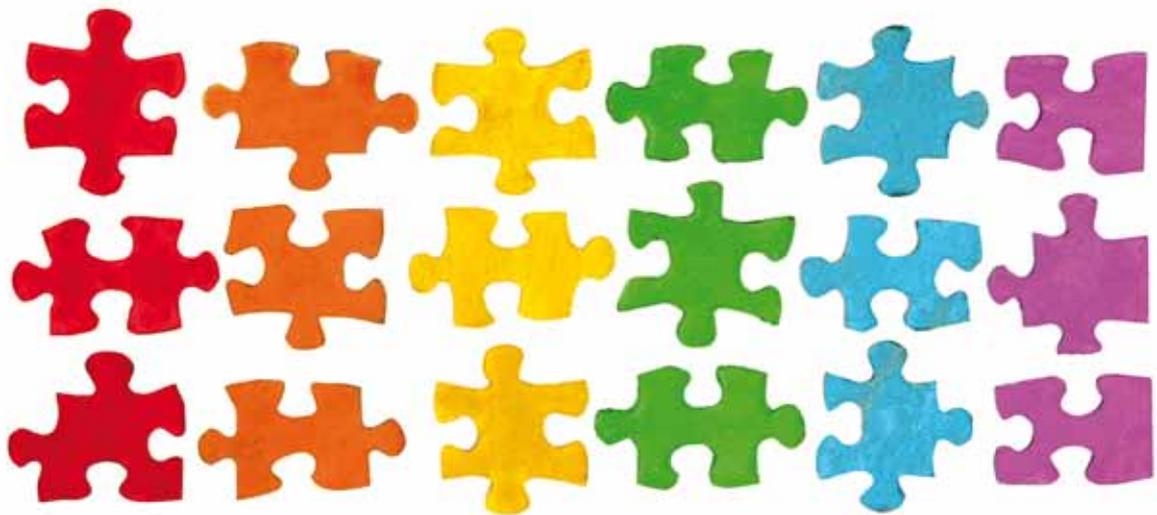




Valuing short lives

Eighth edition, 2011



Basic Symptom Control in Paediatric Palliative Care

The Rainbows Children's Hospice Guidelines

ACT for children **ACT** for families **ACT** together **ACT** now!

Basic Symptom Control in Paediatric Palliative Care

The Rainbows Children's Hospice Guidelines

Eighth edition 2011

ACT Brunswick Court, Brunswick Square, Bristol, BS2 8PE

T: 0117 916 6422

F: 0117 916 6430

E: info@act.org.uk

www.act.org.uk

Helpline: 0845 108 2201

ISBN: 1 898 447 179

Basic Symptom Control in Paediatric Palliative Care

© Dr Satbir Singh Jassal, March 2011.

This project is supported by Department of Health (England).

Formulary

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Author: Dr Satbir Singh Jassal, B.Med Sci, B.M., B.S., DRCOG, Dip Pall Med, MRCGP, FRCPCH (Hon),
Medical Director, Rainbows Children's Hospice and General Practitioner

Production: Myra Johnson and Susannah Woodhead, ACT

Design: Qube Design Associates Ltd

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Valuing short lives

ACT is the only organisation working across the UK to achieve the best possible quality of life and care for every life-limited child and their family.

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Hearing the news that your child has a health condition that is life-threatening or will shorten their life is devastating. It's a time when families need care, support and information. ACT aims to help families and children along this journey, every step of the way.

There are approximately 23,500 children and young people in the UK who have been diagnosed with health conditions for which there is no reasonable hope of cure.

ACT works with policy makers and practitioners to improve practice and provision and to raise awareness of what children, young people and families need. ACT campaigns for the development of integrated, equitable and sustainable children's palliative care services.

ACT for families

ACT helps family members, friends and carers, and provides them with the information and support they need in order to access the best possible care. We lobby on their behalf, and empower families to have a voice in the development of services.

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Contributions and peer review

Dr Justin Amery, GP in Oxford, Hospice Doctor at Keech Hospice

Nigel Ballantine, Specialist Clinical Pharmacist, Haematology Oncology, Birmingham

Ann Booth, RSCN, Rainbows Children's Hospice

Dr Lynda Brook, Macmillan Consultant in Paediatric Palliative Care, Alder Hey Children's Hospital

Dr Michael Capra, Lecturer in Paediatric Oncology, QMC

Susan Carr, Senior Pharmacist, Regional Drug Information Centre LRI

Vanessa Chapman, Regional Prescribing and Drug Information Development Pharmacist, LRI

Dr Finella Craig, Consultant in Children's Palliative Care, Great Ormond Street Hospital

Dr Jonathan Cusack, Consultant Neonatologist, University Hospitals of Leicester

Chris Cutts, Paediatric Pharmacist, LRI

Dr Henry Davis, Hospice Doctor, Acorns Hospice, Birmingham

Lynne Demelo, Clinical Nurse Specialist, Rainbows Children's Hospice

Francis Edwards, Independent Nurse Consultant

Dr Richard Hain, LATCH Senior Lecturer and Honorary Consultant in Paediatric Palliative Medicine, University Hospital of Wales

Dr Clare Hale, Deputy Medical Director, Rainbows Children's Hospice

Lucy Hawkes, Neonatal Pharmacist, University Hospitals of Leicester

Dr Anne Hunt, Senior Research Fellow in Children's Palliative Care, University of Central Lancashire

Dr Patrick Ireland, Retired

Helen Kenney, Respiratory Nurse Specialist, Rainbows Children's Hospice

Dr Nicola King, Demelza House Hospice, Kent

Dr Susie Lapwood, Lead Doctor, Helen and Douglas House Hospices for children and young adults, Oxford

Julia Martin, RSCN Children's Gastroenterology Nurse Specialist, LRI

Dr Renee McCulloch, Paediatric Palliative Care Consultant

Dr George Murty, Consultant ENT, Leicester Royal Infirmary

Dr Jill Platt, Retired

Dr Peter Sullivan, Consultant Paediatrician, Oxford

Dr Angela Thompson, Associate Specialist, Palliative Care Lead Paediatrician, Coventry and Warwickshire

Dhiraj D Vara, Head of Respiratory Physiology Unit Glenfield Hospital Leicester

Dr David Walker, Consultant Paediatric Oncologist, (Senior Lecturer) QMC

Zoe Wilkes, Nurse Consultant in Paediatric Palliative Care, Diana Children's Community Service, Leicester

The authors have made every effort to check current data sheets and literature up to February 2011, but the dosages, indications, contraindications and adverse effects of drugs change over time as new information is obtained. It is the responsibility of the prescriber to check this information with the manufacturer's current data sheet and we strongly urge the reader to do this before administering any of the drugs in this document. In addition, palliative care uses a number of drugs for indications or by routes that are not licensed by the manufacturer. In the UK such unlicensed use is allowed, but at the discretion and with the responsibility of the prescriber.

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Foreword

Welcome to the eighth edition of the Rainbows Basic Symptom Control Manual. This is the first major revision of the manual for several years. There are new chapters on Ethics and HIV/AIDS, and major rewrites on Syringe drivers, Ventilation and Neurology.

The two biggest changes have been around the formulary and references. The new formulary has been adopted from the Association of Paediatric Palliative Medicine master formulary in the hope of reducing the number and style of different formularies. The formulary used in this manual will slowly be adopted by other units around the UK. Following feedback from the previous edition I have agreed to include my references for the manual. I have resisted this in the past to reduce the size of the formulary but now accept it is necessary. I have put the references at the back so those who wish to have a lighter version can avoid printing them.

I wish to thank ACT for agreeing to provide the considerable administrative support needed to revise the manual.

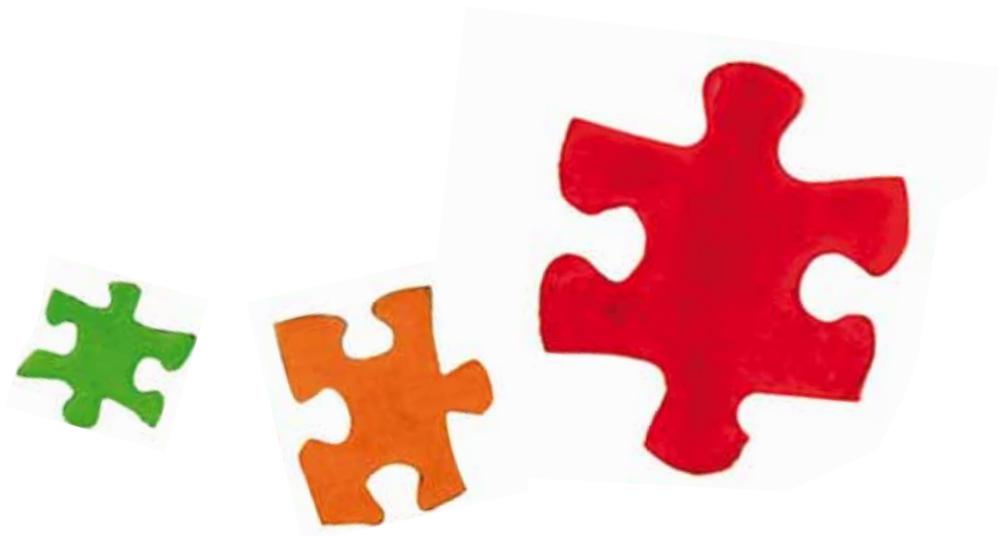
Please let me know if you would like additional chapters on particular themes or if you have any comments on the work by e-mailing me at sat.jassal@gmail.com

This manual is provided free of charge and all the contributors work to improve paediatric palliative care around the world. Feel free to make as many copies as you like but please do not alter, plagiarise or try to copy any of the work into your own name. If you wish to use the work in a specific way then contact me for approval; I rarely say no.

We now give all the parents of our children who are receiving end of life care a copy to keep at home, to help visiting health professionals. We hope you find it useful.

Dr Satbir Jassal

March 2011



Introduction

This protocol has been written to allow doctors (both GPs and Paediatricians) and nursing staff in specialised units and in the community, an understanding of the basis of symptom control in paediatric palliative care. This topic normally instils tremendous anxiety in professional people.

Quite rightly if we think that the average GP will have to look after only one or two children with life-limiting disorders in their entire working life. Fortunately, provided we remember the basic skills we were all taught, care of a child follows a very similar pathway to that used in adult palliative care. This protocol assumes a narrative style deliberately, as distinct from a textbook, as it is designed to provide more practical support and hands on clinical information in the acute setting. There is much more to supporting the terminal child and family than just the symptom control outlined in this paper: we must also remember the important emotional, social and spiritual needs of the child, siblings, parents, grandparents, family and society around the child.

Unless the child is older and can describe their symptoms, we need to glean an understanding of how the illness is affecting the child from all possible sources. Remember to read the notes from hospital consultants, ward nursing notes, question any specialist community health visitors and ask the opinion of the nursing staff supporting you. Doctors will spend on average five to thirty minutes a day looking at a child. It therefore follows that palliative care can only be done as a team approach.

The first rule is don't panic, do not dive in blindly, keep your hands tucked behind your back, your mouth shut and listen to the parents. In terminal care the parents assume a pivotal role in the care for their child. They have often experienced a variety of levels of medical and nursing care ranging from excellent to pathetic, and have a much deeper understanding of their child's medical, nursing and social needs than we give them credit for. Only once you have obtained a good history from all sources should you start an examination. Remember the laying on of hands is as important as anything you may discover on your examination. Be methodical, logical and above all professional: the parents have allowed you into their lives because they perceive that you may be able to help them. Once you have formulated a plan of action go through it with the parents in language that they understand. Parents may well feel that they want more or even less than has been recommended to them. Explanation, compromise and the knowledge that decisions can be amended as the child's condition changes, allows the parents to feel that they have informed choice in the care of their dying child. This particular point is also very important in post bereavement support.

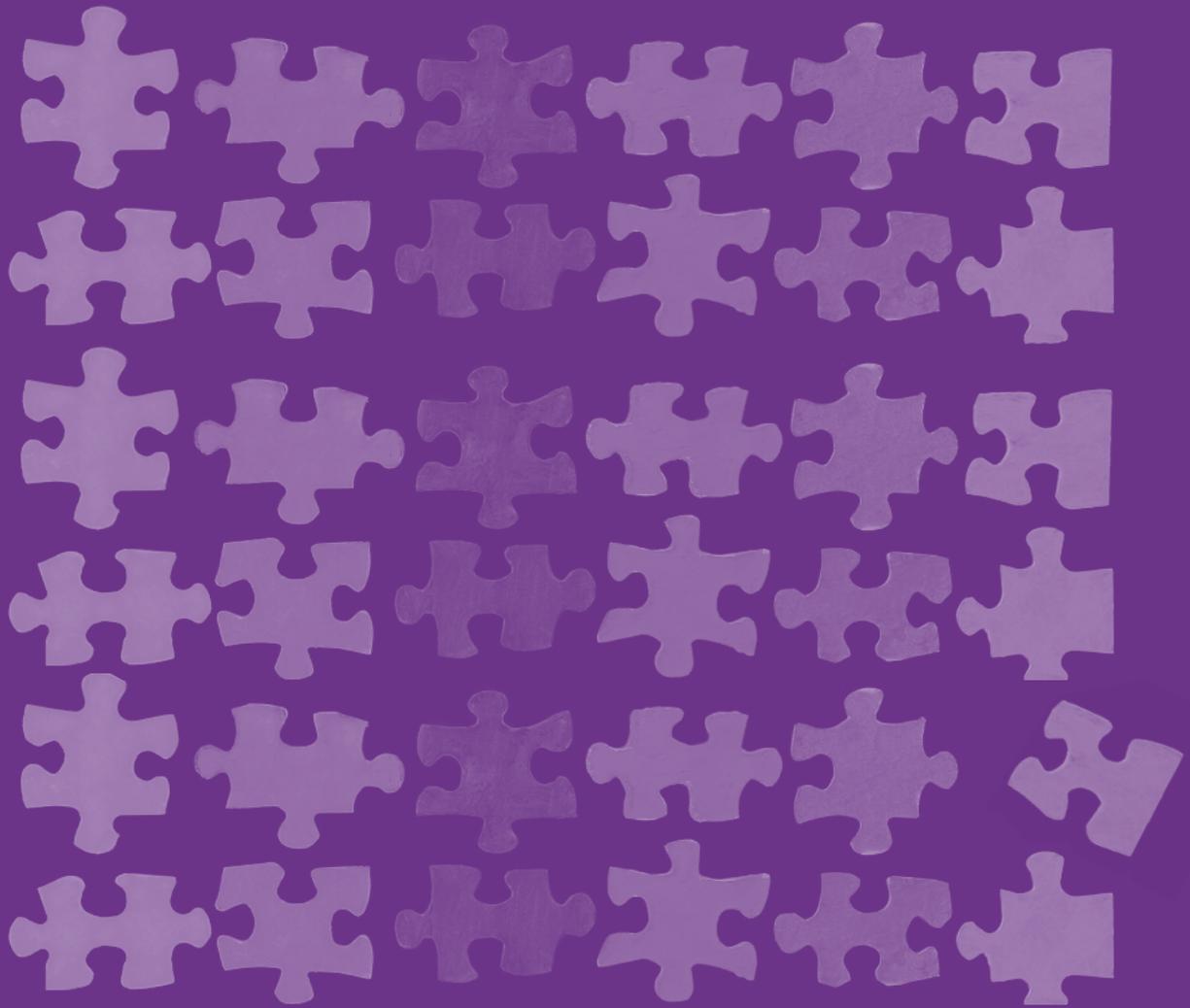
The second rule is to document and disseminate information to all your care team. Check that they are happy about the care plan and that everyone is clear about their role. Unfortunately, care at the terminal phase cannot be conducted by numerous junior doctors, deputising services or half a dozen different key workers. We as health care professionals have to make ourselves available even at short notice.

The third rule is beware that you do not fall into the same trap as Icarus (who flew too close to the sun). The intensity of emotion surrounding a dying child would make even the sun pale. Many nurses and doctors get so personally attached that they burn out emotionally. This unfortunately will be of little or no benefit for the next family they have to look after. Remember to retain a sensitive professional distance.

How to use Basic Symptom Control in Paediatric Palliative Care

The symptoms included in this manual are listed alphabetically. Under each symptom you will find a purple banner containing a series of numbers referring to evidence, such as Ref: [128,197-200]. The numbers in square brackets refer to the references which can be found on pages 143-154.

Symptoms



Anorexia

Ref: [3-10]

One of the primeval instincts all parents have is to feed their children. So when children, particularly those with malignancy, stop eating it generates considerable anxiety in their parents. Anorexia can be caused by:

- Pain
- Anxiety
- Nausea or vomiting
- Thrush in the mouth or oesophagus
- Drugs
- Depression
- Dyspepsia
- Constipation
- Radiotherapy
- Certain smells
- Altered taste
- Anorexia/Cachexia syndrome

It is always worth hunting out and treating these conditions, and involving a dietician. Otherwise it is important to reassure the parents that the inactive child may need less food and will not be feeling hungry. There are other common-sense approaches, such as presenting small meals on a small plate, spending some time on the presentation and remembering that many of children's favourite meals, such as Macdonald's, are in fact very high in calories.

The only therapeutic approach is small dose steroids used in 5 to 7 day courses. However the side effect profile is often so profound that it is normally difficult to justify.

Bladder

Ref: [11]

Although one need not get too concerned about falling urinary output in the terminal phase of illness one should remember two special cases.

1. A number of children with neurodegenerative disorders may have problems with emptying their bladder.
2. Children on opiates may go into retention.

Urinary retention due to opioids may improve with Bethanechol. Fentanyl causes less urinary retention than other opiates and a change to Fentanyl may be helpful. In these children gentle bladder massage, warm baths or catheterisation can easily alleviate the obstruction. Catheterisation of children is similar to adults with due regard to catheter size and depth of insertion. The loss of bladder function in a child who has previously been continent can often be a source of great distress to parents; another 'loss' that needs to be mourned, another indignity the child must suffer. The use of pads is non-invasive and simple, although may require a careful approach of tact and sensitivity to introduce.

Bleeding

Ref: [12-14]

The sight of blood is very distressing to patient, parent and carer alike. If bleeding is likely, or if it has already started, gentle warning of the possibility that it could happen, or get worse, may help to reduce the distress and shock that the parents' experience. Bleeding can be a major problem in a number of malignancies and liver diseases. Although it is a subject that should normally be dealt with in specialist units, in the terminal phase heroics are often inappropriate.

- Small bleeds can often be dealt with by using oral tranexamic acid or topical Adrenaline 1:1000 on a gauze and applied directly to the wound.
- Bleeding gums can be helped with tranexamic acid mouthwashes or absorbable haemostatic agents such as Gelfoam or Gelfilm.
- Liver dysfunction with coagulation abnormalities can be helped with Vitamin K both orally (prevention) or by injection (acute bleed).
- Vaginal bleeding can respond to oral progestogen.
- Platelet or blood transfusion if necessary.

To minimise the shock of seeing their child's blood, the use of red towels and blankets may be tried.

In the face of a catastrophic haemorrhage, some authors recommend the use of intravenous Diamorphine and Diazepam or Midazolam. If no intravenous route is available then subcutaneous Diamorphine with rectal Diazepam can be given. However it is important to recognise that haemorrhage of this type is normally painless and that the principle of double intent for the use of Diamorphine may apply in this situation.



Constipation

Ref: [4, 7, 10, 15-27]

The management of constipation in paediatrics follows many of the same principles as in adult care, but there are certain important differences.

- The definition of constipation in paediatrics can be difficult. A newborn baby may not open its bowels for three days. A breast-fed baby may not open its bowels for seven days. However they would not be thought of as being constipated. It is better perhaps in paediatrics to think of alteration in bowel habits as a way of detecting constipation.
- The ability of a medication to relieve constipation is often linked less to pathophysiology than to the flavour. If it tastes bad then it's not going to go down that child's mouth without a fight. After a week of fighting, the parents will be knocking on the doctor's door.
- Oral preparations are generally preferable to rectal. Because of the number of medications that can be given to children rectally, some nurses and parents are often keen to jump into using rectal treatment very early. One should try to resist this pressure, trying to remember that this may not be in the best interests of the child.
- It is important in paediatrics to recognise the specific sensitivities of the child. Rectal examination in adults is fairly straightforward. In children it should be done only when absolutely necessary and then only by experienced physicians or nurses. The little finger should be used in most cases. A child with an anal tear may well have anal spasm of a level that makes it impossible to insert a finger without causing significant pain. Children who have had repeated rectal examinations in the past may become very distressed if they need to be re-examined. This can make the examination technically very difficult and emotionally traumatic for both the child and doctor. It is important to explain the reasons for a rectal examination to the parents, especially from a medico-legal position.
- Although much is made of diet in the management of constipation, many of the children that we see in paediatric palliative care fall under the heading of special needs. These children will have disorders that limit their ability to chew food or even swallow their food easily. The food often has to be puréed and it can take up to an hour to feed that child a single meal. Many of the children will have gastrostomies and feeds specially designed and calculated for them by dietitians.

Before rushing in to prescribe, one should consider the possible causes of constipation in children.

- **Inactivity:** some children with neurodegenerative or genetic disorders can find themselves becoming wheelchair bound, for example boys with muscular dystrophy.
- **Neurological:** as some of the neurodegenerative disorders progress they can affect the nerve pathways and musculature required for defecation, for example myotonic dystrophy. Due to the rarity of many of these conditions we are often unaware of the actual mechanism involved.
- **Metabolic:** dehydration can affect all children very quickly. Cystic fibrosis (meconium ileus equivalent) can cause constipation. Hypercalcaemia and hypokalaemia can cause problems in paediatric oncology.
- **Decreased food intake:** as any parent will know, any child who feels unwell may go off their food. Children in the paediatric oncology field are particularly susceptible as they are affected both by the disease process and the treatment modalities.
- **Fears of opening bowels:** a child who is constipated may well get significant pain when he does actually defecate. For the child the best way not to have pain is to hold back the urge to empty his bowels for as long as possible.

- **Rectal tears:** when children pass hard, large stools, these stools can, through stretching, cause superficial rectal tears. This results in two problems. The tears are very painful when the child tries to empty its bowels. The tears produce anal spasm and so emptying the bowels require the child to exert even greater pressure and strain than normal.
- **Social:** many children are shy or nervous about using toilets outside the home or away from their parents. They may not know where the toilets are, or may be too shy to ask a nurse to help them.
- **Drugs:** one of the major causes of constipation in the hospice is iatrogenic. Doctors continue to fail to appreciate the side effect profiles of the drugs that they use. Although the constipation side effects of the opioids are well recognised many physicians fail to remember that anticholinergics (Hyoscine etc.) and anticonvulsants can also induce constipation.
- **Liaise with parents:** they know their child and his/her habits, also they may have misconceptions about defecation and use of laxatives. Co-operation is needed for treatment to be successful.

Types of laxatives

The types of laxatives used in paediatrics are often limited by special factors such as taste. Laxatives can be divided into predominantly softening or peristalsis stimulating, also whether they are used orally or rectally.

Softening laxatives given rectally

Type	Mechanism	Notes
Lubricant, e.g. <i>Arachis oil, olive oil</i>	Penetrates stools and softens.	Used as retention enemas overnight to soften stool. <i>Be careful of nut allergy as arachis oil is made from peanuts.</i>
Surfactant, e.g. <i>sodium docusate</i>	Act like detergents and increase water penetration into stool.	Can be used by itself. Other similar compounds found in mini-enemas.
Osmotic, e.g. <i>glycerine</i>	Soften stool by osmosis and act as a lubricant.	Very useful as they come in various sizes.
Saline, e.g. <i>sodium phosphate</i>	Release bound water from faeces and may stimulate peristalsis.	Very effective in difficult cases. Also has an osmotic mechanism of action. Repeated use is inappropriate and can cause biochemical imbalance.

Softening laxatives given orally

Type	Speed of onset	Mechanism	Notes
Lubricant, e.g. <i>Paraffin</i>	1 to 3 days	Penetrates stools and softens.	Taste and risk of inhalation particularly in children with gastro-oesophageal reflux limits use. No longer recommended for internal use.
Surfactant, e.g. <i>docusate or poloxamer</i>	1 to 3 days	Act like detergents and increase water penetration into stool.	Docusate can be used by itself. Poloxamer is combined to make co-danthramer.
Bulk forming, e.g. <i>Fybogel</i>	2 to 4 days	Act as stool normalisers.	Very limited use in paediatric palliative care.
Osmotic, e.g. <i>lactulose macrogol</i>	1 to 2 days	Exert an osmotic influence in the small bowel and so retain water in lumen.	Lactulose is first line treatment. Sickly taste can be a problem.
Saline, e.g. <i>Magnesium hydroxide or sulphate, sodium sulphate</i>	1 to 6 hours	Osmotic effect in all of gut. Increase water secretion and stimulate peristalsis.	Not used very much in ill children because of their strong purgative action.

Peristalsis stimulating

Type	Speed of onset	Mechanism	Notes
Anthracene, e.g. senna and danthron	Orally 6 to 12 hours or rectally 15 to 60 minutes	Directly stimulate the myenteric plexus	Senna is very commonly used as the liquid. It combines well with lactulose. Danthron is used in combinations e.g. co-danthramer.
Polyphenolics, e.g. bisacodyl and sodium picosulphate			Bisacodyl can be given orally or rectally. It is particularly useful in its suppository form. Sodium picosulphate should be reserved for the most difficult cases.

Having developed an understanding of the special needs of children with constipation and the types and mode of action of the medication, we can now outline a simple strategy (see the steps below).

Step 1

Take a history and examine the child. Abdominal examination may reveal a sausage shaped mass in the left iliac fossa. Rectal examination may reveal a rectum that is full of hard stools, soft stools or empty. Assess possibility of impaction and overflow presenting as diarrhoea or faecal soiling.

Step 2

Start with lactulose, building up the dose over a week.

Step 3

If no improvement add senna.

Special Step 4

If the child is on an opioid then ignore steps 2 and 3 and start a macrogol such as Movicol or sodium picosulphate.

Step 5

If the child is distressed with the constipation, then from the rectal examination follow the guidance:

If stool hard – use glycerine suppository.

If stool soft – use bisacodyl suppository.

If rectum empty – use bisacodyl suppository to *bring stool down* or high phosphate enema.

Step 6

If severely constipated use MiraLax or phosphate enema or if you have time Movicol (see table below).

Movicol is an iso-osmotic laxative only licensed for children over the age of two years. It is flavour and sweetener free but most importantly it is highly effective.

Number of sachets of Movicol to use in severe constipation

Number of sachets of Movicol							
Age	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
2-4yrs	2	4	4	6	6	8	8
5-11yrs	4	6	8	10	12	12	12

Step 7

If manual removal is necessary then use a topical anaesthetic gel or discuss the possibility of a general anaesthetic with the local hospital.

As with so many conditions in medicine, prevention is better than cure. The physician should attempt to predict the possibility of constipation and treat it prophylactically.

Novel approaches

It is helpful to know about a number of alternative approaches to constipation, although all of these are unlicensed uses of these agents. The use of prokinetic drugs such as Metoclopramide or Domperidone (less effective but less dystonic) have been shown to be helpful. The side effects of increased bowel motility with Erythromycin can be effective. Oral Naloxone can help with opioid induced constipation, whilst its poor absorption from the gut limits its effects systemically.

Cough

[4, 28-39]

The management of cough involves accurate diagnosis of the various causes of cough. Often the underlying illness will give clues to the cause, but be wary of dual pathology.

Causes

- Cystic fibrosis
- Heart failure
- Lung metastases
- Infections
- Neurodegenerative disorders
- Gastro-oesophageal reflux
- Seizure activity

Initial treatment consists of treating the underlying cause, i.e. diuretics for heart failure or antibiotics for infections etc. Clues to coughing being driven by subclinical seizure activity are its paroxysmal and episodic clustering, its association with retching and/or screaming together with a background of poorly controlled epilepsy. Hyoscine patches can help dry excessive secretion particularly in the neurodegenerative disorders.

However, we are often confronted with situations when symptomatic treatment is required. Humidified air or oxygen can help in a number of cases. It is often worth trying nebulised Salbutamol or Atrovent although sometimes nebulised normal saline works just as well. Sometimes a child unaccustomed to masks and nebulizers may become distressed with this treatment, and staff along with parents may have to judge whether the efficacy of this treatment is worth the distress caused to the child.

Physiotherapy with or without suction can often settle a child down. One of the most effective treatments is to hold the child propped up: parents and carers are very good at this and it may help them to feel involved in the care of the child. Cough suppressants can also be used starting with simple Linctus or Pholcodine (often not very effective at this level), then Codeine Linctus, and if necessary Morphine or Diamorphine Linctus. Coughing can be very exhausting for the child and family and warrants aggressive management from the care team. An adult approach is to use nebulised local anaesthetics such as Lignocaine or Bupivacaine. However, this is much less appropriate in children both because of the unpleasant taste and numbness that it leaves in the mouth and because in the presence of neurological compromise, there is risk of aspiration when the gag reflex is anaesthetised.

Cough itself is a very important reflex and without it mucous would soon build up in the lungs. In a number of conditions, particularly neurodegenerative disorders, the loss of the ability to cough is a major problem. Good physiotherapy, posture drainage and suction can be very helpful. With the advent of new technologies we are finding increasing benefits of using cough assist machines in many of these cases.

Diarrhoea

[19, 40-43]

Diarrhoea in children can occur for various reasons and requires a detailed history of past illness, diet, medication and treatments.

Causes

- Gastroenteritis
- Faecal impaction with overflow
- Malabsorption/diet
- Drug induced, e.g. antibiotics
- Post radiation/chemotherapy
- Concurrent illness, e.g. colitis

Simple reassurance, and clear fluids, can deal with most cases. Dioralyte can be helpful to replace sugar and salts in the short term. Faecal loading and impaction would need appropriate treatment. Nappy rashes are common and barrier creams should be used early to prevent rashes. Subsequent rashes can be treated with exposure of the skin to air and Daktacort cream. Stool cultures and reducing substance screens are sometimes needed to make an appropriate diagnosis. The use of live yoghurt or soya milk can sometimes help with malabsorption. If, however, simple methods fail, then a pharmacological approach is needed.

Both Imodium and Lomotil can be used medically to control persistent diarrhoea.

Dyspnoea

[44-47]

Dyspnoea refers to a subjective sensation that breathing has become unpleasant, rather than an objective observation that it has become fast or difficult. This is an important distinction as it underlines the importance of discrimination in investigating and treating.

Dyspnoea can be a frightening symptom; the idea that their child is suffocating to death would terrify any parent. Correct early treatment can be very rewarding and helps parents to develop confidence in the care team. As in all symptoms a good understanding of pathology and physiology makes management a simple and logical process.

Causes

- Anaemia
- Anxiety, fear or claustrophobia
- Ascites
- Cerebral tumours
- Congenital heart disease
- Cystic fibrosis
- Hepatic or renal impairment
- Infection
- Metabolic
- Mechanical
- Pain
- Pleural effusion, left ventricular failure or pneumothorax
- Raised intracranial pressure
- Respiratory muscle dysfunction, e.g. neurodegenerative disorders
- Secondary tumours, i.e. lymphoma

Anaemia is often seen in the haematological malignancies, and towards the terminal phase can cause mild to moderate dyspnoea. The decision to give blood transfusions is often difficult. Transfusion is an invasive process, which limits parent child contact and is not without a degree of discomfort for the child. Transfused blood itself, for various reasons of storage, is not always as successful as expected at reducing dyspnoea. Communication between the hospital specialist unit, the care team and parents is therefore essential in making the appropriate decision.

Anxiety and dyspnoea is the proverbial chicken and egg. Anyone who cannot breathe will feel anxious. The process of anxiety itself will lead to hyperventilation. This in itself will make the dyspnoea feel worse. It is therefore important that initial management should be to calm the situation down and reassure both the child and parents. Small dose Diazepam, Midazolam or chloral hydrate can be helpful without necessarily suppressing respiration.

Cerebral tumours can affect the respiratory centres either directly through local invasion or indirectly by raising intracranial pressure. Dexamethasone is helpful in the short term, but eventually the progression of the disease or side effects from the steroids reduce its benefit.

A child propped up by a calm parent or carer with oxygen via a nasal tube will help most cases of dyspnoea. In palliative care higher than normal flow rates are perfectly acceptable. However we will often see children on heroic doses of oxygen (10-14L/min). This is very rarely necessary for the child and appears to be more for the doctors and parents. It is often helpful to measure oxygen saturation (pulse oximeter), but probably better to look at the child and their condition in the context of their illness.

The oxygen cylinders used in the community are smaller than those in hospitals, so with higher rates of flow it is always worth ordering more cylinders than normal.

1360L cylinder lasts 11 hrs @ 2L/min

Nasal cannulae	1L/min	24% delivered
	2L/min	28% delivered
Ventimask	2L/min	24% delivered

Oxygen concentrator	X1 = 2-4L/min
	X2 = 4-8L/min

Dyspnoea is commonly seen in the neurodegenerative disorders due to weakened respiratory muscles and inability to clear secretions. Physiotherapy should be done very gently in these often fragile children. Suction can cause more distress than benefit and should in such cases be undertaken by experienced staff or not at all.

Thick secretions can sometimes be managed with mucolytics such as N-acetyl Cysteine. The use of nebulised normal saline can also be helpful in difficult cases (be aware that some children can have reflex bronchospasm).

Pleural effusions are thankfully rare, tending to occur in lymphoma and other malignancies. Pleural taps are invasive, can be distressing for the child and may only give temporary relief.

Two other empirical treatments that should be considered are nebulised bronchodilators and analgesia.

Even without the presence of wheeze, nebulised Salbutamol or Ipratropium can produce symptomatic benefit. The use of oral Morphine or subcutaneous Diamorphine (**in half-analgesic doses**) can help settle dyspnoea. They reduce anxiety and pain, settle down the respiratory centres and reduce pulmonary artery pressure, which is the cause of a lot of breathlessness (this effect is more marked with Diamorphine).

Emergencies in paediatric palliative care

[48-57]

Uncontrolled and distressing symptoms are a medical emergency and need to be actively treated.

Types of emergency in paediatric palliative care

- Severe pain
- Difficulty breathing and airway obstruction
- SVC obstruction
- Spinal cord compression
- Agitation
- Haemorrhage
- Seizures
- Urinary retention

Most emergencies can be anticipated by knowing the natural history of a disease (for example, anticipate breathlessness in disease that metastasises to lungs), and from a knowledge of the individual child (for example, anticipate haemoptysis in a child with pulmonary Aspergillus).

Proactive planning and preparation for medical emergencies is essential

- Discuss possible events with the family.
- Discuss how events could be managed at home, in hospital or in a hospice. Management can sometimes vary according to location (e.g. a chest drain would not be inserted at home to manage a pneumothorax, but could be done in hospital).
- Find out where the child and family want to be in an emergency situation, for example moving to a hospice, staying at home.
- Have a management plan which parents can initiate.
- Appropriate drugs available and usable.
- Make sure parents have professionals they can contact.
- Make sure the professionals they will contact have a plan.

Investigation, management and treatment of palliative care emergencies

With all emergencies it is important to consider:

- Do I need to know the underlying cause or can I manage the symptom effectively without confirming the cause?
- Is the underlying cause likely to be treatable?
- Are investigations of the underlying cause appropriate, (for example, are they invasive, do they require being in hospital etc).
- Will treating the underlying cause improve prognosis or quality of remaining life?
- How effective could any potential treatment be?
- How toxic could any potential treatment be?

- Will the child have to move to another location for the investigation and/or treatment? Will this be possible, will they be willing to do this?
- Wishes of the child and family.

It is essential to adopt a holistic approach to symptom management, as medication alone is rarely sufficient.

Uncontrolled or poorly controlled pain

Good early pain control is the best way to avoid severe uncontrolled pain at the end of life. It is essential that drug doses are increased quickly enough to manage rapidly escalating pain, and that the right analgesic is used. Inadequately treated neuropathic pain is perhaps one of the hardest to manage emergencies, yet one that is potentially preventable when tackled early.

Sudden onset rapidly escalating opiate-sensitive pain

This type of pain is often seen in children with cardiac disease associated with pulmonary constriction. It is also seen in children with malignant disease who have rapid onset of break-through pain that is opiate responsive, but where oral opiates take too long to be effective.

Intranasal or buccal Morphine:

- Use the IV solution.
- Start with a dose of 0.05mg/kg if the child is opiate naïve; 0.1mg/kg if the child is already on opiates.
- Make sure the parents are able to draw up and administer the medication. It is useful to mark the syringe clearly with the volume of Morphine they will need to give.
- Advise the parents to repeat the dose every 10-15 minutes up to a maximum of the dose you would give if you were giving an IV breakthrough dose. It is unusual for a child to need as much as this.
- If a child needs two to three doses, increase the starting dose for the next episode to the total dose that was needed in the previous episode.
- If you do not get good pain relief, despite titrating the dose up, then this is unlikely to be purely opiate sensitive pain.

Neuropathic pain

Neuropathic pain should always be considered in the following groups of children:

- Any solid tumour.
- Epidermolysis bullosa.
- Rapidly progressive spinal curvature.
- Dislocated/displaced hip.

We also suspect that some children with encephalocele and hypoxic ischaemic encephalopathy experience neuropathic pain.

It is absolutely essential that neuropathic pain is treated early, particularly in children with malignant disease, before a crisis situation arises.

For children with severe neuropathic pain that needs emergency treatment the following options should be considered:

- For solid tumours: high dose Dexamethasone and radiotherapy.
- Methadone: either added in as an additional analgesic or by converting all opiates to Methadone.
- Ketamine: sublingual or by continuous subcutaneous infusion.
- Lidocaine: by continuous subcutaneous infusion.
- Regional nerve block.
- Intrathecal and epidural analgesia: this is best considered ahead of a crisis situation. In the right situations it can be extremely effective and children with severe uncontrolled neuropathic pain can become completely pain free.

We strongly advise that Methadone, Ketamine and Lidocaine are only considered with the support of a specialist palliative care or pain team.

Breathlessness

Breathlessness should be anticipated in the following situations:

- Reduced lung volume, for example tumour growth, chronic lung disease.
- Upper airway obstruction, for example from tumour.
- Pneumothorax, for example in children with lung metastases.
- Superior vena cava obstruction.
- Pulmonary oedema, for example in children with cardiac failure.
- Chest infection.
- Anaemia.

Treatment of the underlying cause should always be considered, but may not be appropriate or possible:

- Steroids and radiotherapy or chemotherapy for malignant disease.
- Chest drain for pneumothorax.
- Diuretics in pulmonary oedema.
- Antibiotics for chest infection.

Severe sudden onset breathlessness:

When this occurs, it is often a terminal event. The goal of care is to get the child settled and comfortable as quickly as possible.

- Give buccal Midazolam 0.5mg/kg and buccal Morphine 0.1mg/kg.
- Repeat every 10 minutes until the child is settled.
- As soon as possible, set up a continuous subcutaneous or intravenous infusion of Midazolam 0.3mg/kg/24hrs and Morphine or Diamorphine at a dose that is at least the equivalent of an intravenous breakthrough pain dose. If pulmonary oedema is likely to be a contributing factor to the breathlessness, consider adding Furosemide, either 0.5mg/kg (od-qds) stat or into the continuous infusion. (NB at high opiate doses, Furosemide may precipitate out.)

Superior Vena Cava (SVC) obstruction

SVC obstruction is most likely to occur in children with mediastinal tumours.

Typical signs of SVC obstruction are:

- Breathlessness
- Headache
- Visual changes
- Dizziness
- Swelling of face, neck, arms.

Emergency treatment is usually with steroids, usually Dexamethasone (1-2mg/kg/day up to 16mg maximum).

Radiotherapy and/or chemotherapy may then be considered.

Symptomatic management of breathlessness before the tumour shrinks is essential.

Spinal cord compression

This is a real medical emergency and prompt appropriate treatment is essential. By the time clinical signs are classic, treatment is unlikely to reverse the disability.

Most usually seen in children with intramedullary metastases, intradural metastases or extradural compression (vertebral body metastases, vertebral collapse, interruption of vascular supply).

Early signs of spinal cord compression:

- Back pain
- Leg weakness
- Vague sensory disturbance in legs

Late signs of spinal cord compression:

- Profound weakness.
- Sensory level.
- Sphincter disturbance.
- Emergency treatment is with steroids, usually Dexamethasone (1-2mg/kg/day up to 16mg maximum).
- Radiotherapy and/or chemotherapy may then be considered.
- Spinal surgery may also be an option.

Agitation

Consider and treat underlying causes where appropriate, for example:

- Fear, anxiety, bad dreams
- Pain
- Medication
- Constipation
- Dehydration
- Hypoxia
- Anaemia

Sudden onset severe agitation can be relieved with intranasal or buccal Midazolam 0.2-0.5mg/kg. The buccal preparation is not always easy to get hold of quickly, so the IV solution can be used instead (given intranasally or buccally at the same dose).

Cerebral irritability

This is not always easy to diagnose and is often a diagnosis of exclusion. It is most frequently a problem in children with severe birth asphyxia. Whilst not strictly something that occurs acutely, these children can cry for hours, without any response to comfort or analgesia.

Medication that can be helpful includes:

- Phenobarbital (1-4mg/kg once to twice daily).
- Levomepromazine (0.25 - 1mg/kg up to 4x day).
- Buccal Midazolam (0.5mg/kg as needed). Midazolam can be used in a crisis situation when the baby needs something to break the cycle of crying and help him/her relax and go to sleep. It should not be considered as 'treatment' for the irritability, but as an essential drug for crisis management.

Acute pulmonary haemorrhage

Children most at risk from this are those with pulmonary Aspergillus, often following bone marrow transplant. It can be a dramatic and catastrophic terminal event. Families must be warned if this is a risk.

- Use coloured towels to soak up blood, so the visual bleeding is less dramatic.
- Give buccal or intranasal Midazolam 0.5mg/kg and buccal or intranasal morphine 0.1mg/kg. Repeat these every 10 minutes until the child is settled. Giving buccal drugs can be very difficult during an acute haemorrhage, so if in hospital give stat IV or S.C. doses.
- As soon as possible, start a continuous subcutaneous or intravenous infusion of Midazolam 0.3mg/kg and Morphine at a dose that is at least the equivalent of an IV breakthrough dose. In an acute severe haemorrhage, the child is likely to die before this is possible.

Seizures

Seizures should be treated according to local seizure management protocols, for example using PR Diazepam, buccal Midazolam, paraldehyde and/or IV Lorazepam.

Resistant seizures can become a medical emergency:

- First line treatment should be with a continuous infusion of Midazolam 0.25-3mg/kg/24hrs. We would recommend starting at a low dose and incrementing every four to six hours as necessary.
- If seizures continue, add in s.c. Phenobarbital. If the child has not recently been on similar drugs, give a loading dose of 15mg/kg over 30-60 mins, then start a continuous infusion at 500mcg/kg/hr. Increment by 20% increases every six hours until seizures stop.
- For children with severe neurological disorders who have been on multiple anticonvulsants, we have found Midazolam is not always helpful and tend to omit this step.

