MANAGEMENT OF PAIN IN PRE-HOSPITAL SETTINGS

Michael Parker and Antony Rodgers discuss ways to measure pain in trauma patients and ask why some practitioners provide patients with inadequate pain relief.

Abstract

Assessment and management of pain in pre-hospital care settings are important aspects of paramedic and clinical team roles. As emergency department waiting times and delays in paramedic-to-nurse handover increase, it becomes more and more vital that patients receive adequate pre-hospital pain relief. However, administration of analgesia can be inadequate and can result in patients experiencing oligoanalgesia, or under-treated pain. This article examines these issues along with the aetiology of trauma and the related socioeconomic background of traumatic injury. It reviews validated pain-assessment tools, outlines physiological responses to traumatic pain and discusses some of the misconceptions about the provision of effective analgesia in pre-hospital settings.

Keywords

Analgesia, oligoanalgesia, pain assessment, pain management, injury, trauma

IN THE UK, major trauma is the leading cause of death in people aged between one and 40 years (National Confidential Enquiry into Patient Outcome and Death 2007). Of about 20,000 major trauma incidents that occurred in 2007, 5,400 resulted in death and about 10,000 resulted in life-changing disabilities (National Audit Office (NAO) 2010).

Incidence of traumatic injury is closely related to sociodemographic background and gender. Traumatic injury is more likely to occur in lower socioeconomic groups, for example, and three quarters of trauma patients are males aged between 16 and 20 years (NAO 2010). According to the charity Brake (2014), drivers aged between 17 and 24 years represent only 1.5% of UK driving licence holders, but are likely to be involved in 12% of fatal or near-fatal motor vehicle collisions or accidents. Brake (2014) cites inexperience and over confidence as the main factors causing such accidents, and suggests that the two factors correlate with a reduced ability to identify hazards and a willingness to engage in risk-taking behaviour, such as driving under the influence of alcohol or drugs. The latter finding is also emphasised by Bonar et al (2015).

Emotional responses to traumatic events include extreme fear, hallucinations and helplessness (Bronson 2000). These responses are innate and initiated whenever there is a threat to life or loss of control, and can have profound psychological effects.

The effects of trauma on patients and their families is too big to quantify (Bronson 2000), and survivors of trauma are often reluctant to talk about their experiences (Geisser et al 1996). Anyone involved in stressful, life-threatening or catastrophic events can experience post-traumatic stress disorder (PTSD), although the symptoms may not become apparent for days, weeks or even months (National Institute for Health and Care Excellence (NICE) 2005).

The development of PTSD is closely linked to maladaptive mechanisms for coping with trauma and pain, whereby untreated pain can produce psychological stress and anxiety, as well as neurohumoral changes, neuronal remodelling,
and long-lasting psychological and emotional distress (Dunwoody et al 2008).

Emergency care practitioners should not underestimate the effects of psychological trauma on the individuals concerned and their families (NICE 2005). Central to the management of such patients is pain control (Iqbal et al 2012), and pain management should be regarded as a crucial element of effective pre-hospital care.

Pain management

Physiology Acute pain is usually associated with injury, and serves as a warning of actual or potential tissue damage. Pain receptors are made up of bare sensory nerve endings, which weave through all types of body cell other than those in the brain. The activation of these nociceptors initiates an action potential, which is transmitted via the axons of afferent, or sensory, nerves. Afferent pathways synapse in the dorsal horn of the spinal cord. Pain signals are then conveyed to the cerebral cortex via higher order neurones and the spinothalamic tract. The signal is then perceived and modulated (Martini and Bartholomew 2010, Waugh and Grant 2010).

The peripheral nerve pathways comprise two types of nociceptor fibre: myelinated A-fibres and unmyelinated C-fibres (Waugh and Grant 2010). Myelinated A-fibres are sensitive to mechanical and thermal stimuli, and can convey signals rapidly. Their signals are perceived as localised sharp pain. Unmyelinated C-fibres respond to mechanical, thermal and chemical stimuli, but conduct signals slowly. Their signals are perceived as poorly localised, dull and aching pain.

