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ENTONOX – no longer carried by TAAS but will be available from crews.

50% Mixture of Nitrous Oxide and Oxygen in a pressurised cylinder

Presentation
Pressurised cylinders blue and white cylinder neck, clearly marked Entonox.

Benefits
Rapid onset/offset, can be used whilst establishing IV access, particularly effective with limb injuries and labour pains. No cardiovascular or respiratory depression, good anxiolysis.

Disadvantages
Requires patient cooperation and clinician support

Contraindications
- Severe head injuries with impaired consciousness
- Decompression Sickness
- Chest Trauma (relative)
- Patients requiring greater than 50% oxygen to prevent hypoxaemia

Preparation
Gently invert the cylinder a few times immediately before use. This is especially important in cold weather as gases can separate. Ensure a clean, new mouthpiece/filter for each patient

Dose
Inhaled as needed. Encourage patient to take slow deep breaths. There is an audible noise from the valve when a sufficiently deep breath is taken. Allow three to five minutes to start working effectively; may take up to ten minutes before full effect is gained. Ensure that the patient takes regular top-up doses as needed. Entonox is safe and effective in children provided they are capable of comprehending the instructions.

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PARACETAMOL - ORAL TABLETS, SYRUP AND IV BOTTLES

Presentation

Sachets containing 120 mg in 5ml (preferred). Bottles or bags containing 1g in 100ml for IV use. 500mg tablets for oral consumption

Benefits

Effective analgesic for mild to moderate pain, especially in children. It has a synergistic effect when used with opiates. It does not produce respiratory depression or hypotension. Antipyretic.

Disadvantages

Paracetamol is a common constituent of many over-the-counter preparations, some of which may sound like an NSAID. It is important to check all preparations that have been administered in the preceding four hours.

Contraindications

- Known allergy to paracetamol (very rare)

Preparation

Use an oral medication syringe and draw up the correct dose for sachets. IV set up as infusion from bottle. An air inlet needle should not be required and risks allowing an air embolus to enter the giving set.

Dose

Adults, children > 50kg: Total 1 gram

Children: The recommended dose is 15 mg/kg up to a maximum of 1g. It is good practice to have both crew members do the calculation separately, thereby avoiding confirmation bias.

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MORPHINE SULPHATE ORAL SOLUTION (ORAMORPH)

Oramorph is only a schedule V controlled drug; however, all stock held, administered and wasted must be accounted for in the appropriate registers.

Presentation

Clear solution containing 2mg of morphine per ml. Currently bottles of 10mg in 5ml or 20mg in 10ml are carried.

Benefits

Morphine is a strong opioid analgesic. It is particularly useful for treating severe continuous pain of visceral or soft tissue origin. It produces analgesia, sedation and euphoria.

Disadvantages

It may depress respiration and induce hypotension.

Contraindications

- Unable to swallow or protect own airway
- Cardiac chest pain and/or Acute Cardiogenic Pulmonary Oedema
- Known hypersensitivity to morphine

Cautions

- Children under 1 year old
- Respiratory Depression or Hypotension
- Head Injury (relative)
- Phaeochromocytoma
- Known severe renal or hepatic impairment
- Acute alcohol Intoxication
- Patients on antidepressants as these may potentiate the respiratory depressant effects of the morphine.

Preparation

Oramorph should be used undiluted. Draw up the required dose into an oral medication syringe and administer. It may be helpful to let a parent give the drug to a child.

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Dose

Adult: 0.2 mg per kg, up to a maximum of 30 mg in adults

Children: 0.2 mg per kg in children under 12 years

NOTE

If morphine (oral or IV) has been administered:

1. The patient MUST be accompanied to hospital by a doctor or paramedic and may not be handed over to a Technician or ECA crew.
2. Naloxone must be available when oramorph is given and in-flight transport to hospital

MORPHINE SULPHATE INJECTION

This is a schedule 2 controlled drug and all stock held, administered and wasted must be accounted for in the appropriate registers

Presentation

Ampoules containing 10 mg in 1 ml

Benefits

Effective analgesia from soft tissue, bone and visceral pain. Morphine produces analgesia, euphoria and sedation. IV Morphine is the preferred analgesic in cardiac chest pain and may be used in conjunction with GTN in patients with Acute Cardiogenic Pulmonary Oedema

Disadvantages

It may depress respiration and induce hypotension, particularly if given in rapid, large doses to patients who already have cardiovascular compromise or are in shock. Although there is good evidence to suggest that, if given slowly, opiates seldom result in nausea and vomiting, these are known side effects.