Urine retention

The most usual causes of urine retention are:

- Side effect of morphine.
- Spinal cord compression.
- Constipation.
- Solid tumours.

Treating the underlying cause can be effective, such as switching to an alternative opiate or using Dexamethasone and/or radiotherapy to shrink a solid tumour.

Having a warm bath and encouraging the child to pass urine in the bath is often the most effective crisis management for children with opioid-induced retention. Creating a relaxed atmosphere and gentle bladder massage are also helpful.

Catheterisation may be necessary to relieve the discomfort of a full bladder. This will usually only be needed for a short time in opioid-induced retention. Be very cautious if considering catheterisation in a child with a solid tumour obstructing urinary outflow; it is likely they will need a suprapubic catheter.

Ethics and the law

UK law is determined in two ways:

- Laws passed through Acts of Parliament.
- Case law arising from Law Lords ruling in the High Court. This then becomes legally binding for subsequent similar cases.

This guidance has been prepared in line with UK law including relevant case law up until November 2010. The scope of this guidance includes babies, children and young people including adults over 18 years. For the purposes of this guidance the term 'child' will be used to describe any baby, child or young person regardless of age unless otherwise specified.

Case law is often complex and often contradictory. Specialist advice is strongly recommended if the issue is beyond the scope of this guidance or there is significant disagreement.

Applied clinical ethics in paediatric palliative care

The primary **duty of care** of any healthcare professional is to the child who is your patient. Consideration of the wellbeing of the parents, carers and wider family is likely to have a direct impact on the child but their needs must not take precedence over that of your patient.¹

Decision making model

Decision making must be made on the grounds of the **best interests**² of the child. The best interests standard refers to what is best for the patient and the option that is likely to result in overall benefit.

¹ General Medical Council. *Treatment and Care Towards the End of Life*, 2010.

² The concept of best interests is used England, Wales (*Mental Capacity Act 2005*) and common law in Northern Ireland. A similar interpretation is attributed to "benefit" in the *Adults with Incapacity (Scotland) Act 2000*.

The **responsible physician** must use their specialist knowledge, experience, clinical judgement, and their understanding of the patient, to identify which investigations or treatments are clinically appropriate and likely to result in overall benefit for the patient. The responsible physician must explain the options setting out the potential benefits, burdens and risks of each option. The responsible physician may recommend a particular option that they believe to be best for the patient, but they must not put pressure on the patient or their carer to accept their advice.

The **person with decision making-responsibility** should weigh up the potential benefits, burdens and risks of the various options as well as any non-clinical issues that are relevant. The person with decision-making responsibility should then evaluate the patient's best interests and decide which, if any of the options to accept.

Person with decision-making responsibility

Adults with capacity

Where the patient is an adult with capacity the patient is assumed to be able to determine their best interests and has responsibility for decision making, including giving or refusing consent to treatment.

Tests for capacity

An adult of 18 years or over is assumed to have **capacity** to decide what is in their best interests unless proven otherwise. An adult with capacity has the right to accept or refuse an option for a reason that may seem irrational to the doctor or for no reason at all. An adult has capacity to consent to or refuse an investigation or treatment if they are able to understand, retain, use and weigh information regarding treatment options and consequences of each option including refusal of treatment and to communicate their decision to others.

Adults who lack capacity

If an adult patient lacks capacity to decide, decisions made on the patient's behalf must be based on their best interests (as determined below) and which option (including the option not to treat) would be least restrictive of the patient's future choices.

In England and Wales³ an adult with capacity may apply for another adult to have Lasting Power of Attorney to make decisions on their behalf should they subsequently lose capacity. The Courts can also appoint a Court Appointed Deputy to make decisions on behalf of an adult who lacks capacity.

In circumstances in which there is no legal proxy with authority to make a particular decision for the patient, the treating physician is responsible for making the decision. In England and Wales, if there is no legal proxy, close relative or other person who is willing or able to support or represent the patient and the decision involves serious medical treatment, the treating physician must approach their employing or contracting organisation to appoint an Independent Mental Capacity Advocate (IMCA).⁴ The IMCA will have authority to make enquiries about the patient and contribute to the decision by representing the patient's interests, but cannot make a decision on behalf of the patient.

Children and young people who may have capacity

Where the patient is a child or young person with capacity for decision making they should be allowed to do so. A child or young person may have capacity to consent to an investigation or treatment if they are able to understand, retain, use and weigh information regarding treatment options including refusal of treatment and consequences of each option and communicate their decision to others. Capacity depends more on a child's or young person's ability to understand and weigh up options than on age. A higher level of capacity is generally considered to be required to refuse treatment options, particularly where the consequence may shorten life or restrict future choices.

Where a child or young person may have capacity they should be involved as much as possible in discussions about their care, whether or not they are able to make decisions for themselves. Information about their diagnosis and prognosis that they are able to understand should not be withheld, unless they specifically request it, or if it is felt that giving such information might cause serious harm. In this context 'serious harm' means more than that the child or young person might become upset or decide to refuse treatment.⁵

³ *Mental Capacity Act 2005.*

⁴ *Mental Capacity Act 2005.*

⁵ *General Medical Council, Treatment and Care Towards End of Life, 2010.*

Children and young people who lack capacity

If a child or young person lacks capacity to consent, the responsible physician should discuss the investigations or treatments that are deemed clinically appropriate and likely to result in overall benefit for the patient with their parents or those with parental responsibility. The child's parents or those with parental responsibility should evaluate the child's best interests and decide whether to consent to any of the options and, if so, which. The parents must be kept fully involved.⁶

The child's parents or those with parental responsibility are usually considered to be in the best position to advocate for the child or young person and advise regarding their best interests. However this may be influenced by the direct consequences including bereavement and secondary losses arising from the outcome of the decision. Specialist advice should be sought if it is unclear whether the parents or those with parental responsibility themselves have capacity. Specialist advice should also be sought if there are doubts regarding ability of the parents or those with parental responsibility to act in the best interests of the child.

Best interests

Decisions must be made on the grounds of the **best interests** of the patient. Best interests is a complex construct closely related to, but not limited exclusively to, quality of life. A patient's best interests are not always limited to clinical considerations and it is important to take account of any other factors relevant to the circumstances of each individual.⁷

A patient with capacity is assumed to be able to determine their own best interests.

The Nuffield Council on Bioethics⁸ suggests that for a neonate up to 28 days of age evaluation of best interests should include consideration of:

- What degree of pain suffering and mental distress will/might the treatment inflict on the child?
- What benefits will/might the future child get from the treatment?
- What kind of support is likely to be available to provide optimum care for the child?
- What are the views and feelings of the parents?
- For how much longer is it likely that the baby will survive if life sustaining treatment is continued?

Determination of best interests for a child, young person or adult without capacity should include:

- All reasonable attempts to elicit the views of the patient themselves. Even if the patient lacks capacity, if they are able to express a view and take part in decision making, it is essential to listen to them and take account of what they have to say about things that affect them.⁹
- Considering an independent advocate on behalf of the child or young person. For an adult who lacks capacity an Independent Mental Capacity Advocate (IMCA) must be appointed if there is no legal proxy, close relative or other person who is willing or able to support or represent the patient and the decision involves serious medical treatment.
- Considering whether the child, young person or adult may gain capacity at some point in the future and if this is the case, whether it is possible to postpone decision making until this time.
- The views of the child's or young person's parents or those with parental responsibility.
- The views of those who have an interest in the welfare of the child, young person or adult.

6 General Medical Council, *Treatment and Care Towards End of Life*, 2010.

7 General Medical Council, *Treatment and Care Towards End of Life*, 2010.

8 Nuffield Council on Bioethics. *Critical care decisions in fetal and neonatal medicine: ethical issues*. 2007.

9 General Medical Council. *Treatment and Care Towards the End of Life*, 2010.

- The views of the treating multi-disciplinary. Professionals must be careful not to rely on their personal views about a patient's quality of life and to avoid making judgements based on poorly informed or unfounded assumptions about the healthcare needs of particular groups, such as those with disabilities.
- When discussing the issues with people who do not have legal authority to make decisions on behalf of a patient who lacks capacity, it should be emphasised that their role is to advise the healthcare team about the patient's known or likely wishes, views and beliefs. They are not being asked to make the decision.¹⁰
- Views of the wider multi-disciplinary team and those who have an interest in the wellbeing of the child or young person are important. These views should be taken into account but must not be allowed to take precedent over the views of those with primary responsibility for decision making.

It should be possible to justify decisions made in the best interests of the child or young person by articulating the balance between potential benefits and harm [dis-benefits] to the child or young person.¹¹ If the decision making process is robust it will not be overly influenced by considerations of what the parents or carers want for themselves. For example, if it is not in a child's best interests to receive cardiopulmonary resuscitation the decision not to provide cardiopulmonary resuscitation should not be directly influenced by whether the child's parents are present at the time of the cardiopulmonary arrest. The presence or absence of the parents during a cardiac arrest situation will not have any direct or indirect influence on the potential benefits or harms of the treatment proposed, in this case cardiopulmonary resuscitation.

Uncertainty about whether a particular treatment will provide overall benefit

The exact consequences for the individual child or young person of a particular course of action are often unclear. In such circumstances, all reasonable attempts should be made to evaluate possible consequences, both positive and negative, including consideration of seeking a second opinion or deferring the decision making until the likely outcomes are clearer.

Where the person with decision making responsibility is not the patient there is a need to consider which option would be least restrictive of the patient's future choices.

If there is a reasonable degree of uncertainty about whether a particular treatment will provide overall benefit, the treatment should be started in order to allow a clearer assessment to be made. Treatment must be monitored and reviewed, and may be withdrawn at a later stage if it proves ineffective or too burdensome for the patient in relation to the benefits. Prior to commencing treatment of uncertain benefit the basis on which the decision will be made about whether the treatment will continue or be withdrawn should be clearly articulated.

In circumstances where the balance between benefits and harms of proposed treatment is very delicate, it is likely that the views of the person with responsibility for decision making will be the deciding factor.

Impact on the family and wider healthcare team

Some members of the healthcare team, or people who are close to the patient, may find it more difficult to contemplate withdrawing a life prolonging treatment than to decide not to start the treatment in the first place. This may be because of the emotional distress that can accompany a decision to withdraw life-prolonging treatment, or because they would feel responsible for the patient's death. These anxieties must not override clinical judgement and allow continuation of treatment that is of no overall benefit or failure to initiate treatment that may be of some benefit to the patient.

Parents may feel responsible for any adverse outcomes and want reassurance that all appropriate treatment for their child is being offered. This does not necessarily mean that they are requesting full cardiopulmonary resuscitation, intensive care or other aggressive life prolonging treatment. It may be that they are simply expressing fear of abandonment and their need for ongoing support.¹²

10 General Medical Council, *Treatment and Care Towards End of Life*, 2010.

11 *An NHS Trust v MB* [2006] EWHC 507 (Fam).

12 Gillis, J. "We want everything done" *Archives of Disease in Childhood*; 93(3): 191-6 2008.

The wider multi-disciplinary team, particularly carers with a longstanding and close relationship with the child or young person and their family, may require additional support in order to understand the decision making process leading to withholding or withdrawing. They may require psychological support to enable them to express and share their views and emotions in a 'safe' environment away from the child and family.

Specific situations

Information giving

Apart from circumstances in which a patient refuses information, you should not withhold information necessary for making decisions, (including when asked by someone close to the patient), unless you believe that giving it would cause the patient serious harm. In this context 'serious harm' means more than that the patient might become upset or decide to refuse treatment.

If you withhold information from the patient, you must record your reasons for doing so in the medical records, and be prepared to explain and justify your decision. You should regularly review your decision and consider whether you could give information to the patient later, without causing them serious harm.

A patient cannot have capacity to consent to or refuse treatment unless they are fully apprised of the treatment options and potential consequences.

Consent to treatment

A young person of 16 or over can be presumed to have capacity to consent. A young person under 16 years old may have the capacity to consent, depending on their maturity and ability to understand. A young person who has the capacity to consent to straightforward, relatively risk-free treatment may not necessarily have the capacity to consent to complex treatment involving high risks or serious consequences.

Refusal of treatment

A young person under 18 years old who has capacity to consent may not necessarily have capacity to refuse treatment. A child or young person may have capacity if they are able to understand, retain, use and weigh information regarding treatment options including refusal of treatment and consequences of each option and communicate their decision to others. Capacity depends more on a young person's ability to understand and weigh up options than on age. A higher level of capacity is generally considered to be required to refuse treatment options, particularly where the consequence may shorten life or restrict future choices. A number of high court rulings have overturned refusal of treatment by a young person including on the grounds that the young person lacked capacity. Are these the only grounds, or do the courts just want to retain the power to have refusal by a competent young person overridden? For example because they were not fully cognisant of the consequences of refusal of treatment.¹³

Advance refusal of treatment

Advance refusals of treatment can only be made by an individual with capacity to do so. Adults with capacity can make provision for future decisions by appointing attorneys, recording statements of their preferences and by making advance decisions or directives refusing treatment.

Children of any age who are assessed as being 'Fraser' competent can validly give/refuse consent to treatment offered to them, including advance decisions.

If a child (under 18) refuses treatment, this can be legally overridden by parental consent to the treatment and/or a court order.

There is no legal precedent in UK law for an advance refusal of treatment to be made by an individual with capacity on behalf of another individual, even if they have responsibility for decision making for that person. Likewise there is no legal precedent for an adult with parental responsibility to make a legally binding advance refusal of treatment for their child. Furthermore the Mental Capacity Act specifies that advance decisions can only be made by persons over 18 years old.

¹³ Re M (Medical Treatment: Consent) [1999] 2 FLR 1097.

The individual with capacity can change their mind, at any time, which will override the previous refusal of treatment. This will include a refusal of treatment revoked by a young person with capacity and regardless of the parent's views.

A valid advance refusal that is clearly applicable to the patient's present circumstances will be legally binding in England and Wales¹⁴ (unless it relates to life-prolonging treatment, in which case further legal criteria must be met). Valid and applicable advance refusals are potentially binding in Scotland¹⁵ and Northern Ireland¹⁶, although this has not yet been tested in the courts.

Written and verbal advance refusals of treatment that are not legally binding, should still be taken into account as evidence of the person's wishes.

Assessing the validity and applicability of advance refusals

If there is doubt or disagreement about the status of advance refusals made by an adult over 18 years professionals should start from a presumption that the patient had capacity when the decision was made. Both the validity and the applicability of any advance refusal should be assessed.

An advance refusal of treatment will be valid if:

- (a) The patient was an adult when the decision was made (16 years old or over in Scotland, 18 years old or over in England, Wales and Northern Ireland see above).
- (b) The patient had capacity to make the decision at the time it was made (UK wide).
- (c) The patient was not subject to undue influence in making the decision (UK wide).
- (d) The patient made the decision on the basis of adequate information about the implications of their choice (UK wide).
- (e) If the decision relates to treatment that may prolong life it must be in writing, signed and witnessed, and include a statement that it is to apply even if the patient's life is at stake (England and Wales only).
- (f) The decision has not been withdrawn by the patient (UK wide).
- (g) The patient has not appointed an attorney, since the decision was made, to make such decisions on their behalf (England, Wales and Scotland).
- (h) More recent actions or decisions of the patient are clearly inconsistent with the terms of their earlier decision, or in some way indicate they may have changed their mind.

An advance refusal of treatment will be applicable if:

- (a) The decision is clearly applicable to the patient's current circumstances, clinical situation and the particular treatment or treatments about which a decision is needed.
- (b) The decision specifies particular circumstances in which the refusal of treatment should not apply.
- (c) There is not an excessive time interval between the time the decision was made or it has been reviewed or updated (this may also be a factor in assessing validity).

¹⁴ The code of practice supporting the Mental Capacity Act 2005, which uses the legal term 'advance decision', sets out detailed criteria that determine when advance decisions about life-prolonging treatments are legally binding.

¹⁵ The code of practice supporting the Adults with Incapacity (Scotland) Act 2000, which uses the legal term 'advance directive', gives advice on their legal status and how advance directives should be taken into account in decisions about treatment.

¹⁶ In Northern Ireland there is no statutory provision or case law covering advance refusals, but it is likely that the principles established in English case law precedents would be followed.

(d) There are no reasonable grounds for believing that circumstances exist which the patient did not anticipate and which would have affected their decision if anticipated.

Advance care plan

In circumstances where an advance refusal of treatment is not applicable, an advance care plan may nevertheless provide appropriate guidance regarding the most appropriate care for a child in specific circumstances such as sudden collapse or cardiopulmonary arrest.

Where the advance care plan suggests specific circumstances when it is not in that particular child's 'best interests' to receive aggressive life prolonging treatment, staff may, in theory, be vulnerable to allegations of assault if this treatment is provided.

However if there is any doubt as to whether the care plan applies in any given situation, those caring for the child should provide life-sustaining treatment until it is possible to obtain further advice from the child's parents and the clinical team.

In an emergency

If there is no time to investigate further, the presumption should be in favour of providing treatment, if it has a realistic chance of prolonging life, improving the patient's condition, or managing their symptoms.

Reviewing decisions

The patients' condition may deteriorate, improve unexpectedly, or may not progress as anticipated. The views of the patient, those with an interest in their welfare or those with decision making-responsibility about the benefits, burdens and risks of treatment may change over time. It is essential that there are clear and robust arrangements in place to review decisions on regular basis.

Requests for treatment

If the person with decision-making responsibility asks for a treatment that would not be clinically appropriate and of overall benefit to the patient, the issues should be discussed and the reasons for their request explored. If, after discussion, it is still considered that the treatment would not be clinically appropriate and of overall benefit to the patient, the treatment does not have to be provided. The reasons for not providing the treatment should be explained together with other options that are available, including the option to seek a second opinion or access legal representation.

Conscientious objection

A healthcare professional can withdraw from providing care on the grounds of their religious, moral or other personal beliefs. However this does not override the duty of care to the patient and alternative arrangements to providing ongoing care must be ensured.

Withholding or withdrawing life-prolonging treatment

If after discussion, there is a consensus that life-prolonging treatment would not be in the child's best interests and the treatment is withdrawn or not started, any distressing symptoms must be addressed and the child must be kept as comfortable as possible. It is essential to monitor the child's condition and reassess the benefits, burdens and risks of treatment in light of changes in their condition.

Resource constraints

If available treatment options are subject to resource constraints such as funding restrictions on certain treatments in the NHS, or lack of availability of intensive care beds, it is essential that the patient continues to receive as good a standard of care as possible. This will include the need to balance sometimes competing duties towards the wider population, funding bodies and employers. There will often be no simple solution.

Ideally, decisions about access to treatments should be made on the basis of an agreed local or national policy that takes account of the human rights implications. Decisions made on a case by case basis, without reference to agreed policy, risk introducing elements of unfair discrimination or failure to consider properly the patient's legal rights.

If resource constraints are a factor, it is essential to:

- (a) Provide the best service possible within the resources available.
- (b) Be familiar with any local and national policies that set out agreed criteria for access to the particular treatment (such as national service frameworks and NICE and SIGN – Scottish Intercollegiate Guidelines Network – guidelines).
- (c) Make sure that decisions about prioritising patients are fair and based on clinical need and the patient's capacity to benefit, and not simply on grounds of age, race, social status or other factors that may introduce discriminatory access to care.

Acrimonious parental relationships, parental disagreement, inability to contact one parent

It is usually sufficient to have consent from one parent, but if more than one person holds parental responsibility you should encourage them to reach a consensus.

When treatment proposed carries a significant risk of mortality, or when discussions include the possibility of withholding or withdrawing life-sustaining treatment, it is strongly recommended that every reasonable attempt is made to contact all those with parental responsibility. If this is impossible, the circumstances including attempts made to contact all those with parental responsibility must be carefully documented.

It has been argued that if an individual with parental responsibility has not had contact with the child or family for a number of years they are not, in practical terms, exerting their parental responsibility. However this has not been tested in a court of law.

Clinically assisted hydration and nutrition

The terms 'clinically assisted nutrition' and 'clinically assisted hydration' do not refer to help given to patients to eat or drink, for example by spoon feeding. Nutrition and hydration provided by tube or drip are regarded in law as medical treatment, and should be treated in the same way as other medical interventions.

Clinically assisted hydration and nutrition can be ethically and legally withdrawn or withheld if it is considered to be in the best interests of the child. However in these circumstances a second opinion, from a physician not previously involved in the care of the child or young person must be sought.¹⁷

For this reason it is especially important that you listen to and consider the views of the patient and of those close to them (including their cultural and religious views) and explain the issues to be considered, including the benefits, burdens when clinically assisted nutrition or hydration would be of overall benefit, it will always be offered; and that if a decision is taken not to provide clinically assisted nutrition or hydration, the patient will continue to receive high-quality care, with any symptoms addressed.

If a consensus is reached that clinically assisted nutrition or hydration would not be of overall benefit to the patient and the treatment is withdrawn or not started, it is essential to ensure that patient is kept comfortable and that any distressing symptoms are addressed. The patient's condition must be monitored and the benefits, burdens and risks of providing clinically assisted nutrition or hydration must be reassessed in light of changes in their condition.

Patients in a persistent vegetative state

In England, Wales and Northern Ireland a court ruling is required before withholding or withdrawing artificial fluids or nutrition for a patient in a persistent vegetative state or a condition closely resembling a persistent vegetative state. The courts in Scotland have not specified such a requirement.

¹⁷ General Medical Council. *Treatment and Care Towards the End of Life*, 2010.

Cardiopulmonary resuscitation

Cardiopulmonary resuscitation is like any other potentially life-prolonging medical treatment and the same principles of decision making in the patient's best interests apply. If cardiopulmonary resuscitation may be successful in restarting a patient's heart and breathing and restoring circulation, the benefits of prolonging life must be weighed against the potential burdens and risks. Accurate information must be provided about the potential the burdens and risks of cardiopulmonary resuscitation interventions including the likely clinical and other outcomes if cardiopulmonary resuscitation is successful.

Some patients or those with decision-making responsibility may request cardiopulmonary resuscitation to be attempted when there is only a small chance of success. As with any other request for treatment, the issues should be discussed and the reasons for the request explored. If, after discussion, it is still considered that the treatment would not be clinically appropriate and of overall benefit to the patient, the treatment does not have to be provided. The reasons for not providing the treatment should be explained together with other options that are available, including the option to seek a second opinion or access legal representation.

Where there is disagreement

In circumstances where the balance between benefits and harms of proposed treatment is very subtle it is likely that the views of the person with responsibility for decision-making will be the deciding factor.

Even when the medical facts are certain, individual interpretation of the facts may lead to different conclusions regarding the best interests of the child or young person.

Depending on the seriousness of any disagreement, it is usually possible to resolve it; for example, by involving an independent advocate, seeking advice from a more experienced colleague, obtaining a second opinion, holding a case conference, or using local mediation services. It may also be possible to consider deferring decision-making until the situation is clearer or until the patient themselves has capacity to make a decision regarding their own best interests.

If disagreements cannot be resolved in an appropriate and timely fashion there must be an application to the courts.

An application to the courts is mandatory in England, Wales or Northern Ireland, when considering withholding or withdrawing clinically assisted feeding or hydration for a patient in a persistent vegetative state.



Fluid and electrolytes management

[61-63]

Patient weight and blood pressure (BP) are useful parameters in assisting with fluid balance interpretation, but it should be borne in mind that BP may be elevated due to causes other than fluid overload. Also, insensible losses need to be considered, so a positive balance on a chart is usually not strictly accurate as it does not account for this loss.

For practical purposes, 1kg of weight = 1L of fluid.

No action should usually be taken on the basis of a single parameter (for example, fluid balance alone). The child should be fully assessed, including BP, heart rate, respiratory rate, capillary refill time, temperature, weight and general condition.

Remember, older children can tolerate a larger positive fluid balance than younger ones.

Normal fluid requirements

Blood volume is about 100ml/kg at birth, falling to about 80ml/kg at one year of age. Total body water varies from about 800ml/kg in the neonate to about 600ml/kg at one year, and subsequently varies very little. Of this, approximately $\frac{2}{3}$ (or 400ml/kg) is intracellular fluid, the rest is extracellular fluid.

Normal daily fluid **maintenance** requirement is calculated on the basis of the amount of fluid required to keep a patient well hydrated and passing reasonable amounts of urine. The standard calculation (based on APLS recommendations) **includes the following considerations:**

1. Baseline maintenance requirements.
2. Replacement of **insensible losses** through sweating, respiration, normal stool loss (usually 10ml/kg in an adult, 20ml/kg in a child & 30ml/kg in a baby <1 year).
3. Replacement of **essential urine output** (= minimal urine output required for waste excretion).
4. Some extra fluid to maintain a modest amount of diuresis.

The calculation is by weight and thus applies to all age ranges.

Total daily fluid requirement consists of:

Maintenance + Replacement of deficit (existing/ongoing loss) + Resuscitation (if required).

Calculation of maintenance fluid requirement

(Includes 1+2+3+4 above)

Body Weight	Fluid Requirement per 24 hours	Fluid Requirement per hour
First 10kg	100ml/kg/24 hrs	4ml/kg/hr
Second 10kg	50ml/kg/24 hrs	2ml/kg/hr
Each subsequent 1kg	20ml/kg/24 hrs	1ml/kg/hr
e.g., 24kg =	$(100 \times 10\text{kg}) + (50 \times 10\text{kg}) + (20 \times 4\text{kg})$ = 1000 + 500 + 80 =1580ml per 24 hours	or $(4 \times 10\text{kg}) + (2 \times 10\text{kg}) + (1 \times 4\text{kg})$ = 40 + 20 + 4 = 64ml per hour x 24 = 1536ml per 24 hours

This shows that either method of calculating fluids is acceptable, giving reasonably close answers for fluids for a 24kg child over a 24 hour period. (Indeed, the difference between the two methods is less than 2ml/hr).

In addition to the above, maintenance fluid requirements, **ongoing losses** (for example, due to significant gastrointestinal losses i.e. diarrhoea or vomiting, polyuria) need to be considered and replaced. In **febrile** patients, **insensible losses through sweating and respiration will be higher than usual**; add approximately 13% extra fluid for each 1 degree C > 37.5 degrees C.

Replacement Fluid (Deficit = existing + ongoing losses)

Ongoing losses, for example, due to significant diarrhoea or vomiting, may be replaced intravenously on an ml-for-ml basis or as part-replacement if the patient is also tolerating some oral fluids.

Existing losses (i.e. dehydration)

Percentage dehydration can be estimated clinically using the following parameters:
(APLS guidelines)

Signs and symptoms of dehydration

Sign/Symptom	Mild (<5%)	Moderate (5-10%)	Severe >10%
Decreased urine output	+	+	+
Dry mouth	+/-	+	+
Decreased skin turgor	-	+/-	+
Tachypnoea	-	+/-	+
Tachycardia	-	+/-	+

NB: Tachypnoea may be due to, or worsened by, metabolic acidosis and pyrexia.

Tachycardia may be due to hypovolaemia, but also due to other causes e.g. pyrexia, pain or irritability.

A low blood pressure is a serious sign in a child: it may be due to hydration/hypovolaemia or due to other causes e.g. septic shock. **It is a late/peri-arrest sign, and preventative action should be taken prior to the child reaching this stage.**

To Calculate Replacement Fluids (according to % dehydration):

Fluid deficit (ml) = Percentage dehydration x Weight (kg) x 10

e.g. A 24kg child is 7.5% dehydrated, calculated fluid requirement. (Assuming no resuscitation required).

Fluid deficit = 7.5 x 24 x 10
= 1800ml

Maintenance = (100 x 10kg) + (50 x 10kg) + (20 x 5kg)
= 1000 + 500 + 80
= 1580ml

Thus **Total** fluid requirement = Maintenance + Deficit + Resuscitation fluids
= 1580ml + 1800ml + 0
= 3380ml over 24 hours
(+ addition for ongoing losses on a ml-for-ml basis)

Normal daily electrolyte requirements

Sodium	2-4mmol/kg/day
Potassium	2mmol/kg/day
Calcium	3mmol/kg/day
Magnesium	0.75mmol/kg/day

To calculate electrolyte deficit:

Deficit (mmol) = (Normal level - actual level) x weight (in kg) x 0.7

e.g. 24kg child with serum potassium of 2.5mmol/L

Deficit = $(4 - 2.5) \times 24 \times 0.7$
= 25.2mmol

Maintenance = 2mmol/kg/day
= 2×24
= 48mmol

Thus, total requirement = Deficit + Maintenance
= $25 + 48$
= 73mmol

If not taking oral fluids will need maintenance hydration containing 73mmol over the next 24 hours.

If taking diet, and hence maintenance electrolytes, needs 25mmol extra potassium over next 24 hours.

Gastro-oesophageal reflux

[19, 30, 64-74]

Gastro-oesophageal reflux (GOR) is a very common and probably under recognised problem in neurologically impaired children, perhaps around 50% (15-75%) in this group. The most common GOR associated symptoms are shown in bold type. The symptoms are particularly significant if multiple, and if during or after feeds.

Gastro-intestinal: **Food refusal.**

Vomiting (especially during/after feeds and supine at night).

Dysphagia/difficulty swallowing.

Weight loss/failure to thrive.

Haematemesis/melaena.

Respiratory:

Troublesome secretions.

Aspiration pneumonia.

Recurrent RTIs/bronchitis.

Cough.

Wheezing.

Choking/gagging.

Other symptoms, especially with temporal relation to feeding:

Irritability (especially when supine).

Pain.

Hyperextensive posturing.

Sandifer's syndrome (neck extension and head rotation during/after meals in infant/young child, associated with iron deficiency anaemia and severe oesophagitis).

Non-drug treatments

- Adjust posture.
- Alter feeding regime from large bolus to frequent small volume, or if nasogastric/gastrostomy fed, overnight feeding/continuous feeding (sometime this may aggravate symptoms: try it and see).
- Check for overfeeding, especially if nasogastric/gastrostomy fed.
- Thicken feed with gum or starch. However, this may aggravate symptoms by osmotic effect.

Drug treatments

- Antacids, especially Gaviscon for its raft as well as antacid effects.
- Omeprazole reduces noxious effects of reflux via its actions as a proton pump inhibitor.
- Ranitidine can be used as second line, but can give problems with rebound nocturnal acid secretion.
- Prokinetic, for example Domperidone or Metoclopramide.

If, despite maximal medical therapy, vomiting, weight loss or distress continues then surgery needs to be considered. Fundoplication with or without pyloroplasty is effective in over 80% of cases, but has a high morbidity (26-59% post-operative complications, 6-70% get recurrent GOR and 5-15% need repeat surgery). If the child has severely compromised nutrition, inefficient feeding, NGT dependency or swallowing problems, then gastrostomy should be considered simultaneously.

Omeprazole

For children who cannot swallow tablets or capsules then the following can be tried:

- Open capsule and mix granules with acidic drink (orange or apple juice) and swallow without chewing.
- MUPS tablets can be dispersed in water, fruit juice or yogurt.
- For PEG and NG tubes the MUPS tablets can be dispersed in a large volume of water.
- For PEG and NG tubes the granules can be mixed with 10ml of sodium bicarbonate 8.4% and left to stand for 10 minutes until a turbid suspension is formed. The suspension is given immediately then flushed with water.
- For older children Lansoprazole fastabs dissolve very well in water and do not block the tubes as badly as Omeprazole.

Gastrostomy care

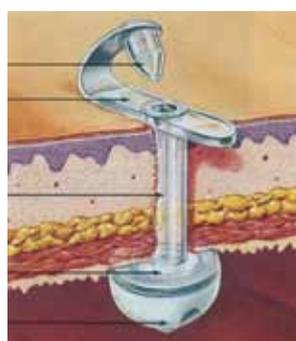
[75-88]

Many of the children requiring palliative care will have a gastrostomy in situ, often for feeding requirements or for medication to be administered where the oral route is either inappropriate or holds the potential risk of aspiration/choking for the child.

The two main types of gastrostomy tubes are PEG (Percutaneous Endoscopic Gastrostomy) and balloon type, usually a MIC-KEY. There are various reasons why some children have one type and some have another. Such reasons could be the length of time the device is in situ, the surgeon's preference and the appropriateness of the device for the child and family.



PEG tube



MIC-KEY button

Daily care

- Clean the skin around the stoma site and under the external fixation device or MIC-KEY head with warm water daily. Normal bath or shower routines can be followed, but the new stoma site should not be submerged in water for three weeks post-operatively. Ensure area is thoroughly dried. Do not use talcum powder around stoma area.
- To prevent blockage, the gastrostomy tube should be flushed with water before and after all feeds and medication. Usually a minimum of 10mls of water unless the child is fluid restricted or a small infant.
- Rotate gastrostomy tube 360 degrees every day to help avoid the formation of granulation tissue.
- Check any external fixation device, (present on all PEG's and some balloon tubes), is comfortably positioned approximately 2mm from the skin surface, and adjust according to manufacturer's instructions.
- THE RETENTION DEVICE SHOULD NOT BE MOVED FOR TWO WEEKS POST OPERATIVELY, TO ALLOW TRACT TO BECOME ESTABLISHED. IF TIGHTNESS OR DISCOMFORT IS NOTED DURING THIS TIME, CONTACT APPROPRIATE MEDICAL STAFF.
- Avoid the use of occlusive dressings over the gastrostomy as these may encourage skin maceration and bacterial growth.
- Check stoma site for signs of irritation, redness or swelling. Contact appropriate medical/nursing staff for advice.

Oral hygiene

- If a child has reduced or no oral feeds, plaque can build up on their teeth rapidly. Poor oral hygiene will cause soreness and pain.
- Teeth need to be cleaned twice daily, and artificial saliva or mouthwash can be used where appropriate.

Weekly care of balloon gastrostomy

- If the gastrostomy is newly formed, **do not deflate the balloon until two weeks post-operatively** to ensure stomach firmly adhered to the abdominal wall.
- Once established, change water in the balloon weekly using sterile water if in hospital, or cooled boiled water in the home (usually 5mls).
- A balloon gastrostomy will require replacing every four to six months according to the manufacturers' instructions.

Tube blockage

It is important that the gastrostomy tube is only used for administering specific enteral feed, water or medication in an appropriate form i.e. liquid, unless specified by a pharmacist. In the event of a blockage the following tactics can be tried:

Using a 50ml syringe the following fluid (25-30mls) can be used (as age appropriate) to try to unblock the tube, usually a minimum of 10mls:

- Flush with warm water.
- Flush with soda water.
- Flush with cola.
- Flush with pineapple juice (contains an enzyme that helps to dissolve the blockage).
- If blockage persists, gently draw back on the syringe and flush as before.
- Gently squeeze the tube between your fingers along its length to 'milk' the tubing.

If blockage persists:

- PEG – a pancreatic enzyme (Pancrex V) may be obtained from a dietitian/doctor which is instilled and left in the tube for approximately 30 minutes, then retry the above. If remains blocked, contact appropriate medical staff.
- MIC-KEY/Balloon gastrostomy – consider a change of tube by an appropriately trained individual deemed competent to do so.

Leakage around the stoma site

- A newly formed gastrostomy may experience slight seepage around tube until the tract is established.
- If established balloon gastrostomy, check sufficient water in balloon.
- If established PEG, check external fixation device has not slipped by pulling gently on gastrostomy tube until resistance is met and positioning fixation device 2mm from skin surface.
- Aspirate tube prior to feeding to remove excessive air from stomach:
PEG – use 50ml syringe ensuring Luer port is closed.
MIC-KEY – as above or use decompression tube provided with the kit.

- If child is inactive, encourage sitting upright following feed or position on right side with the head elevated, to promote gastric emptying.
- Discuss with the possibility of reducing rate of feed with the dietitian; or giving smaller, more frequent feeds.
- Gastric contents will quickly cause excoriation and soreness. Protect the skin with water proofing product such as stoma care skin wipes or Cavilon, whilst establishing and correcting cause.
- If leakage persists, contact appropriate medical staff.

Ensure leakage is not due to:

1. Granulation tissue

Looks like a raised red lip or cauliflower type growth(s) around the stoma site.

Will produce a copious, sticky, mucus type discharge – often mistaken for infection.

Treatment: Topical steroid based, antifungal cream i.e. Tri-Adcortyl.

Apply twice daily for maximum of 10 days then review.

May need second course of treatment but advise parent/carer against prolonged use.

If in doubt swab before starting treatment.

2. Infection

- Inspect for signs of redness, swelling or tenderness around gastrostomy site.
- Note colour and consistency of leakage.
- If infection suspected swab before starting treatment.
- Consider Fucidin cream for topical application or systemic antibiotics.
(Caution with Erythromycin with children who have epilepsy).

If gastrostomy tube is pulled out

- Appropriate action needs to be taken as soon as possible as the stoma will begin to close after four to six hours.
- Leakage may occur from the stoma site – use skin protective wipe or Cavilon if available, and cover with dry dressing.

MIC-KEY or balloon gastrostomy

Child should have spare tube with them which can be replaced by appropriately trained nursing/medical staff or carers. Or contact hospital ward or Community Children's Nurses.

PEG gastrostomy

Contact hospital surgical team as soon as possible.

A size 12g Foley catheter can be used to keep the stoma patent until PEG is replaced.

If this is to be used for feeds/medication ensure tip of catheter has not migrated into small bowel; inflate balloon and pull back gently until resistance felt, secure to skin with tape, note length of external catheter from stoma site.

Hiccough

[89-94]

Hiccough is a common occurrence in normal individuals, and only becomes a symptom when it becomes troublesome, severe or intractable, which can occur in palliative care situations.

In terminal care the most common cause of hiccough is gastric distension. The first line of treatment is often a defoaming antifatulent containing Simeticone (active dimeticone such as Asilone or Maalox Plus). If this fails to settle the hiccough a prokinetic drug such as Metoclopramide can be added to tighten the lower oesophageal sphincter and promote gastric emptying. Sometimes peppermint water is helpful, by relaxing the lower oesophageal sphincter to facilitate belching, but as this works in opposition to the action of Metoclopramide these two should not be given together.

Gastrointestinal reflux can sometimes cause hiccough, and this can be reduced by the use of prokinetics such as Metoclopramide, or by H₂ antagonists or proton pump inhibitors.

Diaphragmatic irritation is another cause of hiccough seen in palliative care. Baclofen is seen as the drug of choice with its muscle relaxant properties.

There are also single case reports in adults for the use of Gabapentin, Nifedipine and Haloperidol supporting their potential benefit for intractable hiccough.

Stimulation of the pharynx may help with the management of hiccough, and this is the basis for how a lot of the traditional 'folk' remedies for hiccough may work. Such advice includes swallowing crushed ice, a cold key down the back of the neck, and drinking from the wrong side of the cup.

More medically based treatments that stimulate the pharynx include normal saline 2mls nebulized over five minutes, and oro-pharyngeal stimulation with an NG tube, both of which suggested a reduction in hiccough. A similar method is by massaging the junction between the hard and soft palate with a cotton bud. Forced traction of the tongue to stimulate a gag reflex is also thought to potentially work by pharyngeal stimulation.

Central suppression of the hiccough reflex can be achieved in several ways. Re-breathing air out of a paper bag and breath holding are both thought to inhibit processing of the hiccough reflex in the brain stem by elevating PaCO₂.

Dopamine antagonists such as Metoclopramide may help by both their central action and if there is associated gastric distension.

Other drugs to centrally suppress hiccough include Haloperidol, or Chlorpromazine. GABA agonists such as Sodium Valproate 200-500mg daily are also potentially effective by central suppression.

Potential biochemical causes of hiccough should be sought and corrected appropriately if possible, including hyponatraemia, hypocalcaemia (for example, after bisphosphonate treatment), and in renal failure.

If hiccoughs persist, the possibility of infection or a brain stem lesion/intra-cranial lesion should be considered.

In summary, if hiccoughs become a persistent and distressing symptom, effort should be made to relieve treatable causes such as gastric distension and reflux or correct biochemical causes, whilst considering infection and neurological causes.

Simple 'folk' remedies and attempts at other methods of pharyngeal stimulation should then be tried, followed by specific drug treatment if the above remedies have proved ineffective.

HIV and AIDS

[95-111]

Introduction

AIDS is by far the biggest the main non-acute cause of childhood death in the world, bringing a huge physical, psychological and social burden to infected children and their families. Even in the era of anti-retroviral therapy (ARTs), palliative care remains a crucial part of HIV/AIDS care, because treatment sometimes fails, and more often is not available or affordable. Palliative care also has an important role to play in the relief of distressing symptoms (some which may be as a result of side effects to ARVs) and immune reconstitution illnesses.

It is important to realise that HIV/AIDS is a multi-system, multi-organ disease; not just a disease of the immune system. Fortunately, most symptoms caused by HIV/AIDS can be managed successfully, using the same principles as with symptoms due to other pathologies. It is not necessary to be an HIV/AIDS expert to provide good children's palliative care, but you do need to know about side effects and interactions of ARVs, which can be significant in palliative care settings.

Facts and figures

Most infections in African children are caused by mother-to-child-transmission (MTCT). These result from a variety of factors: the high HIV infection rate in women of childbearing age, the high birth rates/fertility rates, and low uptake and coverage of PMTCT (preventing mother to child transmission).

There are approximately 2.1 million children under the age of 15 years living with HIV worldwide, at least 90% of these live in Africa. UNAIDS estimated that in 2003 there were 630,000 new paediatric HIV infections. It is currently estimated that in developing countries 1,600 children are infected daily by their HIV-infected mothers and in Africa, more than 400,000 children under 15 died of AIDS in 2003 alone. In 2004 there were over 13 million orphans worldwide who have lost one or both parents from AIDS and this is projected to rise to 25 million by 2010.

The impact of AIDS on families and communities also affects non-orphaned children. With the deepening poverty that results from sick and dying parents, children are the first to suffer. They suffer mental, psychological, and social distress and increasing material hardships. The children may be the only caregivers for their sick or dying parents/guardians, may drop out of or interrupt school, and are at risk of discrimination and abuse, both physical and sexual. Children with HIV/AIDS in resource-constrained countries experience high rates of morbidity and mortality relatively early in their lives, with up to 75% mortality by five years of age.

Improvements in basic HIV care, and more recently antiretroviral therapy, have improved survival among HIV-infected children in developed countries. On the other hand, HIV-infected children in resource-limited settings continue to have little access to even basic HIV and supportive care. Globally, but particularly in resource-constrained settings, the terminal care needs and services for children with life-threatening illnesses are poorly understood and poorly developed.

Relevant information about HIV and its pathology

HIV attacks the immune system of the individual leading to decline in CD4 cell counts. CD4 cells are a group of T-lymphocytes vital in fighting infections and immunosurveillance. HIV infection may be asymptomatic for a number of years whilst the virus insidiously damages the immune system. As the level of immunity falls children become susceptible to specific types of infections.

