13.3.2 Anaesthetic agents in the emergency department

Ketamine is an option for analgesia and it may be appropriate in selected scenarios. Adequate analgesia can usually be achieved with IV doses of up to 0.5 mg/kg, titrated at approximately 0.2 mg/kg. An initial dose of 2–4 mg/kg intravenously produces *anaesthesia* within 30 seconds, which lasts up to 10 minutes. Thereafter, repeated increments of half the induction dose can usually be given every 5–10 minutes without significant accumulation. The administration of 10 mg/kg IM is an alternative which induces anaesthesia or deep sedation (dissociation) within 3–4 minutes, which lasts approximately 15–20 minutes. *Oral ketamine* 10 mg/kg also produces sedation adequate to either establish venous access or perform short painful procedures in uncooperative patients. Although ketamine has been used *intranasally* in children, more studies are needed to establish the appropriate dose for procedural sedation and analgesia. The effective doses varied from 6–10 mg/kg.

Ketamine is not useful for procedures where decreased muscle tone is required (e.g. shoulder or hip dislocations). Hallucinations commonly occur during ketamine sedation and while waking up from ketamine anaesthesia.

Methoxyflurane (Penthrop) is a volatile anaesthetic agent with analgesic properties at sub-anaesthetic doses. The delivery of this agent in the outpatient setting is now possible owing to a disposable inhalational delivery system. The drug offers adequate analgesia for short intense periods of pain, such as during dressing changes or wound debridement.

Anaesthetic induction agents, such as propofol and etomidate, should not be used unless the doctor knows the effect of these potent agents in healthy and injured patient, changes in pharmacokinetics, and airway management (laryngoscopy, intubation, prevention of aspiration, influence of burns, and maxillofacial and neck injury). As soon a patient has been intubated, they become an intensive care patient and must be managed as such.

13.3.3 Specific conditions commonly seen in the emergency department

- Acute cardiac pain
- Acute abdominal pain: biliary colic, renal colic, dysmenorrhoea
- Posttraumatic pain
- Acute musculoskeletal pain (including acute spinal pain)
- Pain management in sports medicine
- Headaches

Acute cardiac pain

Acute cardiac pain results from acute myocardial ischaemia and includes acute MI and unstable angina. Pain or discomfort is typically precordial, radiating or referred to the left arm and jaw,

but patients may also experience pain in either arms, left shoulder, back, neck or stomach. This is accompanied by dyspnoea, sweating, stomach discomfort (indigestion or heartburn), nausea and vomiting. Depending on the extent and location of ischaemia, patients may be dizzy (hypotensive due to myocardial failure or dysrhythmias). Sympathetic activation (sweating), radiating pain, referred pain, nausea and vomiting are typical of visceral pain (see the next section).

The restoration of adequate myocardial oxygenation is the mainstay of treatment. This is done by increasing arterial partial pressure of oxygen (PO_2), increasing coronary blood flow, and decreasing myocardial oxygen demand. These steps limit cardiac muscle damage and reverses ischaemic pain. However, early pain control is important in decreasing myocardial oxygen demand as it decreases the stress response.

Supplemental oxygen is usually administered as soon as possible. IV morphine is analgesic, anxiolytic, decreases blood pressure and suppresses the stress response. These effects decrease oxygen demand. Concurrent management includes nitrates, antihypertensives, antiplatelet agents and interventions to restore myocardial perfusion.

Morphine sulphate has been shown to be very effective at suppressing acute cardiac ischaemic pain. It is titrated at a dose of 50 µg/kg every 5 minutes. Keep in mind that morphine delays the antiplatelet effect of ticagrelor.

Acute cardiac pain due to pericarditis is somatic pain, as opposed to ischaemic pain, and is best treated with NSAIDs.

Acute abdominal pain

A wide spectrum of conditions present with acute abdominal pain. These conditions may be due to abdominal pathology (intra- or extraperitoneally), radiating or referred pain from extra-abdominal pathology, or systemic conditions presenting with abdominal pain. Therefore, it is once again important to not only manage the pain, but also consider anatomical, physiological (including functional disturbances and psychological) and pharmacological factors (including toxins), as well as conducting appropriate investigations before deciding on the management (intervention).

Abdominal pain can have its origin intra-abdominally (intra- or extraperitoneally) or extra-abdominally. Pain can radiate or refer from the abdomen to extra-abdominal regions, for example, to the right shoulder (the gallbladder, liver or right diaphragm), to the back (stomach, pancreas, retroperitoneal blood or kidney) and to the groin (kidneys and ureters). Conversely, pain due to extra-abdominal pathology can radiate or refer to the abdomen, for example, MI, pericarditis, testicular pathology, pleural pathology (pneumonia or PE), herpes zoster (may