The concomitant use of an antiemetic should be considered in patients who are likely to be immobilised and/or flown in a supine position. It is advised that morphine is only given when the antagonist (naloxone) is available.

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Morphine takes 20-30 minutes to reach maximum effect, so be cautious in repeating the dose too early. If immediate analgesia is needed, consider using Fentanyl, Entonox and/or Ketamine.

Contraindications

- Phaeochromocytoma
- Known hypersensitivity to Morphine

Cautions

- Children under 1 year old
- Respiratory depression or hypotension
- Head Injury (relative)
- Known severe renal or hepatic impairment
- Acute alcohol Intoxication
- Patients on antidepressants as these may potentiate the respiratory depressant effects of the morphine.

Preparation

Morphine is to be diluted with 0.9% saline, made up to 10ml, in a 10 ml syringe. This makes a concentration of 1mg in 1ml.

Dose

Adults: 0.1 mg per kg, IV, slowly and titrated to effect. Paramedics are limited to administering 20mg of morphine; doctors may administer a greater dose although if pain is not controlled after 20mg, alternative analgesia should also be considered.

Children**:** Up to 0.1 mg per kg, IV slowly, titrated to effect. May be repeated to a total dose of 0.2 mg per kg over 30 minutes.

Sedation and maintenance of Anaesthesia

Morphine is used (in the concentrations and doses above) as part of balanced sedation and maintenance of anaesthesia as indicated in the relevant protocols.

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KETAMINE

This CSOP discusses Ketamine as an analgesic agent and is distinct from its use as a sedative or anaesthetic agent.

Presentation

Pre-filled 10mg per ml in 20ml syringes (200mg) or plastic sealed, rubber-capped vials containing clear liquid 200mg in 2mls.

Benefits

Ketamine is a potent analgesic with rapid onset of action. It has euphoric and dissociative properties. In higher doses it is sedative and may be used as an anaesthetic agent. It can be administered intramuscularly and appears very effective in orthopaedic trauma and burns.

Ketamine is a sympathetic agonist and causes a rise in heart rate and blood pressure in well-perfused patients. Respiratory depression is less common than with opiates and Ketamine in analgesic concentrations is more likely to preserve respiratory drive than other agents.

The evidence that ketamine elevates Intracranial Pressure (ICP) is weak. Many pre-hospital practitioners feel it's maintenance of Mean Arterial Pressure (MAP) compared with other analgesics results in a more favourable Cerebral Perfusion Pressure (CPP) and so it is not considered contraindicated in head injury

Disadvantages

In the shocked, hypotensive patient, large doses or rapid administration of ketamine can lead to cardiovascular collapse and loss of airway reflexes.

It can produce an emergence delirium, which appears to be more common in adults and if large doses are given quickly. Small amounts (1mg in adults) of Midazolam may be effective in reducing emergence delirium. Alternatively, ensure the patient has had longer acting analgesia such as morphine before the ketamine wears off. Aim to titrate the dose to effect and maintain verbal contact with the patient.

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It may produce hyper-salivation in children that can be treated with IV Atropine (0.01mg per kg) if higher doses of IM ketamine are used.

Contraindications

- Cardiac chest pain
- Pain associated with a suspected Aortic Aneurysm
- Known sensitivity

Preparation

IV: 10 mg in 1ml solution drawn up into either a 10 or 20 ml syringe and labelled

Dose: Intranasal Use

Adults & Children: 0.5-1 mg per kg. which may be repeated, although IV or IO access should be obtained as soon as possible.

Dose: Intravenous Use

Adults & Children: 0.1-0.2 mg per kg initially repeated at 2-minute intervals until satisfactory analgesia is achieved, maintaining verbal contact with the patient. Up to 40mg on CCP PGD.