In children immunosuppression is defined according to age group since children usually have higher cell counts in all blood lines than adults. In children in the developed world, the median time from the onset of severe immunosuppression to an AIDS defining illness is 12-18 months in children not receiving antiretroviral drugs. HIV-infected infants frequently present with clinical symptoms in the first year of life, and by one year of age an estimated one-third of infected infants will have died, and about half by two years of age. There is thus a critical need to provide antiretroviral therapy (ART) for infants and children who become infected.

It is important to look for opportunistic infections as a cause of pain and symptoms in HIV positive children. Treating them may enable a patient to stop analgesics and improve their quality of life greatly, even returning to school and normal activities. Many of these infections (for example, candida, toxoplasmosis, tuberculosis, and pneumonia) can be treated with inexpensive medications, although some treatments are more expensive, such as treatment of cryptococcal meningitis.

Pathophysiology of HIV/AIDS

It is important to understand that the HIV virus causes pathology in two ways:

1. By suppressing the immune system.
2. By directly infecting and damaging organs and systems.

Organs and systems that can be directly infected and damaged include:

- **The central nervous system:** The HIV virus damages the central and peripheral nervous system causing HIV encephalopathy and both central and peripheral neuropathies. These can cause a range of problems from subtle developmental and cognitive delay through to global neuro-degeneration with severe disability and ultimately death. Other less common problems include vascular myelopathy of the spinal cord and a sensory polyneuropathy affecting the hands and feet which can cause severe pain.
- **The gastrointestinal system:** HIV enteropathy is used to describe a syndrome of diarrhoea, mal-absorption and weight loss for which no other explanation is found. Villous atrophy is a common histological finding and small bowel permeability is increased.
- **The heart:** Causing HIV related cardiomyopathy.
- **The kidneys:** Causing HIV related nephropathy.
- **The respiratory system:** Causing lymphocytic interstitial pneumonitis (LIP) and debilitating chronic lung disease often complicated by cor pulmonale.

Psychosocial issues in HIV/AIDS

Children with HIV/AIDS are liable to suffer with all of the psychosocial problems of children with any other life-limiting condition, but there are additional issues that HIV-infected children face because of the nature of the HIV virus: its infectivity, its long latent period, its tendency to decimate whole families, and the fact that is still highly stigmatizing.

Symptoms in AIDS

Incidence of different symptoms

HIV-related conditions in children that are observed to cause pain particularly in children include:

- Meningitis and sinusitis (headaches).
- Pneumonia and chest pain.
- Otitis media.
- Shingles.
- Cellulitis and abscesses.
- Severe candida dermatitis.
- Oral lesions such as herpes, acute necrotizing gingivitis and severe dental caries.
- Intestinal infections, such as mycobacterium avium intracellulare (MAI) and cryptosporidium.
- Hepatosplenomegaly.
- Oral and esophageal candidiasis.
- Disseminated Kaposi's Sarcoma.
- Dystonic pain secondary to encephalopathy.

Pain

Pain in AIDS can be caused by:

1. The effects of specific opportunistic infections (e.g. headache with cryptococcal meningitis, visceral abdominal pain with disseminated *Mycobacterium Avium* complex).
2. The effects of HIV itself or the body's immune response to it (e.g. distal sensory polyneuropathy, HIV-related myelopathy).
3. The effects of medications used to treat HIV disease (for example, dideoxynucleoside-related peripheral neuropathy, zidovudine-related headache, protease inhibitor-related gastrointestinal distress).
4. The non-specific effects of chronic debilitating illness.
5. Procedural pain due to repeated procedures such as venesection, tube feeding, lumbar punctures and so on.

AIDS pain syndromes and most common pain diagnoses in AIDS

It should be noted that in some instances the incidence and/or prevalence of pain may have actually increased with the advent of ART (anti-retroviral therapy). As is often the case with AIDS, the irony of decreased mortality rates is that by surviving longer some children may thus be vulnerable to new complications and pain, as in the observed increasing prevalence of peripheral neuropathy which occurred with longer survival according to the Multi-Centre AIDS Cohort Study.

Despite the high prevalence of pain in AIDS, several studies have also demonstrated that pain in children with AIDS is likely to be under-diagnosed and under-treated. This failure to diagnose and treat pain may reflect both the general under-recognition of pain by most physicians and/or the additional reluctance to consider seriously any self-report of pain in children.

In addition to pain, children with AIDS have been found to have a high prevalence of other symptoms, particularly but not exclusively in the advanced stages of the disease. Moreover, one recent study suggested that physicians frequently also fail to identify and under-treat common non-pain symptoms reported by children with AIDS. Symptoms include a mixture of physical and psychological conditions, such as fatigue, anorexia, weight loss, depression, agitation and anxiety, nausea and vomiting, diarrhoea, cough, dyspnoea, fever, sweats and pruritus.

Other symptoms

The prevalence of the most common ten symptoms for children with HIV/AIDS in Africa has been reported as follows:

- Fever, sweats, or chills (51%)
- Diarrhoea (51%)
- Nausea or anorexia (50%)
- Numbness, tingling, or pain in hands/feet (49%)
- Headache (39%)
- Weight loss (37%)
- Vaginal discharge, pain, or irritation (36%)
- Sinus infection or pain (35%)
- Visual problems (32%)
- Cough or dyspnoea (30%)

Management of symptoms in children with AIDS

Individual symptom management advice is covered more fully in the relevant chapters of this book. However, to demonstrate the overlap between disease specific treatment and palliative treatment that is a feature of AIDS, the following table will give an overview.

Practical management of symptoms in HIV/AIDS

Symptom	Causes	Disease specific therapy	Palliative therapy
Fatigue, weight loss, anorexia	HIV infection Opportunistic infections Malignancy Anaemia	ART. Treat infections. Transfusions. Nutritional support.	Explanation and reassurance. Lifestyle modifications. Steroids.
Pain	See above	ART. Treat specific diseases using antibacterials/antifungals/antivirals.	Treat underlying cause. Remember non-pharmacological approaches. Consider ART. Use WHO pain ladder.
Nausea and vomiting	Drugs. Gastrointestinal infections.	Stop drugs. Treat infections using antifungals, antiparasitics, antivirals and antibiotics.	Antiemetics. Prokinetic. H2 blockers (e.g. Ranitidine) or PPI (e.g. Omeprazole). Small frequent feeds, fluids between meals, offer cold foods, eat before taking medications, dry foods, avoid sweet, fatty salty, or spicy foods.
Dysphagia	Candidal Oesophagitis	Antifungals	If severe, reduce inflammation by giving steroids initially (may need IV initially). The ideal treatment is Fluconazole which may need to be given intravenously. If this is not available, we have had some success using Clotrimazole pessaries -500mgs to be sucked daily for five days. Use analgesic ladder for pain.
Sore mouth	Herpes simplex Aphthous Ulcers Thrush Gingivitis	Acyclovir	Keep mouth clean; clean with soft cloth or gauze in clean salt water. Give clear water after each feed. Avoid acidic drinks and hot food. Give sour milk or porridge, soft and mashed. Ice cubes may help; ice cream or yoghurt.
Chronic diarrhoea	Infections (gastroenteritis, parasites, MAC, cryptosporidium, CMV), malabsorption, malignancies, drug-related.	Antibiotics/antivirals/antiparasitics	Rehydration (Bowie's regimen), Vitamin A and Zinc. Diet modification (e.g. yoghurt rather than fresh milk if lactose intolerance is a possibility), micronutrient supplements. Kaolin (cosmetic only) or Bismuth. Oral morphine can alleviate intractable diarrhoea as can Loperamide if available.
Constipation	Dehydration Tumours Drugs	Rehydrate. Treat tumours with DXT or chemo if appropriate. Adjust medication.	Activity. Diet modification. Laxatives.
Ano-genital ulceration	Commonly due to herpes simplex virus. Candidiasis.	Herpes: Acyclovir (oral) or an emulsion mixture of Nystatin 5 ml, metronidazole powder 400mgs and Acyclovir 1 tablet. Antifungals.	Crush a tablet of Prednisolone and apply the powder to the affected part.

Breathlessness	Pneumonia. Anaemia. Tumour. Effusion. Weakened respiratory muscles.	Treat cause. Antibiotics. Iron or transfusion if severe. Treatment of tumour (if appropriate). Drainage (if appropriate).	Fan and maximize airflow. Counselling. Distraction. Relaxation. Guided imagery. Opioids. Benzodiazepines.
Persistent cough	Infections LIP Bronchiectasis TB Effusion Tumour	Antibiotics. PCP treatment. Anti-TB treatment. Treatment of tumour (if appropriate). Drainage.	Nebulisation with physiotherapy. Suppressant (e.g. low-dose morphine). Physiotherapy. Humidification. Steroids (LIP).
Severe dermatitis	Seborrhoea dermatitis Infestations Folliculitis Fungal infection Hypersensitivity Renal and liver disease	Antibacterials/antifungal/antiparasitics. Hydration. Steroids.	Emollients. Antihistamines. Antiseptics. Topical steroids. Antimuscarinic antidepressants (e.g. Amitriptyline). Anxiolytics. Keep nails short to minimize trauma and secondary infection from scratching.
Shingles and post-herpetic neuralgia	Herpes Zoster	Aciclovir if caught early	Liquid from frangipani tree when applied to the vesicles (before they break) causes paralysis of nerves for up to eight hours. Break off a small branch and collect the white fluid into a clean jar. Paint this onto the area. (This fluid can be kept up to 24 hours). ¹⁸ Post herpetic neuralgia: use Amitriptyline, Valproate, Phenytoin or Carbamazepine for shooting pain (but beware interactions with ARTs). Add Morphine if necessary.
Convulsions	Infections and infestations Encephalopathy Malignancies PMLE		Diazepam or Phenobarbitone or paraldehyde for acute control, then convert to longer term therapy. Beware interactions between anticonvulsants and ART's.
Metabolic disorders	Anticonvulsants Dextrose Mannitol Steroids		Rehydrate. Ensure good oxygenation. Give high energy, low protein feeds until disorder resolves. Treat individual cause.
Fevers, sweats	HIV MAC CMV Lymphoma	HAART. Azithromycin. Aciclovir. Chemotherapy.	NSAIDS. Steroids. Hyoscine. Cimetidine.
Pressure sores	Malnutrition Reduced mobility	Nutrition. Mobilisation.	Wound dressing: metronidazole powder to control odour, honey applications on clean, debridement if necessary.
Delirium, agitation	Electrolytes disturbances Toxoplasmosis Cryptococcal meningitis IC sepsis	Correct imbalances and rehydrate. Antifungals and antibiotics.	Assist orientation. Haloperidol or Promazine. Benzodiazepines.
Depression	Reactive Chronic illness	Play therapy. Counselling. Distraction. (Role of antidepressants in children still uncertain)	Counselling. Distraction.

¹⁸ The frangipani tree is not native in Europe and may not be available. The plant is native to Central and South America, South East Asia, the Caribbean and East Africa.

Antiretroviral therapy in children's palliative care

A significant proportion of children with HIV/AIDS receiving children's palliative care will be on ARTs, usually including nucleoside reverse transcriptase inhibitors (NRTI), non-reverse transcriptase inhibitors (NNRTI) and a few on protease inhibitors (PI). It is very important to understand that significant drug interactions can occur in children receiving palliative care drugs who are also on ARTs. Furthermore most of these medications may need to be administered in the presence of other co-morbid conditions such as hepatitis, pancreatitis, gastritis, hypertriglyceridaemia, hyperglycaemia, lipodystrophies, HIV-associated nephropathies and opportunistic infections. These can increase the risk of and the effects of interactions and adverse effects of drugs.

It is beyond the boundaries of this book to deal with the whole pharmacology of ARTs. If you are regularly prescribing and managing ARTs, or if you do not have ready access to advice and support from professional ART providers, you should familiarise yourself with the relevant pharmacology using other more detailed sources. The aim of this chapter is to highlight at least the major risks.

The key system to understand is the cytochrome P450 (CYP) enzyme system. This group of enzymes is largely located in the liver, but also in the kidneys, lungs, brain, small intestine and placenta. The CYP system is responsible for the metabolism of almost all clinically useful medications, most importantly the antiretroviral agents (PIs and NNRTIs), several drugs used in the management of opportunistic infections in advancing HIV disease, many of the newer serotonin-specific reuptake inhibitors (SSRIs) and other psychotropic agents, endogenous substances such as steroids and prostaglandins, environmental toxins, anti-malarial and dietary components.

The primary role of the CYP system is to make the drugs more water-soluble and less fat-soluble, so that biliary excretion of the drugs can take place. As a result, these enzymes can affect the amount of active drug in the body at any given time. Such changes can be positive, enhancing efficacy, or negative, worsening toxicity and adverse events.

Recognising significant interactions and adverse effects

Any child with seemingly exaggerated toxicities on usual doses of medications or manifesting treatment failure in the absence of factors such as resistance or poor adherence/compliance should be considered to be suffering from an unidentified drug-drug interaction until proven otherwise. In such cases, careful review of the child's medication profile is necessary. Fortunately, the majority of drug-drug interactions are minor in nature and do not require extensive changes to the child's drug regimen. However, the minority of drug interactions that can be clinically important can reduce the effectiveness of both HIV/AIDS treatment and palliative care treatment, and so need to be addressed.

Common effects of children's palliative care drugs on ARTs

Certain drugs commonly used in children's palliative care can induce or inhibit the CYP system. Those that induce CYP can reduce the amount of available ARTs in the system, thereby making treatment failure more likely. Those that inhibit CYP can increase the amount of available ARTs in the system, thereby making ART toxicity more likely.

Known CYP Inducers	Known CYP Inhibitors
Carbamazepine (Tegretol)	Ketoconazole
Rifampin (Rifadin)	Itraconazole
Phenobarbital	Erythromycin
Phenytoin	Fluoxetine
Prednisolone	Diltiazem
Cigarette smoke	Verapamil
Omeprazole	Clarithromycin
Isoniazid	Omeprazole
	Ciprofloxacin
	Fluconazole
	Metronidazole
	Trimethoprim/Sulfamethoxazole (Septrin)
	Haloperidol
	Cimetidine

Common effects of ART's on children's palliative care drugs

Some PI's and NRTIs can induce or inhibit the CYP, thereby increasing or reducing the effects of certain drugs commonly used in children's palliative care. Different PI's and NRTI's have different effects on the CYP system; some are more powerful inducers or inhibitors than others. The most potent inhibitor is Ritonavir. Where the child is taking CYP inducers or inhibitors, you may find you need to use different starting and continuation doses than would otherwise be the case. As a general rule, drugs that inhibit the CYP system cause the most dangerous interactions as they increase the level of toxic drugs thereby making dangerous toxic effects more likely. Some of these interactions are potentially very harmful. These are outlined below.

Highest risk drugs when used with CYP inhibitors

- **Tricyclic antidepressants (e.g. Amitriptyline):** risk of prolonged QT interval and sudden cardiac deaths.
- **Macrolides (for example, Erythromycin):** risk of prolonged QT interval and sudden cardiac deaths.
- **Newer antihistamines (e.g. Terfenadine):** risk of prolonged QT interval and sudden cardiac deaths.
- **Cisapride:** risk of prolonged QT interval and sudden infant death syndrome.
- **Quinine and Chloroquine:** risk of prolonged QT interval and sudden cardiac deaths.
- **Chloral Hydrate:** risk of prolonged sedation and respiratory depression.
- **Benzodiazepines:** risk of prolonged sedation and respiratory depression.
- **Methadone:** risk of prolonged sedation and respiratory depression.
- **Rifabutin (Mycobutin):** Ritonavir increases the risk of rifabutin-induced hematological toxicity by decreasing its metabolism.
- **Clotrimoxazole/Sulfamethoxazole (Septrin):** risk of increase in allergic reactions, especially rash.
- **Beta blockers:** risk of significant falls in blood pressure and heart rate.
- **Haloperidol:** risk of increased dystonic side effects and drowsiness.

Counselling children and families about potential cardiac interactions

While children are generally less prone to cardiotoxicity than adults, this is not always the case, particularly where there are co-morbid cardiac conditions. All children using these drug combinations should be counselled to immediately report tachycardia, light-headedness, palpitations, vomiting or diarrhoea and avoid use of street drugs, substances of abuse, or excessive use of alcohol.

Ethics and communication

Fuller discussion of ethics can be found in this book. However, there are particular issues that apply in children's palliative care in children with HIV/AIDS. These arise partly because ARTs are so effective, even in children who are apparently moribund (the so-called 'Lazarus effect') and partly because ARTs can be quite toxic, burdensome and expensive. Common dilemmas include:

- **Balancing risks versus harms at the end of life:** Should a child with very advanced HIV neuropathy causing global neurological and functional loss be given ARTs, thereby potentially extending lifespan when the quality of life could be argued to be overly burdensome to the child?
- **Benefits versus harms of treatment:** Should we treat severe side-effects of ARTs with more drugs, such as anti-emetic therapy for protease inhibitor-induced nausea and vomiting or alternatively to stop/change the ARTs?

- **Withdrawing life-sustaining treatment:** Should we withdraw drugs such as PCP prophylaxis or ARTs when a child is clearly at the end of life?
- **Justice:** Should life-sustaining treatments such as ARTs be limited either to children whose families can afford them or, where ARTs are available, on a rationing system?

Prognostication

With the advent of ART, prognostication in HIV/AIDS has become extremely unreliable, as children apparently on death's door can make dramatic recoveries. It requires a very good understanding of both the evidence and the specifics of the individual child (his or her nature, history, investigations, previous management and so on). Even then, prognostication is little more than educated guesswork, but the guess is often crucial to a decision which literally has life and death consequences. To help you, here are some indicators of a poor prognosis in HIV/AIDS.

Laboratory markers

CD4 + T-lymphocyte count < 25cells/mm³

Cd4 < 15%

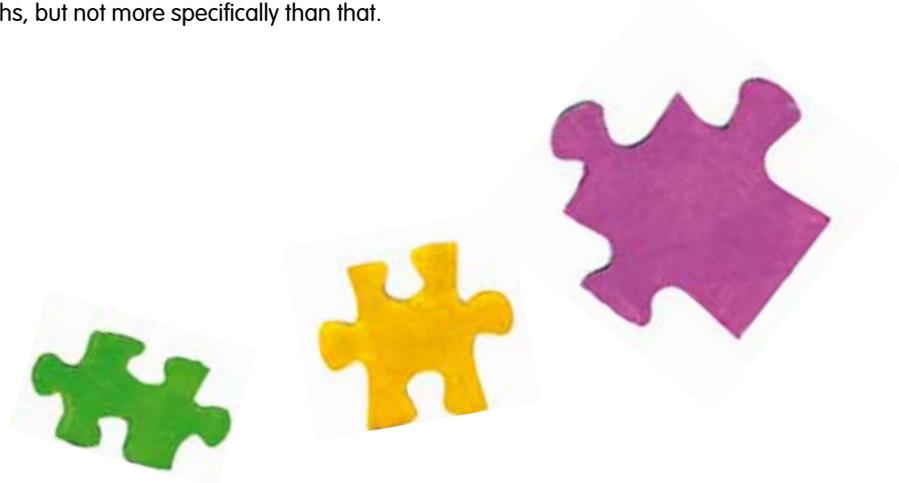
Serum albumin < 2.5gm/dl

Clinical conditions

- CNS lymphoma
- PML
- Cryptosporidiosis
- Severe wasting
- Visceral Kaposi's sarcoma
- Advanced AIDS dementia (more in adults)
- Toxoplasmosis
- Severe cardiomyopathy
- Chronic severe diarrhoea
- Life-threatening malignancies
- Advanced end-organ failure (for example, liver failure, congestive heart failure, COPD, renal failure, chronic lung disease).

Note: All of these factors may potentially be over-ridden in the setting of effective antiretroviral therapy.

Ultimately, it is almost certain that you will be called upon by a child's family to give your opinion as to the child's likely prognosis, because it is very stressful and exhausting not to know when death is going to occur. This stress and exhaustion can be complicated by guilt and anxiety triggered by wishing that everything could be all over with. In the author's experience, as long as you explain that you cannot be certain, it is usually possible to talk in terms of hours, days, weeks or months, but not more specifically than that.



Managing opportunistic infections in children with HIV/AIDS

Arguably, this section does not belong in a book on palliative care. However, opportunistic infections (OI's) are a source of common and highly distressing symptoms and so should be treated as part of a palliative approach.

Symptom	Treatment
Bacterial Pneumonia (non severe)	<p>Follow national or IMCI guidelines. If no guidelines:</p> <p>Oral Amoxicillin or Penicillin (10y 125mg tds, >10y 250-500mg tds)</p> <p>Or Cotrimoxazole (<5month 120mg bd, 6m-5y 240mg bd, 6-12y 480mg bd, >12y 960mg bd)</p> <p>Plus Paracetamol 15mg/kg/dose qds or Ibuprofen</p> <p>If recurrent (>3x/y) investigate for TB, foreign body, or chronic lung disease.</p>
Severe Pneumonia	<p>Admit if possible.</p> <p>Supportive Care:</p> <p>Supplemental oxygen</p> <p>Correct severe anaemia (Hb <5g/dL) by transfusion</p> <p>Oral or IV hydration</p> <p>Monitor fluid input/output</p> <p>Analgesic/antipyretic</p> <p>Vitamin A supplementation</p> <p>Specific Therapy:</p> <p>Unknown organism: Amoxicillin 50-100mg/kg/day IV divided doses or third generation Cephalosporin (for example, Ceftriaxone 100mg/kg IV or IM once a day) or Ampicillin <i>plus</i> Cloxacillin <i>plus</i> Gentamicin.</p> <p>If <1 year old: consider PCP (see below).</p> <p>If staphylococcal skin lesions or bullae on CXR or post measles, or with poor response to first line add Cloxacillin or Vancomycin.</p> <p>If repeated pneumonia, poor response, bronchiectasis, or chronic lung disease; suspect gram negatives and add Gentamicin or Ceftazidime.</p>
Pneumocystis Pneumonia Major cause of severe pneumonia (15-30%) and death (30-50%) in HIV-infected infants, peaking at 3 to 6 months of age	<p><i>Pneumocystis carinii</i> pneumonia (PCP): If PCP is suspected, continue to treat for bacterial pneumonia, but also treat for PCP:</p> <p>Supportive Management:</p> <p>See section on cough and dyspnoea.</p> <p>Hydration</p> <p>Vitamin A supplementation</p> <p>Correct severe anaemia by transfusion</p> <p>Oxygen</p> <p>Prednisone at 2mg/kg/day for 7-14 days.</p> <p>Specific Care:</p> <p>High dose Cotrimoxazole 20mg/kg Trimethoprim/day. (OR 80 mg/kg/day of Sulphamesoxazole) tds for 21 days.</p>
Tuberculosis	<p>NB Treatment for TB should be started two months (two weeks to one month) prior to starting ART to avoid the immune reactivation syndrome.</p> <p>Treat as recommended by national guidelines.</p> <p>Take care with possible interactions between antiretroviral, antifungal, and anti-tuberculous drugs.</p>
Lymphocytic Interstitial Pneumonitis	<p>Oxygen</p> <p>Pulsed steroid (2mg/kg for seven days, tailed to 5mg/day over a month).</p> <p>Bronchodilators (e.g. nebulised salbutamol 2.5-5mg four hourly).</p> <p>Start ART if available.</p> <p>Physiotherapy</p> <p>Treat associated cor pulmonale with diuretics (for example, Furosemide) and potassium supplementation.</p>

Scabies	<p>Children <1yr</p> <p>25% benzyl benzoate for 12 hours or gamma benzene hexachloride.</p> <p>2.5% sulphur ointment three times daily for three days.</p> <p>Screen and treat other household contacts where appropriate.</p> <p>Wash and iron bedding and clothing or hang it out in the sun.</p>
Ringworm	<p>Whitfield's ointment (benzoic acid with salicylic acid).</p> <p>2% miconazole cream: twice daily for two to five weeks.</p> <p>For scalp lesions give oral Ketoconazole if available.</p> <p>If not use Griseofulvin 10mg/kg/day for eight weeks, but beware side effects.</p>
Herpes zoster	<p>Analgesia (for example, Paracetamol or Ibuprofen and add adjuvant, for example Carbamazepine or Amitriptyline if necessary).</p> <p>IV acyclovir 30mg/kg/day in three doses every eight hours for seven days.</p> <p>Prevention in exposed child: varicella-zoster immune globulin (VZIG) 125U per 10kg (max 625U) within 48-96 hours of exposure.</p>
Impetigo Treatment	<p>Hygiene</p> <p>10% iodine solution 3x daily or zinc oxide cream.</p> <p>If pyrexial or resistant: Flucloxacillin or Erythromycin for 7-10 days.</p>
Chickenpox	<p>Topical calamine lotion.</p> <p>If available; all HIV infected children should receive acyclovir 20mg/kg PO four or five times daily for 21 days.</p> <p>Where supplies are limited, it should be used for disseminated chicken pox with complications.</p>
Herpes simplex	<p>Local antiseptic (e.g. gentian violet)</p> <p>Analgesia: Paracetamol or Ibuprofen and add adjuvant for example, Amitriptyline if necessary.</p> <p>If disseminated: acyclovir 5mg/kg intravenously three times a day or 200-400mg orally five times a day, for seven to ten days.</p>
Oral candidiasis (present in 75% of patients)	<p>Nystatin drops 5ml qds</p> <p>Nystatin lozenges qds</p> <p>Fluconazole (loading dose 6mg/kg then 3mg/kg/24h)</p> <p>Amphotericin (0.3mg/kg/24h)</p>
Recurrent herpes simplex	Acyclovir
Bacterial meningitis	1st line: chloramphenicol IV 50-100mg/kg/day IV in 24 divided doses or third generation Cephalosporin (e.g. Ceftriaxone 100 mg/kg IV or IM once a day).
Cryptococcal meningitis	<p>Treat pain using WHO ladder.</p> <p>Amphotericin B 0.7-1mg/kg/day IV for two weeks followed by fluconazole 3-6g/kg/day for eight weeks or until CSF is sterile Fluconazole requires an induction dose especially in children (10-12mg/kg PO or IV in two divided doses).</p> <p>Maintain prophylaxis with Fluconazole unless the child is on ART and with sustained immune recovery (3-6mg/kg/day PO or IV).</p>
Tuberculous meningitis	<p>12 months of Rifampicin and Isoniazid plus Pyrazinamide and a fourth drug (Ethambutol, Ethionamide, or Streptomycin) for at the first two month.</p> <p>Corticosteroids as adjunctive therapy in more serious cases.</p>
CMV infection	<p>IV ganciclovir 10mg/kg per day in two divided doses for two to three weeks.</p> <p>Foscarnet 180mg/kg/day in three divided doses for 14-21 days may be used when there is sight threatening CMV retinitis.</p>
Cryptococcus	Induction with Amphotericin B (0.7-1.0 mg/kg/day) for two weeks followed by fluconazole 400mg/day for a minimum of 10 weeks, then 200mg/kg maintenance therapy.
Toxoplasmosis	<p>Pyrimethamine loading dose 2mg/kg/day (max 50mg) for two days then maintenance, 1mg/kg/day (max 25mg) plus sulphadiazine 50mg/kg every 12 hours/folinic acid 5-20mg three times weekly.</p> <p>Treat until one to two weeks beyond resolution of signs and symptoms.</p>

Infections

Any infection causing symptoms and affecting quality of life should be treated. Antibiotic resistance and allergies are a common problem. In the palliative care setting rules may be bent; hence antibiotics not normally recommended for children, e.g. tetracycline could be given. Other antibiotics not normally available in liquid form for children can be given. Hospital pharmacies and traditional retail pharmacies can be very helpful in providing such information. Remember to record in the notes and discuss with the parents what you are doing to protect yourselves medico-legally.

Pneumonia is sometimes called the 'old man's friend'. It is also the most common cause of the terminal event in many children with life-threatening conditions. The use of antibiotics can present the parents and care team with an ethical dilemma. It is best to sit down and discuss the pros and cons of treatment together. Oral treatment in the terminal phase does not extend the life expectancy of the child but can allow the parents to feel that they tried their best to the last. Most parents will accept that intravenous antibiotics are normally inappropriate at this stage.

It is worth remembering that while we cannot insist on treating an infection if the parents refuse, neither are we forced to give treatment that we consider is inappropriate. This type of dilemma is best resolved by negotiation with parents and, where appropriate, the child.

Sometimes antibiotics are necessary, e.g. pain relief in acute ear infections or severe tonsillitis, even when the parents of the child have decided on no more active treatment.



Mouthcare

[4, 9, 42, 112-117]

This is an overlooked aspect of palliative care but correct management can easily enhance the quality of life for a dying child. As in all cases take a good history and look inside the mouth. Establishing the cause of the mouth problem helps to direct the correct treatment.

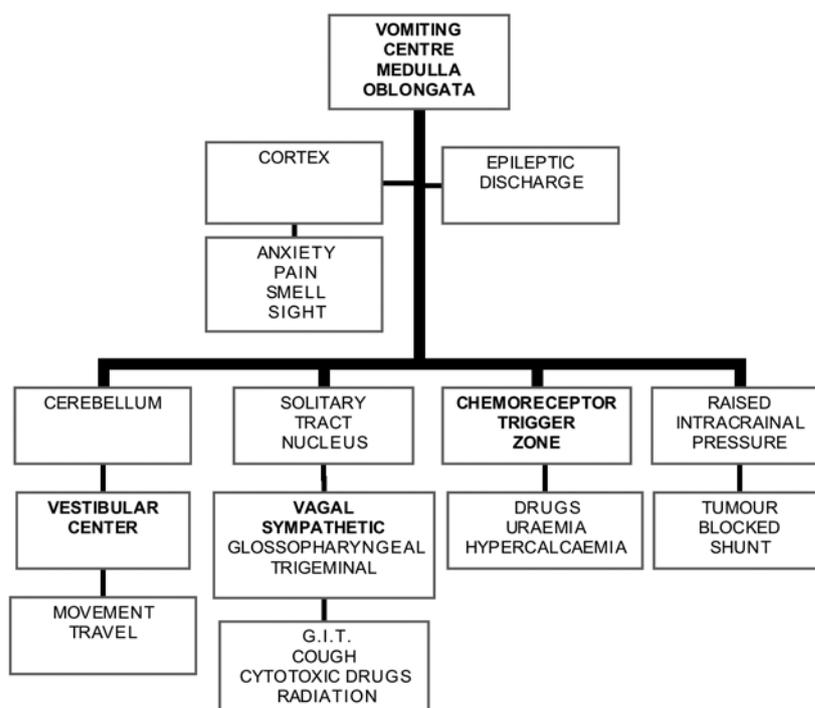
Causes

- Oral candidiasis
- Poor oral hygiene
- Dry mouth from
 - a) Mouth breathing
 - b) Oxygen that has not been humidified
 - c) Drugs i.e. Morphine, Hyoscine or Amitriptyline
 - d) Radiotherapy
- Mouth ulcer
 - a) Traumatic
 - b) Aphthous
- Bleeding gums from
 - a) Haematological cancers
 - b) Liver disease
 - c) Clotting disorders
- Oral hygiene can be maintained by careful and gentle cleaning of teeth and gums. This is a task that the parents may like to carry out as part of the child's daily routine.
- Pink sponges dipped in mouthwash can be applied to the gums and teeth to keep the mouth moist and cream applied to the lips to prevent dryness and cracking. This attention to mouth care will go a long way to maintaining hygiene, preventing some of the complications and aiding the child's comfort.
- Oral thrush can be cleared using various anti-fungal agents. Nystatin drops are really not very effective in these cases and Miconazole oral gel applied gently around the mouth is better. Fluconazole, which is a once daily oral anti-candidal agent, is often more effective than topical agents.
- Artificial saliva, e.g. Glandosane comes in various forms and the spray is particularly effective. KY Jelly is very effective for dry mouths and is well tolerated.
- Community dentists can advise regarding traumatic ulcers.
- Aphthous ulcers can be treated with Adcortyl in Orabase applied locally.
- Bleeding gums can be helped with tranexamic acid mouthwashes or haemostatic agents such as Gelfoam or Gelfilm. Bleeding from blood malignancies may require platelet transfusions even in the palliative setting. Oral Ethamsylate decreases capillary bleeding and has been used in adults at a dose of 500mg qds in a palliative care setting.

Nausea and vomiting

[7, 117-127]

The management of nausea and vomiting highlights the importance of understanding the cause of a symptom to determine the appropriate therapeutic course.



Whilst nausea and vomiting can be effectively managed with medication, common sense principles must not be forgotten:

- Identify and manage the correctable causes e.g. pain, infection, drugs, biochemical, etc.
- Certain smells may antagonise the nausea.
- Leftover food must be removed immediately.
- Staff and parents advised against the use of strong perfumes.
- Strong odours avoided.
- Meals kept small but often, if the child's appetite allows.

Once we have an understanding of the cause we can then target anti-emetics according to their mode of action. It may be necessary to use a number of different anti-emetics, and logic dictates that we use medications from different groups. Many of the drugs used will overlap in their site of action.

There is no evidence to support any particular dosage of Dexamethasone when used as an anti-emetic. Another rule of thumb is 8mg/m²/day. Remember this is not for long-term use because of side effects and altered body image.

Octreotide has been used in adults for vomiting secondary to obstruction but its benefits in children is unknown.

If you need to use more than one anti-emetic then make sure they are complementary e.g. Cyclizine and Haloperidol and not antagonist e.g. Cyclizine and Domperidone.

Site of action of anti-emetic drugs

Drug	Site of action	Notes
Haloperidol	Chemoreceptor trigger zone.	Anxiolytic benefits.
Thioridazine	Chemoreceptor trigger zone.	May have some benefits in epilepsy, although generally Phenothiazine can exacerbate epilepsy.
Chlorpromazine	Chemoreceptor trigger zone.	Sedation benefits. Contra-indicated in epilepsy.
Prochlorperazine	Vestibular centre and chemoreceptor trigger zone.	Side effects in children, limit use.
Ondansetron	Chemoreceptor trigger zone. Medulla oblongata. Also may work at vagal level.	Side effects of flushing, headaches and constipation. More effective combined with corticosteroids (dexamethasone). Onset of action 30 minutes, peak one to two hours, duration 12 hours.
Cyclizine	Medulla oblongata.	Commonly used and highly effective. Sedating antihistamine with antimuscarinic properties. May crystallise with Diamorphine in s/c infusion. Side effects drowsiness, dry mouth, blurred vision, urinary retention. Onset 30 minutes, peak two hours, duration four to six hours.
Levomopromazine	Effects at all levels.	Phenothiazine. Broad spectrum. Use when there is failure of specific anti-emetic. Stable with Diamorphine in s.c. infusion. Side effects sedative and postural hypotension.
Domperidone	Vagal sympathetic.	Prokinetic in upper gut. Good for dysmotility in neurological conditions.
Metoclopramide	Vagal sympathetic.	Crosses blood brain barrier. Causes extrapyramidal side effects in children limit use.
Dexamethasone	Intracranial pressure.	Use in short bursts due to side effects. Reduces permeability of chemoreceptor trigger zone and blood brain barrier to emetogenic substances and reduce GABA in brainstem.



Neonatal palliative care

[128-132]

Introduction

There have been many advances both in antenatal diagnosis and neonatal intensive care over recent times. However there still remain a number of babies where full intensive care is not indicated, or is futile.

There are a number of common reasons that neonatal intensive care may be withheld or withdrawn after discussion with the family including:

- Genetic problems with a limited life expectancy – for example Trisomy 18.
- Severe congenital abnormalities – for example spina bifida or cardiac problems that are not amenable to surgery.
- Complications of extreme prematurity – for example, low blood pressure that fails to respond to inotropic medication, or extensive bowel damage that is incompatible with life following necrotizing enterocolitis.
- Perinatal hypoxic brain injury with a poor prognosis.

Some babies, particularly preterm babies, will already be receiving intensive care support when the decision is made to withdraw or withhold intensive care.

The intensive care support received may include:

- Support of the respiratory system, either via an endotracheal tube, or via nasal continuous positive airway pressure (CPAP).
- Support of the blood pressure with inotropic medication.
- Infusion of opiate medications or muscle relaxants to facilitate artificial ventilation.
- Organ support (renal replacement therapy etc.).

Following discussion with the family, a decision may be made not to escalate the intensive care support further, or more commonly, to withdraw support, keep the baby comfortable and allow the baby to die with their family.

Many parents will have built up a relationship with the team on the neonatal unit, and will choose to spend time with their baby on the intensive care unit, supported by the staff that they know. Some families may prefer for the baby to die at home, or in the hospice setting.

It is usual practice on the intensive care unit to discontinue muscle relaxant medications, and allow these to 'wear off,' but to continue any other sedative or analgesic medications after removing the baby from the ventilator. Intravenous access is often left in place to allow for the administration of palliative medications, but oral and subcutaneous medications can be given, even to the smallest of infants.

There are a number of issues that need to be thought about when caring for the dying baby, and the principles of care are similar to those for an older child. It is important to remember that simple comfort measures, such as positioning the baby with suitable boundaries, gentle rocking and swaddling, can be very effective.

Feeds

Most full term babies will feed around 120ml per kilogram per day of breast or formula milk if left to their own devices. Most babies feed six to seven times per day, but many breast fed infants feed more frequently than this.

Preterm babies start to learn to suck and swallow at around 33-34 weeks gestation, and babies younger than this are usually fed via a nasogastric tube.

Babies who are receiving palliative care should be allowed to feed orally if they wish to do so. They are likely to find breast feeding comforting even if they are not able to take much milk. If a baby is unable to take oral feeds, it is usually appropriate to offer feeds via a nasogastric tube. Providing around 50ml/kg/day of milk, split into six to eight feeds, will keep the baby hydrated, and may produce less vomiting and feed intolerance than using higher volumes. The aim of this approach is to reduce distress from hunger, rather than to provide calories for growth.

Gastro-oesophageal reflux

A small amount of vomiting or possetting following feeds is normal for babies. Antiemetics are not often required or used in small babies because of the significant side effect profile.

Gastro-oesophageal reflux is fairly common, particularly in babies with neurological problems. This can be distressing for the infant and can be dealt with by:

- Feeding with the head of the cot slightly elevated, and the baby lying with the left side down.
- Giving nasogastric feeds slowly (sometimes it is best to remove the plunger from the syringe and allow the milk to flow in 'by gravity').
- Giving smaller volume feeds more regularly (two hourly instead of four hourly for instance).
- Considering anti-reflux medications:

Drugs commonly used as anti-reflux medications in neonates:

Drug	Use
Gaviscon Infant	'feed thickener'/alginate
Ranitidine oral solution	H2 antagonist
Domperidone	prokinetic

Constipation

Constipation can be a problem, particularly for babies taking long term opioids.

Lactulose syrup 2.5ml twice daily titrated to response can be helpful, and ensuring adequate hydration is important. Lactulose may take 36-48 hours to act.

Distressing constipation in babies can be relieved by administering the 'tip' of a glycerine suppository rectally (it is easiest to slice a small chip off a 1gram suppository with a blade).

Pain

It is imperative that all babies receiving palliative care have close attention paid to their analgesia. The assessment of pain in babies is very difficult.

There are many pain 'scoring systems' that have been widely used for neonates, but the scores given are often subjective and not always clinically useful.

The following features are the most reliable indicators of pain in small babies:

- Persistent crying (although remember that a silent baby may be suffering from severe pain).
- Furrowing or bulging of the brow.
- Furrowing of the nasolabial folds (the folds between the lips and nose).
- Tight squeezing of the eyes.

Simple environmental methods may be very effective for relieving pain in babies.

Babies (particularly preterm babies) will often settle simply with a dark, quiet, warm environment. Other methods include swaddling of the baby in a blanket, allowing the baby to suck at the breast or on a dummy (see below), gentle rocking, stroking and massage of the baby.

There is good evidence that sucking on a syringe or dummy containing glucose or sucrose provides short term pain relief. This is particularly useful for procedural pain, including dressing/stoma changes for example. Glucose 30% solution 1ml orally as required can be used.

Non-opioid analgesia

Paracetamol:

Paracetamol can be given orally, or PR if needed by cutting up suppositories.

Non steroidal anti-inflammatory drugs:

Ibuprofen suspension after feeds.

Diclofenac is not usually recommended below six months of age because of the significant side effects. However, if the oral route is unavailable, rectal Diclofenac may be useful in neonates weighing 3.125kg or greater. The smallest dose that can practically be given is 3.125mg (by cutting a 12.5mg suppository into quarters).

Opioids

Morphine remains the most commonly used medication for neonatal analgesia.

Morphine can be given intravenously for acute pain, using a dose of 40-100micrograms/kg as needed.

Intravenous Morphine infusions are used, even in the smallest preterm infants, and doses of 10-40micrograms/kg/hour are often used. In unventilated babies the initial dose is 10-20micrograms/kg/hour and is then titrated to response. High doses of morphine can lead to a change in the respiratory pattern, and occasionally respiratory depression.

Subcutaneous infusions of morphine can be used in small babies, but are often problematic in small preterm infants, because of a lack of subcutaneous tissue.

Diamorphine is useful for subcutaneous use as it is more water soluble than morphine so smaller infusion volumes can be achieved, and is the preferred opioid for subcutaneous use. Intravenous Diamorphine has been extensively used in ventilated neonates, a dose of 100micrograms/kg is useful for acute pain, and an initial infusion of 2.5-7micrograms/kg/hour can be used safely in non-ventilated babies and then titrated to response.

Morphine sulphate oral solution is the most common oral opioid used. The total daily intravenous opioid requirements can be calculated and converted to an oral regime, giving the morphine every four hours initially. Breakthrough analgesia (PRN doses) should also be prescribed and given in-between the regular doses if required. The dose is then adjusted to response – there is no maximum dose of morphine for neonatal palliative care – high doses of morphine will often change the breathing pattern, and may cause respiratory suppression.

Codeine phosphate is occasionally used. It is not as effective as oral morphine and often causes problematic constipation.

Opioids may also help to relieve breathlessness at rest.

Fentanyl has been associated with chest wall muscle spasm in neonates, and is not often used. It is difficult to cut Fentanyl patches into small enough pieces for use with small babies.

Seizures

Seizures are a common problem encountered in neonatal palliative care. These are often secondary to a perinatal hypoxic insult to the brain or a primary brain problem and can be distressing for the family to see. Seizures can manifest in subtle ways in babies, common features are cycling movements of the arms and legs, unusual mouth movements or lip smacking.

There are a number of medications used for seizures in neonates – most neonatologists start with Phenobarbital.

Drugs used to treat seizures in neonates

Drug	Comments
Phenobarbital (Phenobarbitone)	Most commonly used first line medication in neonates – causes sedation and may suppress respiration in high doses. Can be given IV or orally.
Phenytoin	Commonly used as a second line agent in neonates – can be given IV or orally. May cause blood and skin disorders with long term use.
Clonazepam	Very effective anticonvulsant – significant sedation which can be useful in palliative care. Can be given orally or IV - IV dose associated with respiratory depression. Can be used to ameliorate distressing gasping.
Midazolam	Midazolam is not often used for IV or subcut infusions in neonates as it tends to accumulate, and can cause respiratory depression. It is not licensed for sedation below six months but is still occasionally used, with good effect. Can be used to ameliorate distressing gasping.