Mechanical, thermal or chemical damage releases chemicals such as leukotrienes, bradykinins, serotonin, histamine and thromboxane, which activate nociceptors. Although prostaglandins are also associated with pain, they do not stimulate receptors directly. Instead, they cause small blood vessels in the damaged areas to dilate so that more blood is able to flow into the regions surrounding them. This causes redness and swelling, which leads to oedema. The swelling and oedema cause pressure on the nerve endings, which results in pain (Waugh and Grant 2010).

Nociceptors are found in the skin, periosteum, arterial walls, teeth, joint surfaces and in the falk and tentorium of the cranial vault. They propagate impulses to their cell bodies in the dorsal horn of the spinal cord, where a neurotransmitter known as ‘substance P’ is released. Substance P then relays the signals through higher order neurones and the spinothalamic tract to the cortex (Dawson 2009, Martini and Bartholomew 2010).

Pain is a complex experience that is unique to each person who feels it. How pain is felt depends partly on the age, gender, ethnicity and prior experiences of the individual who feels it, and so can be difficult to measure objectively (Joint Royal Colleges Ambulance Liaison Committee (JRCALC) 2013). Nevertheless, a number of pain measurement tools have been developed to aid the assessment of pain, and the effectiveness of pharmacological and non-pharmacological interventions to manage it (Curtis and Morrell 2006).

Pain scales The Wong-Baker Face system (Wong et al 2001) is used in many emergency care settings for the assessment of pain in children or patients who cannot communicate easily (Krigger 2006). The system comprises a numerical scale of between zero and six, where zero represents no pain and six represents the worst pain. Each degree of pain is illustrated by the drawing of a face with an expression ranging from distressed to happy.

Another assessment tool that is used primarily with children is the Face, Legs, Activity, Crying, Consolability (FLACC) scale (Merkel et al 1997). This comprises a shorter numerical scale in which zero represents no pain, one represents moderate pain and two represents severe pain. Clinicians are expected to make subjective assessments of children’s pain based on the degree of discomfort or pain shown in their faces, legs, activities, how much they are crying and how easily they can be consoled.

The Wong-Baker Face system and FLACC scale may seem basic, but they are useful in pre-hospital settings, especially with people who have communication difficulties or where no alternative is available (Kenyon 2009).

Alternative pain-measuring tools include the Visual Analogue Scale (VAS) (Crichton 2001), a 100mm line on which patients mark the degree of pain they are experiencing between no pain at one end of the scale and severe pain at the other. Illustrations similar to those in the Wong-Baker Face system can be added to the scale to help to communicate its purpose to patients who have difficulty understanding what is asked of them. As Crichton (2001) acknowledges, the VAS is a subjective method of assessment, but it can be useful in assessing pain in older patients and those with difficulties understanding.

The Numerical Rating Scale (NRS) (Downie et al 1978) is an 11-point numerical rating scale in which zero represents no pain and ten severe pain, and on which patients attribute a numerical value to the level of pain they experience. Some patients struggle with the concept of applying a subjective value to pain, however.
In a comparison of the VAS and NRS, Williamson and Hoggart (2005) conclude that both are appropriate, valid and effective for assessing pain. However, they also note that interpreting pain scores on a small vertical line requires dexterity, and conclude that the NRS is more effective and simpler to use than the VAS.

In an examination of the relationship between NRS scores and the administration of analgesia to 150 patient participants, Silka et al. (2004) found that 60% of the participants assessed with the NRS, but only 30% assessed with the VAS, received adequate and effective pain relief. The researchers conclude that the NRS is the most appropriate in pre-hospital care environments because it allows rapid and accurate re-assessment of pain, thus allowing clinicians to titrate analgesia appropriately (Williamson and Hoggart 2005).

Meanwhile, Bijur et al. (2006) found that, when recording pain scores every 30 minutes to show pain progression over a two-hour period, the NRS is more accurate and easier to use than the VAS in emergency departments (EDs). Of the 108 patients in their study, regular pain scores were documented in 103.

The Verbal Rating Scale (VRS) (Berthier et al. 1998) is a five-point scoring system where one represents no pain and five represents severe pain. In comparing the effectiveness of the NRS, VAS and VRS when used with 200 trauma patients and 90 non-trauma patients, Berthier et al. (1998) found a correlation in pain scores between the NRS and VAS. The effectiveness of the VAS and VRS were limited, however, due to a lack of understanding among the patients. Almost 20% of patients did not understand how to use the VAS and 11% did not understand the how to use the VRS, but 96% of patients understood the NRS. Berthier et al. (1998) conclude, therefore, that the NRS is the most appropriate measurement of pain in emergency care settings.

