic assessment involves the ABCDE approach to care (Guly 2003).

**Airway with cervical spine control** Assessment of the patient’s airway and consideration of potential damage to the cervical spine are important. Driscoll and Skinner (2000) advise that a semi-rigid collar and secured head blocks should be used if there is evidence of injuries above the clavicle, or a dangerous mechanism of injury. Nurses or doctors closest to a patient’s head should attempt to talk to him or her to assess responsiveness and possible airway obstruction. If patients are able to respond coherently to simple questions then it is likely that the airway is clear and the brain is adequately perfused with oxygen (Hadfield-Law 2000).

If patients do not respond, the airway should be checked by opening the mouth. In patients with suspected cervical spine injury a jaw-thrust manoeuvre should be used to open the mouth to enable examination of the airway, while minimising movement of the neck (Driscoll and Skinner 2000). It may be that the jaw thrust has moved the patient’s tongue forward and this is all that is required. At this point, any solid obstruction or foreign object should be removed, and any fluid gently suctioned out as required. If a cervical spine injury is suspected the patient’s head should not be tilted to one side while suctioning takes place as further injury may result (Driscoll and Skinner 2000).

The use of a nasopharyngeal airway can be useful in patients who are maintaining their own gag reflex, but require help to maintain their airway (Hadfield-Law 2000). For patients who cannot maintain their own airway and have no gag reflex, the early use of intubation with an endotracheal tube is recommended (Driscoll and Skinner 2000). Excessive ventilation with a bag-valve mask can increase the risk of patients vomiting. In some instances it might be impossible to pass an endotracheal tube successfully, either because of the nature of a patient’s injuries or his or her anatomy (Watson 2000). It may be necessary for nurses to prepare for an emergency needle cricothyroidotomy (a cannula placed into the larynx) to establish a temporary airway before attempting to establish a surgical airway (Hadfield-Law 2000). Nursing staff do not perform these highly invasive procedures, but they often assist anaesthetics staff, and a knowledge of how the procedure is carried out and what equipment is required is useful.

**Breathing and ventilation** All trauma patients should have high flow oxygen applied through a mask with a reservoir bag attached (American College of Surgeons (ACS) 1997). The patient’s breathing should then be examined. Some clothing might need to be removed to observe the patient’s chest movements. Observation should include the rate and depth of breathing, use of accessory muscles of respiration and tracheal shift from the midline (Hadfield-Law 2000). Pulse oximetry can also be used in a breathing assessment to provide an indication of haemoglobin saturation with oxygen.

Thoracic injuries can be life-threatening if they are not recognised and treated promptly. These injuries include (Greaves et al 2000):

- Airway obstruction.
- Tension pneumothorax – accumulation of air under pressure in the pleural space. A one-way valve is formed allowing air to enter the pleural space and preventing air from escaping naturally.
- Open pneumothorax – where a pneumothorax communicates with the outside air through a hole in the chest wall.
- Haemothorax – accumulation of blood in the pleural space.
- Flail chest – a condition where there are multiple fractures in adjacent ribs and a segment moves independently to the rest of a patient’s chest.
- Cardiac tamponade – accumulation of fluid in the pericardium.

Penetrating trauma to the thorax can cause a haemothorax or pneumothorax. A doctor should auscultate a patient’s chest to identify haemothorax or pneumothorax early in the assessment process (Driscoll and Skinner 2000). A pneumothorax or haemothorax should be treated with a chest drain to allow air and fluid to be drained from the chest, although this should always be preceded by insertion of an intravenous (IV) catheter to allow replacement of blood should it become necessary (Driscoll and Skinner 2000). Early use of chest X-ray in...
have experienced excessive blood loss from the wound, obtaining IV access can be difficult. If staff are unable to site an IV catheter adequately, help should be sought from a more experienced colleague.

When the normal IV route is unobtainable there are a number of other options available to ensure adequate blood and fluid replacement. The central venous route can be used if peripheral access is difficult, and Dawes (2005) recommends that a skilled doctor should perform the procedure.

If peripheral access is not possible it might be worth considering the intraosseous route (Lavis et al. 2000), where access is gained directly into the patient’s bone. The intraosseous route of administration is common in emergency paediatric care, but has only recently been introduced for adult trauma patients. The intraosseous route has the advantage of allowing easy access irrespective of how peripherally shut down patients are, and the process requires limited training.

The administration of fluids to replace blood lost following penetrating injury should be considered in cardiovascularly unstable patients, in small controlled amounts of 250-500ml, and the patient’s response should be monitored carefully.

There is conflicting advice about the administration of fluid in traumatic patients. During initial assessment and management the ACS (1997) recommends the infusion of between one and two litres of crystalloid, for example Hartmann’s solution. Revell et al. (2002) highlight that in some instances the rapid infusion of fluid can have a detrimental effect on patients because it can increase the circulating volume, therefore potentially increasing cardiac output and blood pressure, and disturbing wounds in the body that may have clotted.

A sudden infusion of fluid can also disrupt wound sites where clotting mechanisms have brought about cessation of haemorrhage (Revell et al. 2002). Although there are risks associated with transfusion, blood is the ideal fluid replacement as it allows clotting factors and haemoglobin to be replaced and ensures that end-organ perfusion is maintained (Revell et al. 2002).

A patient’s cardiovascular status can appear stable, with no active bleeding. However, careful monitoring should take place to ensure any subtle changes are detected early. Any cardiovascular instability requires thorough clinical examination to determine the point of bleeding, and with senior surgical input, the early use of surgical interventions to stop the bleeding.
Disability and neurological assessment

An assessment of the patient’s conscious level should be conducted using the Alert, Voice, Pain, Unresponsive (AVPU) scale, which is a quick tool for assessing his or her consciousness, particularly if there is any suspicion that the patient may have sustained a head injury. Patients not alert on the AVPU scale should have a full Glasgow Coma Score (GCS) assessment carried out and neurological observations should be monitored and recorded every 30 minutes until his or her GCS returns to 15/15 (National Institute for Health and Clinical Excellence 2007). Unless there is a known reason for a drop in GCS, such as the effect of drugs that have been administered, then hypoxia, hypovolaemia or a neurological problem should be suspected, along with any other injuries that are already known.