Sedation

It is important to ensure that babies who are 'unsettled' are not in pain.

Occasionally babies benefit from oral sedative drugs to help them sleep.

The most commonly used sedatives in babies are:

- Chloral Hydrate orally or rectally at night, or as required.
May be used up to QDS for continuing sedation.
The oral solution can be given rectally if suitably sized suppositories are unavailable.
(Chloral can accumulate if used regularly in babies. It is also an irritant to the stomach if given orally so should ideally be given with or after milk feeds).
- Alimemazine (Trimeprazine) orally as required (maximum four times daily).

Excessive secretions

Many babies with neurological problems have difficulties clearing secretions from their mouth and pharynx.

Some babies are managed at home, or in the hospice setting with oral suction.

Hyoscine patches (quarter of a patch, applied behind the ear, every 72 hours) are often useful for excessive respiratory secretions.

Mouthcare

Opioids and hyoscine may cause dry mouth – regular mouth care should be performed.

Syringe drivers

In palliative care, when the parenteral route becomes necessary for symptom control, the use of syringe drivers to administer continuous subcutaneous infusions can be useful to reduce the discomfort of repeated injections. Commonly used drugs given via continuous subcutaneous infusion include opioid analgesics, antiemetics, sedatives and anti-secretory agents. Most drugs can be diluted with water for injection for continuous subcutaneous infusion. Luer-Lok syringes should be used.

When given subcutaneously, Diamorphine is preferred over Morphine because it is more soluble so can be made up in smaller volumes which are suitable for subcutaneous use.

Daily oral or IV Morphine requirements can be used to calculate equivalent daily subcutaneous Diamorphine doses;

Total daily dose of oral Morphine: total daily dose of subcutaneous Diamorphine = 1: 0.33

Total daily dose of IV Morphine: total daily dose of subcutaneous Diamorphine = 1: 0.66

Caution must be used when using Graseby pumps to administer subcutaneous infusions to ensure the correct rate of administration, because the rate of delivery is set in either mm per hour (MS16A device) or mm per 24 hours (MS26 device). The rate of delivery is calculated by measuring the “length of infusion fluid” in the syringe.

Once the drug to be administered as a continuous infusion over 24 hours is diluted to the volume required the “length of infusion fluid” in mm can be determined by measuring the length in mm from the top of the syringe barrel to the top of the plunger.

Graseby MS16A

Rate (mm/hr) = measured “length of infusion fluid” in mm ÷ delivery time in hours.

Graseby MS26

Rate (mm/24hours) = measured “length of infusion fluid” in mm ÷ delivery time in days.

If a patient is receiving several subcutaneous infusions, it may be possible to mix both drugs in one syringe to avoid multiple infusion sites – check the compatibility of the combination with a pharmacist before proceeding.

The site of subcutaneous infusion should be monitored to check for precipitation of drug, local reactions, fluid accumulation and inflammation.

Summary

The palliative care of infants is important, and follows the same principles as in older children. There should be a focus on relieving pain and distress, and opioids remain the most commonly used medication. Unfortunately, many of the other medications used in older children accumulate in babies and this can cause problems if these medications are used in the longer-term.

The treatments discussed are by no means comprehensive – in difficult cases it would be advisable to seek the advice of a neonatologist or a neonatal pharmacist.

Neurological

(See specific text)

Epilepsy

Definition

Recurrent convulsive or non-convulsive seizures caused by partial or generalised epileptogenic discharges in the cerebrum.

General points

- Not all seizures are grand-mal epileptic seizures; they come in many forms and it is important to recognise the different types.
- Not all seizures require immediate administration of medication. The majority of seizures will settle given five to ten minutes, particularly in children with neurodegenerative disorders.
- Look for the reversible causes of increased seizures and attempt to correct them.
- Seizures can be very frightening for the child, family and carers. Try to remain calm and give the parents an explanation of what is happening.

Reversible causes of increased seizures

- Infection
- Renal failure
- Hepatic failure
- Electrolyte imbalance (sodium, calcium or magnesium)
- Hypoglycaemia
- Raised intracranial pressure
- Inappropriate epilepsy management
- Too rapid an increase or decrease of epilepsy medication

General principles of management [2, 133]

- Correctly diagnose the type of epileptic seizure [2, 134].
- Know which drugs are used to treat the different types of seizures (See table on page 58).
- Start with one drug, working up the dose gradually until seizure control or side effects occur [2].
- Add second drug only if seizure control not achieved with first drug alone.
- Remember to weigh up the benefits vs side effects of the treatments. 30% of children have behavioural problems whilst on anticonvulsants [135, 136].
- Change doses gradually.
- Regular re-calculation of drug dosage as the child grows and puts on weight.
- Metabolism of drugs can be affected by hepatic and renal failure [137].
- Children under the age of three years may need higher doses of drugs due to their more efficient drug metabolism.
- Blood levels are generally unhelpful.
- If in doubt ask a paediatric neurologist.

Antiepileptic drugsModified from R. Mattson *Epilepsia* vol 36, supp 2, 1995 [1], [2]

Drugs	Advantages	Disadvantages	Comment
Carbamazepine	Effective for partial and tonic-clonic seizures, minimal s/e.	Transient adverse effects during initiation, no parenteral formulation, may worsen absence seizures complex pharmacokinetics. Drowsiness. Co-ordination problems and extrapyramidal movements.	Drug of first choice for partial epilepsies.
Ethosuximide	Effective for absence seizures, few s/e.	Only for absence. Frequent gastrointestinal symptoms.	Drug of first choice for absence seizures.
Phenobarbital	Broad spectrum of efficacy.	Sedative, cognitive or behavioural effects. Hyperkinetic behavior.	No longer a drug of first choice but safe and cheap. Useful in cerebral irritation.
Phenytoin	Effective for partial and tonic-clonic seizures, parenteral formulation.	Cosmetic or dysmorphic side effects, saturation kinetics.	Another drug of first choice for partial epilepsies, potent enzyme inhibitor.
Primidone	Effective for partial and tonic-clonic seizures.	Toxicity. Adverse s/e; behavioural effects, drowsiness, ataxia, personality changes.	Not a drug of first choice.
Valproate (Valproic Acid)	Broad spectrum of efficacy.	Weight gain, tremor, ataxia, drowsiness.	Drug of first choice for idiopathic epilepsy, an alternative for partial seizures.
Gabapentin	Effective in partial and tonic-clonic seizures, well tolerated.	Limited absorption, short half life, moderate efficacy. Somnolence.	Mechanism of action unknown. Additional use as adjuvant in neuropathic pain.
Lamotrigine	Broad spectrum, sense of well being.	Hypersensitivity reaction rash, metabolism inducible. Dizziness, ataxia, somnolence.	
Vigabatrin	Effective in partial and tonic-clonic seizures, infantile spasms.	Eye problems, dyskinesias.	Unique mechanism of action.



Intractable epilepsy

The management of intractable epilepsy is beyond the scope of this manual. However it is worth remembering a few points [2, 138-142].

40% of children with intractable epilepsy are misdiagnosed. This can be due to:

- Underlying aetiology overlooked.
- Misdiagnosis of syndrome or seizure type.
- Poor EEG recording or interpretation.
- Non-epileptic disorders that mimic epileptic disorders.

There are often errors in therapy due to:

- Inappropriate choice of drugs.
- Inappropriate dose and dosing interval.
- Inappropriate polytherapy.

In all cases of intractable epilepsy check:

- That child has actually seen a paediatric neurologist and has had a formal diagnosis of type of epilepsy.
- If on polytherapy, has this decision been made by a paediatric neurologist, and if not, what is the rationale for the polytherapy.

Status epilepticus

Definition

When seizures occur so frequently that over the course of thirty or more minutes, they have not recovered from the coma produced by one attack, before the next attack supervenes.

Management [52]

In the community or smaller units (major hospitals have established protocols that should be followed).

- Secure airway.
- Give oxygen.
- Establish cause.
- Check for hypoglycaemia.
- If facilities available, check FBC, U+E, glucose, calcium, magnesium, liver function tests, blood cultures. If possible check urine for infection.

First line treatment [48, 143, 144]

Diazepam

- Intravenously: getting new access site is difficult, onset of action in one to three minutes, effective in 80% of cases within five minutes, short duration of action 15-20 minutes.
- Rectally: as a solution (suppositories take too long to work) works within six to eight minutes.
- Nasogastric tube or gastrostomy: best mode if available.

Midazolam

- Buccally: increasingly popular due to ease of administration, works within six to eight minutes.
- Rectally.

Lorazepam

- Intravenously: as infusion, give slowly to avoid apnoea.
- Rectally.
- Orally.
- Sublingually.

The metabolites of diazepam are active. Furthermore, diazepam accumulates in lipid stores. When these stores saturate, then the levels rise rapidly leading to unexpected side effects (secondary peak phenomenon). This is not true of Lorazepam.

Second line treatment

If still fitting then repeat first line treatment after 10-15 minutes.

Third line treatment

If there is still no response then rectal paraldehyde should be administered.

Paraldehyde should be mixed in an equal volume of arachis oil (or olive oil if there is any nut allergy), drawn up into a glass syringe and given via a quill (if urgent, a plastic syringe can be used provided it is drawn up and given immediately).

Fourth line treatment

Hospitalise the child for advanced management, paralysis and ventilation.

Terminal seizures or if not appropriate to hospitalise

In the terminal phase seizures can become more severe and frequent. The child at this stage is normally not able to take or absorb oral anti-epileptics, and in such cases continuous subcutaneous Midazolam or Phenobarbitone can be used. The physician needs to balance the heavily sedating effects of treatment against the benefits of seizure control. It may not be possible to control all the seizures, and an explanation is needed to the parents that some minor seizures may breakthrough and do not necessarily require escalation of treatment.

Midazolam subcutaneous infusion [48, 143, 144]

- Onset of action one to five minutes.
- Duration of action one to five hours.
- Easier to titrate than phenobarbitone.
- Good anxiolytic.
- Dose can be steadily increased (up to 150mg/24 hours then consider changing to Phenobarbitone).
- Only available in one strength so volume in smaller Graseby syringe drivers can be a problem.
- Anecdotal evidence suggests that a small dose of Diamorphine added to syringe driver can help with seizures requiring increasing doses of Midazolam.
- Clonazepam is an alternate to Midazolam.

Phenobarbitone subcutaneous infusion

- Sedating.
- Anxiolytic.
- Do not combine with other drugs in syringe driver (only miscible with Diamorphine and Hyoscine).
- Should be diluted with water.

Spasticity

Definition

Is a condition of increased tone, spasms, clonus, weakness and loss of dexterity.

Causes

- Cerebral palsy
- Brain haemorrhage
- Brain tumours
- Anoxia
- Vegetative state

Management [145]

- Multidisciplinary
- Physiotherapy
- Surgical
- Botulinum A injections [146]
- Drugs [147], not always very successful:
 - Baclofen, orally or by pump
 - Diazepam
 - Tizanidine
 - Dantrolene
 - Quinine
 - Gabapentin

Myoclonus

Definition

Brief, abrupt, involuntary, non-suppressible, and jerky, contractions involving a single muscle or muscle group [148].

Causes

- Normal; onset of sleep, exercise, anxiety.
- Neuro-degenerative disorders.
- Secondary to opioid overdose.

Management

- Opioid rotation.
- Benzodiazepines:
 - Diazepam
 - Lorazepam
 - Clonazepam

Chorea

Definition

Frequent, brief, purposeless movements that tend to flow from body part to body part chaotically and unpredictably [148].

Causes

- Rheumatic fever.
- Neuro-degenerative disorder.
- Encephalopathy.
- Hypo – and hypernatraemia.
- Drugs including [149]:
 - Haloperidol
 - Phenytoin
 - Phenothiazines

Management

- Bed rest in quiet darkened room.
- Sodium Valproate.

Dystonia

Definition

Syndrome of sustained muscle contractions, frequently causing twisting and repetitive movements or abnormal postures [148].

Causes

- Neuro-degenerative disorders.
- Metabolic disorders.
- In drug induced reactions producing extrapyramidal reactions.
- Drugs including [149]:
 - Dopamine antagonists
 - Antipsychotics
 - Antiemetics
 - Antidepressants
 - Antiepileptics

Management

- Anti-cholinergic drugs such as Benztropine or Diphenhydramine (in collaboration with neurologist).
- Review medication and reduce or stop drugs if possible.

Akathisia

Definition

Motor restlessness, in which the patient feels compelled to pace up and down, or to change body position frequently [148].

Causes

- Drugs including Haloperidol and Prochlorperazine [149].

Management

- Review medication and reduce or stop drugs if possible.
- Propranolol.

Noisy breathing

[58-60]

Noisy breathing from excessive secretions or a death rattle in an unconscious child is very distressing. Excessive respiratory secretions are a dose-related side effect of all the benzodiazepines.

Hyoscine hydrobromide can be used to dry secretions and its sedative effects can be helpful. It can be given as patches or by subcutaneous infusion. It has a tendency to inflame subcutaneous sites after 24-48 hours and so the site should be moved regularly. Officially the patches should not be cut but instead occluded to produce the half and quarter patch, in reality most users tend to cut the patches.

The anticholinergic drug Glycopyrronium has been used in children with chronic handicap to reduce hypersalivation.

The 'death rattle' can be treated with Diamorphine, Midazolam subcutaneously or Diazepam rectally.

Pain assessment

[31, 150-170]

Assessing pain in children with life-limiting illness can be complex but is assisted by:

- Building a relationship with the child and family;
- Understanding the context in which pain occurs; and
- Being familiar with the child's medical condition.

The object of pain assessment is to capture the various dimensions of the pain, including:

- Location;
- Intensity;
- Character (for instance is it burning or sharp?);
- The significance or meaning of the pain for the child and family.



Pain measurement

The main purposes of pain measurement are to:

- Quantify the experience;
- Monitor the effects of treatment;
- Provide a shared medium through which the child can communicate the experience to others.

Children's self-report of pain

Children are less able than adults to quantify and qualify abstract phenomena so any measures of pain need to be appropriate to the child's cognitive and developmental level. It should be kept in mind that during illness children may be less able to use tools designed for their age and cognitive ability.

There are several tools that can help the child to communicate their pain to others. It is sensible to have a few that are well known to your practice.

Pain location

Body map

The child can be asked to indicate on a body outline (or themselves) where the pain is. Children could also be asked to choose colours which signify different levels of pain and use these to colour in the painful areas.

Pain intensity

Faces pain rating scales

Faces scales consist of a number of cartoon type faces in which the facial expression varies on one end with either a smiling face or a neutral (no pain) face to an expression which signifies extreme pain. The child is asked to identify their own pain intensity from the faces offered. Faces pain scales are suitable for children who are at a developmental age of five or above. Adolescents may find the tool tiresome if used over the longer term and may prefer a straightforward Numerical Rating Scale (NRS).

The Wong-Baker Faces pain rating scale is probably the most commonly used. Copies can be downloaded from the internet for clinical use from: www.wongbakerfaces.org

Numerical rating scales

Children must have a sound understanding of language, order and number to be able to use either the verbal or the numerical scales, probably seven to eight years upwards. Ask the child how bad their pain is on a zero to ten scale, with zero being no pain and ten being as much pain as you can imagine.

Verbal pain rating scales

Four to five point categorical scale with pain ratings from no pain to severe, or very severe pain. For example, pain could be none, mild, moderate, severe, very severe.

Parents as proxy reporters of their child's pain

When children are unable to rate their pain, parents or clinicians can provide a proxy rating. The source of these ratings is usually the child's behaviour in relation to their non-pain behaviour, the context in which the behaviour is taking place, and the provider of the ratings own attitude towards pain. As with the children themselves, parents may place particular meaning on a change in the child's behaviour and this can be explored. Assessments can sometimes vary between proxy raters of the child's pain, and it is helpful to discuss and explore the reasons for any differences.

Behaviours that signal pain

There are categories of pain cues that, whilst the emphasis may change with age, are common across all ages. These include changes in:

- facial expression
- vocal sounds
- bodily posture
- movements
- mood

Facial expression and cry are widely discussed in the literature on neonatal and infant pain, but their importance as indicators of pain appears to decrease with age. This downward trend is associated with, in normal circumstances, the development of a wider repertoire of behaviour which includes language. Consequently, older children are normally less likely to emit behaviours with high 'signal value' such as crying and grimacing [17]. In addition, as children mature they learn to moderate their behaviour in line with the expectations of the culture within which they live.

Children who are unable to communicate verbally or by augmentative means are wholly dependent upon their carers correctly interpreting their behavioural cues of pain. The Paediatric Pain Profile (PPP) has been developed for children with severe neurological impairments. The 20-item behaviour rating scale is incorporated into a parent-held document which can be downloaded here: www.ppprofile.org.uk

Pain diaries and flow sheets

Ask parents, children or carers to keep a pain diary or a flow sheet, where space is provided to write the time, duration, context in which pain has occurred, pain measurement on one of the above tools or suitable alternative, the intervention and the outcome of the intervention using the same pain measure. The use of a standard pain measure will help to evaluate the effectiveness of different interventions.

Some useful web resources

International Association for the Study of Pain. Pain assessment in children www.iasp-pain.org/PCU95b.html

Cancer Page: Pain relief for children www.cancerpage.com/centers/pain/pediatrics_p.asp

Wong Baker Faces Pain Rating Scale www.wongbakerfaces.org

Paediatric Pain Profile: A behaviour rating scale for children with severe to profound neurological impairments www.ppprofile.org.uk

Institute of Child Health: Children's pain assessment project www.ich.ucl.ac.uk/cpap

Eland colour tool and other faces scales www.stat.washington.edu/TALARIA/attachment.html

A pain flow sheet www3.us.elsevierhealth.com/WOW/op020.html

World Health Organisation book: Cancer Pain in Children, available to buy from: www.tso.co.uk/bookshop/bookstore.asp?FO=1160671&DI=352971

Pain

(See individual drugs for references)

The most common fear expressed in paediatric palliative care by parents is that their child may experience pain. Fortunately in the majority of cases, pain control is relatively straightforward and easier to manage than some of the other symptoms. The whole topic of pain is so vast that this section can only represent a synopsis of the basics of cause and management. In more complex cases it is worth consulting with local hospices, pain clinics and paediatric consultants.

Determining whether a child is in pain, or the level of that pain is not easy. Various pain-scoring techniques have been developed and if one has knowledge of these, they are worth trying. However in most cases, parents and experienced nurses can provide invaluable information from their knowledge of the child's behaviour. Older children can often describe pain but only in the context of their experience related to their age. A good history and knowledge of pathogenesis of the disease will help to direct one to the underlying cause of pain.

Causes

- Direct visceral involvement
- Bone involvement
- Soft tissue infiltration
- Nerve compression
- Nerve destruction
- Raised intracranial pressure
- Muscle spasm
- Colic/constipation
- Gastritis
- Retention of urine
- Psychological

As with all the other symptoms it is worth remembering to 'listen, look and examine' before rushing in with medication. Not all pain can or needs to be controlled with opiates. It is relatively easy to feel or percuss a child's bladder. Pain from direct tumour spread will often improve by reducing inflammation around the tumour with non-steroidal anti-inflammatory drugs or steroids.

Good nursing and social support can help the child and family cope with pain. Religion and/or strong faith can sometimes modify perceptions of pain. Alternative medical practises such as herbal, reflexology etc. are helpful to some. The only rule in pain control is that there are no rules; you need do the best you can to help the child out of their pain.

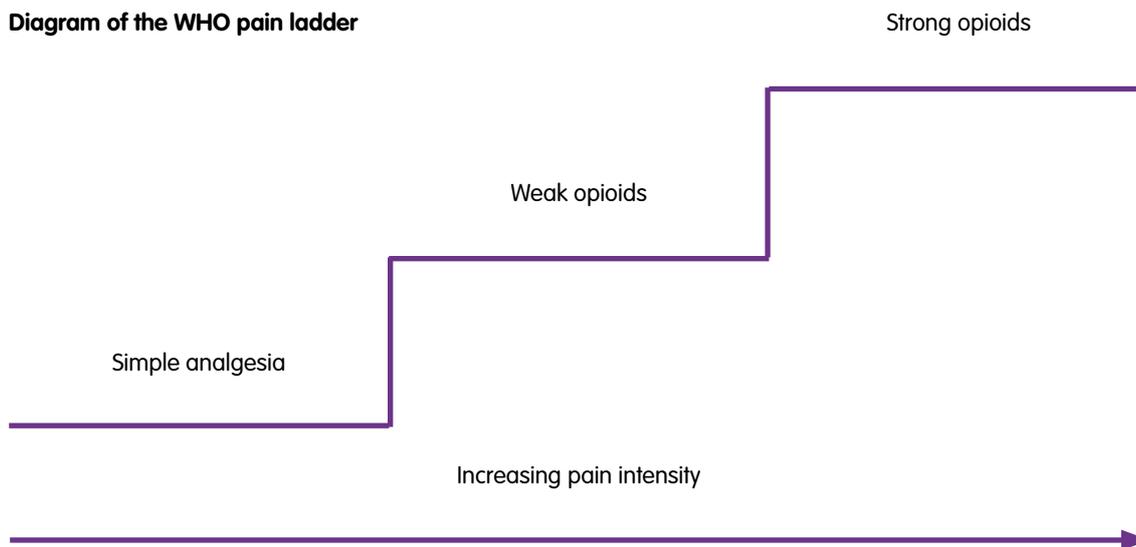
Treatments

There are numerous drugs on the market for pain control. It is always best to get to know one or two drugs from each group well. Using the ladder system of increasingly stronger drugs within each group is a useful tool in general medicine. In paediatric palliative care however it is best to change to a stronger group if one medication does not work.

WHO pain ladder

Pain control should follow the rules laid down by the WHO pain ladder, i.e. start at the bottom of the ladder and work your way up depending on the severity of the pain and the control achieved. If treatment at one level does not work then do not try other drugs of the same level, but go up the ladder. **Use adjuvant therapy at any level of the ladder.**

Diagram of the WHO pain ladder



Non-opioids

Paracetamol is the drug of choice in mild pain. Its antipyretic effects are also very helpful with concurrent infections. Administration is aided by the fact that it comes in so many strengths and forms. Ibuprofen is often used specifically by families, as it is available over the counter. Ibuprofen has a mild antiplatelet effect and should be used with caution in patients with a bleeding tendency.

Weak opioids

Codeine Phosphate or Dihydrocodeine are the drugs of choice in moderate pain. Both drugs suppress the cough reflex and cause constipation. They also both have a maximum dose limitation above which they do not provide any increase in benefit. Approximately 10-20% of the population have a liver enzyme problem that prevents the conversion of codeine into its active metabolite and so makes its use ineffective.

Strong opioids

There is often great hesitancy shown from parents and carers about initiating morphine. There are a great many fears and myths surrounding its use. It is very important that before starting any treatment these issues are addressed and the parents and child are aware of the truth.

Myth: It will shorten the child's life.

Truth: Pain control does not shorten a child's life; it only brings comfort to a child's death. It can even extend a child's life because they are not exhausted from fighting pain.

Myth: It will suppress a child's breathing.

Truth: Respiratory depression can be avoided by steady increases of dose.

Myth: It will give the child nausea.

Truth: Nausea may occur in 25% of cases but will normally settle in five to seven days.

Myth: It will make the child even more constipated.

Truth: Constipation must be prevented by the early use of prophylactic laxatives.

Myth: They will develop addiction to it.

Truth: Addiction is not a problem encountered in paediatric palliative care.

Myth: Sedation will affect the quality of the child's life in the final days.

Truth: Sedation will normally improve within a few days of taking morphine.

Myth: It is the beginning of the end.

Truth: Our experience is that children will often live longer than we expect. Also dosage can be reduced or increased depending on the child's state.

Also

- It is not a problem to wean children off Morphine should they improve for a while.
- Children metabolise opiates very well: their excretion through the kidneys is, if anything, better than adults.
- There is no evidence to suggest that morphine gets into the cerebrospinal fluid (CSF) of children any more than it does in adults.

The opioids have no upper limit effect. Incremental increases in dose should be of the level of 30-50% or based on previous days breakthrough pain dose.

The Morphine-based products come in numerous types and forms. It is best to get to know a few well and keep the rest for specific uses. Liquid Morphine is often the best way to start, using it on an as required bases (clinical skill, judgement and knowledge of the child should be used with children unable to communicate). After a few days the child can be converted over to slow release Morphine with additional liquid Morphine for breakthrough pain. The conversion factor is 1:1. Slow release Morphine is available in tablet and granular forms. Once a child is unable to take preparations orally then it is worth thinking of either Fentanyl patches or Diamorphine infusion.

Fentanyl patches come in various strengths. A few key points need to be observed when using them:

- Unfortunately the size of the stronger patches can be a problem with smaller children.
- The old reservoir patch cannot be cut. The new patches are matrix based and in theory may be cut but this is not advised by the manufacturer.
- The strength of patch to use is dependent on the morphine dose and conversion has to be done correctly.
- They take 12 hours to reach therapeutic plasma levels. If converting from four-hourly oral morphine, then continue to use morphine for 12 hours.
- If converting from slow release morphine, then apply patch at same time as last oral dose.
- Fentanyl patches have the advantage of lasting 72 hours each and provide a level release of opiate.
- They also cause less sedation, less respiratory depression and less constipation than Morphine.
- Fever and external heat (from hot baths, hot water bottles, radiators etc.) increase the rate of absorption and can cause toxic effects.
- Because they do not involve using needles and can be administered by a competent parent, they tend to be fairly well received by the families.

Diamorphine infusions can be given via a central line or subcutaneously. Diamorphine has the advantage of being highly soluble and can be mixed with other drugs. This mode of administration allows constant levels of analgesics with the benefit of greater dose variations and the ability for parents to give boost doses via syringe drivers. Dose conversion is based on one third of the total oral dose of Morphine over 24 hours.

- Maximum solubility of Diamorphine is 400mg/ml.
- Oral Diamorphine and Morphine are equipotent.
- Peak blood levels of intravenous Diamorphine are approximately double that of a SC or IM dose.
- Peak plasma levels of Morphine/Diamorphine occur approximately 30 minutes after IM or SC injection, but two to three hours after setting up a continuous SC infusion.
- Subcutaneous injection or infusion of Diamorphine is 1.5 times as potent as Morphine (e.g. 15mg Morphine SC = 10mg Diamorphine SC).
- Oral Morphine is only half as potent as by injection.
- Thus oral Morphine dose conversion to Diamorphine subcutaneously or by infusion is one third (e.g. 30mg Morphine p.o. = 10mg Diamorphine s.c.).
- For **breakthrough pain** give a dose of oral Morphine 50-100% of the four-hourly equivalent dose.
- Buccal or intranasal diamorphine may be useful for rapid pain control.

Two side effects of opioids that appear to be more common in children are urinary retention and pruritus.

- Urinary retention may improve with Carbachol or Bethanechol.
- Pruritus can be treated with topical treatments (calamine lotion, Eurax, hydrocortisone creams) or oral antihistamines. Ondansetron and oral Naloxone have also been used. Reducing the dose of opioid or changing to an alternative such as Fentanyl can also help.

Oxycodone is an alternative opioid analgesic used as second or third line treatment in patients who are unable to tolerate Morphine. It is not licensed for use in children under the age of 18 years. It comes in three forms:

1. OxyContin prolonged release tablets (every 12 hours)

- The tablet is biphasic with initial fast release providing early onset analgesia followed by controlled release over 12 hours.
- Morphine equivalence is 2:1 (20mg oral Morphine = 10mg oral Oxycodone).
- The tablets cannot be crushed, broken, chewed or halved.
- The tablet matrix is insoluble and may be passed in stools (the drug will have been absorbed in the GI tract).
- Breakthrough pain dosage is $\frac{1}{6}$ total 24 hour dose.

2. OxyNorm immediate release liquid or capsules (every four to six hours)

- The capsules cannot be opened.
- The liquid can be mixed with soft drinks and contains no sugar.
- There is no data on administration down an NG tube.

3. OxyNorm 10mg/ml, solution for injection or infusion

- Can be given IV or SC by injection or infusion.
- Can be diluted in 0.9% saline, 5% dextrose or water for injection.
- Conversion ratio for oral to parenteral Oxycodone = 2:1.
- Conversion ratio for parenteral morphine to parenteral Oxycodone = 1:1.
- Conversion ratio for parenteral diamorphine to parenteral Oxycodone = 1:1.
- OxyNorm injection is stable for 24 hours at room temperature and need not be protected from sunlight.
- See Formulary for compatibility with other drugs.

Hydromorphone use in the paediatric setting is currently unclear. It is an alternative opioid analgesic used as second or third line treatment in patients who are unable to tolerate morphine.

- It is licensed for use in children from age 12 years.
- It comes in two forms a slow release capsule and a standard release capsule for breakthrough and incident pain.
- It can be used if there is renal impairment.
- The capsules can be opened and sprinkled onto cold soft food (swallow without chewing: chewing SR formulations can lead to over dose).
- Morphine equivalence is 7.5:1 (30mg oral Morphine = 4mg oral Hydromorphone).

NSAID

Inflammation can cause pain either directly or by adding to pressure e.g. tumours in bones. Anti-inflammatories such as Diclofenac, Naproxen or Indomethacin can be very effective in these cases. Piroxicam is available as oral 'melts'. Be watchful for dyspeptic symptoms, which are a common side effect and can be reduced by concurrent use of prophylactic Omeprazole or Misoprostol. The new Cox-2 selective NSAID e.g. Celecoxib may be helpful although many of these types of NSAID have been withdrawn due to cardiac side effects. Oral Ketorolac is very effective for short-term postoperative pain relief and the intravenous form can help with severe pain from soft tissue or bony metastases, if this has been poorly responsive to other NSAID.

Steroids

Steroids, particularly Dexamethasone, can help reduce pain from raised intracranial pressure, bone pain and pain from nerve infiltration. Used in short courses they can be very effective. Unfortunately long-term use can cause problems including:

- a) Mood and behaviour problems
- b) Weight gain and changes of appearance
- c) Reduced mobility
- d) Insomnia
- e) Dyspepsia
- f) Peptic ulceration
- g) Oral or oesophageal candidiasis
- h) Psychosis

Antidepressants

Pain due to nerve compression or destruction (often described as burning pain) can be modified with the use of certain tricyclic antidepressants e.g. Imipramine, Amitriptyline or Doxepin. Benefit should be seen within one to four weeks. If there is no response then it is worth changing to an anticonvulsant.

Anticonvulsants

Stabbing pain from nerve damage can be modified with the use of certain anticonvulsants e.g. Carbamazepine or Phenytoin. Gabapentin is now also being used with good effect. Benefit should be seen within one to four weeks. If there is no response then it is worth changing to an antidepressant.

Other drugs

Methadone is used in parts of the world although experience in the UK is limited. Difficulties with its long plasma half life and broad-spectrum receptor affinity limit its uses to specialist units.

The intravenous preparation of Ketamine given orally can be useful for resistant neurogenic pain. However it is not always well tolerated and bioavailability is unpredictable, as such its use should be limited to specialist units.

Lidocaine patches are now available for management of localised pain.

Nitrous oxide given by facemask can be useful in the older child.

Bisphosphonates have been used for bone pain in children.

Hyoscine butylbromide is the initial treatment of choice for colicky abdominal pain. Beware of the use of opioids with this type of pain.

Radiotherapy

Even in cases where therapeutic radiotherapy is no longer appropriate, pain from bone or soft tissue malignant deposits can be treated with palliative local radiotherapy.

Nerve blocks

This form of treatment is best left to specialist pain clinics. Our experience in paediatric palliative care of this is limited.

Nursing and supportive care

Good nursing care is beyond value. A child who is in pain or distress can be seen visibly to improve and settle just by being held and hugged. The reassurance of physical contact and affection can and does modify perceptions of pain.

Spirituality/religion

Whether the carers concerned believe that religion modifies perceptions of pain is irrelevant. What matters is what the child and family believe. Our job is to use all the means available to aid the child, and to that end religion and faith is a most powerful tool in appropriate cases.

Other

There appears to be an emergence of a number of alternative medical practises; acupuncture, reflexology, aromatherapy, herbal medicine etc. Just because we do not necessarily understand how these work does not mean we should ignore them. Some may in the future become useful additions to our armoury against pain.

Dose conversion of Morphine to Fentanyl patches

Dose conversion of Morphine to Fentanyl patches							
Four hourly oral Morphine (mg)	<20	25-35	40-50	55-65	70-80	85-95	100-110
Fentanyl patch strength	25	50	75	100	125	150	175
24 hour oral Morphine dose (mg)	<135	135-224	225-314	315-404	405-494	495-584	585-674

Psychological

[172-184]

The whole subject of child psychiatry in paediatric palliative care is vast and complex. The symptoms that present themselves are often a reflection of the internal stresses and strains within a family. Helping the parents cope with a particular illness is as important as helping the child itself. All parents with healthy children who have been up with them a few nights during a trivial illness will have a brief understanding of the tiredness, fatigue, frustration and worry that is constantly felt by the parents of life-limited children. The children themselves can also be left feeling frightened and guilty about their illness. There is no magical secret in helping these children and families. It requires good old-fashioned care and compassion. We need to give the family our time and we need to be prepared to listen. Giving honest answers to straight questions can allay fears and anxieties. A doctor or specialist counsellor is not necessarily the best or only person to tackle these issues. Our experience is that children and their families often prefer to talk to the nurses, teachers or priests. All these carers will need support to cope with the issues.

When, however, despite our best efforts, a child is manifesting clinical symptoms of anxiety or depression, we must not be afraid of using medication as an adjuvant to our counselling and support. Symptoms manifested by children are not the same as those manifested by adults. They are also very dependent on the age and development of the child. Younger children tend to regress and develop behavioural problems; older children may have nightmares, insomnia or become introspective. It is very difficult without experience to diagnose many of the psychological problems that these children can get. Fortunately a child psychiatrist can be very helpful and supportive. Also it is worth trusting the natural instincts of the parents and nurses who often know the children better than we do.

Anxiety

Particularly in the terminal stages, anxiety can be helped with a number of drugs each of which can have different benefits. Midazolam and Methotrimeprazine are two of the first line drugs for treating anxiety (although Midazolam can cause paradoxical agitation). Chlorpromazine works well and its sedating effects can be helpful in certain cases. Diazepam also has sedative effects and its rectal form can be used in urgent cases when agitation is a major problem. Haloperidol has an important role in treating confusion.

Insomnia

A problem not only for the child but also for the parents. Parents may benefit from the use of complimentary therapies, particularly aromatherapy and massage, which can help to reduce tension and anxiety and promote relaxation and hopefully sleep. Temazepam can be used for the older child. Triclofos or Choral are useful in the younger child. The antihistamine Promethazine can be used in the milder cases. Melatonin can help in managing insomnia and appears to be used increasing in children with special needs. However it is unlicensed in the UK for this and so many general practitioners may feel unhappy about prescribing it.

Depression

Treatment has the disadvantage of taking two to three weeks to work. The older child may benefit from serotonin re-uptake inhibitors such as Fluoxetine. Paroxetine has been used in the past but is now no longer licensed for use in children due to its side effects. There is currently a lot of controversy about the other forms of serotonin re-uptake inhibitors (except for Fluoxetine) and in view of this it is probably best to avoid them unless there is no other option.

Parents and other family members may also require medical treatment.

Respiratory ventilation and management

[189-195]

Physiology of breathing

During normal respiration an increase in CO₂ levels and decrease in O₂ levels in the blood triggers a response in the brain. Information is then transmitted to the muscles used in respiration.

The intercostal muscles, between the ribs, contract which causes the ribs to move upwards and outwards. At the same time the diaphragm contracts and moves downwards. The lung tissue is enclosed in the pleura, which is a thin covering that protects and cushions the lungs; it is made up of two thin layers which are separated by a small amount of fluid. The pleura is attached to the ribcage and diaphragm, as the ribcage moves upwards and outwards and the diaphragm moves downwards the pleura follows. This movement increases the space inside the lungs with the same amount of gas present. The pressure inside the lungs falls, whilst the pressure outside the lungs, in the atmosphere is higher, air is then sucked in to the lungs to try to equalise the pressure.

Children/young people can have blocks on this process of information and action at various levels.

Neurologically

Interference in information being sensed, interpreted or transmitted can create a need for mechanical ventilation. If the part of the brain which controls breathing is damaged or affected by disease, e.g. Congenital Central Hypoventilation Syndrome (Ondine's Curse) or a spinal cord injury at, or above the level at which messages are relayed, then the information is not processed.

Physically

Muscle weakness or deformity, such as scoliosis, Duchenne muscular dystrophy or spinal muscular atrophy, can prevent effective movement and breathing, therefore reducing lung volume.

Respiratory

Prolonged periods of low volume breathing can result in the chest wall becoming less compliant and making it more difficult for respiratory muscles to expand; the loss of elasticity can prevent air from being drawn in. Children/young people with low lung volume become more prone to chest infections, which are slower to clear due to ineffective coughing. Also, there is an increased risk of aspiration if their swallowing reflex is weak.

Breathing out is usually a passive process and does not require strong muscles. However, coughing does require effective contraction of expiratory muscles and normal function of upper airway muscles.

With prolonged periods of low lung volume the chest wall becomes stiff and less compliant and it becomes increasingly more difficult for respiratory muscles to expand.

This is usually the reason people are offered life enhancing ventilation at night when they do not normally require ventilation during the day.

Hypoventilation

During sleep, inspiratory and expiratory muscles relax and breaths become smaller and oxygen levels reduce. If respiratory muscles are already weak then oxygen levels which are already low decrease even more which is known as under ventilation or hypoventilation.

Mild cases of hypoventilation do not display any symptoms and is only noticed during REM sleep with a drop in oxygen levels and a rise in carbon dioxide levels. However, if the condition progresses, it can lead to low oxygen and high carbon dioxide levels during the day.

Symptoms of hypoventilation

- Morning headaches
- Lethargy
- Breathlessness
- Disturbed sleep
- Sweating at night
- Poor appetite
- In young children, failure to thrive/poor weight gain

Ventilation

Positive pressure ventilation-pressurised gas is forced into the lungs from the ventilator, forcing them to expand due to the air movement. There is a risk of lung damage if the pressure is too high, which can cause barotrauma or a pneumothorax.

After a short pause, the ventilator lowers the pressure and the lungs return to their previous size and air leaves the lungs.

A small amount of pressure is kept in the lungs so the alveoli remain slightly inflated making the process of breathing easier.

Terminology

PIP (Positive Inspired Pressure/IPAP-Inspired Positive Airway Pressure)

The airway pressure that the alveoli expand to, during inspiration.

PEEP (Peak End Expired Pressure/EPAP – Expired Positive Airway Pressure)

The pressure in the airway, at which the alveoli are kept open to at the end of expiration.

Trigger

The level of negative pressure generated by the child/young person, which will trigger the ventilator to support a breath. This is used as a way to build up the muscles required for respiration.

Inspiratory Period

The length of time, in seconds, in which the breath is delivered into the lungs.

I:E ratio (Inspiratory:Expiratory ratio)

The time, in seconds, for the inspiratory and expiratory periods of ventilation.

Tidal volume

The volume of gas generated on each breath, measured in millilitres.

Minute volume

The volume of gas generated over a minute, it is calculated by multiplying the tidal volume by the respiratory rate per minute. This is measured in litres.

Modes of ventilation

CPAP (Continuous Positive Airway Pressure)

A constant flow of positive pressure on inspiration and expiration allows less work by the respiratory muscles. The bronchioles and alveoli do not collapse at the end of expiration so significant pressure is not required to re-expand them. This is a support mode of ventilation and requires the child/young person to trigger every breath.

BiPAP (Bi-level Positive Airway Pressure)

This is also a support mode of ventilation, airflow is strongest when the young person breathes in, encouraging increased air into the lungs. Airflow pressure is lowered when they breathe out but remains positive. The continual positive pressure “splints” the airway open. However this is not suitable for young children as a negative pressure needs to be generated to alter the pressure level for inspiration.

Pressure Control Ventilation

A control form of ventilation; where a prescribed number of breaths are delivered to a maximum pressure setting. However if compliance in the lungs changes due to secretions or tension in the lungs then a reduced volume of gas is delivered, which will affect oxygen uptake and carbon dioxide clearance. This is the preferred form of ventilation in small children as setting a maximum target for pressure will reduce the risk of barotraumas and pneumothorax.

Volume Control Ventilation

A control form of ventilation; where a prescribed volume of gas is administered. The ventilator will administer the volume at whatever pressure it needs to generate to get the gas in. It is usually used in older children and those who have stiff lungs. It is not recommended in young children as it could result in barotraumas and pneumothorax.

Pressure Support

This is used in conjunction with forms of support ventilation which have a prescribed number of breaths with a set PIP and PEEP. When the child/young person takes a spontaneous breath on the ventilator, this breath is then supported by the pressure support which is added to the PEEP, creating a PIP value which will differ from the prescribed level. This allows the child/young person to take bigger spontaneous breaths than they would normally be able to manage unsupported, improving oxygen intake and carbon dioxide clearance.

SIMV (Synchronized Intermittent Mandatory Ventilation)

This is a support form of ventilation. The length of each breath is calculated by a Continuous Mandatory Ventilation (CMV) rate, an SIMV rate is then set and these are administered by the ventilator, the SIMV rate will be less than the CMV rate. A gap is then given to allow the child/young person to instigate breaths themselves, these breaths are supported by the pressure support which will also have been prescribed.

Observations

It is recommended that any child/young person who is on full face mask CPAP or BiPAP should have saturation monitoring even if they are not on any additional oxygen. As they are wearing a full mask which is securely fixed to their face they are at risk of aspiration if they vomit. The ventilator will not always alarm as it will continue to deliver the gas at the prescribed settings. The only indicator will be a drop in oxygen saturations due to aspiration.

Hourly observations of ventilator settings should be recorded to ensure the ventilator is delivering the prescribed settings. Delivered settings may be different to prescribed settings if there are physiological changes in the child/young person. These can include compliance changes in the child's/young person's lungs, position of the mask or PEEP valve, or airway obstruction with the position of their head or neck. These will not always trigger the alarms if the delivered setting are borderline acceptable to the alarm settings.

- Look at chest movement to see if it is good or poor. Listen to breath sound, do they sound steady and regular or restless?
- Check whether the child's/young person's colour is appropriate to their oxygen saturations.
- Listen to the noise of the ventilator, are there any change to sound level or pattern?
- Is there a leak from the circuit or mask?
- Check that the machine is not overheating.

Care needs to be taken with the positioning of the face mask in CPAP or BiPAP. The mask needs to fit securely, but does not need to be over tightened. This could result in skin ulceration or eye irritation if the masks are fitted incorrectly. If straps are used rather than a hat, it is usually beneficial to put gauze dressings over their ears to prevent irritation from straps which may be tight. If the CPAP or BiPAP is given without humidification there is an increased likelihood of a dry mouth, nasal congestion and nose bleeds. Regular mouth care is required.