Although most pain-assessment studies are carried out in acute hospital environments, their findings are relevant and transferable to pre-hospital settings. With the advent of paramedic practitioners, hazardous area response teams and helicopter emergency medical services there is scope for research into pre-hospital pain management. Until this research is undertaken, emergency nurses should be aware of what pain-assessment tools are available and should choose the most appropriate tool for individual patients during specific events.

**Pain control** Research into effective pain control in pre-hospital settings is limited and most studies of acute pain relief focus on EDs. Pain assessment and management are important issues in pre-hospital care environments, yet are not always carried out (Curtis and Morrell 2006). For example, Abbuhl and Reed (2003) conducted a retrospective review over 18 months of patients with isolated, painful extremity injuries who had been transported by emergency ambulance to EDs. Exclusion criteria were inter-hospital transfers, and patients with altered levels of consciousness, haemodynamic instability, head or multiple injuries, intoxication or organic mental health problems. The researchers found that, of 706 patients studied, only 104 were not excluded by these criteria and, of these, only 13 received analgesia, which suggests that pre-hospital pain assessment and management can be mismanaged. They conclude that assessment and treatment of pain should be a priority in pre-hospital settings, and that effective pain management can result in positive patient outcomes, including a reduction in anxiety and fewer adverse physiological responses (Abbuhl and Reed 2003).

In an examination of the pre-hospital assessment and management of pain by 155 paramedics, Hennes et al. (2005) conclude that awareness of analgesia protocols is vital to pain management, and that the main reason that administration of analgesia by paramedics is inadequate is that they experience difficulties when assessing pain and the perception of pain.

**Under-treatment**

The term ‘oligoanalgesia’ describes inadequate treatment of acute or chronic pain. The reasons for oligoanalgesia are complex, but include preoccupation with diagnosis and treatment of underlying medical conditions, attending to traumatic injuries, concern about masking symptoms, concern about causing addiction to analgesics, ineffective communication and language barriers (Curtis and Morrell 2006).

These findings are supported by Walsh et al. (2013), who conducted a US-based qualitative research study in which they interviewed 15 paramedics with more than one year’s experience. The paramedics were employed by five emergency medical service agencies made up of private and hospital-based providers in urban and rural settings, and were asked to reflect on their experiences of delivering pain relief in pre-hospital environments. Results show that the paramedics were reluctant to administer pain relief without seeing either physical or physiological evidence of pain, such as limb deformities or changes in vital signs.

The withholding of analgesia when vital signs are normal is based on the misconception that
pain always initiates a physiological response, an association that has never been validated. Lord and Woollard (2011) published a retrospective study of adults with Glasgow Coma Scale (GCS) scores greater than 12 who had been assessed by paramedics in a metropolitan area over a seven-day period in 2005. The 3,357 eligible patients then self-assessed their pain using an NRS and 1,268 reported a pain score greater than six. The researchers found no meaningful correlation between pain scores and changes in vital signs, and conclude that this finding demonstrates that the severity of pain reported by adult patients is not validated by their vital signs (Lord and Woollard 2011).

The paramedics interviewed by Walsh et al (2013) also disclosed an unwillingness to administer strong doses of opioids, but preferred to opt for initial loading doses of intravenous morphine sulphate 5mg. Their choice of dose was based on a suspicion of potential drug-seeking behaviour in the patients concerned and uncertainty about masking pain-related symptoms. The study concludes that the paramedics' attitude and lack of understanding prevented the administration of appropriate pain relief.

Although no valid conclusions can be drawn from Walsh et al (2013), under-treatment of pain in pre-hospital environments is a recurring theme in the literature. For example, McEachin et al (2002) reviewed 124 patients with lower limb injuries and possible hip fractures who had been transported to EDs over a four-month period. Of the 124 patients, only 22 received pre-hospital analgesia, while 113 received analgesia once they arrived at the ED. Most of those who received pre-hospital analgesia were young people with lower extremity fractures. These findings demonstrate inadequate pre-hospital pain assessment and management.