Exposure and environmental control

At this stage a patient’s clothing is usually removed and patients are examined for further injuries. It is possible that pain from another injury can mask pain from a stab wound and vice versa. Nurses should use blankets to ensure that patients do not become hypothermic, and to maintain their privacy and dignity.

If there are no immediate surgical problems that require transfer to theatre then a secondary survey should be performed. Secondary survey involves a more detailed assessment of patients, patients are examined from head to toe and further tests and investigations are organised (Driscoll and Skinner 2000). These tests can range from a computed tomography (CT) scan on a non-urgent basis, to an ultrasound scan of a limb in the vascular studies department.

Tension pneumothorax

Emergency management is required if a tension pneumothorax develops as patients deteriorate rapidly. A tension pneumothorax develops when air enters the potential space between the two pleura and becomes trapped under tension. This can occur as a result of a penetrating injury to the lung, bronchus or chest wall (Greaves et al 2000). Air that enters the pleural space is unable to escape causing a rapid accumulation of air, which can cause collapse of the lung and eventual compromise of the circulatory system as the pressure causes a shift of the mediastinum.

Tension pneumothorax can be recognised by respiratory distress, reduced or absent breath sounds, overinflated or hyper-resonant percussion notes on the affected side of the chest, tracheal deviation, which is a late sign and absent in the majority of cases, or distended neck veins, which may not be seen in patients who are hypovolaemic (Greaves and Porter 1999).

Primary management involves needle chest decompression. A large IV cannula is inserted into the chest, in the second intercostal space in the midclavicular line. The needle is then removed and the air allowed to escape. The cannula should be left in place and secured. The cannula should not be capped or the end covered (Bjerke 2006). In most circumstances patients will then have a chest drain inserted on the affected side for further management during their hospital stay (Bjerke 2006).

Abdominal stab wounds

An assessment of a patient’s abdomen, especially if there is evidence of any injury, is necessary soon after arrival in the emergency department. A large amount of blood can accumulate in the abdomen after injury, which is not always easily detected and can have a significant effect on a patient’s ability to maintain end-organ perfusion. The large surface area of the abdomen and the large number of organs within, mean that any stab wound to that area of the body can become life threatening (ACS 1997). Unlike the thoracic cavity there is no protective bone structure surrounding the abdomen and once the surface skin has been penetrated there is little other resistance offered.

The surface appearance of a stab wound, particularly on the abdomen (Figure 1), can hide the seriousness of tissue damage underneath. About one third of patients who have serious tissue damage on exploration in theatre display minimal pre-operative physical signs (Cope and Stebbings 2000). Young patients are able to compensate well for fluid loss and usually only display a sudden deterioration, therefore the involvement of a senior surgical doctor is required early on in assessment.

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**FIGURE 1**

Close-up of a penetrating stab wound to the abdomen

NURSING STANDARD
The main options open to a surgeon looking after a patient with an abdominal stab wound involve whether to take patient to theatre for a laparotomy or consider conservative management. Small stab wounds can be explored by surgeons in the emergency department using local anaesthetic. It is estimated that this allows the discharge of approximately 25% of patients after a short period of observation (Lawson and Goosen 2008). Patients who are haemodynamically unstable or show signs of peritonitis should not have their wounds explored and should be taken for immediate laparotomy (Lawson and Goosen 2008).

Some patients will have an ultrasound scan. In the majority of emergency departments this will be a portable Focused Assessment with Sonography for Trauma (FAST) scan. While the FAST scan has poor sensitivity (Brooks et al 2005) and does not rule out the presence of blood in the abdominal cavity, it is non-invasive and can be repeated as often as required. A CT scan of the abdomen might also be undertaken. However, this is usually only appropriate if a patient’s cardiovascular system is stable enough for him or her to be transferred to the radiology department (Ertekin et al 2005).

Nurses’ preparation of patients going to theatre should include completion of any necessary pre-theatre check lists and informing the next of kin. It is important to note that the transfer of patients to theatre for an emergency operation should never be delayed under any circumstances.

Extremity stab wounds

While a stab wound to a patient’s limbs might initially appear less serious than those to the abdomen or thorax (Figure 2), such wounds can result in life-threatening complications (Figure 3). Major blood vessels perfuse the arms and legs, and vessel injury can result in excessive haemorrhaging.

With the majority of limb wounds (Figure 4), simple direct pressure will be successful in stemming haemorrhage. A stab wound that will not stop bleeding from direct or indirect pressure requires further action. The ACS (1997) advises against the application of a tourniquet to assist in haemorrhage control, because of the damage that can occur to the underlying tissue. The application of tourniquets can occur in specific situations – although these are limited – where their application will halt excessive haemorrhage loss before immediate surgical intervention (Lee et al 2007).
Assessing and managing patients who have sustained a stab injury can be challenging because their wounds can be life threatening and the patient can deteriorate quickly. Special care should be taken with patients who present with penetrating trauma to ensure that they are examined fully and that any other injuries are not overlooked. A structured ABCDE approach to assessment should be adopted by all members of the trauma team to ensure that the patient receives the best possible care.

**Time out 5**
Using the information in this article, structure a plan of action for staff to use to assess and manage patients with stab wounds.

**Conclusion**

Now that you have completed the article, you might like to write a practice profile. Guidelines to help you are on page 60.