Face mask ventilation will also blow air into the stomach as well as the lungs, this can result in bloating and stomach ache.

If a child/young person is on life-enhancing ventilation they will only have one ventilator which should be kept in a working condition and charged up at all times. If they have life-sustaining ventilation they will have two ventilators which should be with them. One will usually be a dry circuit with a HME (Heat Moisture Exchange) device which uses the heat and moisture from the expired breath to warm and humidify the inspired breath. The other on warmed humidification, the humidified ventilator is used at night for at least eight hours.

Life-sustaining ventilation is invasive ventilation via a tracheostomy which bypasses the body's normal route of warming and humidifying the air breathed in via the nasal passages. This can cause problems with cold dry air going straight to the lungs which can cause irritation and thick secretions. However, it is not practical to use a humidifier with the ventilator during the day so ventilation is provided via the dry circuit with a HME device alternating at night with a humidified ventilator. Both ventilators should be checked daily, kept in working condition and charged up.

Signs of poor ventilation

- Poor chest movement.
- Child/young person is restless.
- Colour is pale, possibly with cyanosed fingers and toes.
- Low saturation levels, but they may not be low enough to trigger the alarms.
- Increase in heart rate.
- Change in noise from the ventilator.

Troubleshooting

- Change the child/young person's position to improve the airway.
- Check the child for other issues, whether too hot/too cold/unwell.
- Ensure their nose is not blocked.
- Ensure mask is fitted correctly.
- Ensure oxygen saturation probe is fitted correctly.
- Check ventilator settings are correct and remain locked.
- Check that there are no kinks or splits in the ventilator tubing and that all connections are secure.

- If a full face mask is used ensure that the blow off valve is clear and working (or else there is no way to release the CO₂ the child/young person is breathing out).
- Do not replace the mask or change connections to a ventilator that does not have a blow off valve.

Alarms

Different ventilators will have slight variations in the type and sound of alarms. It is important to familiarise yourself with the ventilators used and their alarms, how to correct the problem, reset the system and silence them.

Common alarms can include:

Power failure: If there is an interruption to the electrical supply.

Low battery level: When running on a battery the alarm will trigger when there is only 10 minutes of battery life left.

Empty battery: Once the battery is completely discharged and an external electrical supply is required.

High pressure alarm: When pressure in the circuit is higher than the high pressure limits setting. The ventilator will stop generating a breath. This can be the result of a change in the physical condition of the child, such as increased secretions, or due to a kink in the circuit.

This will require an urgent review of the child/young person, and an alternative form of ventilation may be required, such as a bagging circuit, to ensure ventilation is maintained until the cause is ascertained.

Low pressure alarm: When pressure in the circuit falls below the pre-set low pressure alarm. Usually caused by a disconnection from the ventilator, this will require an urgent review of the child/young person.

Low minute alarm: Can occur on ventilators with a prescribed volume of gas to be delivered. If the child/young person does not take as many breaths when asleep, this alarm may occur as the volume of gas inspired per minute is lower than the alarm setting.

This will also occur when the ventilator is disconnected and the low pressure alarm is triggered.

Fault: May be triggered by an internal fault.



Skin

[185-187]

Management of skin problems is often challenging. This is one subject where prevention is better than cure. Our children are often wasted and immobile. Because the metabolism of the body enters a catabolic phase during severe illness the skin becomes very vulnerable to breakdown and subsequent poor healing. Good nursing care is required to predict where potential problems may occur. Special mattresses, aids and appliances can be organised. Turning of the child needs to be frequent and regular. Skill is also required in knowing how to move the child. Hoists and harnesses may be needed.

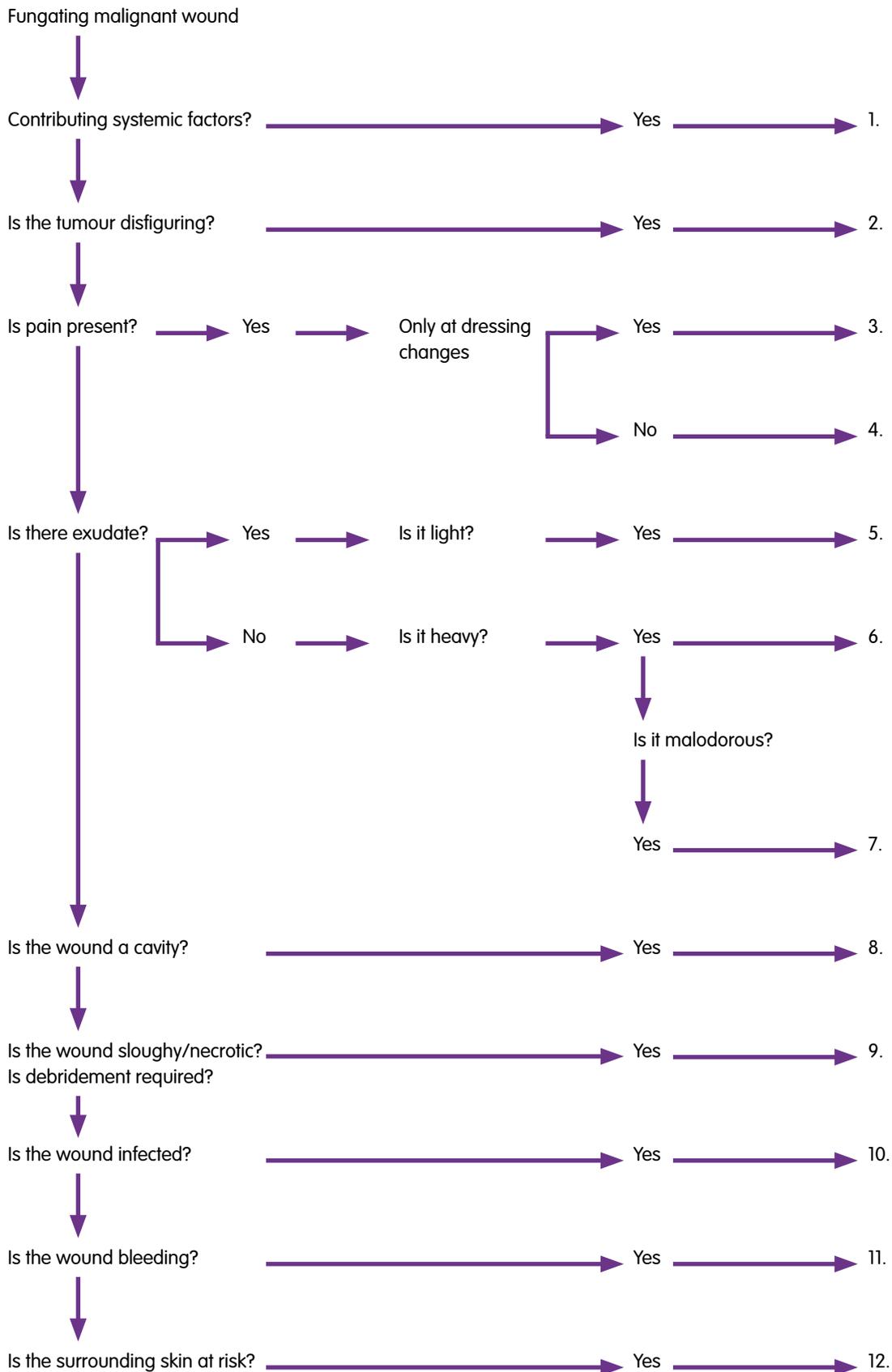
- Initial problems tend to start from pressure sores or friction burns.
- The skin at this stage can be protected with OpSite, Tegaderm or Cutifilm.
- Care must be taken when removing these dressings so as not to further damage the skin.
- Once it breaks down then DuoDerm or Spyrosorb can be used.
- Infected skin ulceration will require IntraSite gel or Lodosorb paste to remove discharge or necrotic tissue (top dressings can be OpSite or Tegaderm).
- Cavities can be packed with Kaltostat or Sorbsan. Re-dressings are done as required depending on the amount of exudate.
- Oral antibiotics may be necessary if cellulitis or discharging pus is present. Because many of the children may be on anti-epileptic drugs, Erythromycin must be used with caution.
- Fungating tumours when infected can be very smelly. This causes great distress to the child and family. Metronidazole orally or topically is very effective and a deodoriser can help. The skin can also be dressed with Actisorb (charcoal dressing) to help reduce the smell. Honey and sugar can be used topically to reduce the smell of ulcers and they are also bacteriostatic.

Types of dressings and their use

Type	Example	Benefit	Notes
Films	OpSite, Tegaderm, Cutifilm.	Semipermeable, totally occlusive, allow observation.	Cannot absorb exudates.
Hydrocolloids	Granuflex, Comfeel, DuoDerm, Spyrosorb.	Occlusive but absorb exudates.	Facilitate autolysis of slough and eschar.
Hydrogels	IntraSite gel, Lodosorb.	Absorb large amounts of exudates.	Useful for cavities. Can damage healing tissue if allowed to dry.
Alginates	Kaltostat, Sorbsan.	Highly absorbent, haemostatic.	
Foams	Lyof foam, Silastic.	Highly absorbent, good for deep cavities.	Not for wounds with sinuses.
Low adherent	Release, Mepore.	Protects wound surface, absorb some exudates.	If dried out then wet to remove.

(Table adapted from commonly used dressing Symptom Management in Advanced Cancer by Robert Twycross [188]).

Flow chart of management of fungating tumours



1. Consider potentially treatable factors:

- Reducing or stopping steroids.
- Improving nutrition.

2. Modify the size and appearance of the tumour:

- Surgery by debulking or excision.
- Radiotherapy.
- Chemotherapy.

3. If pain present at dressing changes:

- Short acting analgesic e.g. buccal Diamorphine.
- Topical anaesthetic agents e.g. Lignocaine.
- Entonox.

4. If pain present all the time:

- Review analgesia.
- Consider topical Diamorphine in dressing.

5. For light exudates:

- Semi-permeable film dressing.
- Hydrocolloid interactive dressing.
- Low adherent dressing.
- Alginate dressing.
- Hydrophilic foam dressing.

6. For heavy exudates:

- Hydrocolloid interactive dressing.
- Hydrogel with secondary dressing.
- Alginate dressing.
- Hydrophilic foam dressing.
- Use of paediatric stoma bags.

7. For malodour consider:

- A counter odour e.g. household air freshener, ostomy agents, aromatherapy oils.
- A deodorant e.g. Naturcare or electric deodoriser.
- Metronidazole either topically or systemically.
- Live yoghurt.
- Charcoal impregnated alginate or foam dressing.
- Totally occlusive dressing e.g. OpSite or almost totally occlusive dressing e.g. Granuflex.

8. If a cavity is present consider:

- Cavity dressing e.g. alginate.
- Silastic foam if wound is clean.
- Foam dressing.

9. If debridement is required consider:

- Surgery.
- Enzymes e.g. Varidase.
- Hydrocolloid paste with dressing.
- Hydrogel.

10. If the wound is infected:

- Topical Metronidazole.
- Irrigate with IV Metronidazole solution.
- Systemic antibiotics.
- Honey and icing sugar dressing.

11. If the wound is bleeding:

- Calcium alginate dressing (haemostatic properties).
- Topical adrenaline 1:1000 solution.
- Radiotherapy.
- Use non-adherent dressings and soak dressings off with normal saline.

12. If the surrounding skin at risk:

- Protect surrounding skin with barrier ointment.

Care must be taken with dressing to:

- Remove dressings without pain.
- Make dressings cosmetically acceptable to the child.
- Lengthen the time required between dressing changes.
- Understand the cost effectiveness in terms of time and money for all the different types of dressings.

Spiritual pain

This chapter is taken from information written for parents of life-limited and life-threatened children. Although it is not directed primarily at practitioners, it will be useful for talking to parents about addressing spirituality with their children, and will also help you find a suitable approach when talking to children about their illness, and about their death.

Introduction

Spirituality and spiritual care are the proper concern of all who work with you as a family. It should be recognised that the issues of spirituality and religion are very important. However, they are two different aspects of care. It has been suggested that we all have a spiritual dimension and needs, and some people also have religious needs. It is possible to have spiritual needs independently of religious needs. Religious needs are to do with a shared faith, beliefs, practices and rituals that help a person make a connection with their 'god'. Spiritual needs are to do with our search for meaning and purpose and a sense of well-being and wholeness.

These next few pages are not about answering all the questions you may now have about 'Why my child' or 'Why our family' or 'What is the meaning of life' and all those very difficult questions you now face with your child and family. Nobody can give you the answers to these profound questions you, your family or your child now ask.

Within this section no answers are given, but it is suggested that you do something that is far from easy for anyone to do. That is to sit with your child and try and stay in that difficult place and listen to your children's questions and hear their fears. You will not be failing your children by not knowing the answers to some of the questions they may now have. Not knowing can be a place of strength and maybe even reassuring for your child.

I once read a book which that was called, "*Failure, the gate way to hope*", which I found very reassuring in itself. We won't always get it right, so don't expect to. Don't go looking for perfection. You will struggle with your own doubts as well as those of your child and family, but the struggle will be worth it.

This advice focuses on the needs of your child who is ill, but they are just as applicable to you as parents or to your other children. I would suggest that we all have spiritual needs to which we must attend. Our spirituality is something that cannot be turned on and off at will, it is a part of us and is always present. Your spirituality cannot be isolated from all that makes you who you are.

As a parent, you now find yourself on a journey, a journey that you have had no choice in taking, and would have preferred not to have started.

I have suggested that spirituality is about a 'journey' to the centre, to the heart of the matter, to our 'deep centre', where sometimes we meet our pain and have to address it. Children do come readily equipped for their spiritual journey, in so far as they have an openness and awareness, which is often unique to a child's early years. As we get older this openness and awareness gets pushed to one side.

Definition

Spirituality is what gives a person's life meaning. It is about how people view the world they find themselves in and this may or may not include a god figure or a religious faith. Spirituality is about how we view the world and how we react within it.

In talking about spirituality we need to bear in mind that we all come from different social and cultural contexts, that we each have a past and a future; and it is out of this setting that our spirituality will manifest itself. It is from this background or setting that your child's questions will flow. Therefore, you may well be the best person to offer this aspect of care, with help and support from others around you.

I have found that children with a life-limiting or life-threatening condition have a highly developed sense of their own spirituality, though they may not say or show it directly. It may well be deeper and more mature, than other children of their age and development. However, they may not always have the words or means of expressing it. Therefore, you as parents are very important, because you will be able to understand your child's language and play far better than anyone else.

Practicalities

If we are to understand our children, their spirituality and their needs, we must first reflect on our own spirituality and be prepared to question our own assumptions about spirituality and religion. How do we see spirituality in our own lives and the psychological influence it may have had on us coming from our past? The current situation in which you find yourself will challenge your value systems and notions of spirituality and cause you to reflect deeply. This process of questioning often happens and you need to know that it is not unusual and you should not be wracked with guilt for questioning.

Spiritual care is about responding to the uniqueness of your children and accepting their range of doubts, beliefs and values as they arise. It means responding to the spoken or unspoken statements from the very core of your children's being as valid expressions of where they are and who they are. It means being their friend, companion and their advocate in their search for identity on their journey and in the particular situation in which they now find themselves. It is to respond to them without being prescriptive, judgemental or dogmatic and without preconditions, acknowledging that your child and other members of the family will be at different stages on this very painful spiritual journey. In order to be able to respond to this call, you need to try and create a safe and secure place, which I have come to call a 'sacred space', where your children can express their inner suffering and know that it is alright to do so, that they will be heard and taken seriously. You can help them best by just sitting with them, watching with them, waiting with them and just letting them wonder. Take your lead from them, go with them, do not try to direct them, and use the language and imagery they use.

We need to be open to what our children have to teach us. We need to be prepared to learn from them. The skill here, as in other aspects of your children's care, is to be able to understand or 'crack' their code. We can start to do this, if we just sit with them, if we learn to watch, wait and wonder with them, if we take our lead from them, and be responsive to their needs, not the needs we think they may have, or our own needs. Never underestimate your child's understanding of what is going on. You may be surprised at how your child has an unclouded, clear way of thinking and their "take" on abstract ideas is often quirky, but relentlessly practical. This is the way in which they can help us with our struggle in trying to understand their suffering.

You may have discovered for yourself by now that you cannot fill the hole in a doughnut as much as you try to fill it, it just keeps disappearing out the back into some black hole. What you need to remember is that when you are with your child, the spaces or the gaps in the conversation do not need to be filled. This may be the centre of their journey and you just need to hold that space with your child and be present with them. *"Suffering is not a question that demands an answer; it is not a problem that demands a solution; it is a mystery that demands a presence."* (Source unknown.)

Tracheostomy care

What is a tracheostomy?

This is an artificial opening into the windpipe (trachea) which is held open by a tracheostomy tube. This helps the child to breathe easily; air now goes in and out through the tracheostomy, bypassing the mouth.

Indications for a tracheostomy

- A narrow upper airway.
- The need for long-term ventilation.
- Bronchial toilet.

There are several types of tracheostomy. They can be made of plastic or metal, may be cuffed (avoided in children), uncuffed, or fenestrated (with a hole in the canula to facilitate speech). The child will be given the one most suitable for his/her needs.

All children that have a tracheostomy must at all times have with them the following:

- Suction machine and charger.
- Appropriate size suction catheters.
- Change of tracheostomy tube – same size and one size down.
- Change of ties/tapes.
- Scissors.
- Water based lubricant.
- Normal saline and gauze.
- Water to clear tubing.
- Gloves.
- Change of Swedish nose.
- Most importantly, a capable adult to change a tracheostomy in the event of an emergency.

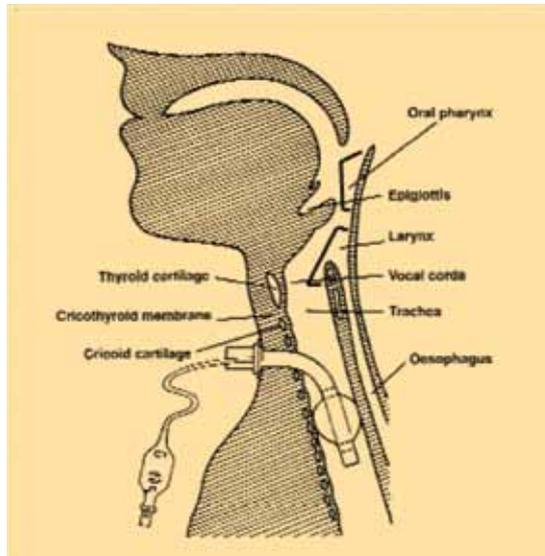
Prior to any procedure in relation to the tracheostomy it is important to reassure the child and explain as much as possible about the procedure to be performed.

Daily care

The tracheostomy stoma needs cleaning daily as tracheal secretions can infect the stoma site. Cleaning may need to be increased if child unwell or there are a lot of secretions. The stoma site is cleaned with normal saline and a cotton wool applicator. This is a time to inspect the stoma for any signs of redness or the presence of granulation tissue (excess new skin). If there is redness/irritation a sterile keyhole dressing can be applied between the skin and the flanges, taking care not to cover the tracheostomy tube.

The dressing should be changed regularly as wet dressings can cause irritation and infection.
BARRIER CREAM SHOULD NOT BE APPLIED.

If there is granulation tissue present discuss with a tracheostomy nurse specialist as this will need to be cauterised or removed.



The anatomical position of a tracheostomy tube.

Tape changes

The tracheostomy tube is held in place by either cotton ties or velcro tapes. These need to be changed daily or more frequently if soiled.

This is a two person procedure; one person secures tracheostomy in place, while the other person changes the ties or tapes.

Prior to any procedure ensure that all the necessary equipment is at hand:

- Two lengths of 1/4 inch cotton tape or Velcro ties.
- Normal saline and gauze to clean the skin.
- Tracheostomy tubes.
- Suction if necessary.

1. Position child on his/her back with the neck extended over a rolled towel.
2. One person secures tube in place, the other cuts and removes the soiled tapes.
3. Thread the end of one of the tapes through the tracheostomy tube flange on the far side and tie it to the other with three knots.
4. Repeat the procedure on the other side but instead of securing the tapes with a knot, just tie in a bow. Keep the tapes as unwrinkled as possible and try to achieve the correct tension before tying the bow.
5. Continuing to hold the tube, sit the child forward and with child's head bent forward it should be possible to place one finger between the ties and the skin. This is the safest recommended tension.
6. If tension is correct then change the bow to three knots securely.
7. If Velcro tapes used, remove soiled tapes, position new tapes, thread the Velcro part through the flange of tracheostomy, fasten and repeat on the other side, ensuring that the safe tension is maintained at all times.

Suctioning

Why suction?

- If secretions are allowed to accumulate they will block the tube.
- Secretions left in the tube could lead to infection.

When to suction?

- Noisy breathing (sound of air bubbling through secretions).
- Visible secretions.
- A cough that sounds like secretions are in the tube.
- Restlessness/crying.
- Increased respiratory rate.

Suctioning instructions

Make sure you have at hand all the equipment you need:

- Suction unit.
- Catheter (correct size) – new one for each suction.
- Connecting tubes if needed.
- Syringe of saline
- Bowl or bottle of water to clean the catheter.

1. Turn on suction pump and check pressure is correct as instructed.
2. Gently insert catheter into tracheostomy, ensure thumb is off port of suction catheter.
3. Apply suction, by covering the port with thumb and withdraw catheter. This should only take five or six seconds.
4. Repeat if necessary but allow child time to settle in-between.
5. Disconnect the catheter from the tubing and dispose of safely. Clear the tubing with the water provided.
6. Attach a new catheter to be ready for next time.

Each time you suction it is important to observe the secretions:

- Have they changed colour?
- Are they thicker than usual?
- Are you suctioning more frequently?
- Unpleasant smell?
- Tinged with blood?

If so, the child may have an infection. Their GP needs to be informed in case the child needs antibiotics. Be aware that when a child has a chest infection he/she will require more frequent suctioning.

Changing tracheostomy tube

In a non-emergency situation leave tube change for one and a half hours after feed as child may vomit when upset. Tracheostomy tubes are usually changed weekly.

Prepare equipment

- Round ended scissors.
 - Two lengths of 1/4 inch cotton tapes or Velcro tapes.
 - New tube, check correct size and that the tube is intact.
 - A smaller sized tube in case the correct size does not go in.
 - Water based lubricant.
 - Prepare tube, insert introducer, apply a small amount of lubricant on the outer tubing away from end of tube, place tube ready to use.
1. Position child as for tape change, older child can sit up.
 2. Hold the tube (one person).
 3. Second person cut and remove the dirty tapes and place clean tapes behind child's head.
 4. First person holds tube; second person holds the new tube by flanges and positions the tip near the child's neck.
 5. Gently remove the old tube following the curve of the tube. Same person firmly and gently slide in the new tube following the curve of the tube so as not to damage the trachea. Remove introducer if used.
 6. Hold new tube securely.
 7. If child is coughing allow to settle.
 8. Check air flow through tube, child's breathing pattern and colour, suction if necessary.
 9. Clean the skin around the tube. Tie the tapes.
 10. Do not let go of the tube until the tapes are securely tied.

Humidification

The normal mechanism of warming and humidifying air is removed with a tracheostomy. Therefore most children have a Swedish nose applied to the tracheostomy to give dry humidification. Wet humidification may also be given by using nebulised saline.

Nebulising with a tracheostomy?

Medication checked and instilled into nebuliser as prescribed. The most important thing to remember is to stand next to the child with the nebuliser near the tracheostomy, to allow the nebulised medication to be given, but NOT to attach the nebuliser to the tracheostomy as this will cause major damage and restrict breathing.

How to recognise blocked tube

- Childs may be coughing vigorously.
- Difficulty breathing.
- Change in colour leading to unconsciousness.

Immediate action is required

1. Try suctioning.

If no better:

- 2. Cut tapes and remove tracheostomy tube.** In long standing tracheostomies the tract will be well developed and no immediate action is required.

If still no better:

- 3. Insert new tube same size or if necessary a smaller size.**

If still no better:

- 4. Insert a cut off piece of suction catheter to allow some air to pass through, call for help and phone 999.**

If changing tube has resolved the problem, hold tracheostomy tube in place until another person arrives to help. Reassure child and allow to settle.

Suction only if necessary.

If a child stops breathing

1. Call for help if someone within earshot.
2. Check if child responsive.
3. Turn child onto back on firm flat surface.
4. Tilt head back slightly to expose tracheostomy.
5. Is tracheostomy blocked? Attempt suction.
6. Still seems blocked? Attempt to change tube.
7. Look, listen and feel for breathing.
8. If not breathing, shout for help get someone to dial 999.
9. Commence basic life support immediately.

DO NOT LEAVE CHILD ALONE, EVEN IF BREATHING RETURNS TO NORMAL.

Travel abroad

Many of our patients will have a desire to travel abroad during their limited life span. This can present particular problems in terms of carrying medication across borders. There are strict rules laid down by the UK Home Office in relation to which medication can be carried and which requires a special Home Office personal export license. These restrictions not only concern controlled drugs but can affect other types as well. There are also rules in terms of the limit of quantity. Each country visited will also have their own rules and the family must contact the appropriate embassy to find out exactly what these are. The Home Office license is for crossing UK borders only; many countries prohibit the import of diamorphine, morphine or methadone for personal use.

It is important to check all these details. To find out more information then contact the Home Office:

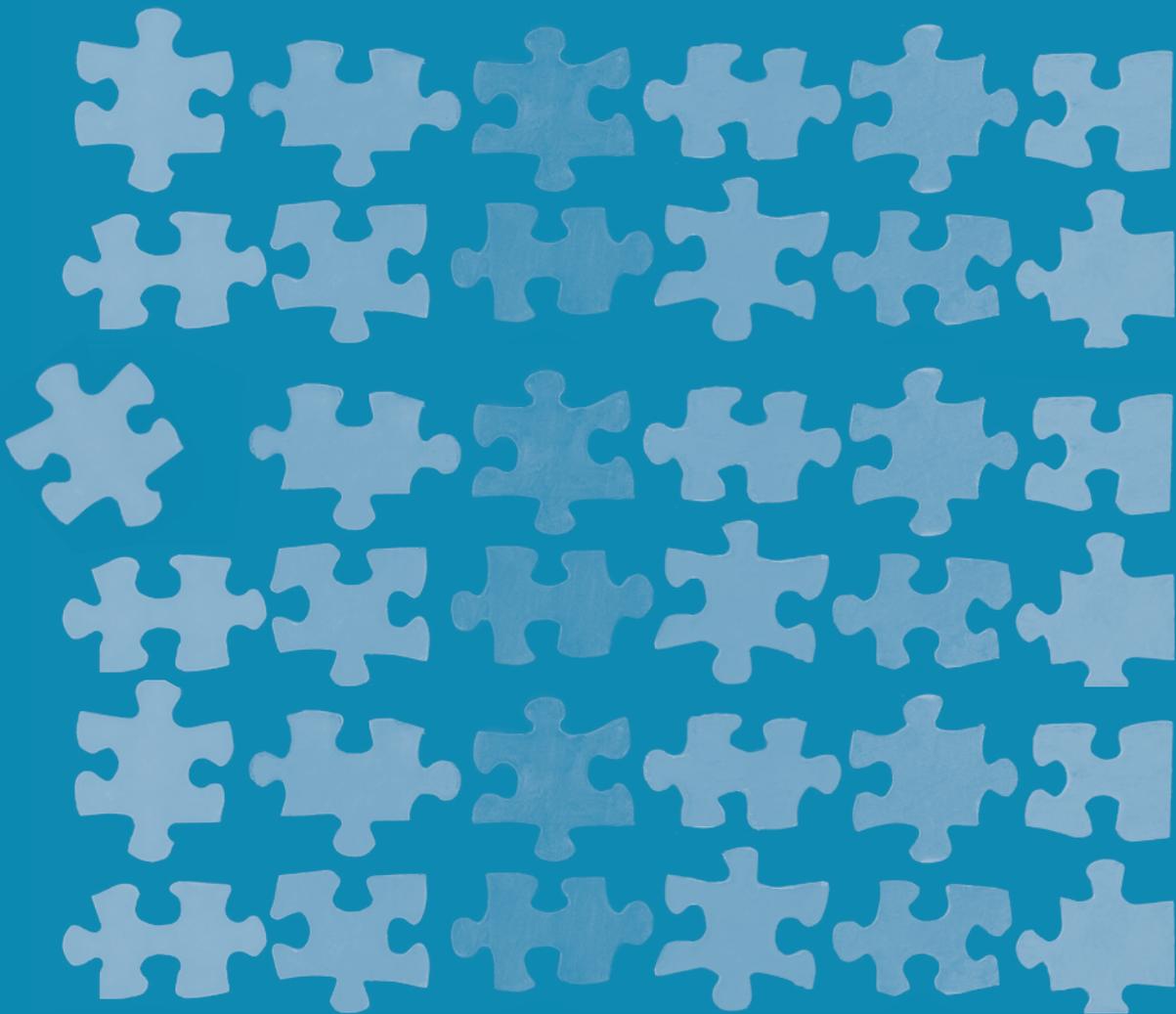
Home Office
Drugs Licensing & Compliance Unit
4th Floor Fry Building
2 Marsham Street
London SW1P 4D

Tel: 0207 035 4848 (9-5 Monday to Friday).

Email: public.enquiries@homeoffice.gsi.gov.uk

Web: www.homeoffice.gov.uk/drugs/licensing/personal

Formulary



How to use the formulary

The medicines included in this formulary are listed alphabetically. Under each medicine heading you will find:

The name of the drug and evidence references – You will find a series of numbers referring to evidence, such as [128, 197-200]. The numbers in square brackets refer to the references which can be found on pages 143-154. For some medicines you will also see abbreviations next to the evidence, such as CC, EA and RC. These refer to the seven abbreviations detailed on this page (below).

Use – This details what the specific medicine is used for in children’s palliative care.

Doses and routes – This details different routes and appropriate doses for each medicine depending on the age/weight of the child.

Notes – This provides any additional relevant notes, cautions, information on compatibility etc. We have also included a note that explains what form and size each medicine is available in.

Abbreviations

- RE** Strong research evidence
- SR** Some weak research evidence
- CC** No published evidence but has clinical consensus
- EA** Evidence (research or clinical consensus) with adults
- SC** Subcutaneous
- IV** Intravenous
- IM** Intramuscular

This formulary includes doses used in palliative care as those recommended in the British National Formulary (BNF) [196], British National Formulary for Children (BNFC) [128], Neonatal Formulary [129], and Medicines for Children [197]. Readers outside the UK are advised to consult local prescribing guidelines (where they exist) as well.

The authors have made every effort to check current data sheets and literature up to February 2011, but the dosages, indications, contraindications and adverse effects of drugs change over time as new information is obtained. It is the responsibility of the prescriber to check this information with the manufacturer’s current data sheet and we strongly urge the reader to do this before administering any of the drugs in this document. In addition, palliative care uses a number of drugs for indications or by routes that are not licensed by the manufacturer. In the UK such unlicensed use is allowed, but at the discretion and with the responsibility of the prescriber.

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Adrenaline (topical)

Evidence: [128] CC

Use:

- Small external bleeds.

Dose and routes:

Soak gauze in 1:1000 (1mg/ml) solution and apply directly to bleeding point.

Alfentanil

Evidence: [128, 197-200]

EA, RC (for PICU settings), CC (in palliative care settings outside ICU)

Use:

- Short acting synthetic opioid analgesic derivative of fentanyl.
- Useful for breakthrough pain, procedure-related pain, and by SC infusion/IV.
- Used as analgesic especially for patients in intensive care and on assisted ventilation (adjunct to anaesthesia).
- Alternative opioid if intolerant to other strong opioids; useful in renal failure if neurotoxic on morphine, or stage 4 to 5 severe renal failure.

Dose and routes:

Titrate from other opioids (subcutaneous alfentanil is about 30 times as potent as oral morphine, and about 4 times less potent than fentanyl) but note poor relationship between effective PRN dose and regular background dose.

Buccal/intranasal dose is equivalent to bolus SC/IV dose. Used for incident and breakthrough pain. If possible, give five minutes before event likely to cause pain, and repeat (and increase) dose if needed.

By IV/SC bolus (**these doses presume assisted ventilation**)

- **Neonate:** 5-20micrograms/kg initial dose, supplemental doses up to 10 micrograms/kg.
- **1 month to 18 years:** 10-20micrograms/kg initial dose, up to 10 micrograms/kg supplemental doses.

By continuous IV or SC infusion (**these doses presume assisted ventilation**)

- **Neonate:** 10-50micrograms/kg over 10 minutes then 30-60micrograms/kg/ hour.
- **1 month to 18 years:** 50-100microgram/kg loading dose over 10 minutes, then 30-60micrograms/kg/ hour as continuous infusion.

Notes:

- Potency: 20 times stronger than parenteral morphine, approx $\frac{1}{4}$ as strong as fentanyl.
- Has the best evidence of all opioids to support its use in severe renal failure. May need to reduce dose in severe hepatic failure.
- To avoid prolonged respiratory depression, administer last bolus dose 10 minutes before end of procedure; discontinue infusion 30 mins before end of procedure.
- Best dosage information available for anaesthetic adjunct use. Analgesic doses mostly extrapolated from fentanyl.
- Compatible with sodium chloride, dextrose and compound sodium lactate infusion fluids.
- Useful in high doses as can be dissolved in small volumes (as diamorphine).
- Available as: injection (500microgram/ml 2ml, 10ml ampoule). Intensive care injection (5mg/ml 1ml ampoule). Nasal spray with attachment for buccal/SL use: (5mg/5ml bottle available as special order from Torbay Hospital).
- Alfentanil injection is licensed for use in children as an analgesic supplement for use before and during anaesthesia. Buccal or intranasal administration of alfentanil for incident/breakthrough pain is an unlicensed formulation and route of administration.
- With the recent availability of commercial buccal fentanyl preparations, and increasing experience with their use in children, there may be less place for alfentanil in children's palliative care outside intensive care settings.

Amitriptyline

Evidence: [128, 196, 201, 202]

Use:

- Neuropathic pain.

Dose and routes:

By mouth:

- **Child 2-12 years:** initially 200-500microgram/kg (max. 25mg) once daily at night, increased if necessary: max. 1mg/kg twice daily on specialist advice.
- **Child 12-18 years:** initially 10-25mg once daily at night, increased gradually every 3-5 days if necessary to 75mg at night. Higher doses up to 150mg daily on specialist advice.

Notes:

- Not licensed for use in children with neuropathic pain.
- Available as: tablets (10mg, 25mg, 50mg) and oral solution (25mg/5mL, 50mg/5mL).
- Analgesic effect unlikely to be evident for several days. Potential improved sleep and appetite; likely to precede analgesic effect.
- Main side effects limiting use in children include; constipation, dry mouth and drowsiness.
- Consider performing ECG to exclude prolonged QT when possible.

Arachis oil enema

Evidence: [128, 197] CC

Use:

- Faecal softener.
- Faecal impaction.

Dose and routes:

By rectal administration

- **Child 3-7 years:** 45-65mL as required (~1/3 to 1/2 enema).
- **Child 7-12 years:** 65ml-100mL as required (~1/2 to 3/4 enema).
- **Child 12 years and over:** 100-130mL as required (~3/4-1 enema).

Notes:

- **Caution:** as arachis oil is derived from peanuts, do not use in children with a known allergy to peanuts.
- Generally used as a retention enema to soften impacted faeces. May be instilled and left overnight to soften the stool.
- Warm enema before use by placing in warm water.
- Administration may cause local irritation.
- Licensed for use in children from 3 years of age.
- Available as: enema, arachis (peanut) oil in 130mL single dose disposable packs.

Arthrotec®

Evidence: [196]

Use:

- Anti-inflammatory pain killer (Diclofenac 50mg) combined with gastroprotective drug (Misoprostol 200 microgrammes).
- For musculoskeletal pain and bone pain caused by tumour.
- Prophylaxis against NSAID-induced gastroduodenal ulceration in patients requiring diclofenac.

Dose and routes:

By mouth:

- Arthrotec® 50, **Adults:** 1 tablet 2-3 times a day.
- Arthrotec® 75, **Adults:** 1 tablet 2 times a day.

Notes:

- Not licensed for children.
- Above doses only for adults.
- Available as: tablets (Arthrotec 50 = diclofenac 50mg and misoprostol 200micrograms and Arthrotec 75 = diclofenac 75mg and misoprostol 200micrograms).

Aspirin

Evidence: [128, 196]

Use:

- Mild to moderate pain.
- Pyrexia.

Dose and routes:

By mouth:

- **> 16 years of age:** 300-900mg every 4-6 hours when necessary; max. 4g daily.

Notes:

- Available as: tablets (75mg, 300mg), dispersible tablets (75mg, 300mg), and suppositories (150mg).
- Contraindicated in children due to risk of Reye Syndrome.
- May be used in low dose under specialist advice for child with some cardiac conditions.

Baclofen

Evidence: [128, 145, 196, 203-209]

Use:

Chronic severe spasticity of voluntary muscle.
Considered as third line neuropathic agent.

Dose and routes:

By mouth:

- **Initial dose for child 1-10 years:** 0.3mg/kg/day in 4 divided doses (maximum single dose 2.5mg) increased gradually to a usual maintenance dose of 0.75-2mg/kg/day in divided doses or the following ranges:
- **Child 1-2 years:** 10-20mg daily in divided doses.
- **Child 2-6 years:** 20-30mg daily in divided doses.
- **Child 6-10 years:** 30-60mg in divided doses.
- **Child 10-18 years:** initial dose 5mg three times daily increased gradually to a usual maintenance dose up to 60mg/day (maximum 100mg/day).

Notes:

- Not licensed for children < 1 year old.
- Avoid abrupt withdrawal.
- Contains isosorbide so may be a cause of diarrhoea.
- Available as: tablets (10mg) and oral solution (5mg/5mL).
- Monitor and review reduction in muscle tone and potential adverse effects on swallow and airway protection.

Bethanechol

Evidence: [11, 210]

Use:

Opioid induced urinary retention.

Dose and routes:

By mouth:

- **Child over 1 year:** 0.6mg/kg/day in 3 or 4 divided doses. Maximum single dose 10mg.
- **Adult dose:** 10 to 50mg per dose 3 to 4 times a day.

Subcutaneous:

- **Child over 1 year:** 0.12 to 2mg/kg/day in 3 or 4 divided doses. Maximum single dose 2.5mg.
- **Adult dose:** 2.5 to 5mg per dose 3 to 4 times a day.

Notes:

- The safety and efficacy of bethanechol in children has not been established (bethanechol is not licensed for use in children).
- Available as: tablets (10mg and 25mg). Injection for subcutaneous injection only (5mg/ml – not licensed in the UK but may be possible to import via a specialist importation company).

Bisacodyl

Evidence: [128, 196]

Use:

Constipation.

Dose and routes:

By mouth:

- **Child 4-10 years:** 5mg at night; adjust according to response.
- **Child 10-18 years:** 5-10mg at night; increase if necessary to maximum of 20mg per dose.

By rectum (suppository):

- **Child 2-10 years:** 5-10mg in the morning.
- **Child 10-18 years:** 10mg in the morning.

Notes:

- Tablets act in 10-12 hours. Suppositories act in 20-60 minutes. Must be in direct contact with mucosal wall.
- Stimulant laxative.
- Available as: tablets (5mg) and suppositories (5mg, 10mg).

Buprenorphine

Evidence: [128, 199, 211, 212]

Use:

Moderate to severe pain.

Dose and routes:

By sublingual route (starting doses):

- **Child body weight 16-25kg:** 100microgram every 6-8 hours.
- **Child body weight 25-37.5kg:** 100-200microgram every 6-8 hours.
- **Child body weight 37.5-50kg:** 200-300microgram every 6-8 hours.
- **Child body weight over 50kg:** 200-400microgram every 6-8 hours.

By transdermal patch:

- By titration or as indicated by existing opioid needs.

Notes:

- Sublingual tablets not licensed for use in children < 6 years old.
- Available as: tablets (200microgram, 400microgram) for sublingual administration. Tablets may be halved.

Available as: two types of patches:

1. BuTrans®-applied every 7 days. Available as 5 (5microgram/hour for 7 days), 10 (10microgram/hour for 7 days), and 20 (20microgram/hour for 7 days).
 2. TransTec®-applied every 96 hours. Available as 35 (35microgram/hour for 96 hours), 52.5 (52.5microgram/hour for 96 hours), and 70 (70microgram/hour for 96 hours).
- Patches not licensed for use in children.
 - Has both opioid agonist and antagonist properties and may precipitate withdrawal symptoms, including pain, in children dependant on other opioids.
 - Sublingual duration of action 6-8 hours.

For patches, systemic analgesic concentrations are generally reached within 12-24 hours but levels continue to rise for 32-54 hours. If converting from:

- 4-hourly oral morphine – give regular doses for the first 12 hours after applying the patch.
- 12-hourly slow release morphine – apply the patch and give the final slow release dose at the same time.
- 24-hourly slow release morphine – apply the patch 12 hours after the final slow release dose.
- Continuous subcutaneous infusion – continue the syringe driver for about 12 hours after applying the patch.
- Effects only partially reversed by naloxone.
- Rate of absorption from patch is affected by temperature, so caution with pyrexia or increased external temperature such as hot baths: possibility of accidental overdose with respiratory depression.
- Patches are finding a use as an easily administered option for low dose background opioid analgesia in a stable situation, for example in severe neurological impairment.

Carbamazepine

Evidence: [128, 213-216]

Use:

- Neuropathic pain.
- Some movement disorders.

Dose and routes:

By mouth:

- **Child 1 month-12 years:** initially 5mg/kg at night or 2.5mg/kg twice daily, increased as necessary by 2.5-5mg every 3-7 days; usual maintenance dose 5mg/kg 2-3 times daily; doses up to 20mg/kg have been used.
- **Child 12-18 years:** initially 100-200mg 1-2 times daily; increased slowly to usual maintenance of 200-400mg 2-3 times daily. Maximum 1.8g/day.

By rectum:

- **Child 1 month-18 years:** use approximately 25% more than the oral dose (max. 250mg) up to 4 times a day.

Notes:

- Not licensed for use in children with neuropathic pain.
- Can cause serious blood, hepatic, and skin disorders. Parents should be taught how to recognise signs of these conditions, particularly leucopenia.
- Different preparations may vary in bioavailability so avoid changing formulations.
- Available as: tablets (100mg, 200mg, 400mg), chew tabs (100mg, 200mg), liquid (100mg/5mL), suppositories (125mg, 250mg), and modified release tablets (200mg, 400mg).

Celecoxib

Evidence: [217-219] SR

Use:

- Pain, inflammatory pain, bone pain, stiffness. Not used first line.
- Dose based on management of juvenile rheumatoid arthritis.

Dose and routes:

By mouth:

- **Child over 2 years:**
 - Weight 10-25kg: 50mg twice daily.
 - Weight more than 25kg: 100mg twice daily.

Notes:

- Tablets may be crushed for oral administration.
- Tablets not licensed for use in children.
- Drug interacts with a great many commonly used drugs, check BNF.
- Comes in tablet (50mg).