In a retrospective study, Albrecht et al (2012) analysed patients transported to EDs by air ambulance in Switzerland. Swiss air ambulance teams consist of pre-hospital care physicians and paramedics, and the review focused on their decision-making skills. A total of 4,904 incidents were analysed with 1,202 meeting the inclusion criteria of patients being aged 16 years or over, with GCS scores of 13 or greater and NRS scores of three or more on arrival at the receiving hospitals.

Under-treatment of acute pain was indicated by documented NSR scores of three or more on arrival at the receiving hospitals, and no administration of analgesia. Findings show that 43% of patients were under-treated for pain by clinicians at the scene. The most frequently injured body parts were the limbs, in 66% of patients, and more than 50% of patients had multiple injuries.

The researchers do not discuss non-pharmacological interventions, such as splitting, which the JRCALC (2013) advocates as an effective non-pharmacological analgesic technique that can prevent unnecessary movement of limbs, and thus reduce anxiety about associated anticipated pain. It should also be noted that Albrecht et al (2012) do not mention the possible exacerbation of pain or discomfort caused by spinal immobilisation and associated spinal board discomfort (Connor et al 2015, Parker 2015). These undocumented non-pharmacological variables could be an important consideration when assessing pain using the NRS on arrival at hospital.

Green (2012) suggests that evidence of oligoanalgesia is flawed due to its retrospective nature, and argues that isolated pain scores do not necessarily suggest that clinicians under-treat patients’ pain. Green (2012) also says that a review of a large database of medical documentation for

References


potentially painful diagnoses cross referenced with analgesia does not offer a valuable insight into the overall clinical picture, and suggests that the perception of oligoanalgesia is due to poor record keeping.

In a study of 209 patient and clinician interactions about pain management in an ED, Chisholm et al (2008) reported that clinicians acknowledged patients’ pain 98% of the time, but recorded their observations only 92% of the time. Meanwhile, analgesia were offered to 80% of patients but this was documented for only 32%, and effective responses to analgesia were documented in only 28% of patients’ clinical case notes.

Chisholm et al (2008) conclude, therefore, that the assessment and management of patients’ pain are adequate, but that the associated documentation and post-analgesia review are not. Green (2012) further suggests that, in reviews of how well pain is managed, patient choice is not always considered. This finding is supported by Allione et al (2011), who reviewed 393 patients’ experiences of reporting pain and found that only 202 requested analgesia, but that almost half refused it. Reasons frequently cited for this refusal include that patients wanted diagnoses before taking analgesia and that they could tolerate pain. However, it should be noted that of the 202 patients who requested analgesia, only 146 received it. Pain score severity was cited as a large influencing factor on the administration of analgesia, but patients who complained of localised pain in the lower extremities were less likely to receive analgesia than others. Allione et al (2011) conclude that patients who received analgesia had greater patient-satisfaction scores.

Green (2012) accepts that pain is sometimes under-treated, but suggests that overcrowding in EDs and clinicians’ workloads are potential contributing factors to under-treatment. In a study over 17 months, Pines and Hollander (2008) interviewed 14,000 patients who reported severe pain. The patients defined poor treatment as no analgesia, or as a delay in administration of analgesia of more than one hour from initial identification of pain and a delay in interventional treatment. Of the 14,000 patient interviewed, only half received analgesia and, of these, 70% experienced delays. Pines and Hollander (2008) conclude that overcrowding in EDs is the biggest influence on reported delays.

Although the studies cited above focus on EDs it seems logical to assume that inadequate staffing levels, volume of patient flow and demand for services result in inadequate pain assessment and management in pre-hospital environments.

Conclusion
Management of acute pain is a fundamental part of patient care and directly linked to patient satisfaction, yet the assessment and management of pain in EDs and pre-hospital settings are often poor. The classic definition of pain as ‘whatever the experiencing person says it is, existing whenever the experiencing person says it does’ (McCaffery 1968) appears to be discounted by some clinicians and paramedics.

Research, into pain assessment and management tends to be hospital focused but, with the advent of consultant paramedics and emergency care practitioners, and in view of the growing demand on ED resources, escalating waiting times and poor patient satisfaction scores, more research on pre-hospital pain assessment and management is needed.

Conflict of interest
None declared

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