LIGNOCAINE 1%

Presentation

Plastic ampoules containing 10 ml of 1% Solution

Benefits

Lignocaine is carried with the EZIO equipment primarily to flush the IO needle to reduce the pain of subsequent infusions. Local anaesthesia may facilitate painful procedures such as the removal of foreign bodies or wound closure. Regional anaesthesia and nerve blocks may be a useful adjunct in the management of long bone injuries, however, requires ultrasound experience in performing blocks and generally more LA than we carry

Disadvantages

1. It is becoming standard practice to use nerve stimulators and/or ultrasound to increase the success rate and reduce the risk of complications in nerve blocks.
2. Many fractured limbs will initially be in an awkward position, where the anatomical landmarks are not as easily identified. IV analgesia +/- sedation are needed to restore alignment and once the limb is aligned and traction applied, analgesic requirements decrease significantly.
3. Nerve blocks may mask the pain of raised compartment pressure or impaired sensation and motor function

Contraindications

- Known hypersensitivity to lignocaine
- Multiple injuries necessitating IV analgesia

Preparation

10 or 20 ml syringes containing lignocaine diluted to a desired concentration. Adrenaline MUST NOT be added to lignocaine used in regional nerve blocks

Dose

Adults & Children: Local infiltration of up to 3mg/kg

DIAMORPHINE

This is a schedule 2 controlled drug and all stock held, administered and wasted must be accounted for in the appropriate registers.

Presentation

Ampoules containing 10 mg of dry powder for reconstitution with water.

Benefits

Diamorphine is carried principally as it can be diluted in very small volumes, suitable for IN use. The IN route in children provides rapid onset analgesia and moderate sedation.

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Disadvantages

Similar to morphine (see above).

Contraindications

- Children under 1 year old
- Respiratory Depression or Hypotension
- Head Injury
- Phaeochromocytoma
- Known hypersensitivity to morphine
- Known severe renal or hepatic impairment
- Acute Alcohol Intoxication
- Caution in patients on antidepressants

Dose: Intranasal Use

Children: Follow dosing regime on aide memoir

Adults: 10mg in two mls split between two nostrils

Dose: Intravenous Use

Dilute 10mg diamorphine in 10 mls of water for injection or saline.

Titrate as with morphine but dose is 0.05mg/kg due to increased potency.

FENTANYL

This is a schedule 2 controlled drug and all stock held, administered and wasted must be accounted for in the appropriate registers

Presentation

Pre-filled syringes containing 500mcg in 10ml (50mcg per ml), ampoules containing 500 mcg in 10ml (50mcg/ml) and ampoules containing 100mcg in 2ml (50mcg/ml).

Benefits

More rapid onset of analgesia than morphine, which makes fentanyl a good choice for rapid control of severe pain. The more rapid onset of fentanyl will allow easier titration against pain scores. Also, there is no histamine release seen with Morphine and Diamorphine.

Disadvantages

Similar to morphine. Appears to cause less nausea and vomiting than an equipotent dose of morphine. The duration of action of smaller doses will be shorter than equivalent morphine dose but should be long enough for the pre-hospital phase in most cases.

Contraindications

Similar to morphine

Dose: Intranasal Use

Children: 2 micrograms/kg, drawn up in volumes as per the aide memoir

Adults: For those above 50kg consider giving ¼ of the total dose into one nostril followed by ¼ into the other nostril then waiting 5 minutes and repeating with the rest.

Dose: Intravenous Use

Use neat, drawn into a 2ml syringe, consider diluting 100 micrograms with 8mls of saline to give a 10 microgram per ml solution when giving to children.

Adults & Children: 0.5-1 micrograms/kg, repeated every 2 minutes until analgesia achieved. In severe pain doses of up to 3 micrograms per kg may be required.

PENTHROX – not carried by TAAS but by some other health care providers

Penthrox is an inhaler device which is licenced for the management of moderate to severe pain in victims of trauma. Indications for use of Penthrox include the manipulation of unstable fractures, to aid extrication and as a bridge to more definitive analgesia.

Penthrox contains the active compound methoxyflurane, which is a volatile anaesthetic agent with analgesic properties. The inhaler device contains a carbon filter which should absorb any exhaled gas (off-gassing) and thereby reduce environmental and staff exposure. Efficiency of the carbon filter is highly dependent on correct patient use and compliance.

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During off-gassing, nearby persons may notice a characteristic smell. Though this may be alarming, there is no evidence that enough exposure will cause any clinical effects even in confined spaces such as an ambulance.

Patients for whom TAAS have received clinical responsibility and have already been treated with Penthrox, should be given definitive analgesia as required before transportation by air or road.
The inhaler device should be returned to the administering service. If conveying by air, there should be at least 10 minutes cessation of use before aircraft door closure and no use within the aircraft cabin itself. This is a conservative timescale to combat any theoretical risks.
The use of Penthrox should be documented in the PRF and also communicated in the handover to the receiving hospital.

END OF DOCUMENT