Chloral hydrate

Evidence: [128, 129, 173, 197, 220, 221]

Use:

- Insomnia.

Dose and routes:

By mouth or rectum:

- **Neonate:** 30-45mg/kg as a single dose at night.
- **Child 1 month-12 years:** 30-50mg/kg single dose at night (max. 1g).
- **Child 12-18 years:** 0.5-1g single dose at night (max. 2g).

Notes:

- Oral use: mix with plenty of juice, water, or milk to reduce gastric irritation and disguise the unpleasant taste.
- For rectal administration use oral solution or suppositories (available from 'specials' manufacturers).
- Accumulates on prolonged use and should be avoided in severe renal or hepatic impairment.
- Available as: tablets (chloral betaine 707mg = chloral hydrate 414mg-Welldorm®), oral solution (143.3mg/5mL-Welldorm®; 200mg/5mL, 500mg/5mL both of which are available from 'specials' manufacturers or specialist importing companies), suppositories (available as various strengths 25mg, 50mg, 60mg, 100mg, 200mg, 500mg from 'specials' manufacturers).

Chlorpromazine

Evidence: [89-92, 94, 121, 123, 126, 128, 222]

Use:

- Nausea and vomiting of terminal illness (where other drugs are unsuitable).
- Hiccups.

Dose and routes:

Hiccups

By mouth:

- **Child 1-6 years:** 500micrograms/kg every 4-6 hours adjusted according to response (max. 40 mg daily).
- **Child 6-12 years:** 10mg 3 times daily, adjusted according to response (max. 75 mg daily).
- **Child 12-18 years:** 25mg 3 times daily (or 75mg at night), adjusted according to response, to usual maintenance dose of 75-300mg daily (but up to 1g daily may be required).

Nausea and vomiting of terminal illness (where other drugs are unsuitable)

By mouth:

- **Child 1-6 years:** 500micrograms/kg every 4-6 hours; max. 40 mg daily.
- **Child 6-12 years:** 500micrograms/kg every 4-6 hours; max. 75 mg daily.
- **Child 12-18 years:** 10-25mg every 4-6 hours.

By deep intramuscular injection:

- **Child 1-6 years:** 500micrograms/kg every 6-8 hours; max. 40mg daily.
- **Child 6-12 years:** 500micrograms/kg every 6-8 hours; max. 75mg daily.
- **Child 12-18 years:** initially 25mg then 25-50mg every 3-4 hours until vomiting stops.

Notes:

- Caution in children with hepatic impairment (can precipitate coma), renal impairment (start with small dose; increased cerebral sensitivity), cardiovascular disease, epilepsy (and conditions predisposing to epilepsy), depression, myasthenia gravis.
- Caution is also required in severe respiratory disease and in children with a history of jaundice or who have blood dyscrasias (perform blood counts if unexplained infection or fever develops).
- Photosensitisation may occur with higher dosages, children should avoid direct sunlight.
- Antipsychotic drugs may be contra-indicated in CNS depression.
- Can cause skin reaction at injection site, so may not be appropriate for subcutaneous use.
- Available as: tablets, coated (25mg, 50mg, 100mg); oral solution (25mg/5mL, 100mg/5mL); injection (25mg/mL (1mL and 2mL ampoules).

Clobazam

Evidence: [128, 197]

Uses:

- Benzodiazepine.
- Adjunctive therapy for epilepsy.

Dose and routes:

For oral administration:

- **Child 1 month-12 years:** initial dose of 125microgram/kg twice daily. Increase every 5 days as necessary and as tolerated to a usual maintenance dose of 250microgram/kg twice daily. Maximum dose 500microgram/kg (15mg single dose) twice daily.
- **Child 12-18 years:** initial dose of 10mg twice daily. Increase every 5 days as necessary and as tolerated to a usual maintenance dose of 10-15mg twice daily. Maximum 30mg twice daily.

Notes:

- Not licensed for use in children less than 3 years of age.
- Tablets should not be chewed.
- Available as: tablets (10mg), tablets (5mg – unlicensed and available on a named-patient basis), oral liquid (various strengths may be prepared as extemporaneous formulations or are available from 'specials' manufacturers or specialist importing companies – unlicensed).
- NHS black-listed except for epilepsy and endorsed 'SLS'.

Clonazepam

Evidence: [128, 129, 174, 208, 215, 223]

Use:

- Tonic-clonic seizures.
- Partial seizures.
- Cluster seizures.
- Myoclonus.
- Status epilepticus (3rd line, particularly in neonates).
- Neuropathic pain.
- Restless legs.
- Gasping.
- Anxiety and panic.

Dose and routes:

By mouth (anticonvulsant doses: reduce for other indications):

- **Child 1 month-1 year:** initially 250microgram at night for 4 nights, increased over 2-4 weeks to usual maintenance dose of 0.5-1mg at night (may be given in 3 divided doses if necessary).
- **Child 1-5 years:** initially 250microgram at night for 4 nights, increased over 2-4 weeks to usual maintenance of 1-3mg at night (may be given in 3 divided doses if necessary).
- **Child 5-12 years:** initially 500microgram at night for 4 nights, increased over 2-4 weeks to usual maintenance dose of 3-6mg at night (may be given in 3 divided doses if necessary).
- **Child 12-18 years:** initially 1mg at night for 4 nights, increased over 2-4 weeks to usual maintenance of 4-8mg at night (may be given in 3 divided doses if necessary).

Subcutaneous:

- **Child 1 month-12 years:** starting dose 20-25microgram/kg/24 hours.
- Maximum starting doses: 1-5 years: 250microgram/24 hours; 5-12 years: 500microgram/24 hours.
- Increase at intervals of not less than 12 hours to 200microgram/kg/24 hours (maximum 8mg/24 hours).
- Doses of up to 1.4mg/kg/24 hours have been used in status epilepticus in PICU environment.

For status epilepticus: (SR)

By intravenous injection over at least 2 minutes, or infusion:

- **Neonate:** 100microgram/kg intravenous over at least 2 minutes, repeated after 24 hours if necessary (avoid unless no safer alternative). Used for seizures not controlled with phenobarbital or phenytoin.
- **Child 1 month to 12 years:** 50microgram/kg (max 1mg) repeated as necessary, then intravenous infusion if necessary 10microgram/kg/hr adjusted by response to max 60microgram/kg/hour.
- **Child 12-18 years:** initially 1mg by intravenous injection, then by intravenous infusion 10microgram/kg/hour, max 60microgram/kg/hour.

Notes

- Licensed for use in children for status epilepticus and epilepsy. Not licensed for neuropathic pain. Tablets licensed in children. Oral liquid is unlicensed in UK and is available from 'specials' manufacturers.
- Very effective anticonvulsant, usually 3rd line due to side effects and development of tolerance.
- Use lower doses for panic, anxiety, terminal sedation, neuropathic pain, and restless legs.

- As anxiolytic/sedative approximately 20 times as potent as diazepam (ie 250mcg clonazepam equivalent to 5 mg diazepam orally).
- Multiple indications in addition to anticonvulsant activity can make it particularly useful in palliative care for neurological disorders.
- Many children with complex seizure disorders are on twice daily doses and on higher dosages.
- Increase for short periods 3-5 days with increased seizures e.g. from viral illness.
- Elimination half life of 20-40 hours means that it may take up to 6 days to reach steady state; risk of accumulation and toxicity with rapid increase of infusion; consider loading dose to reach steady state more quickly.
- Compatible with most drugs commonly administered via continuous subcutaneous infusion via syringe driver.
- Available as: tablets (500 microgram scored, 2mg scored); liquid (various strengths available from 'specials' manufacturers or specialist importing companies); injection (1mg/ml).

Co-danthrusate

Evidence: [128, 196]

Use:

- Constipation in terminal illness only.

Dose and routes:

By mouth:

Co-danthrusate 50/60 suspension 5ml = one co-danthrusate 50/60 capsule.

- **Child 6-12 years:** 5mL or 1 capsule at night
- **Child 12-18 years:** 5-15mL or 1-3 capsules at night.

Notes:

- Co-danthrusate is made from danthron and docusate sodium.
- Acts as a stimulant laxative.
- Avoid prolonged skin contact due to risk of irritation and excoriation.
- Danthron can turn urine red/brown.
- Rodent studies indicate potential carcinogenic risk.

Co-danthramer

Evidence: [128, 196]

Use:

- Constipation in terminal illness only.

Dose and routes:

By mouth:

Co-danthramer 25/200 suspension 5mL = one co-danthramer 25/200 capsule:

- **Child 2-12 years:** 2.5-5mL at night.
- **Child 6-12 years:** 1 capsule at night.
- **Child 12-18 years:** 5-10mL or 1-2 capsules at night.
Dosage can be increased up to 10-20mL twice a day.

Strong co-danthramer 75/1000 suspension 5mL = two strong co-danthramer 37.5/500 capsules:

- **Child 12-18 years:** 5mL or 1-2 capsules at night.

Notes:

- Co-danthramer is made from danthron and poloxamer '188'.
- Acts as a stimulant laxative.
- Avoid prolonged skin contact due to risk of irritation and excoriation.
- Danthron can turn urine red/brown.
- Rodent studies indicate potential carcinogenic risk.

Codeine phosphate

Evidence: [128, 129, 196, 215]

Use:

- Mild to moderate pain (Step 2 of WHO Pain Ladder) in patients known to be able to benefit. For PRN use only – not suitable for management of background pain.
- Marked diarrhoea, when other agents are contraindicated or not appropriate, with medication doses and interval titrated to effect.
- Cough suppressant.

Dose and routes:

By mouth, rectum, SC injection, or by IM injection:

- **Neonate:** 0.5-1mg/kg every 4-6 hours.
- **Child 1 month-12 years:** 0.5-1mg/kg every 4-6 hours; max. 240mg daily.
- **Child 12-18 years:** 30-60mg every 4-6 hours; max. 240mg daily.

As cough suppressant in the form of pholcodine.

- **Child 6-12 years:** 2.5mg 3-4 times daily.
- **Child 12-18 years:** 5-10mg 3-4 times daily.

Notes:

- Not licensed for use in children < 1 year old.
- Codeine is effectively a pro drug for morphine, delivering approximately 1 mg of morphine for every 10 mg of codeine.
- Conversion to morphine is subject to pharmacogenetic variation.
- Pharmacologically, codeine is no different from morphine except that it is weaker and less consistently effective. This has led some to suggest it is an unnecessary step in the WHO Pain Ladder, better replaced by low doses of morphine itself.
- 10-20% of population have enzyme deficiency that prevents activation of codeine to active metabolite and so is ineffective in this group.
- Seems relatively constipating compared with morphine/diamorphine, particularly in children.
- Rectal administration is an unlicensed route of administration using an unlicensed product.
- Must *not* be given IV.
- Reduce dose in renal impairment.
- Available as: tablets (15mg, 30mg, 60mg), oral solution (25mg/5mL), injection (60mg/mL), suppositories of various strengths available from 'specials' manufacturers. Pholcodine as linctus 2mg/5mL, 5mg/5mL and 10mg/5mL.
- Some retail pharmacies do not stock codeine phosphate solution at 25mg/5ml. They usually do stock codeine phosphate linctus at 15mg/5mls and this is worth enquiring of if a practitioner is working in the community and wishes to prescribe this medication.

Cyclizine**Evidence:** [128, 224]**Use:**

- Nausea and vomiting and particularly useful in vomiting associated with raised intracranial pressure.

Dose and routes:

By mouth or by slow IV injection over 3-5 min:

- **Child 1 month-6 years:** 0.5-1mg/kg up to 3 times daily; max. single dose 25mg.
- **Child 6-12 years:** 25mg up to 3 times daily.
- **Child 12-18 years:** 50mg up to 3 times daily.

By rectum:

- **Child 2-6 years:** 12.5mg up to 3 times daily.
- **Child 6-12 years:** 25mg up to 3 times daily.
- **Child 12-18 years:** 50mg up to 3 times daily.

By continuous IV or SC infusion:

- **Child 1 month-6 years:** 3mg/kg over 24 hours.
- **Child 2-5 years:** 50mg over 24 hours.
- **Child 6-12 years:** 75mg over 24 hours.
- **Child 12-18 years:** 150mg over 24 hours.

Notes:

- Tablets may be crushed for oral administration.
- Tablets not licensed for use in children < 6 years old.
- Injection not licensed for use in children.
- Care in subcutaneous infusion: Important to use in water for injections rather than saline. Can precipitate with diamorphine at high concentrations, and can cause injection site reactions.
- Suppositories must be kept refrigerated.
- Available as: tablets (50mg), suppositories (12.5mg, 25mg, 50mg, 100mg from 'specials' manufacturers) and injection (50mg/mL).

Dantrolene**Evidence:** [128, 147, 204, 205, 209, 225]**Use:**

- Skeletal muscle relaxant.
- Chronic severe muscle spasm or spasticity.

Dose and routes:

By mouth:

- **Child 5-12 years:** initially 500microgram/kg once daily; after 7 days increase to 500microgram/kg/dose 3 times daily. Every 7 days increase by further 500microgram/kg/dose until response. Max. 2mg/kg 3-4 times daily (max. total daily dose 400mg).
- **Child 12-18 years:** initially 25mg once daily; after 7 days increase to 25mg 3 times daily. Every 7 days increase by further 500microgram/kg/dose until response. Max. 2mg/kg 3-4 times daily (max. total daily dose 400mg).

Notes

- Not licensed for use in children.
- Hepatotoxicity risk, consider checking liver function before and at regular intervals during therapy.
- Avoid in liver disease or concomitant use of hepatotoxic drugs.
- Available as: capsules (25mg, 100mg), oral suspension (extemporaneously).

Dexamethasone

Evidence: [126, 197, 226-228]

Use:

- Headache associated with raised intracranial pressure caused by tumour.
- Anti-inflammatory in brain and other tumours causing pressure on nerves, bone or obstruction of hollow viscus.
- Analgesic role in nerve compression, spinal cord compression and bone pain.
- Antiemetic either as an adjuvant or in highly emetogenic cytotoxic therapies.

Dose and routes:

Prescribe as dexamethasone base.

Headache associated with raised intracranial pressure
By mouth or IV.

Child 1 month-12 years: 250microgram/kg twice a day for 5 days; then reduce or stop.

To relieve symptoms of brain or other tumour
Numerous other indications in palliative medicine such as spinal cord compression, some causes of dyspnoea, bone pain, superior vena caval obstruction etc, only in discussion with specialist palliative medicine team.

Antiemetic

By mouth or IV:

- **Child < 1 year:** 250microgram-1mg 3 times daily.
- **Child 1-5 years:** 1-2mg 3 times daily.
- **Child 6-12 years:** 2-4mg 3 times daily.
- **Child 12-18 years:** 4mg 3 times daily.

Notes:

- Not licensed for use in children as an antiemetic.
- Dexamethasone 1mg = dexamethasone phosphate 1.2mg = dexamethasone sodium phosphate 1.3mg.
- Dexamethasone 1mg = 7mg prednisolone.
- Problems of weight gain and Cushingoid appearance are major problems specifically in children. All specialist units therefore use pulsed dose regimes in preference to continual use. Regimes vary with conditions and specialist units. Seek local specialist advice.
- Other side effects include; diabetes, osteoporosis, muscle wasting, peptic ulceration and behavioural problems, particularly agitation.
- Tablets may be dispersed in water or injection solution given by mouth.

- Available as: tablets (500microgram, 2mg), oral solution (2mg/5mL and other strengths available from 'specials' manufacturers) and injection as dexamethasone sodium phosphate (equivalent to 4mg/1mL dexamethasone base (Organon® brand) or 3.3mg/mL dexamethasone base (Hospira® brand).

Diamorphine

Evidence: [128, 143, 197, 215, 229]

Use:

- Pain of all types unless opioid insensitivity has been shown (Step 3 WHO Pain Ladder, second line).
- Background pain relief (maintenance phase).
- Dyspnoea.

Dose and routes:

Titrate from previous opioid or use the doses below, using the lower dose as a starting dose.

Acute or chronic pain

By mouth:

- **Child 1 month-12 years:** 100-200micrograms/kg (max. 10mg) every 4 hours as necessary.
- **Child 12-18 years:** 5-10mg every 4 hours as necessary.

By continuous intravenous infusion:

- **Neonate:** 2.5-7micrograms/kg/hour
- **Child 1 month-12 years:** 12.5-25micrograms/kg/hour.

By intravenous injection:

- **Child 1-3 month:** 20micrograms/kg every 6 hours as necessary.
- **Child 3-6 months:** 25-50micrograms/kg every 6 hours as necessary.
- **Child 6-12 months:** 75micrograms/kg every 4 hours as necessary.
- **Child 1-12 years:** 75-100micrograms/kg every 4 hours as necessary.
- **Child 12-18 years:** 2.5-5mg every 4 hours as necessary.

By SC or IM injection:

- **Child 12-18 years:** 5mg every 4 hours as necessary.

By intranasal or buccal route:

- **Child over 10kg:** 50-100micrograms/kg; maximum single dose 10mg.

By subcutaneous infusion:

- **Neonate:** 2.5-7micrograms/kg/hour
- **Child 1 month-12 years:** 12.5-25micrograms/kg/hour.

Breakthrough

By buccal or subcutaneous routes.

- 10% of total daily background dose as needed 1-4 hourly.

Dyspnoea

By buccal or subcutaneous routes

- Prescription as for pain, but at 50% of breakthrough dose.

Notes:

- Available as: injection (5mg, 10mg, 30mg, 100mg, 500mg ampoules).
- Diamorphine injection is licensed for the treatment of children who are terminally ill.
- Administration of diamorphine by the intranasal or buccal routes is not licensed.
- For intranasal or buccal administration of diamorphine use the injection powder reconstituted in water for injections.
- In neonates, dosage interval should be extended to 6 or 8 hourly depending on renal function and the dose carefully checked, due to increased sensitivity to opioids in the first year of life.
- In poor renal function, dosage interval may be extended or opioids given as required only to titrate against symptoms. Or consider Fentanyl.
- Reduce dose accordingly where respiratory insufficiency exists.
- Significant tolerance to opioids is unusual. If it occurs, the best solution is simply to increase the opioid dose to overcome tolerance (being mindful that the dose is not increased inappropriately too high when it would be better to opioid rotate earlier). If this is limited by adverse effects, opioid substitution should be carried out with a 25-50% reduction in oral morphine equivalence (OME). Adjuvants such as ketamine intended to reduced opioid tolerance are rarely indicated in paediatric palliative care.

Diazepam

Evidence: [48, 52, 54, 128, 174, 196, 197, 204, 209, 230-232]

Use:

- Short term anxiety relief.
- Agitation.
- Panic attacks.
- Relief of muscle spasm.
- Treatment of status epilepticus.

Dose and routes:

Short term anxiety relief, panic attacks and agitation

By mouth:

- **Child 2-12 years:** 2-3mg 3 times daily.
- **Child 12-18 years:** 2-10mg 3 times daily.

Relief of muscle spasm

By mouth:

- **Child 1-12 months:** initially 250microgram/kg twice a day.
- **Child 1-5 years:** initially 2.5mg twice a day.
- **Child 5-12 years:** initially 5mg twice a day.
- **Child 12-18 years:** initially 10mg twice a day; maximum total daily dose 40mg.

Status epilepticus

By IV injection over 3-5 min:

- **Neonate:** 300-400microgram/kg repeated once after 10 min if necessary.
- **Child 1 month-12 years:** 300-400microgram/kg repeated once after 10 min if necessary.
- **Child 12-18 years:** 10-20mg repeated once after 10 min if necessary.

By rectum (rectal solution):

- **Neonate:** 1.25-2.5mg repeated once after 10 min if necessary.
- **Child 1 month-2 years:** 5mg repeated once after 10 min if necessary.
- **Child 2-12 years:** 5-10mg repeated once after 10 min if necessary.
- **Child 12-18 years:** 10mg-20mg repeated once after 10 min if necessary.

Notes:

- Available as: tablets (2mg, 5mg, 10mg), oral solution (2mg/5mL, 5mg/5mL), rectal tubes (2.5mg, 5mg, 10mg), and injection (5mg/mL solution and 5mg/ml emulsion).
- Rectal tubes not licensed for children < 1 year old.

Diclofenac sodium

Evidence: [128, 197, 222]

Use:

- Mild to moderate pain and inflammation, particularly musculoskeletal disorders.

Dose and routes:

By mouth or rectum:

- **Neonates weighing 3.125kg or greater:** 0.3-1mg/kg 3 times daily (CC).
- **Child 6 months-18 years:** 0.3-1mg/kg (max. 50mg/dose) 3 times daily.

By IM or IV injection or infusion:

- **Child 2-18 years:** 0.3-1mg/kg 1-2 times a day; maximum of 150mg/day and for a maximum of 2 days.

Notes:

Will cause closure of ductus arteriosus; contraindicated in duct dependent congenital heart disease

- Not licensed for use in children < 1 year old.
- Suppositories not licensed for use in children < 6 years old (except in children > 1 year old with juvenile idiopathic arthritis).
- Smallest dose that can be given practically by rectal route is 3.125mg by cutting a 12.5mg suppository into quarters (CC).
- Injections not licensed for use with children.
- Solid forms of 50mg or more are not licensed for use in children.
- Available as: tablets/capsules (25mg, 50mg, 75mg modified release), dispersible tablets (10mg from a 'specials' manufacturer, 50mg), injection (25mg/mL Voltarol® for IM injection or IV infusion only), injection (37.5mg/ml Dyloject® for IM or IV bolus injection) and suppositories (12.5mg, 25mg, 50mg and 100mg).

Dihydrocodeine

Evidence: [128, 149, 199, 215, 222] EA, CC for injection

Use:

Mild to moderate pain (Step 2 of WHO Pain Ladder) in patients known to be able to benefit. For PRN use only – not suitable for management of background pain.

Dose and routes:

By mouth or subcutaneous or deep intramuscular injection:

- **Child 1-4 years:** 500microgram/kg every 4-6 hours.
- **Child 4-12 years:** 0.5-1mg/kg (max 30mg) every 4-6 hours.
- **Child 12-18 years:** 30mg (max 50mg by intramuscular or deep subcutaneous injection) every 4-6 hours.
- Modified release tablets used 12 hourly (use 1/2 of previous total daily dose for each modified release dose).

Notes:

- Most preparations not licensed for children under 4 years.
- Available as: tablets (30mg, 40mg), oral solution (10mg/5ml), injection (CD) (50mg/ml 1ml ampoule) and m/r tablets (60mg, 90mg, 120mg).
- Relatively constipating compared with morphine/diamorphine and has a ceiling analgesic effect.
- Dihydrocodeine is itself an active substance, not a pro-drug like codeine.
- Oral bioavailability 20%, so probably equipotent with codeine by mouth (but opinion varies), twice as potent as codeine by injection.
- Time to onset 30 mins, duration of action 4 hours for immediate release tablets.
- Side effects as for other opioids, plus paralytic ileus, abdominal pain, paraesthesia.
- Precautions: avoid or reduce dose in hepatic or renal failure.

Docusate

Evidence: [128]

Use:

- Constipation (faecal softener).

Dose and routes:

By mouth:

- **Child 6 months-2 years:** initially 12.5mg 3 times daily; adjust dose according to response.
- **Child 2-12 years:** initially 12.5-25mg 3 times daily; adjust dose according to response.
- **Child 12-18 years:** up to 500mg daily in divided doses; adjust dose according to response.

By rectum:

- **Child 12-18 years:** 1 enema as single dose.

Notes:

- Adult oral solution and capsules not licensed in children < 12 years.
- Oral preparations act within 1-2 days.
- Rectal preparations act within 20 min.
- Mechanism of action is emulsifying, wetting and mild stimulant.
- Doses may be exceeded on specialist advice.
- Available as capsules (100mg), oral solution (12.5mg/5mL paediatric, 50mg/5mL adult), and enema (120mg in 10g single dose pack).

Domperidone

Evidence: [19, 69, 71, 118, 120, 128, 129, 197]

Use:

- Nausea and vomiting where poor GI motility is the cause.
- Gastro-oesophageal reflux resistant to other therapy.

Dose and routes:

For nausea and vomiting

By mouth:

- **> 1 month and body-weight ≤ 35kg:** initially 250-500microgram/kg 3-4 times daily; maximum. 2.4mg/kg in 24 hours.
- **Body-weight > 35kg:** initially 10-20mg 3-4 times daily; maximum. 80mg in 24 hours.

By rectum:

- **Body-weight 15-35kg:** 30mg twice a day.
- **Body-weight > 35kg:** 60mg twice a day.

For gastro-oesophageal reflux and gastrointestinal stasis

By mouth:

- **Neonate:** 100-300 micrograms/kg 4-6 times daily before feeds.
- **Child 1 month-12 years:** 200-400 micrograms/kg (max. 20 mg) 3-4 times daily before food.
- **Child 12-18 years:** 10-20 mg 3-4 times daily before food.

Notes:

- Only licensed in children for the management of nausea and vomiting following radiotherapy or chemotherapy.
- Not licensed for use in gastro-intestinal stasis; not licensed for use in children for gastro-oesophageal reflux disease.
- QT-interval prolongation reported.

- Reduced ability to cross blood brain barrier, so less likely to cause extrapyramidal side effects.
- Available as: tablets (10mg), oral solution (5mg/5mL), and suppositories (30mg).

Entonox (nitrous oxide)

Evidence: [128, 233]

Use:

- As self-regulated analgesia without loss of consciousness.
- Particularly useful for painful dressing changes.

Dose and routes:

By inhalation:

- **Child usually > 5 years old:** self-administration using a demand valve. Up to 50% in oxygen according to child's needs.

Notes:

- Is normally used as a light anaesthesia.
- Rapid onset and then offset.
- Should only be used as self-administration using a demand valve; all other situations require specialist paediatric anaesthetist.
- Is dangerous in the presence of pneumothorax or intracranial air after head injury.
- Prolonged use can cause megaloblastic anaemia.
- May be difficult to make available in hospice settings especially if needed infrequently, due to training, governance and supply implications.

Erythromycin

Evidence: [15, 128, 234] SR

Use:

- Gastrointestinal stasis (motilin receptor agonist).

Dose and routes:

By mouth:

- **Neonate:** 3mg/kg 4 times daily.
- **Child 1 month-18 years:** 3mg/kg 4 times daily.

Notes:

- Not licensed for use in children with gastrointestinal stasis.
- Available as: tablets (250mg, 500mg) and oral suspension (125mg/5mL, 250mg/5mL).
- Interacts with many antiepileptics by reducing metabolism.

Etamsylate

Evidence: [196]

Use:

- Treatment of haemorrhage, including surface bleeding from ulcerating tumours.

Dose and routes:

By mouth:

- **> 18 years:** 500mg 4 times daily, indefinitely or until a week after cessation of bleeding.

Notes:

- Not licensed for use with children with haemorrhage.
- Available as: tablets (500mg).

Fentanyl

Evidence: [25, 128, 199, 200, 229, 236-245]

Use:

- Step 3 WHO pain ladder once dose is titrated.

Dose and routes:

By transmucosal application (lozenge with oromucosal applicator), buccal or sublingual tablet or intranasal:

- **Child 2-18 years and greater than 10kg:** 15-20micrograms/kg as a single dose, titrated to a maximum dose 400micrograms (higher under specialist supervision).

By transdermal patch or continuous infusion:

- Based on oral morphine dose equivalent (given at 24-hour totals).

Product monograph:

- Oral morphine 45mg = 12 micrograms/hour patch of fentanyl.
- Oral morphine <90mg = 25 micrograms/hour patch of fentanyl.
- Oral morphine 135-189mg = 50 micrograms/hour patch of fentanyl.
- Oral morphine 225-314mg = 75 micrograms/hour patch of fentanyl.

Notes:

- Injection not licensed for use in children less than 2 years of age. Lozenges and buccal tablets are not licensed for use in children. Intranasal fentanyl is an unlicensed route of administration.
- The main advantage of fentanyl over morphine in children is its availability as a transdermal formulation.

- It can simplify analgesic management in patients with poor, deteriorating or even absent renal function.
- It is a synthetic opioid, very different in structure from morphine, and therefore ideal for opioid substitution.
- Evidence that it is less constipating than morphine has not been confirmed in more recent studies [235].
- The patch formulation is not usually suitable for the initiation or titration phases of opioid management in palliative care since the patches represent large increments and because of the time lag to achieve steady state.
- The usefulness of buccal or sublingual tablets in children is limited by the dose availability. The opioid morphine equivalence of the smallest buccal or sublingual tablet (100microgram) is 15mg, meaning it is suitable breakthrough only for children receiving a total daily dose equivalent of 90mg morphine or more.
- Effectiveness of buccal preparations depends upon a moist mouth. A drink should be offered pre buccal tablet.
- The usefulness of lozenges in children is also limited by the dose availability. The opioid morphine equivalence of the smallest lozenge (200microgram) is 30mg, meaning it is suitable breakthrough only for children receiving a total daily dose equivalent 180mg morphine or more. Older children will often choose to remove the lozenge before it is completely dissolved, giving them some much-valued control over their analgesia. Note lozenge must be rotated in buccal pouch, not sucked. Unsuitable in pain in advanced neuromuscular disorders where independent physical rotation of lozenge not possible.
- Pharmacokinetics of fentanyl intranasally are favourable but it is not always practical and/or well tolerated in children.

Available as fentanyl citrate:

- Sublingual tablets (100 micrograms, 200 micrograms, 300 micrograms, 400 micrograms, 600 micrograms, 800 micrograms Abstral®).
- Buccal tablets (100micrograms, 200micrograms, 400micrograms, 600micrograms, 800micrograms Effentora®).
- Intranasal spray (50 micrograms/metered spray, 100 micrograms/metered spray, 200 micrograms/metered spray Instanyl®).
- Lozenge with oromucosal applicator (200 micrograms, 400 micrograms, 600 micrograms, 800 micrograms, 1.2 mg, 1.6 mg Actiq®).
- Patches (12microgram/hour, 25microgram/hour, 50microgram/hour, 75microgram/hour, 100microgram/hour).

Fluconazole

Evidence: [128, 246]

Use:

- Mucosal candidiasis infection.

Dose and routes:

By mouth or intravenous infusion:

- **Neonate under 2 weeks:** 3-6mg/kg on first day then 3mg/kg every 72 hours.
- **Neonate over 2 weeks:** 3-6mg/kg on first day then 3mg/kg every 48 hours.
- **Child 1 month-12 years:** 3-6mg/kg on first day then 3mg/kg (maximum 100mg) daily.
- **Child 12-18 years:** 50-100mg daily.

Notes:

- Use for up to 7-14 days in oropharyngeal candidiasis.
- For 14-30 days in other mucosal infection.
- Different duration of use in severely immunocompromised patients.
- Available as: capsules (50mg, 150mg, 200mg) and oral suspension (50mg/5mL, 200mg/mL).

Fluoxetine

Evidence: [128, 172, 180-184, 196, 247, 248]

Use:

- Major depression.

Dose and routes:

By mouth:

- **Child 8-18 years:** initial dose 10mg once a day. May increase after 3-4 weeks if necessary to a maximum of 20mg once daily.

Notes:

- Licensed for use in children from 8 years of age.
- Use with caution in children ideally with specialist psychiatric advice.
- Increase in anxiety for first 2 weeks.
- Onset of benefit 3-4 weeks.
- Consider long half-life when adjusting dosage.
- May also help for neuropathic pain and intractable cough.
- Available as: capsules (20mg) and oral liquid (20mg/5mL).

Gabapentin

Evidence: [128, 196, 213, 215, 249, 250] CC, SR

Use:

- Adjuvant in neuropathic pain.

Dose and routes:

By mouth:

- **Child > 2 years**
- Day 1 10mg/kg (maximum single dose 300mg).
- Day 2 10mg/kg twice daily.
- Day 3 onwards 10mg/kg three times daily.
- Increase further if necessary to maximum of 20mg/kg/dose (maximum single dose 600mg).
- **From 12 years:** the maximum daily dose can be increased according to response to a maximum of 3600mg/day.

Notes:

- Not licensed for use in children with neuropathic pain.
- Speed of titration after first 3 days varies between increases every 3 days for fast regime to increase every one to two weeks in debilitated children or when on other CNS depressants.
- No consensus on dose for neuropathic pain. Doses given based on doses for partial seizures and authors' experience.
- Capsules can be opened but have a bitter taste.
- Available as: capsules (100mg, 300mg, 400mg) and tablets (600mg, 800mg).

Gaviscon®

Evidence: [128, 129, 196]

Use:

- Gastro-oesophageal reflux, dyspepsia, and heartburn.

Dose and routes:

By mouth:

- **Neonate-2 years, body weight < 4.5kg:** 1 dose (half dual sachet) when required mixed with feeds or water for breast fed babies, max. 6 doses in 24 hours.
- **Neonate-2 years body weight > 4.5kg:** 2 doses (1 dual sachet) when required mixed with feeds or water for breast fed babies, max. 6 doses in 24 hours.
- **Child 2-12 years:** 2.5-5mL or 1 tablet after meals and at bedtime.
- **Child 12-18 years:** 5-10mL or 1-2 tablets after meals and at bedtime.

Notes:

- Available as: tablets, liquid (Gaviscon® Advance), and infant sachets (comes as dual sachets, each half of dual sachet is considered one dose).
- Gaviscon Infant not to be used with feed thickeners, nor with excessive fluid losses, (eg, fever, diarrhoea, vomiting).

Glycerol (glycerin)

Evidence: [128, 196, 222]

Use:

- Constipation.

Dose and routes:

By rectum:

- **Neonate:** tip of a glycerol suppository (slice a small chip of a 1g suppository with a blade).
- **Child 1 month-1 year:** 1g infant suppository as required.
- **Child 1-12 years:** 2g child suppository as required.
- **Child 12-18 years:** 4g adult suppository as required.

Notes:

- Moisten with water before insertion.
- Hygroscopic and lubricant actions. May be a rectal stimulant too.
- Response usually in 20 minutes to 3 hours.
- Available as: suppositories (1g, 2g, and 4g).

Glycopyrronium bromide

Evidence: [58-60, 128]

Use:

- Control of upper airways secretion and hypersalivation.

Dose and routes:

By mouth:

- **Child 1 month-18 years:** 40-100microgram/kg 3-4 times daily, max. single dose of 2mg.

Subcutaneous:

- **Child 1 month-12 years:** 4-10micrograms/kg (max. 200micrograms) 3 to 4 times daily
- **Child 12-18 years:** 200micrograms every 4 hours when required.

Continuous subcutaneous infusion:

- **Child 1 month-12 years:** 10-40micrograms/kg/24 hours (max. 1.2mg/24 hours).
- **Child 12-18 years:** 0.6-1.2mg/24 hours.

Notes:

- Not licensed for use in children for control of upper airways secretion and hypersalivation.
- Excessive secretions can cause distress to the child, but more often cause distress to those around him.
- Treatment is more effective if started before secretions become too much of a problem.
- Glycopyrronium does not cross the blood brain barrier and therefore has fewer side effects than hyoscine hydrobromide, which is also used for this purpose. Also fewer cardiac side effects.
- Slower onset response than with hyoscine hydrobromide or butylbromide.
- For oral administration injection solution may be given or crushed tablets suspended in water.
- Available as: tablets (1mg, 2mg via an importation company as the tablets are not licensed in the UK): dosing often too inflexible for children, costly and can be difficult to obtain. Injection (200microgramcg/mL 1mL ampoules) can also be used orally (unlicensed route). Oral solution can also be prepared extemporaneously from glycopyrronium powder and obtained from a 'specials' manufacturer.

Haloperidol

Evidence: [128, 175-177, 196, 197, 228, 251, 252]

Use:

- Nausea and vomiting where cause is metabolic or in tricky or difficult to manage cases.
- Restlessness and confusion.
- Intractable hiccups.
- Psychosis, hallucination.

Dose and routes:

By mouth for nausea and vomiting:

- **Child 12-18 years:** 1.5mg once daily at night, increased to 1.5mg twice a day; max. 5mg twice a day.

By mouth for restlessness and confusion:

- **Child:** 10-20microgram/kg every 8-12 hours.

By mouth for intractable hiccups:

- **Child 12-18 years:** 1.5mg 3 times daily.

By continuous IV or SC infusion (for any indication):

- **Child 1 month-12 years:** 25-85microgram/kg over 24 hours.
- **Child 12-18 years:** 1.5-5mg over 24 hours (higher doses under specialist advise).

Notes:

- D2 receptor antagonist and typical antipsychotic.
- Not licensed for use in children with nausea and vomiting, restlessness and confusion or intractable hiccups.
- Useful as long acting – once daily dosing often adequate.
- Available as: tablets (500microgram, 1.5mg, 5mg, 10mg, 20mg), capsules (500microgram), oral liquid (1mg/mL, 2mg/mL), and injection (5mg/mL).

Hydromorphone

Evidence: CC, EA, [128, 196, 212, 215, 239, 240, 253, 254]

Use:

- Alternative opioid analgesic for severe pain (Step 3 WHO Pain Ladder) especially if intolerant to other strong opioids.
- Antitussive.

Dose and routes:

By mouth:

- **Child 12-18 years:** initially 1.3mg or 22-55 micrograms/ kg per dose every 4 hours increasing as required. Modified release capsules: initially 4mg/dose every 12 hours increasing if necessary.

By IV or SC infusion:

- Convert from oral (halve dose for equivalence).

Notes:

- Hydrated morphine ketone; effects are common to the class of mu agonist analgesics.
- Injection is not licensed in the UK. May be possible to obtain via a specialist importation company but as hydromorphone is a CD this is not a straightforward process.
- Oral bioavailability 37-62% (wide inter-individual variation), onset of action 15 min for SC, 30min for oral. Peak plasma concentration 1 hour orally. Plasma half life 2.5 hours early phase, with a prolonged late phase. Duration of action 4-5 hours.
- Oral form licensed for use in children with cancer pain.
- Potency ratios seem to vary more than for other opioids. This may be due to inter-individual variation in metabolism or bioavailability.
- Conversion of oral morphine to Hydromorphone: divide morphine dose by 9.
- Conversion of IV Morphine to Hydromorphone: divide morphine dose by 7.
- Modified release capsules given 12 hourly.
- Capsules (both types) can be opened and contents sprinkled on soft food.
- Available as: capsules (1.3mg, 2.6mg) and modified release capsules (2mg, 4mg, 8mg, 16mg, 24mg).

Hyoscine butylbromide

Evidence: [59, 60, 128, 196]

Use:

- Adjuvant where pain is caused by spasm of the gastrointestinal or genitourinary tract.
- Management of secretion, especially where drug crossing the blood brain barrier is an issue.

Dose and routes:

By mouth:

- **Child 1 month-2 years:** 300-500micrograms/kg (max. 5mg/dose) 3-4 times daily.
- **Child 2-5 years:** 5mg 3-4 times daily.
- **Child 5-12 years:** 10mg 3-4 times daily.
- **Child 12-18 years:** 10-20mg 3-4 times daily.

By IM or IV injection:

- **Child 1 month-4 years:** 300-500micrograms/kg (max. 5mg) 3-4 times daily.
- **Child 5-12 years:** 5-10mg 3-4 times daily.
- **Child 12-18 years:** 10-20mg 3-4 times daily.

By continuous subcutaneous infusion

- **Child 1 month-4 years:** 1.5mg/kg/24 hours (max 15mg/24 hours).
- **Child 5-12 years:** 30mg/24 hours.
- **Child 12-18 years:** up to 60-80mg/24 hours.
- Higher doses may be needed; doses used in adults range from 20-120mg/24 hours (maximum dose 300mg/24 hours).

Notes:

- Does not cross blood brain barrier (unlike hyoscine hydrobromide), hence no central antiemetic effect and doesn't cause drowsiness.
- Tablets are not licensed for use in children < 6 years old.
- Injection is not licensed for use in children.
- The injection solution may be given orally. Injection solution can be stored for 24 hours in the refrigerator.
- IV injection should be given slowly over 1 minute and can be diluted with glucose 5% or sodium chloride 0.9%.
- Available as: tablets (10mg) and injection (20mg/mL).

Hyoscine hydrobromide

Evidence: [58-60, 128, 196, 222]

Use:

- Control of upper airways secretion and hypersalivation.

Dose and routes:

By mouth or sublingual:

- **Child 2-12 years:** 10micrograms/kg; max. 300 micrograms 4 times daily.
- **Child 12-18 years:** 300 micrograms 4 times daily.

By transdermal route:

- **Neonate:** quarter of a patch every 72 hours.
- **Child 1 month-3 years:** quarter of a patch every 72 hours.
- **Child 3-10 years:** half of a patch every 72 hours.
- **Child 10-18 years:** one patch every 72 hours.

By SC or IV injection or infusion:

- **Child 1 month-18 years:** 10 micrograms/kg (max. 600 micrograms) every 4-8 hours.

Notes:

- Not licensed for use in children for control of upper airways secretion and hypersalivation.
- Higher doses often used under specialist advise.
- Can cause delirium or sedation (sometimes paradoxical stimulation) with repeated dosing.
- Constipating.
- Apply patch to hairless area of skin behind ear.
- Some specialists do not advise that transdermal patches should not be cut – however, the manufacturers of Scopoderm TTS patch state that it is safe to do this.
- Injection solution may be administered orally
- Available as: tablets (150micrograms, 300micrograms), patches (releasing 1mg/72 hours), and injection (400microgram/mL, 600microgram/mL).

Ibuprofen

Evidence: [128, 129, 196, 255]

Use:

- Simple analgesic.
- Pyrexia.
- Adjuvant for musculoskeletal pain.

Dose and routes:

By mouth:

- **Neonate:** 5mg/kg/dose every 12 hours.
- **Child 1-3 months:** 5mg/kg 3-4 times daily preferably after food.
- **Child 3-6 months:** 50mg 3 times daily preferably after food; in severe conditions up to 30mg/kg daily in 3-4 divided doses.
- **Child 6 months-1 year:** 50 mg 3-4 times daily preferably after food; in severe conditions up to 30 mg/kg daily in 3-4 divided doses.
- **Child 1-4 years:** 100 mg 3 times daily preferably after food; in severe conditions up to 30 mg/kg daily in 3-4 divided doses.
- **Child 4-7 years:** 150 mg 3 times daily, preferably after food. In severe conditions, up to 30mg/kg daily in 3-4 divided doses. Maximum daily dose 2.4g.
- **Child 7-10 years:** 200mg 3 times daily, preferably after food. In severe conditions, up to 30mg/kg daily in 3-4 divided doses. Max. daily dose 2.4g.
- **Child 10-12 years:** 300mg 3 times daily, preferably after food. In severe conditions, up to 30mg/kg daily in 3-4 divided doses. Maximum daily dose 2.4g.
- **Child 12-18 years:** 300-400mg 3-4 times daily preferably after food. In severe conditions the dose may be increased to a maximum of 2.4g/day .

Pain and inflammation in rheumatic diseases, including idiopathic juvenile arthritis:

- **Child aged 3 months-8 years and body weight > 5kg:** 30-40mg/kg daily in 3-4 divided doses preferably after food. Maximum 2.4g daily.

In systemic juvenile idiopathic arthritis:

- Up to 60mg/kg daily in 4-6 divided doses up to a maximum of 2.4g daily (off-label).

Notes:

- **Will cause closure of ductus arteriosus; contraindicated in duct dependent congenital heart disease.**
- Orphan drug licence for closure of ductus arteriosus in preterm neonate.
- Caution in asthma and look out for symptoms and signs of gastritis.
- Consider use of proton pump inhibitor in prolonged use of ibuprofen.
- Liquid and plain tablets are not licensed for use in children < 7kg or < 1 year old.
- Topical preparations and granules are not licensed for use in children.
- Available as: tablets (200mg, 400mg, 600mg), capsule (300mg MR), oral syrup (100mg/5mL), granules (600mg/sachet), and spray, creams and gels (5%).

Ipratropium bromide

Evidence: RE [128]

Use:

- Wheezing/breathlessness caused by bronchospasm.

Dose and routes:

Nebulised solution

- **Child less than 1 year:** 125micrograms 3 to 4 times daily.
- **Child 1-5 years:** 250micrograms 3 to 4 times daily.
- **Child 5-12 years:** 500micrograms 3 to 4 times daily.
- **Child over 12 years:** 500micrograms 3 to 4 times daily.

Aerosol Inhalation

- **Child 1 month-6 years:** 20micrograms 3 times daily.
- **Child 6-12 years:** 20-40micrograms 3 times daily.
- **Child 12-18 years:** 20-40micrograms 3-4 times daily.

Notes:

- Available as: nebuliser solution (250micrograms in 1ml, 500micrograms in 2ml), aerosol inhaler (20microgram per metered dose).
- Inhaled product should be used with a suitable spacer device, and the child/ carer should be given appropriate training.
- In acute asthma, use via an oxygen driven nebuliser.
- In severe acute asthma, dose can be repeated every 20-30 minutes in first two hours, then every 4-6 hours as necessary.

Ketamine

Evidence: [240, 256-263] CC, EA

Use:

- Adjuvant to a strong opiate for neuropathic pain.
- To reduce NMDA wind-up pain and opioid tolerance.

Dose and routes:

By mouth or sublingual:

- **Child 1 month-12 years:** Starting dose 150 microgram/kg, as required or regularly 6-8 hourly; increase in increments of 150 microgram/kg up to 400 microgram/kg as required. Doses equivalent to 3mg/kg have been reported in adults.
- **Over 12 years and adult:** 10mg as required or regularly 6-8 hourly; increase in steps of 10mg up to 50mg as required. Doses up to 200mg 4 times daily reported in adults.

By continuous SC or IV infusion:

- **Child 1 month-adult:** Starting dose 40 microgram/kg/hour. Increase according to response; usual maximum 100 microgram/kg/hour. Doses up to 1.5mg/kg/hour in children and 2.5mg/kg/hour in adults have been reported.

Notes:

- NMDA antagonist.
- Specialist use only.
- Not licensed for use in children with neuropathic pain.
- Higher doses (bolus injection 1-2mg/kg, infusions 600-2700 microgram/kg/hour) used as an anaesthetic e.g. for short procedures.
- Sublingual doses should be prepared in a maximum volume of 2ml. The bitter taste may make this route unpalatable.
- Enteral dose equivalents may be as low as 1/3 IV or SC dose because ketamine is potentiated by hepatic first pass metabolism.
- Agitation, hallucinations, anxiety, dysphoria and sleep disturbance are recognised side effects. These may be less common in children and when sub-anaesthetic doses are used.
- Dilute in 0.9% saline for subcutaneous or intravenous infusion.
- Can be administered as a separate infusion or by adding to opioid infusion/ PCA/NCA.
- Can also be used intranasally and as a topical gel.
- Available as: injection (10mg/mL, 50mg/mL, 100mg/mL) and oral solution 50mg in 5 ml (from a 'specials' manufacturer). Injection solution may be given orally. Mix with a flavoured soft drink to mask the bitter taste.

Lactulose

Evidence: [17, 24, 128, 196, 197, 199, 222]

Use:

- Constipation.
- Hepatic encephalopathy and coma.

Dose and routes:

Constipation

By mouth: initial dose twice daily then adjusted to suit patient:

- **Neonate:** 2.5ml/dose twice a day.
- **Child 1 month to 1 year:** 2.5ml/dose 1-3 times daily.
- **Child 1 year to 5 years:** 5ml/dose 1-3 times daily.
- **Child 5-10 years:** 10ml/dose 1-3 times daily.
- **Child 10-18 years:** 15ml/ dose 1-3 times daily.

Hepatic encephalopathy

- **12-18 years:** use 30-50ml three times daily as initial dose. Adjust dose to produce 2-3 soft stools per day.

Notes:

- Side effects may cause nausea and flatus, with colic especially at high doses. Initial flatulence usually settles after a few days.
- Precautions and contraindications; Galactosaemia, intestinal obstruction. Caution in lactose intolerance.
- Often used as first line treatment but a macrogol is often better in palliative care. Sickly taste.
- Onset of action can take 36-48 hours.
- May be taken with water and other drinks.
- Relatively ineffective in opioid induced constipation: need a stimulant.
- 15ml/ day is 14kcal so unlikely to affect diabetics.
- Does not irritate or directly interfere with gut mucosa.
- Available as oral solution 10g/ 15ml. Cheaper than Movicol (macrogol).
- Licensed for constipation in all age groups. Not licensed for hepatic encephalopathy in children.

Levomepromazine

Evidence: [127, 128, 178, 196, 199] CC, EA

Use:

- Broad spectrum antiemetic where cause is unclear, or where probably multifactorial.
- Second line if specific antiemetic fails.
- May be of benefit in a very distressed patient with severe pain unresponsive to other measures.
- Sedation for terminal agitation, particularly in end of life care.

Dose and routes:

Used as antiemetic

By mouth:

- **Child 2-12 years:** starting dose 0.1-1mg/kg; max 25mg once or twice daily.
- **Child 12-18 years:** 6.25-25mg once or twice daily.

By continuous IV or SC infusion over 24 hours:

- **Child 1 month-12 years:** 100-400microgram/kg over 24 hours.
- **Child 12-18 years:** 5-25mg over 24 hours.

Used for sedation

By SC infusion over 24 hours:

- **Child 1 year-12 years:** 0.35-3mg/kg over 24 hours.
- **Child 12-18 years:** 12.5-200mg over 24 hours.

Analgesia

- Stat dose 0.5mg/kg by mouth or SC. Titrate dose according to response; usual maximum daily dose in adults is 100mg SC or 200mg by mouth.

Notes:

- Licensed for use in children with terminal illness for the relief of pain and accompanying anxiety and distress.
- Low dose often effective as antiemetic. Titrate up as necessary. Higher doses very sedative.
- For SC infusion dilute with sodium chloride 0.9%.
- Some experience in adults with low dose used buccally as antiemetic (e.g. 1.5mg three times daily as needed).
- Can cause hypotension particularly with higher doses.
- Available as: tablets (25mg) and injection (25mg/mL). An extemporaneous oral solution may be prepared.

Lidocaine (Lignocaine) patch

Evidence: [196, 264-266] CC, EA

Use:

- Localised neuropathic pain.

Dose and routes:

Topical:

- **Child 3-18 years:** apply 1-2 plasters to affected area(s). Apply plaster once daily for 12 hours followed by 12 hour plaster free period.
- **Adult 18 years or above:** up to 3 plasters to affected area(s). Apply plaster once daily for 12 hours followed by 12 hour plaster free period.

Notes:

- Not licenced for use in children or adolescents under 18 years.
- Available as 700mg/medicated plaster (5% w/v lidocaine).
- Cut plaster to size and shape of painful area. Do NOT use on broken or damaged skin. If skin is unbroken and normal hepatic function risk of systemic absorption is low.
- Maximum recommended number of patches in adults currently is 3 per application.
- Doses extrapolated from BNF 2010 March.

Lomotil® (co-phenotrope)

Evidence: [40, 41, 43, 128, 196]

Use:

- Diarrhoea from non-infectious cause.

Dose and routes:

By mouth:

- **Child 2-4 years:** half tablet 3 times daily.
- **Child 4-9 years:** 1 tablet 3 times daily.
- **Child 9-12 years:** 1 tablet 4 times daily.
- **Child 12-16 years:** 2 tablets 3 times daily.
- **Child 16-18 years:** initially 4 tablets then 2 tablets 4 times daily.

Notes:

- Not licensed for use in children < 4 years.
- Available only as tablets Co-Phenotrope (2.5mg diphenoxylate hydrochloride and 25microgram atropine sulphate).
- Tablets may be crushed.

Loperamide

Evidence: [128, 196, 267, 268]

Use:

- Diarrhoea from non-infectious cause.

Dose and routes:

By mouth:

- **Child 1 month-1 year:** 100-200microgram/kg twice daily, 30 min before feeds; increase as necessary up to 2mg/kg daily in divided doses.
- **Child 1-12 years:** 100-200microgram/kg (max. 2mg) 3-4 times daily; increase as necessary up to 1.25mg/kg daily in divided doses (max. 16mg daily.)
- **Child 12-18 years:** 2-4mg 2-4 times daily (max. 16mg daily).

Notes:

- Not licensed for use in children with chronic diarrhoea.
- Capsules not licensed for use in children < 8 years.
- Syrup not licensed for use in children < 4 years.
- Available as tablets (2mg) and oral syrup (1mg/5mL).

Lorazepam

Evidence: [128, 175, 269] CC, EA

Use:

- Background anxiety.
- Agitation and distress.
- Adjuvant in cerebral irritation.
- Background management of dyspnoea.
- Muscle spasm.
- Status epilepticus.

Dose and routes for all indications except status epilepticus:

By mouth:

- **Child < 2 years:** 25microgram/kg 2-3 times daily.
- **Child 2-5 years:** 0.5mg 2-3 times daily.
- **Child 6-10 years:** 0.75mg 3 times daily.
- **Child 11-14 years:** 1mg 3 times daily.
- **Child 15-18 years:** 1-2mg 3 times daily.

Sublingual

- **Children of all ages:** 25-50micrograms/kg single dose
- **Usual adult dose:** 500microgram-1mg as a single dose, repeat as required.

Notes:

- Well absorbed sublingual, fast effect.
- Potency in the order of 10 times that of diazepam per mg as anxiolytic/sedative.
- Most children will not need more than 0.5mg for trial dose.
- Injectable form can also be given sublingual in same doses (off-label).
- May cause drowsiness and respiratory depression if given in large doses.
- Caution in renal and hepatic failure.
- Available as tablets (1mg, scored, 2.5mg) and injection (4mg in 1ml).
- Not licensed for use in children for these indications.
- Tablets licensed in children over 5 years for premedication, injection not licensed in children less than 12 years except for treatment of status epilepticus.

Melatonin

Evidence: [128, 196, 270-285]

Use:

- Sleep disturbance due to disruption of circadian rhythm (not anxiolytic).

Dose and routes:

By mouth:

- **Child 1 month-18 years:** initially 2-3mg, increasing every 1-2 weeks dependent on effectiveness up to max. 10mg daily (higher doses have been used).

Notes:

- Not licensed for use in children.
- Specialist use only.
- Some prescribers use a combination of immediate release and m/r tablets to optimise sleep patterns.
- Only licensed formulation in the UK is 2mg m/r tablets (Circadin). Various unlicensed formulations, including an immediate release preparation are available from 'specials' manufacturers or specialist importing companies.

Methadone

Evidence: [128, 196, 199, 212, 222, 286-296]

Use:

- Major opioid (step 3), particularly in neuropathic pain.

Dose and routes:

Dose unknown, but the following doses have been used.

Used as breakthrough with other major opioid as background.

Seek specialist palliative medicine advice and guidelines.

By mouth:

- When used as an 'adjunct' to long acting major opioid, start with once day dose at night at 0.1mg/kg/dose with **maximum of 5mg per dose**. Then increase to a twice daily dose, and if necessary to three times daily, slowly over the course of one week. At this point, if there has been analgesic benefit from Methadone, the other major opioid may be reduced if there is somnolence or adverse reactions as probably excess major opioid determining these side effects.
- **Child 2-12 years:** 0.1mg/kg/dose as needed, max 8 hourly.
- **Child 12-18 years:** 3-5mg as needed, max 8 hourly.

Used in opioid substitution

Seek specialist palliative medicine advice and guidelines:

- **There is no single agreed approach or opioid equivalency.**
- **The opioid equivalency ratio of morphine to methadone appears to change as the dose of morphine increases.**
- **In the interest of safety we recommend a morphine to methadone conversion ratio of between 20:1 and 10:1 i.e. 5-10%**
- **Dangers of sudden overdose (secondary peak phenomenon) so rotation to methadone should only be undertaken on inpatients.**
- **Caution: rotation to methadone is a specialist palliative medicine skill and should only be undertaken in close collaboration with the local specialist team. There is a risk of unexpected death through overdose.**

Use in opioid switch

- When switching from oral morphine to oral methadone.
- Morphine is stopped abruptly when methadone is started.

If switching from:

- Normal-release morphine, give the first dose of methadone \geq 2 hours (pain present) or 4 hours (pain-free) after last dose of morphine.
- Modified release morphine, give the first dose of methadone \geq 6 hours (pain present) or 12 hours (pain-free) after the last dose of a 12 hour preparation, or \geq 12 hours (pain present) or 24 hours (pain-free) after the last dose of a 24 hour preparation
- **For regular dose;** take 10-20% of 24 hour oral morphine dose. If you suspect tolerance or rapid dose escalation of previous major opioid, recommend start at 5-10% of the previous total 24 hour oral morphine dose. This gives the total daily dose of methadone and then divide by 3 for three times daily oral dose. (some people use twice daily; but we would consider that three times daily works better initially). (Maximum total daily dose of 30 mg is considered reasonable).
- Consider a short acting opioid for breakthrough pain. Recent research would suggest using methadone as a 'background opioid' and using an alternative major opioid (ie Oxycodone, Fentanyl) for breakthrough pain doses if required. If necessary a fourth dose of methadone may be started after 3-4 days.

Converting oral methadone to SC/IV or CSCI/CIV methadone

- Calculate the total daily dose of oral methadone and halve it (50%). This will be the 24 hour methadone dose.
- If CSCI methadone causes a skin reaction, double the dilution and change the syringe every 12 hours.
- The breakthrough dose of SC/IV methadone will be 5-10% of the 24 hour SC/IV dose. This can be given 3 hourly as needed.
- DO NOT increase the 24 hour methadone dose on the basis of previous 24 hour requirement. If more than 2 when required doses are needed daily, the 24 hour dose should be increased every 3-5 days, guided by as required use.

Converting other CSCI/CIVI opioids to CSCI/CIVI methadone

- The safest approach is to follow the method for oral switching, using bolus injections of SC/IV methadone instead of oral doses.
- Convert the opioid 24 hour CSCI/CIVI dose to its oral morphine equivalent and determine the oral methadone dose.
- The SC/IV dose of methadone is 50% the oral dose; the maximum initial dose of SC/IV methadone will be 10mg.

Notes:

- Not licensed for use in children with neuropathic pain.
- Use of methadone is complicated by variable equivalency with other opioids, and by idiosyncratic distribution that can result in sudden toxicity (secondary peak phenomenon).
- Following concerns regarding methadone and sudden death from prolongation of QT interval it is recommended that patients have an ECG prior to initiation of treatment if they have any risk factors or are having intravenous treatment.
- Carbamazepine, phenobarbital, phenytoin and rifampicin increase the metabolism of methadone; amitriptyline, cimetidine, ciprofloxacin, fluconazole and SSRIs decrease its metabolism.
- Efavirenz, lopinavir-ritonavir, nelfinavir, nevirapine and ritonavir (all antiretroviral agents) may reduce plasma methadone concentrations.
- Close supervision and monitoring are required when commencing regular use.
- It can be difficult to convert patient off methadone on to other opiates.
- Current practice is usually to admit to a specialist inpatient unit for 5-6 days of regular treatment or titrate orally at home with close supervision.
- Available as: linctus (2mg/5mL), mixture (1mg/mL), solution (1mg/mL, 5mg/mL, 10mg/mL, and 20mg/mL), tablets (5mg), and injection (10mg/mL).

Methylnaltrexone

Evidence: [196, 297]

Use:

- Opioid induced constipation in palliative care not responsive to other laxatives.

Dose and routes:

- Subcutaneous injection: 150microgram/kg on alternate days.
- Patients may receive two consecutive doses 24 hours apart, only when there has been no response (bowel movement) to the dose on the preceding day.

Notes:

- Constipation in palliative care is usually multifactorial and other laxatives are often required in addition; reduce dose by 50% in severe renal impairment.
- Does not cross blood brain barrier.
- Not licenced for use under 18 years.
- Available as: subcutaneous injection 20mg/mL.
- Contraindicated in bowel obstruction.

Metoclopramide

Evidence: [19, 67, 91, 93, 94, 120, 123, 128, 129, 196, 222, 298, 299]

Use:

- Antiemetic if vomiting caused by gastric compression or hepatic disease.
- Prokinetic for slow transit time (not in complete obstruction or with anticholinergics).
- Hiccups.

Dose and routes:

By mouth, IM injection, or IV injection:

- **Neonate:** 100microgram/kg every 6-8 hours (by mouth or IV only).
- **Child 1 month-1 year and body weight up to 10kg:** 100microgram/kg (max. 1mg/dose) twice daily.
- **Child 1-3 years and body weight up to 10-14kg:** 1mg 2-3 times daily.
- **Child 3-5 years and body weight up to 15-19kg:** 2mg 2-3 times daily.
- **Child 5-9 years and body weight up to 20-29kg:** 2.5mg 3 times daily.
- **Child 9-10 years and body weight up to 30-60kg:** 5mg 3 times daily.
- **Child 15-18 years and body weight over 60kg:** 10mg 3 times daily.

Notes:

- Not licensed for use in neonates as a prokinetic.
- Available as: tablets (10mg), oral solution (5mg/5mL) and injection (5mg/mL).
- Use may be limited by dystonic side effects

Metronidazole topically

Evidence: [128, 196]

Use:

- Odour associated with fungating wound or lesion.

Dose and routes:

By topical application:

- Apply to clean wound 1-2 times daily and cover with non-adherent dressing.
- Cavities: smear gel on paraffin gauze and pack loosely.

Notes:

- Anabact® not licensed for use in children < 12 years.
- Metrogel® not licensed for use with children.
- Available as: gel (Anabact® 0.75%, Metrogel® 0.75%, MetrotopR 0.8%).

Miconazole oral gel

Evidence: [128]

Use:

- Oral and intestinal fungal infection.

Dose and routes:

By mouth:

- **Neonate:** 1mL 3-4 times a day.
- **Child 1 month-2 years:** 2.5mL twice daily.
- **Child 2-6 years:** 5mL 2 times daily.
- **Child 6-12 years:** 5mL 4 times daily.
- **Child 12-18 years:** 5-10mL 4 times daily.

Notes:

- After food retain near lesions before swallowing.
- Treatment should be continued for 48 hours after lesions have healed.
- Not licensed for use in children under 4 months.
- Available as: oral gel (24mg/mL in 15g and 80g tube).

Micalax® Micro-enema (sodium citrate)

Evidence: [128, 196]

Use:

- Constipation where osmotic laxative indicated.

Dose and routes:

By rectum:

- **Child 3-18 years:** 5mL as a single dose.

Notes:

- Not recommended in children < 3 years.
- Available as: micro-enema (5mL).

Midazolam

Evidence: [48, 52, 53, 128, 143, 144, 197, 300-303]

Use:

- Status epilepticus and terminal seizure control.
- Breakthrough' anxiety, e.g. panic attacks.
- Adjuvant for pain of cerebral irritation.
- Anxiety induced dyspnoea.
- Agitation at end of life.

Dose and routes:

By buccal or intranasal administration for status epilepticus, should wait 10 minutes before repeating dose:

By oral or gastrostomy administration for anxiety or sedation:

Buccal doses for status epilepticus:

- **Neonate:** 300microgram/kg as a single dose.
- **Child 1-6 months:** 300microgram/kg (max. 2.5mg), repeated once if necessary.
- **Child 6 months-1 year:** 2.5mg, repeated once if necessary.
- **Child 1-5 years:** 5mg, repeated once if necessary.
- **Child 5-10 years:** 7.5mg, repeated once if necessary.
- **Child 10-18 years:** 10mg, repeated once if necessary.

Buccal doses for acute anxiety:

- **Any age:** 100microgram/kg as a single dose (max.5mg).

By SC or IV infusion over 24 hours for anxiety or terminal seizure control:

- **Neonate** (anxiety): 50-100micrograms/kg SC or IV.
- **Neonate** (seizure control): 150microgram/kg IV loading dose followed by a continuous IV infusion of 1microgram/kg/minute. Dose can be increased by 1microgram/kg/minute every 15 minutes until seizure controlled (max dose 5microgram/kg/minute).
- **Child 1 month-18 years:** 50-300microgram/kg/hour.
- No known maximum limits to dose but opinions vary between 80-150mg/day. High doses can lead to paradoxical agitation.

Notes:

- Not licensed for use in children with these conditions.
- In single dose for sedation midazolam is 3 times as potent as diazepam, and in epilepsy it is twice as potent as diazepam. (Diazepam gains in potency with repeated dosing because of prolonged half life).
- Recommended doses vary enormously in the literature. If in doubt, start at the lowest recommended dose and titrate rapidly.
- Onset of action by buccal and intranasal route 5-10 minutes.
- Onset of action by oral or gastrostomy route 10-30 minutes.
- Onset of action by IV route 2-3 minutes.
- Midazolam has a short half life.
- Available as oral solution (2.5mg/mL), buccal liquid (10mg/mL), and injection (1mg/mL, 2mg/mL, 5mg/mL). Oral and buccal liquids are available from 'specials' manufacturers or specialist importing companies (unlicensed)
- First dose in community may be given as two aliquots.

Morphine

Evidence: [11, 128, 129, 196, 197, 212, 229, 239, 256, 304-320]

Use:

- Major opioid (step 3). First line oral opioid for breakthrough and background.
- Dyspnoea.
- Cough suppressant as morphine linctus.

Dose and routes:

By mouth or rectum:

- **Child 1-3 months:** initially 50-100micrograms/kg every 4 hours adjusted to response.
- **Child 3-6 months:** initially 100-150micrograms/kg every 4 hours adjusted to response.
- **Child 6-12 months:** initially 200micrograms/kg every 4 hours adjusted to response.
- **Child 1-2 years:** initially 200-300micrograms/kg every 4 hours adjusted to response.
- **Child 2-12 years:** initially 200-300micrograms/kg every 4 hours adjusted to response, maximum initial dose of 20mg.
- **Child 12-18 years:** initially 5-20mg every 4 hours adjusted to response.

By continuous SC infusion:

- **Child 1-3 months:** 10micrograms/kg /hour adjusted to response.
- **Child 3 months-18 years:** 20micrograms/kg /hour adjusted to response.

By single SC injection:

- **Neonate:** initially 100micrograms/kg every 6 hours adjusted to response.
- **Child 1-6 months:** initially 100-200micrograms/kg every 6 hours adjusted to response.
- **Child 6 months-2 years:** initially 100micrograms/kg every 4 hours adjusted to response.
- **Child 2-12 years:** initially 200micrograms/kg every 4 hours adjusted to response.
- **Child 12-18 years:** initially 2.5-10mg every 4 hours adjusted to response.

By single IV injection (over at least 5 minutes):

- **Neonate:** initially 50micrograms/kg every 6 hours adjusted to response.
- **Child 1-6 months:** initially 100micrograms/kg every 6 hours adjusted to response.
- **Child 6 months-12 years:** initially 100micrograms/kg every 4 hours adjusted to response.
- **Child 12-18 years:** initially 2.5mg every 4 hours adjusted to response.

By continuous IV infusion:

- **Neonate:** initial loading dose of 50microgram/kg by IV injection (over at least 5 minutes) then by continuous IV infusion 5-20micrograms/kg/hour adjusted according to response.
- **Child 1-6 months:** initial loading dose of 100microgram/kg by IV injection (over at least 5 minutes) then by continuous IV infusion 10-30micrograms/kg/hour adjusted according to response.
- **Child 6 months-12 years:** initial loading dose of 100microgram/kg by IV injection (over at least 5 minutes) then by continuous IV infusion 20-30micrograms/kg/hour adjusted according to response.
- **Child 12-18 years:** initial loading dose of 2.5-10mg by IV injection (over at least 5 minutes) then by continuous IV infusion 20-30micrograms/kg/hour adjusted according to response.

Parenteral dose: 30-50% of oral dose if converting from oral dose of morphine.

Dyspnoea

Prescription as for pain, but at 30-50% dose.

Notes:

- Oramorph® solution not licensed for use in children < 1 year.
- Oramorph® unit dose vials not licensed for use in children < 6 years.
- Sevredol® tablets not licensed for use in children < 3 years.
- MXL capsules not licensed for use in children < 1 year.
- Where opioid substitution or rotation is to morphine: use oral morphine equivalency.
- Particular side effects include urinary retention and pruritus in paediatric setting, in addition to the well recognised constipation, nausea and vomiting.
- Morphine toxicity often presents as myoclonic twitching.
- Rectal route should be avoided if possible, and usually contraindicated in children with low platelets and/or neutropenia.
- In an emergency, when oral intake not appropriate, MST tablets can be administered rectally.

Available as:

- Tablets (10mg, 20mg, 50mg).
- Oral solution (10mg/5mL, 100mg/5mL).
- Modified release tablets and capsules (5mg, 10mg, 15mg, 30mg, 60mg, 100mg, 200mg).
- Modified release capsules 24hourly (30mg, 60mg, 120mg, 200mg).
- Modified release suspension (20mg, 30mg, 60mg, 100mg, 200mg).
- Suppositories (10mg, 15mg, 20mg, 30mg).
- Injection (10mg/mL, 15mg/mL, 20mg/mL and 30mg/mL).

Movicol® Macrogol

Evidence: [17, 20, 128, 196]

Use:

- Constipation.
- Faecal impaction.
- Suitable for opioid-induced constipation.

Dose and routes (Movicol® paediatric plain):

By mouth for constipation:

- **Child under 1 year:** 1/2-1 sachet daily.
- **Child 1-6 years:** 1 sachet daily (max. 4 sachets daily).
- **Child 6-12 years:** 2 sachets daily (max. 4 sachets daily).
- **Child 12-18 years:** 1-3 sachets daily of adult Movicol®.

By mouth for faecal impaction:

- **Child under 1 year:** 1/2-1 sachet daily.
- **Child 1-5 years:** 2 sachets on first day and increase by 2 sachets every 2 days (max. 8 sachets daily). Treat until impaction resolved.
- **Child 5-12 years:** 4 sachets on first day and increase by 2 sachets every 2 days (max. 12 sachets daily). Treat until impaction resolved.
- **Child 12-18 years:** 8 sachets daily of adult Movicol® for a usual max. of 3 days.

Notes:

- Not licensed for use in children < 5 years with faecal impaction and < 2 years with chronic constipation.
- Need to maintain hydration. Caution if fluid or electrolyte disturbance.
- Mix powder with water: Movicol® paediatric 60mL per sachet and adult Movicol® 125mL per sachet.

Nabilone

Evidence: EA [128, 196, 199]

Use:

- Antiemetic if vomiting caused by anxiety/anticipation (e.g. chemotherapy) and unresponsive to conventional antiemetics.

Dose and routes:

By mouth:

- **Adult dose:** 1-2mg twice a day as required; maximum dose 6mg/day in divided doses.

Notes:

- Not licensed for use in children.
- Medication is a cannabinoid.
- For specialist use only.
- Available as capsules (1mg).

Naloxone

Evidence: [23, 128] EA

Use:

- Emergency use for reversal of opioid-induced respiratory depression or acute opioid overdose.
- Constipation when caused by opioids if Methylnaltrexone not available.

Dose and routes:

Reversal of respiratory depression due to opioid overdose

By intravenous injection: (review diagnosis, further doses may be required if respiratory depression deteriorates)

- **Neonate:** 10micrograms/kg;
- **Child 1 month-12 years:** 10micrograms/kg
- **Child 12-18 years:** 0.4-2mg; if no response repeat at intervals of 2-3 minutes to max. 10mg.

By subcutaneous or intramuscular injection only if intravenous route not feasible

- As per intravenous injection but onset slower.

By continuous intravenous infusion, adjusted according to response

- **Neonate:** 5-20micrograms/kg/hour.
- **Child 1 month-12 years:** 5-20micrograms/kg/hour.
- **Child 12-18 years:** 0.24-1.2mg infused over 1 hour then using solution of 4micrograms/mL infuse at rate adjusting according to response.

Opioid-induced constipation

By mouth:

- In adults the following doses have been used: total daily dose oral naloxone = 20% of morphine dose; titrate according to need; max. single dose 5mg.

Notes:

- Not licensed for use in children with constipation.
- Although oral availability of naloxone is relatively low, be alert for opioid withdrawal symptoms, including recurrence of pain, at higher doses.
- Available as: injection (400microgram/mL).

Nystatin

Evidence: [116, 128, 246]

Use:

- Oral and perioral fungal infection.

Dose and routes:

By mouth:

- **Neonate:** 100 000 units 4 times a day.
- **Child 1 month-12 years:** 100 000 units 4 times a day.
- **> 12 years:** 500 000 units 4 times a day.

Notes:

- After food retain near lesions before swallowing.
- Treatment for 7 days and should be continued for 48 hours after lesions have healed.
- Licensed from 1 month of age. Not licensed for use in neonates for treatment of infection but licensed once daily for prophylaxis.
- Available as: oral suspension 100 000 units/mL 30mL with pipette.

Octreotide

Evidence: [128, 199, 222]

Use:

- Bleeding from oesophageal or gastric varices.
- Nausea and vomiting.
- Intestinal obstruction.
- Intractable diarrhoea.
- Also used for hormone secreting tumours, ascites, bronchorrhoea.

Dose and routes:

Bleeding from oesophageal varices

By continuous intravenous infusion

- **Child 1 month-18 years:** 1microgram/kg/hour, higher doses may be required initially. When no active bleeding reduce dose over 24 hours. Usual maximum dose is 50micrograms/hour.

Nausea and vomiting, intestinal obstruction and intractable diarrhoea

By continuous intravenous or subcutaneous infusion: 25microgram/kg/24 hours.

Notes:

- Not licensed for use in children.
- Administration: dilute with sodium chloride 0.9% to a concentration of 10-50%.
- Avoid abrupt withdrawal.
- Available as: injection for SC or IV administration (50micrograms/mL, 100micrograms/mL, 200micrograms/mL, 500micrograms/mL). Also available as depot injection for IM administration every 28 days (10mg, 20mg and 30mg Sandostatin Lar). Recommend specialist palliative care advice.

Omeprazole

Evidence: [30, 68, 128, 129, 196, 321, 322]

Use:

- Gastro-oesophageal reflux.
- Treatment of peptic ulcers.
- Gastrointestinal prophylaxis (e.g. with combination NSAID/steroids).

Dose and routes:

By mouth:

- **Neonate:** 700microgram/kg once daily, max. 2.8mg/kg daily.
- **Child 1 month-2 years:** 700microgram/kg once daily, max. 3mg/kg daily.
- **Child body weight 10-20kg:** 10mg once daily, max. 20mg for 12 weeks.
- **Child body weight > 20kg:** 20mg once daily max. 40mg for 12 weeks.

Intravenous (by injection over 5 minutes or by infusion)

- **Child 1 month-12 years:** initially 500micrograms/kg (max 20mg) once daily, increased to 2mg/kg (max 40mg) once daily if required.
- **Child 12-18 years:** 40mg once daily.

Notes:

- Oral formulations not licensed for use in children except for severe ulcerating reflux oesophagitis in children > 1 year.
- Injection not licensed for use in children under 12 years.
- Many children with life-limiting conditions have GORD and may need to continue with treatment long term.
- Can cause agitation.
- Occasionally associated with electrolyte disturbance.
- For oral administration tablets can be dispersed in water or with fruit juice or yoghurt. Capsules can be opened and mixed with fruit juice or yoghurt.
- Administer with care via gastrostomy tubes to minimise risk of blockage. Seek advice.
- Available as: MUPS tablets (10mg, 20mg, 40mg), capsules (10mg, 20mg, 40mg), intravenous injection (40mg) and intravenous infusion (40mg), oral suspension available as special order 10mg/5mL.

Ondansetron

Evidence: [119, 121, 128, 197, 228, 298, 323]

Use:

- Antiemetic, if vomiting caused by chemotherapy or radiotherapy.
- Vomiting breaking through background levomepromazine.
- May have a use in managing opioid induced pruritus.

Dose and routes:

By mouth:

- **Child 1-12 years:** 4mg by mouth every 8-12 hours for up to 5 days after chemotherapy.
- **Child 12-18 years:** 8mg by mouth every 8-12 hours for up to 5 days after chemotherapy.

By slow intravenous injection or by intravenous infusion:

- **Child 1-12 years:** 5 mg/m² (max. single dose 8 mg) every 8-12 hours.
- **Child 12-18 years:** 8 mg every 8-12 hours.

Notes:

- Not licensed for use in children < 2 years.
- Available as: tablets (4mg, 8mg), oral lyophilisate (4mg, 8mg), oral syrup (4mg/5mL), injection (2mg/mL, 2mL and 4mL amps).
- For slow intravenous injection, give over 2-5 minutes.
- For intravenous infusion, dilute to a concentration of 320-640 micrograms/mL with Glucose 5% or Sodium Chloride 0.9% or Ringer's Solution; give over at least 15 minutes.

Oxycodone

Evidence: [25, 128, 196, 199, 324-328]

Use:

- Pain of all types unless opioid insensitive. Step 3 WHO pain ladder.

Dose and routes:

By mouth:

- **Child 1 month-12 years:** starting dose 100-200micrograms/kg/dose (up to 5mg) every 4-6 hours or convert from oral morphine equivalent.
- **Child 12-18 years:** starting dose 5mg every 4-6 hours or convert from oral morphine equivalent.
- Titrate as for morphine
- **m/r tablets 8-12 years:** initial dose 5mg every 12 hours, increased if necessary.
- **m/r tablets 12-18 years:** initial dose 10mg every 12 hours, increased if necessary.

By intravenous injection, subcutaneous injection or continuous subcutaneous infusion:

- To convert from oral to IV or SC Oxycodone injection, divide the dose of oral Oxycodone by 2.
- For conversion from oral Oxycodone to a continuous subcutaneous infusion of Oxycodone, divide the total daily dose of oral Oxycodone by 2.

Notes:

- Oxycodone is more effective than placebo in neuropathic pain but there is nothing to suggest it is more so than other opioids.
- It is important to prescribe breakthrough analgesia which is 1/6th of the total 24 hour dose.
- It is moderately different from morphine in its structure, making it a candidate for opioid substitution.
- It is significantly more expensive than morphine.
- Available as: tablets and capsules(5mg, 10mg, 20mg), liquid (5mg/5ml, 10mg/ml) and m/r tablets (5mg, 10mg, 20mg, 40mg, 80mg), injection (10mg/ml and 50mg/ml).

Oxygen

Evidence: [44, 46, 128, 196, 329-331]

Use:

- Breathlessness caused by hypoxaemia.
- Placebo in other causes of breathlessness.

Dose and routes:

By inhalation through nasal cannula

- Flow rates of 1-2L/min adjusted according to response. This will deliver between 24-35% oxygen depending on the patient's breathing pattern and other factors. Lower flow rates may be appropriate particularly for preterm neonates.

By inhalation through facemask

- Percentage inhaled oxygen is determined by the oxygen flow rate and/or type of mask. 28% oxygen is usually recommended for continuous oxygen delivery.

Notes:

- Oxygen saturations do not necessarily correlate with the severity of breathlessness. Where self-report is not possible observation of the work of breathing is a more reliable indicator of breathlessness.
- Frequent or continuous measurement of oxygen saturations may lead to an over-reliance on technical data and distract from evaluation of the child's over-all comfort and wellbeing.
- Target oxygen saturations 92-96% may be appropriate in acute illness but are not necessarily appropriate for palliative care. More usual target oxygen saturations are above 92% in long-term oxygen therapy and 88-92% in children at risk of hypercapnic respiratory failure.
- Moving air e.g. from a fan maybe equally effective in reducing the sensation of breathlessness when the child is not hypoxaemic.
- Nasal cannula are generally preferable as they allow the child to talk and eat with minimum restrictions. However continuous nasal oxygen can cause drying of the nasal mucosa and dermatitis.
- Oxygen administration via a mask can be claustrophobic.

- The duration of supply from an oxygen cylinder will depend on the size of the cylinder and the flow rate.
- An oxygen concentrator is recommended for patients requiring more than 8 hours oxygen therapy per day.
- Liquid oxygen is more expensive but provides a longer duration of portable oxygen supply. Portable oxygen concentrators are now also available.
- If necessary two concentrators can be Y-connected to supply very high oxygen concentrations.
- Higher concentrations of oxygen are required during air travel.
- Home oxygen order forms (HOOF) and further information available from www.bprs.co.uk/oxygen.html

Pamidronate (disodium)

Evidence: CC, EA [196, 199, 332]

Use:

- Bone pain caused by metastatic disease or osteopenia.
- Acute hypercalcaemia.

Dose and routes:

For bone pain (metastatic bone disease or osteopenia):

By IV

- 1mg/kg infused over 6 hours, repeated daily for 3 days. Can be given 3 monthly.

For malignant hypercalcaemia:

By IV

- 1mg/kg infused over 6 hours, then repeated as indicated by serum calcium.

Notes:

- Not licensed for use in children.
- May have worsening of pain at first
- Many bisphosphonates available in different formulations, including oral.
- Risk of osteonecrosis, especially of jaw if pre-existing pathology.
- Anecdotal risk of iatrogenic osteopetrosis with prolonged use (if prolonged use is likely, precede with DEXA scan and investigation of calcium metabolism).

Paracetamol

Evidence: [128, 129, 196, 197]

Use:

- Mild to moderate pain.
- Pyrexia.

Dose and routes:

Oral

- **Neonate 28-32 weeks postmenstrual age:** 20mg/kg as single dose then 10-15mg/kg every 8-12 hours (max 30mg/kg/24 hours).
- **Neonates over 32 weeks postmenstrual age:** 20mg/kg as a single dose then 10-15mg/kg, every 6-8 hours; (max 60mg/kg/24 hours).
- **Child 1-3 months:** 20mg/kg loading dose, then 20mg/kg 8 hourly (max 60mg/kg/24 hours).
- **Child 3 months to 12 years:** 20 mg/kg loading dose, then 15 mg/kg 4-6 hourly (max is the lower of 90 mg/kg/24 hours or 4g/24 hours).
- **Over 12 years:** 500mg-1g 4-6 hourly, (max 4g /24 hours).

Rectal:

- **Neonate 28-32 weeks postmenstrual age:** 20mg/kg as single dose then 10-15mg/kg every 12 hours (max 30mg/kg/24 hours).
- **Neonates over 32 weeks postmenstrual age:** 30mg/kg as a single dose then 20mg/kg every 8 hours as necessary (max 60mg/kg/24 hours) .
- **Child 1-3 months:** 30mg/kg loading dose, then 20 mg/kg maintenance dose 8 hourly (maximum 60mg/kg/24 hours).
- **Child 3 months to 12 years:** 40mg/kg loading dose then 20 mg/kg maintenance dose 4-6 hourly (maximum 90mg/kg/24 hours or 4g/24 hours).
- **Over 12 years:** 500mg-1g 4-6 hourly (maximum 4g/24 hours).

IV: give infusion over 15 minutes

- **Neonate:** 7.5mg/kg every 4-6 hours, maximum 30mg/kg/24 hours.
- **Under 10kg:** 7.5mg/kg every 4-6 hours (maximum 30mg/kg/24 hours).
- **10-50kg:** 15mg/kg every 4-6 hours (maximum 60mg/kg/24 hours).
- **Over 50kg:** 1g every 4-6 hours (max 4g/24 hours).

Notes:

- Hepatotoxic in overdose.
- In moderate renal impairment use maximum frequency of 6 hourly; in severe renal impairment maximum frequency 8 hourly.

- Onset of action 15-30 minutes orally, 5-10 minutes IV (analgesia), 30 minutes IV (antipyretic). Duration of action 4-6 hours orally and IV. Oral bioavailability 60-90%. Rectal bioavailability about 2/3 of oral.
- Dispersible tablets have high sodium content (over 14mmol per tablet), so caution with regular dosing.
- Available as: tablets and caplets (500mg), capsules (500mg), soluble tablets (120mg, 500mg), oral suspension (120mg/5ml, 250mg/5ml), suppositories (60mg, 125mg, 250mg, 500mg and other strengths available from 'specials' manufacturers or specialist importing companies) and intravenous infusion (10mg/ml in 50ml and 100ml vials).
- Oral and licensed rectal preparations are licensed for use in infants from 2 months for post immunisation pyrexia and from 3 months as antipyretic and analgesic.
- IV paracetamol is licensed for short term treatment of moderate pain, and of fever when other routes not possible.

Paraldehyde (rectal)

Evidence: [128, 197, 333] CC

Use:

- Treatment of prolonged seizures and status epilepticus.

Dose and routes:

By rectal administration (dose as paraldehyde)

- **Child birth-12 years:** 0.4ml/kg paraldehyde (maximum 10mL) as a single dose.
- **Child 12 years and over:** 5-10mL paraldehyde as a single dose.

Notes:

- Available as: paraldehyde ampoules (5mL containing 100% paraldehyde which must be diluted with at least an equal volume of olive oil before administration) or paraldehyde enema may be extemporaneously prepared or is available from 'special-order' manufacturers or specialist importing companies.
- Note – if using a ready-prepared special, be aware that the paraldehyde is already diluted and dose accordingly. The usual strength of paraldehyde enema is 1:1 with olive oil.
- Rectal administration may cause irritation.
- Paraldehyde enema for rectal use is an unlicensed formulation and route of administration.

Phenobarbital

Evidence: [50, 52, 128, 129, 334]

Use:

- Adjuvant in pain of cerebral irritation.
- Control of terminal seizures.
- Sedation.
- Epilepsy including status epilepticus. Commonly used first line for seizures in neonates (phenytoin or benzodiazepine are the main alternatives).
- Agitation refractory to midazolam in end of life care.

Dose and routes:

Loading dose: Oral, intravenous or subcutaneous injection: 20mg/kg/dose.

By mouth:

- **Neonates for control of ongoing seizures:** 2.5-5mg/kg once or twice daily as maintenance (SR).
- **Child 1 month-12 years:** 1-1.5mg/kg twice a day, increased by 2mg/kg daily as required (usual maintenance dose 2.5-4mg/kg once or twice a day).
- **Child 12-18 years:** 60-180mg once a day.

Subcutaneous or intravenous injection or infusion:

- **Neonates for control of ongoing seizures:** 2.5-5mg/kg once or twice daily as maintenance; (SR).
- **Child 1 month-18 years:** 5-10mg/kg/24 hours continuous infusion or 2 divided doses; max. 1gram/24 hours.

Notes:

- Not licensed for agitation in end of life care.
- Tablets may be crushed.
- Single loading dose required for initiation; administer via enteral route if possible. Loading dose can be administered intravenously over 20 minutes or as a slow subcutaneous loading dose however volume of resultant solution will limit the rate at which a subcutaneous bolus can be administered. Use a separate site to commence subcutaneous infusion.
- Essential to dilute injection in 10 times volume of water for injection before intravenous or subcutaneous injection.
- Elimination half life of 2-6 days in adults, 1-3 days in children.
- Loading dose essential to reach steady state quickly and avoid late toxicity due to accumulation.
- For patients already on phenobarbital, doses equivalent to the patient's usual total daily dose of enteral phenobarbitone have been used. Doses up to 20mg/kg maximum 1200mg /24 hours.
- Available as: tablets (15mg, 30mg, 60mg), oral elixir (15mg/5mL) and injection (200mg/mL)

Phenytoin

Evidence: [128, 129, 197, 199, 216, 327, 335]

Use:

- Epilepsy (3rd or 4th line oral antiepileptic) including status epilepticus.
- Rarely used for neuropathic pain.

Dose and routes:

All forms of epilepsy except absence seizures.

Status epilepticus and acute symptomatic seizures due to head trauma or neurosurgery:

Oral:

- **Neonate-birth to 1 month:** Use IV dose.
- **1 month to 12 years:** initial dose of 1.5-2.5mg/kg twice daily then adjusted according to response and plasma phenytoin levels to 2.5-5mg/kg twice daily as a usual target maintenance dose. Max dose of 7.5 mg/kg twice daily or 300mg daily.
- **12 to 18 years:** initial dose of 75-150 mg twice daily then adjusted according to response and plasma phenytoin levels to 150-200mg twice daily as a usual target maintenance dose. Max dose of 300mg twice daily.

Intravenous:

- **Neonate:** 20mg/kg loading dose over 30-45 mins, then 2.5-5mg/kg/dose (over 30 minutes) every 12 hours as a usual maintenance dose. Adjust according to response and older babies may need higher doses.
- **1 month to 12 years:** 18mg/kg loading dose over 30-45 mins, then 2.5-5mg/kg twice daily usual maintenance dose.
- **12 to 18 years:** 18 mg/kg loading dose over 30-45 mins, then 100mg (over 30 minutes) 3 to 4 times daily usual maintenance dose.

Notes:

- Recommend prescriptions for oral preparations should include brand name to ensure consistency of drug delivery as not all preparations are equivalent in bio-availability.
- Reduce dose in hepatic impairment. Monitor carefully if reduced albumin or protein binding e.g. in renal failure.
- Avoid abrupt withdrawal.
- Bioavailability may be reduced by enteral feeds and/or nasogastric tube feeds, so flush with water, and interrupt enteral feeding for at least 1-2 hours before and after giving phenytoin.
- Oral bioavailability roughly equivalent to intravenous.

- Oral bioavailability 90-95%, plasma half-life 7-42 hours. Poor rectal absorption.
- Available as tablets (phenytoin sodium 100mg, generic), capsules (phenytoin sodium 25mg, 50mg, 100mg, 300mg Epanutin®), infatabs (chewable tablets of phenytoin base 50mg), oral suspension (phenytoin base 30mg/5ml Epanutin® and 90mg/5ml available as an 'unlicensed special') and injection (phenytoin sodium 50mg/ml generic and Epanutin®).
- Licensing; suspension 90 mg in 5ml is a 'special' and unlicensed. Other preparations are licensed for use in children as anticonvulsant (age range not specified).

Phosphate (rectal enema)

Evidence: [128, 196]

Use:

- Constipation intractable to other treatments.

Dose and routes:

By rectal enema:

- **Child 3-7 years:** 45-65mL once daily.
- **Child 7-12 years:** 65-100mL once daily.
- **Child 12-18 years:** 100-128mL once daily.

Notes:

- Watch for electrolyte imbalance.
- Use only after specialist advice.
- Available as Phosphate enema BP formula B in 128mL with standard or long rectal tube (do not confuse with Fleet enema).

Promethazine

Evidence: [128, 173, 316]

Use:

- Sleep disturbance.
- Mild sedation.
- Antihistamine.

Dose and routes:

By mouth:

- **Child 2-5 year:** 15-20mg at night.
- **Child 5-10 years:** 20-25mg at night.
- **Child 10-18 years:** 25-50mg at night.

Notes:

- Available as: tablets (10mg, 25mg) and oral solution (5mg/5mL).

Quinine sulphate

Evidence: [196]

Use:

- Leg cramps.

Dose and routes:

By mouth:

- Not licensed or recommended for children as no experience.
- **Adult dose:** 200-300mg at night.

Notes:

- Not licensed for use in children for this condition.
- Available as: tablets (200mg, 300mg quinine sulphate).

Ranitidine

Evidence: [128, 129, 196, 336]

Use:

- Gastro-oesophageal reflux.
- Treatment of peptic ulcers.
- GI prophylaxis (e.g. with combination NSAID/steroids).

Dose and routes:

By mouth:

- **Neonate:** 2-3mg/kg 3 times daily.
- **Child 1-6 months:** 1mg/kg 3 times daily increasing if necessary to max. 3mg/kg 3 times daily.
- **Child 6 months-3 years:** 2-4mg/kg twice a day.
- **Child 3-12 years:** 2-5mg/kg (max. single dose 300mg) twice a day.
- **Child 12-18 years:** 150mg twice a day or 300mg at night. May be increased if necessary in moderate to severe gastro-oesophageal reflux disease to 300mg twice a day or 150mg 4 times daily for up to 12 weeks.

Notes:

- Oral formulations not licensed for use in children < 3 years.
- Available as: tablets (150mg, 300mg) and oral solution (75mg/5mL).
- May cause rebound hyperacidity at night.

Risperidone

Evidence: CC [128, 177]

Use:

- Dystonia and dystonic spasms refractory to first and second line treatment.
- Psychotic tendency/crises in Battens disease.

Dose and routes:

Oral:

- **Child 5-12 years (weight 20-50kg):** 250 microgram once daily; increasing, if necessary, in steps of 250 microgram every 7 days to maximum of 750 microgram daily.
- **Child 12 years or over (> 50kg):** 500 microgram once daily; increasing in steps of 500 microgram every 7 days to maximum of 1.5mg daily.

Notes:

- Not licenced for this indication. Not licenced for children under 15 years.
- Caution in epilepsy and cardiovascular disease; extrapyramidal symptoms less frequent than older antipsychotic medications; withdraw gradually after prolonged use.
- Available as: tablets (0.5mg, 1mg, 2mg, 3mg, 4mg, 6mg), , orodispersible tablets (0.5mg, 1mg, 2mg, 3mg, 4mg), Liquid 1mg/ml.

Salbutamol

Evidence: [128, 129, 196]

Use:

- Wheezing/breathlessness caused by bronchospasm.

Dose and routes:

Nebulised solution:.

- **Neonate:** 1.25-2.5mg up to four times daily.
- **Child 1 month-18 years:** 2.5-5mg up to four times daily.

Aerosol Inhalation:

- **Child 1 month-18 years:** 100-200micrograms (1-2 puffs) for persistent symptoms up to four times a day.

Notes:

- Many paediatricians now advise multi-dosing of salbutamol 100microgram up to 10 times, via a spacer, instead of a nebuliser.
- Available as nebuliser solution (2.5mg in 5ml, 5mg in 2.5ml, 5mg in 1ml), aerosol inhalation (100micrograms/puff). Other types of dry powder inhaler are also available.
- For nebulisation dilute the nebulised solution with a suitable volume of sterile sodium chloride 0.9% according to the nebuliser type and duration; can be mixed with nebulised solution of ipratropium bromide.
- Salbutamol may not be effective in very young children due to the immaturity of the receptors; ipratropium may be more helpful in those less than 1 year.
- Inhaled product should be used with a suitable spacer device, and the child/carer should be given appropriate training.
- Side effects: increased heart rate; feeling "edgy" or agitated; tremor.
- The side effects listed above may prevent use- in which case ipratropium bromide is a good alternative.
- Nebuliser solution and inhalers are licensed for children for this use.

Senna

Evidence: [19, 128, 197]

Use:

- Constipation.

Dose and routes:

By mouth:

- **Child 1 month-2 years:** 0.5mL/kg (max. 2.5mL) of syrup once a day.
- **Child 2-6 years:** 2.5-5mL of syrup a day.
- **Child 6-12 years:** 5-10mL a day of syrup or 1-2 tablets at night or 2.5-5mL of granules.
- **Child 12-18 years:** 10-20mL a day of syrup or 2-4 tablets at night or 5-10mL of granules.

Notes:

- Syrup is not licensed for use in children < 2 years and tablets/granules are not licensed for use in children < 6 years.
- Stimulant laxative.
- Onset of action 8-12 hours.
- Initial dose should be low then increased.
- Doses can be exceeded on specialist advice.
- Granules can be mixed in hot milk or sprinkled [128] on food.
- Available as: tablets (7.5mg sennoside B), oral syrup (7.5mg/5mL sennoside B) and granules (15mg/5mL sennoside B).

Sodium picosulphate

Evidence: [128, 196]

Use:

- Constipation.

Dose and routes:

By mouth:

- **Child 1 month-4 years:** 2.5-10mg once a day.
- **Child 4-18 years:** 2.5-20mg once a day.

Notes:

- Available as: elixir (5mg/5mL) and capsules (2.5mg).
- Acts as a stimulant laxative.
- Onset of action 6-12 hours.
- Elixir is licensed for use in children of all ages; capsules are not licensed for use in children less than 4 years of age.
- Effectiveness dependent upon breakdown by gut flora – previous effectiveness may therefore be lost during courses of antibiotics and ensuing altered gut flora.

Sucralfate

Evidence: [128, 197]

Use:

- Stress ulcer prophylaxis.
- Prophylaxis against bleeding from oesophageal or gastric varices; adjunct in the treatment of: oesophagitis with evidence of mucosal ulceration, gastric or duodenal ulceration, upper GI bleeding of unknown cause.

Dose and routes:

Oral

Stress ulcer prophylaxis, prophylaxis against bleeding from oesophageal or gastric varices

- **Child 1 month-2 years:** 250mg four to six times daily.
- **Child 2-12 years:** 500mg four to six times daily.
- **Child 12-15 years:** 1g four to six times daily.
- **Child 15-18 years:** 1g six times daily (maximum 6g/day).

Oesophagitis with evidence of mucosal ulceration, gastric or duodenal ulceration

- **Child 1 month-2 years:** 250mg four to six times daily.
- **Child 2-12 years:** 500mg four to six times daily.
- **Child 12-15 years:** 1g four to six times daily.
- **Child 15-18 years:** 2g twice daily (on rising and at bedtime) or 1g four times daily (1 hour before meals and at bedtime) taken for 4-6 weeks (up to 12 weeks in resistant cases); max 8g daily.

Notes:

- Administer 1 hour before meals.
- Spread doses evenly throughout waking hours.
- Tablets may be crushed and dispersed in water.
- Administration of sucralfate suspension and enteral feeds via a NG or gastrostomy tube should be separated by at least 1 hour. In rare cases bezoar formation has been reported when sucralfate suspension and enteral feeds have been given too closely together.
- Caution – sucralfate oral suspension may block fine-bore feeding tubes.
- Caution – absorption of aluminium from sucralfate may be significant in patients on dialysis or with renal impairment.
- Not licensed for use in children less than 15 years; tablets are not licensed for prophylaxis of stress ulceration.
- Available as: oral suspension (1g in 5mL), tablets (1g).

Temazepam

Evidence: [196]

Use:

- Sleep disturbance where anxiety is a cause.

Dose and routes:

By mouth:

- **Adult:** 10-20mg at night. Dose may be increased to 40mg at night in exceptional circumstances.

Notes:

- Not licensed for use with children.
- Available as: tablets (10mg, 20mg) and oral solution (10mg/5mL).

Tizanidine

Evidence: [196, 204, 205, 209, 337-340]

Use:

- Skeletal muscle relaxant.
- Chronic severe muscle spasm or spasticity.

Dose and routes:

Children doses based on SR [337]

- **Child 18 months-7 years:** 1mg/day; increase if necessary according to response.
- **Child 7-12 years:** 2mg/day; increase if necessary according to response.
- **Child > 12 years:** as per adult dose [196]: Initially 2mg increasing in increments of 2mg at intervals of 3-4 days. Give total daily dose in divided doses up to 3-4 times daily. Usual total daily dose 24mg. Max. total daily dose 36mg.

Notes:

- Not licensed for use in children.
- Timing of dose individual to specific patient as maximal effect is seen after 2-3 hours and is short-lived.
- Caution in liver disease, monitor liver function regularly.
- Usually prescribed and titrated by neurologists.
- Available as: tablets (2mg, 4mg).

Tramadol

Evidence: [128, 196, 212, 215]

Use:

- Minor opioid (step 2) with additional non-opioid analgesic actions.

Dose and routes:

By mouth:

- **Child 5-12 years:** 1-2mg/kg every 4-6 hours (maximum 4 doses in 24 hours); maximum dose 3mg/kg (maximum single dose 100mg) every 6 hours.
- **Child 12-18 years:** initially 50mg every 4-6 hours, max. 400mg/day.

By IV injection or infusion

- **Child 5-12 years:** 1-2mg/kg every 4-6 hours (maximum 4 doses in 24 hours); maximum dose 3mg/kg (maximum single dose 100mg) every 6 hours.
- **Child 12-18 years:** 50-100mg/dose every 4-6 hours.

Notes:

- Not licensed for use in children < 12 years.
- Not a controlled drug.
- Although a minor opioid, additional non-opioid effects mean oral morphine equivalence, more than might be expected. By mouth about 1/5 as potent as morphine.
- Onset of action after oral dose 30 to 60 minutes. Duration of action 4-9 hours.
- May be appropriate to consider small doses of morphine for breakthrough when background is tramadol.
- Causes less constipation and respiratory depression than equivalent morphine dose.
- Analgesic effect is reduced by ondansetron.
- Available as tablets (100mg), capsules (50mg, 100mg), soluble tablets (50mg), orodispersible tablets (50mg), m/r tablets and capsules (100mg, 150mg, 200mg, 300mg, 400mg) and injection (50mg/ml).

Tranexamic acid

Evidence: [13, 14, 128, 197, 341-343]

Use:

- Oozing of blood (e.g. from mucous membranes/capillaries), particularly when due to low or dysfunctional platelets.
- Menorrhagia.

Dose and routes:

By mouth:

- **Child 1 month-18 years:** 15-25mg/kg (max. 1.5g) 2-3 times daily.

Menorrhagia

- **Child 12-18 years:** 1g 3-4 times daily for up to 4 days; maximum 4g daily (initiate when menstruation has started).

By intravenous injection over at least 10 minutes:

- **Child 1 month-18 years:** 10mg/kg (max 1g) 2-3 times a day.

By continuous intravenous infusion:

- **Child 1 month-18 years:** 45mg/kg over 24 hours.

Mouthwash 5% solution:

- **Child 6-18 years:** 5-10mL 4 times a day for 2 days. Not to be swallowed.

Topical treatment:

- Apply gauze soaked in 100mg/mL injection solution to affected area.

Notes:

- Parenteral preparation can be used topically.
- Available as: tablets (500mg), syrup (500mg/5mL available from 'specials' manufacturers) and injection (100mg/mL 5mL ampoules). Mouthwash only as extemporaneous preparation.

Triclofos

Evidence: [128, 179]

Use:

- Sleep disturbance. Not anxiolytic or analgesic.

Dose and routes:

By mouth:

- **Neonate:** 25-30mg/kg at night.
- **Child 1 month-1 year:** 25-30mg/kg at night.
- **Child 1-5 years:** 250-500mg at night.
- **Child 6-12 years:** 0.5-1g at night.
- **Child 12-18 years:** 1-2g at night.

Notes:

- Not for use with children for painless procedure.
- Available as: oral solution (500mg/5mL).

Vitamin K (Phytomenadione)

Evidence: [128, 129, 196, 197]

Use:

- Treatment of haemorrhage associated with vitamin-K deficiency (seek specialist advice).

Dose and routes:

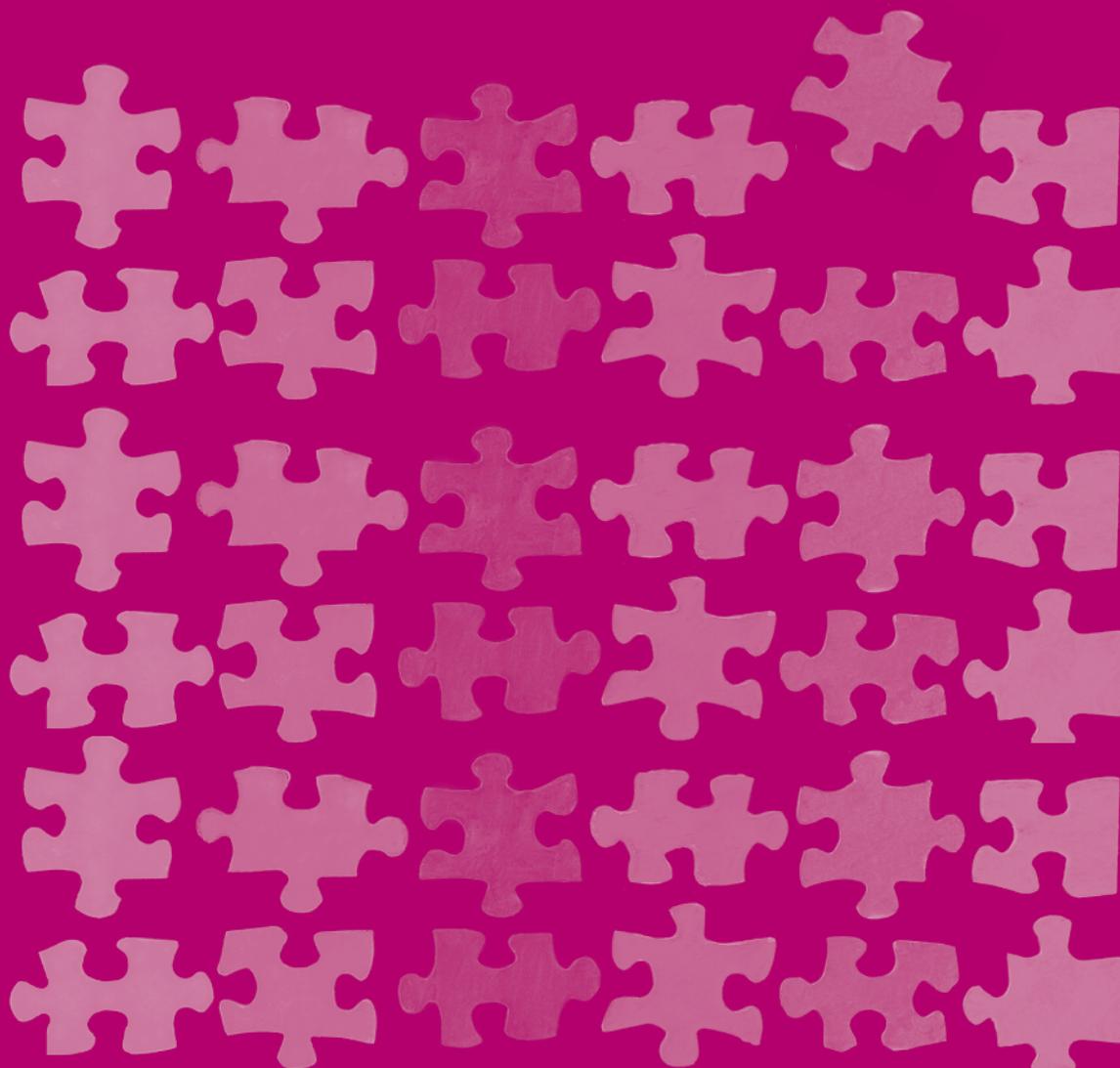
By mouth or intravenous:

- **Neonate:** 100 micrograms/kg.
- **Child 1 month-18 year:** 250-300 micrograms/kg (max. 10mg) as a single dose.

Notes:

- Available as Konakion MM injection 10mg/mL (1 mL amp) for slow intravenous injection or intravenous infusion in glucose 5% NOT for intramuscular injection.
- Available as Konakion MM Paediatric 10mg/mL (0.2mL amp) for oral administration or intramuscular injection. Also for slow intravenous injection or intravenous infusion in glucose 5%.
- There is not a UK licensed formulation of Vitamin K tablets currently available (licence for Menadiol 10mg tablets anticipated mid-2011). Possible to obtain 10mg phytomenadione tablets via a specialist importation company.
- Caution with intravenous use in premature infants < 2.5kg.

Appendices



Appendix 1: Morphine equivalence single dose [128, 196]

Analgesic	Dose
Morphine oral	10mg
Morphine subcutaneous	5mg
Diamorphine subcutaneous	3mg
Hydromorphone oral	1.3mg
Oxycodone oral	5mg
Methadone	Variable

Appendix 2: Subcutaneous infusion drug compatibility

Evidence suggests that during end of life care in children, where the enteral route is no longer available, the majority of symptoms can be controlled by a combination of six “essential drugs” [344]. Compatibility for these six drugs is given in the Table 1 below [199]. For more detailed information professionals are advised to consult an appropriate reference source [130].

Table 1: Syringe driver compatibility for two drugs in water for injection

diamorphine							
-	morphine sulphate						
+	+	midazolam					
A+	+	+	cyclizine				
A+	+	+	+	haloperidol			
+	?	+	-	-	levomepromazine		
+	+	+	?	?	?	hyoscine hydrobromide	

A Laboratory data; physically and chemically compatible but crystallization may occur as concentrations of either drug increase.

+ Compatible in water for injection at all usual concentrations.

- Combination not recommended; drugs of similar class.

? No data available.

Table 2: The compatibility of drugs with OxyNorm injection

Drug	Compatible with OxyNorm injection
Dexamethasone	Yes
Haloperidol	Yes
Hyoscine butylbromide	Yes
Hyoscine hydrobromide	Yes
Levomepromazine	Yes
Metoclopramide	Yes
Midazolam	Yes
Cyclizine	Incompatible in concentrations >3mg/ml of cyclizine (i.e. 30mg in standard 10ml syringe). Use water for injection as diluent.
Prochlorperazine	No

Appendix 3: Don't panic: where to get help

Dr Lynda Brook

Macmillan Consultant in Paediatric Palliative Care
Royal Liverpool Children's Hospital
Alder Hey
Eaton Road
Liverpool L12 2AP
Tel: 0151 252 5187
Mobile: 07881 788903
Long range bleep via switchboard:
0151 228 4811
Lynda.Brook@alderhey.nhs.uk

Dr Pat Carragher

Deputy Chief Executive (Medical)
Children's Hospice Association
Scotland
Canal Court
42 Craiglockhart Avenue
Edinburgh
EH14 1LT
Tel: 0131 444 1900
Tel: 0131 444 4015 DDL
Fax: 0131 444 4001

Rachel House
Kinross
KY13 8AA
Tel: 01577 865777
p.carragher@chas.org.uk

Dr Finella Craig

Paediatric Palliative Care
Consultant
Great Ormond Street Children's
Hospital
Symptom Care Team (x8678)
Tel: 020 7829 8678
CraigF@gosh.nhs.uk

Dr Richard Hain

LATCH Senior Lecturer and
Honorary Consultant in Paediatric
Palliative Medicine
Department of Child Health
Cardiff School of Medicine
University Hospital of Wales
Heath Park
Cardiff CF14 4XN
Tel: 029 2074 3373
Fax: 029 2074 4283
HainRD@Cardiff.ac.uk

Dr Satbir Singh Jassal

Medical Director
Rainbows Children's Hospice
Lark Rise
Loughborough
Leicestershire
LE11 2HS
Tel: 01509 638000
Tel: 01509 263018
sat.jassal@gmail.com

Dr Susie Lapwood

Lead Doctor
Helen & Douglas House
14a Magdalen Road
Oxford
OX4 1RW
Tel: 01865 794749
slapwood@helenanddouglas.org.uk

Dr Mike Miller

Consultant in Paediatric Palliative
Medicine
Martin House
Grove Road
Clifford
Wetherby
LS23 6TX
Tel: 01937 845 045
Mobile: 07802448890
mmiller@martinhouse.org.uk

ACT

Brunswick Court
Brunswick Square
Bristol
BS2 8PE
United Kingdom
Tel: 0117 916 6422
Fax: 0117 916 6430
info@act.org.uk
www.act.org.uk

Children's Hospices UK

4th Floor
Bridge House
48-52 Baldwin Street
Bristol
BS1 1QB
Tel: 0117 989 7820
Fax: 0117 929 1999
info@childhospice.org.uk
www.childhospice.org.uk

APPM: Association of Paediatric Palliative Medicine

Chairman: Dr Lynda Brook
Secretary: Dr Mike Miller
appm@act.org.uk
www.act.org.uk/appm

Diploma in Paediatric Palliative Medicine

Dippallmed@velindre-tr.wales.nhs.uk

Palliative Drugs.Com

(Website hosts the latest version of the Palliative Care Formulary, as well as an active bulletin board for drug-related questions).
www.palliativedrugs.com

Medical resources: paper-based

- *Care of the Dying Child* (2nd edition): Ann Goldman.
- *A Guide to Symptom Relief in Palliative Care* (5th edition): Claud Regnard 2003. User friendly and practical.
- *Oxford Handbook of Paediatric Palliative Medicine*: Richard Hain and Satbir Singh Jassal. A wealth of resources in a small space.
- *Medicines for Children* (3rd edition): RCPCH 2006.
- *BNF for Children 2010* (and the standard BNF).
- *Palliative Care Guidelines 2006*: Max Watson et al. This was the precursor to the Oxford Handbook. It was produced for the SW London Cancer network, has both adult and paediatric sections, and copies are available very cheaply from Princess Alice Hospice, Esher, Surrey, and from the handbook website www.greenbox.net/palliative or call 0870 163 0073.
- *Oxford Textbook of Palliative Medicine* (3rd edition) Doyle et al 2005.
- *Oxford Textbook of Palliative Care for Children*: Goldman, Hain, Liben, Jan 06.
- *Symptom Management in Advanced Cancer*: Twycross.
- *Palliative Care Formulary*: Twycross (same as is available online through Palliative Drugs site), (3rd edition) Oct 07.

Medical resources: online

Child-specific:

ACT

Go to the 'downloads' and 'other resources' option for the useful Rainbows Symptom Control Manual (2006). This site also hosts PaedPalCare (an electronic listserve to post and respond to queries online) and PaedPalLit (free electronic access to a quarterly-ish roundup of relevant journal abstracts).

www.act.org.uk

Children's Hospices UK

www.childhospice.org.uk

Canadian Paediatric Palliative Care

Lots of useful links and resources.
www.cnppcc.ca

Great Ormond Street Hospital

Useful for clinical guidelines and patient information.
www.gosh.nhs.uk/clinical_information

Palliative care:

Palliative Drugs

Excellent palliative drugs website and bulletin board. Very active and helpful international palliative medicine community: post a query here and you should get a useful answer within the day. Also hosts the electronic version of Palliative Care Formulary (Palliative version of the BNF, which includes syringe driver compatibility charts etc), and a 'RAG' section with lots of useful guidelines and protocols from elsewhere.

www.palliativedrugs.com

Palliative Medicine Handbook

A useful UK site, which includes the 'Palliative Care Matters' handbook.

www.book.pallcare.info

Palliative Info

Canadian palliative care website with a lot of useful links and protocols.

www.palliative.info

Help the Hospices

Help the Hospices site is useful, in particular the education section has a very full listing of courses available, and the 'e-learning' section has helpful modules based on the CLIP programme.

www.helpthehospices.org.uk/education

For information regarding specific diseases:

National Organization for Rare Diseases

Holds a rare diseases database and very useful for looking up rare syndromes (US site).

www.rarediseases.org/search/rdblist.html

National Institute for Neurological Diseases and Stroke

Holds a good disease database for medical information (US site).

www.ninds.nih.gov/disorders/disorder_index.htm

Contact a Family

Includes very useful information for families about specific conditions and offers access to support and information.

www.cafamily.org.uk

Appendix 4: Protocol for subcutaneous drug administration

In palliative care the sub-cutaneous route of drug administration is often the most convenient. It has many advantages, including being seen as less invasive than intravenous therapy, not requiring venous access where such access may be difficult or impossible, being easily monitored for local irritation, and being easily relocated if such problems occur.

The network of small blood vessels provide good absorption of medication and parenteral drugs are often absorbed more rapidly than oral drugs. The sub-cutaneous tissue lies between the skin and the underlying muscle, it is made up of loose connective tissue and varying amounts of fat. It also contains cutaneous nerves, small lymph vessels and blood vessels.

It is also widely acceptable in the community setting, making it possible to manage patients at home when more invasive devices would preclude this.

Sub-cut treatment can be given when it is not possible or desirable for it to be given orally.

Indications for its use may be:

- Persistent nausea and vomiting.
- Dysphagia.
- Mouth/throat/oesophageal lesions.
- Intestinal obstructions.
- Malabsorption of oral medication.
- Unconscious child/young person.
- Profound weakness when child/young person unable to swallow medication.

Advantages to this method of administration are:

- Constant serum plasma levels ensuring better pain control.
- Usually reloaded once every 24 hours.
- No repeated injections.
- Permits better control of nausea and vomiting.
- Control of multiple symptoms with a combination of drugs.

If possible involve the child or young person in the choice of site. This may increase compliance and acceptability.

The most frequently used sites are:

- Abdomen or chest wall.
- Thighs; upper and lateral aspects.
- Buttocks.
- Upper arms.

Preparation of child and family

- Explain the full procedure to the child and family including the purpose and any possible side effects and allow them to ask questions.
- Assess the child for the most suitable infusion site.
- Offer topical anaesthetic. EMLA or Ametop.
- Apply topical anaesthetic cream according to manufacturers' instructions and allow maximum time for it to take effect.
- If possible involve the parents, particularly if the treatment is being given at home. This will offer security to the child and assist with distraction.

Preparation of medication and equipment

- Check the prescription is written correctly to comply with local policy.
- Check child/young person's allergies.
- Wash hands according to standard (universal) precautions to reduce the risk of cross infection.
- Prepare a tray or suitable working surface.

Equipment required

- Syringe driver policy.
- Syringe driver that has been serviced in the last 12 months.
- Medication to be administered.
- Luer lock syringe appropriate to the infusion volume, usually 10 or 20ml.
- Blue or green needles for drawing up the medication.
- Butterfly needle appropriately sized depending on age/size of child/young person and amount of sub-cutaneous tissue they have.
- Opsite or tegaderm dressing to secure butterfly.
- Portable syringe pump. Graseby MS26 or Mckinley T34 depending on child to ensure their comfort and ease of movement.
- Sharps bin to ensure equipment is disposed of safely.
- Prepare the drug and diluents, checking name, dose and expiry date.
- Draw up the injection with the blue or green needle and luer lock syringe.
- Remove needle and discard in sharps bin.
- Complete label to attach to syringe with drug name(s), strength, batch number, child/young person's name and date of birth and initialled by two nurses.
- Connect the syringe to the infusion needle. Prime extension and ensure medication at tip of butterfly needle.

Administration

- Remove anaesthetic cream 2-5 minutes before needle insertion to allow skin to dry and to maximise its effect.
- Check child/young person's details with parents and second nurse.
- Ensure the child is comfortable and if appropriate, encourage them to participate. This may help the child to co-operate and ensure their safety.
- Wash hands.
- Lift a skin fold and insert the needle into the sub-cutaneous tissue at approximately a 45 degree angle.
- Ensure the needle and extension line are connected to the syringe and the syringe is fitted into the pump correctly.
- Start infusion ensuring rate corresponds to prescription.

Graseby MS26

- Insert 9 volt battery into pump and listen for alarm. Press and hold start/test button for ten seconds; the motor will then run and stop. Release the button. Observe for the flashing light.
- Ensure you have protective plastic cover for pump.
- Ensure you have a rate adjuster and a Graseby ruler to measure length of syringe contents.
- Wash hands.
- Draw up the prescribed medication and the diluents and make up to **48mm** within the syringe barrel. Check the solution for clouding or crystallisation. If this occurs, do not use and check with pharmacist regarding compatibility of drugs. Whatever syringe size used the total volume should measure **48mm**.
- Connect syringe to butterfly tubing. Prime the line and the butterfly with the prescribed medication.
DO NOT PRIME THE LINE WHEN ATTACHED TO THE CHILD/YOUNG PERSON.
- **By loading the syringe and then priming the infusion line it is recognised that this will reduce the duration of the infusion by approximately 2-4 hours.**
This will occur each time a new infusion line is primed, i.e. on each re-siting of the needle.
Do not make up the fluid lost in the infusion line as this will dilute the drug concentration and thus reduce the amount of medication the child/young person receives each hour.

NB. If the combination of drugs is changed it is essential to replace the infusion line. This prevents a delay in the child or young person receiving the new prescription and possible drug incompatibility occurring in the infusion line.

- Hold the syringe driver with the battery side facing you. Press the square actuator button to move the actuator to the far right hand side. Put the syringe on top of the driver with the barrel in the shallow V shaped recess. The finger grip on the syringe barrel must be in the slot in the case.
- Move the actuator up to the syringe plunger by pressing and holding in the button on the side and sliding it along. The push button on the plunger of the syringe must be fitted in the slot in the actuator. Be careful not to push the plunger forwards.
- Put the rubber securing strap over the syringe barrel and pull it tight. Hook and then press it into the groove in the side of the case.
- Slide the syringe driver into the clear plastic cover with the front facing the side of the cover with the hole in it. NEVER PUT THE SYRINGE DRIVER IN FACING THE OTHER WAY.

Setting the correct rate for the MS26 and starting the infusion

- Fill the syringe with the required volume of medication.
- Connect and fill the infusion line. Make sure the connection is secure and the air is expelled.
- Measure the distance in millimetres (mm) from the empty line on the syringes scale up to the line where the plunger piston is.
- In the hospice we draw up 8ml of medication and diluents which runs at 48mm in 24 hours.
- Press and hold the START button. The motor will turn and stop after ten seconds, then the alarm will sound. This will continue for about 15 seconds longer if the button is not released.
- Releasing the button starts the syringe driver. The indicator lamp will begin to flash: once every 25 seconds.

During the administration

- It is recommended that procedures are established for regular checks on the progress of the administration. In the hospice or hospital environment this should be done hourly. In a patients home it should be done twice in 24 hours.

Parents or carers can be made aware of a few simple checks that can be made:

- The volume is being delivered as expected
- The rate set is the correct value
- The indicator lamp is flashing
- The syringe driver is in good condition.

A family must know who to contact in an emergency.

Stopping the syringe driver

- When the syringe is empty the syringe driver will stop automatically and the alarm will sound for about 15 seconds.
- There is no OFF switch to stop the driver before the syringe is empty. To stop it move the rate switches to 00 – the indicator lamp will still flash, or take the battery out.

Alarms

The syringe driver will give an audible alarm lasting about 15 seconds:

- When a battery is put in.
- When the START/TEST button is pressed for longer than ten seconds.
- When the syringe is empty.
- When the syringe driver has stopped. This may be caused by a blocked or trapped infusion line.

The indicator lamp will stop flashing:

- When the syringe driver has stopped and switched off.
- When the battery needs replacing.

Troubleshooting

The syringe driver will not start:

- The START button has not been pressed in enough. Press again.
- There is no battery. Fit a battery.
- The battery is in the wrong way round. Refit battery.
- The battery is exhausted. Fit a new battery.
- The syringe driver is faulty. Service needed.

The infusion is going too quickly or has ended early:

- Wrong rate set. Correct error.
- Wrong syringe brand or size. Correct error.
- Syringe plunger push-button or finger grips were not held in the actuator or case correctly. Correct error.
- Plunger position measured wrongly. Correct error.
- Line was filled after the plunger position was measured. Correct error.
- Syringe driver has got wet. Remove from use immediately.

The infusion is going too slowly:

- Wrong rate set. Correct error.
- Wrong syringe brand or size. Correct error.
- Plunger position measured wrongly. Correct error.

The syringe driver has stopped before emptying the syringe:

- Exhausted battery. Fit new battery.
- Blocked or trapped infusion line. Clear line.

The syringe driver has stopped with the lamp still flashing:

- The mechanism for pushing the plunger has worn out. Listen for a faint click when the motor turns a few times. Service needed.

McKinley T34 Pump

Batteries

Always use a 9 volt battery. When setting up the pump always check there is enough charge in the battery to cover the infusion being set up. To do so follow this procedure:

- Switch the pump ON.
- Press INFO key.
- Select BATTERY LIFE from the menu and press YES to confirm.
- Verify sufficient battery charge is available to complete the current programme. If not, change the battery.

Access codes and keypad lock

Program lock

Always use the program lock when the pump is used in a home environment to prevent patient or family changing the prescription.

Keypad lock

To activate the keypad lock:

- With the pump infusing, press and hold the INFO key until a chart is displayed showing a bar moving from left to right.
- Hold the key until the bar has moved completely across the screen and a beep is heard to confirm the lock has been activated.
- To turn off repeat this procedure. The bar will now move from right (ON) to left (OFF) and a beep will be heard to confirm.

Infusion set up and programming

Always use luer lock syringes.

Priming the infusion set

After filling the syringe attach the infusion set, prime manually to remove all air from the syringe and extension set and apply clamp to the line.

Pre-loading and syringe placement

- Before placing the syringe into the pump ensure the barrel clamp arm is down then press and hold the ON/OFF key until the SELF TEST screen appears. Do not label the syringe or apply anything that changes its external diameter at the point where the barrel clamp is applied as incorrect syringe recognition may result.
- Check the remaining battery life is sufficient to cover the infusion you are about to program. Press the INFO key and use the UP or DOWN arrow keys to select battery level. Press YES/START to confirm and view battery status.
- Load the syringe into the pump prior to connecting the syringe to the child/young person.
- The LCD display will show PRE-LOADING and the actuator will start to move. Wait until it stops moving and the syringe detection screen appears.
- If the actuator is not in the correct position to accommodate the syringe leave the barrel arm clamp down and use the FF or BACK buttons on the keypad to move the actuator to the required position. Forward movement of the actuator is limited, therefore repeated presses of the FF key may be required when moving the actuator forward. Backwards movement is not restricted.
- Lift the barrel arm clamp and load the syringe into the pump. Note that the syringe graphic on the screen flashes in three places, the barrel, ear/collar and plunger, denoting the position and status of each sensor. Seat the collar/ear and plunger first. As you correctly seat each point of the syringe note that the flashing indicator for that sensor becomes solid on the display.
- Lower the barrel arm clamp. If the syringe is correctly loaded the syringe graphic will become solid (no flashing components) and the pump will display the next screen – size and brand of the syringe detected.

Syringe detection and confirmation

- Check the LCD display to ensure the pump has correctly identified the syringe size and brand. If it is not correct use the UP or DOWN arrow keys to scroll between brands.
- Press YES/START to confirm.
- If the pump was stopped and turned off before the last program reached End Program, the Resume Prompt screen will appear. Press NO to continue programming the new regime.
- Once the syringe brand and size are confirmed the pump calculates and displays the deliverable volume in the syringe.
- The pump cannot deliver the full contents of all syringe brands/sizes so in some cases there may be a slight residual volume left in the pump when the actuator has travelled to the zero position. So when the syringe is loaded, the VTBI may read 17.5ml when 18ml has been drawn up.
- Press YES/START key to confirm the volume to be infused (VTBI).
- Set duration of infusion. Will read 24:00. Use UP and DOWN arrow keys to set desired duration or press YES to confirm 24:00.

Setting the infusion rate

- The pump calculates and displays the rate (in millilitres per hour) required to deliver the VTBI over the infusion duration confirmed.
- Press YES to confirm the calculated rate or use the UP and DOWN arrow to adjust. Changing the rate will alter the duration confirmed at the previous step.

Starting the infusion

- The summary screen confirms the volume to be infused, duration and infusion rate. **You must always check the details on this screen match the prescription.**
- Press YES/START to confirm the infusion parameters.
- Pump prompts, 'START INFUSION?' Check infusion set is attached to patient access device and the clamp is released. Press YES/START to commence infusion.
- While running, the LCD displays infusion 'Time Remaining' (top line), 'Infusion Rate' (in bold on the middle line) and the bottom line will alternate between 'Syringe Size and Brand' and 'Pump Delivering.'

Recommended checks during infusion

- CHECK THE LCD DISPLAY to confirm the pump is still running at the same infusion rate as originally set (unless the titration option has been enabled and the user has been authorised to adjust the rate within the programmed limits).
- CHECK THE GREEN LED IS FLASHING and/or pump delivering animation appears intermittently on the bottom line of the LCD display.
- CHECK FOR SIGNS OF PHYSICAL DAMAGE to the pump or accessories.
- PRESS THE INFO KEY TO CHECK:

Single Press: Volume to be Infused (VTBI) & Volume Infused (VI).

Double Press: for battery life remaining.

This information is for a quick reference only. You must refer to the pump manufacturer's booklet for the full information and instructions.

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Basic Symptom Control in Paediatric Palliative Care

Basic Symptom Control in Paediatric Palliative Care is a key clinical tool used by children's palliative care doctors and nurses across the world. It is the only resource of its kind that provides comprehensive guidelines for treating a wide range of symptoms experienced by children with life-limiting or complex health conditions. *Basic Symptom Control in Paediatric Palliative Care*, now in its eighth edition, has become known as the symptom control 'industry bible' for professionals working in the field.

Basic Symptom Control in Paediatric Palliative Care has been developed and edited by Dr Satbir Singh Jassal, GP and Medical Director at Rainbows Children's Hospice, with contributions and peer reviews from 30 leading paediatric and palliative care specialists. It provides doctors and nursing staff with an 'all in one' reference tool for symptom management and children's palliative care medicines. It's been designed to provide both practical support and hands on clinical information in the acute setting. It's also been written in language that parents can easily understand, as doctors and nursing staff who care for children in the community often leave a copy in the family home so it is on hand for reference.

Basic Symptom Control in Paediatric Palliative Care is packed with information about how to appropriately treat a wide range of symptoms including: infections, nausea and vomiting, seizures and muscle spasm, as well as pain management. The eighth edition of *Basic Symptom Control in Paediatric Palliative Care* includes new chapters on Ethics and HIV and AIDS; plus major updates on Syringe Drivers, Ventilation and Neurology. For the first time ever it includes a comprehensive prescribing formulary. The new formulary has been adapted from the Association of Paediatric Palliative Medicine's master formulary to support those prescribing in children's palliative medicine.

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ACT Brunswick Court, Brunswick Square, Bristol, BS2 8PE

T: 0117 916 6422

F: 0117 916 6430

E: info@act.org.uk

www.act.org.uk

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