Shropshire Community Health NHS
NHS Trust

McKinley T34

Syringe Pump

Resource Pack

Children

2012

1689-19066

Contents

1 Introduction

In order to administer drugs via the McKinley T34 syringe pump you must be a (NMC) registered nurse and have completed mandatory training and have successfully completed the T34 (lock-on) competency based assessment. (Appendix 1)

Reference to NMC Standards for:

Standards for medicines management (2010)

NMC Code of conduct (2008)

Record keeping guidance nurses and midwives (2010)

Policy for the administration of drugs via a McKinley T34 syringe pump for adults in the community (2011)

Trust Medicines Policy (2010)

2 Purpose

To ensure safe use of the McKinley T34 Syringe Pump.

Comprehend indications for the use of a syringe pump

List the equipment necessary and be able to safely set up a Syringe pump for patient use

Identify the key component parts of the McKinley T34 Syringe Pump.

Select appropriate sites that may be used for infusion by the Syringe Pump and subcutaneous bolus dosing.

To understand the need for subcutaneous bolus dosing .

Set up the McKinley T34 Syringe Pump

Identify drugs that are commonly used in the syringe pump

List T34 alert and alarm types, possible causes and action to be taken.

Understanding of and adherence to local guidelines and policies regarding use of the relevant equipment

2.1 Indications for the Use of a Syringe Pump

The syringe pump is an effective way of controlling a variety of symptoms

To relieve pain not adequately controlled by oral medication

For intractable nausea/vomiting not adequately controlled by oral/rectal route

Inability to swallow/loss of oral route eg dysphagia

To effectively control colic associated with bowel obstruction

To provide effective sedation for agitated/restless end of life patients

To reduce excessive/noisy secretions

End of life care

2.2 Infusion Sites for Soft Sets

Anterior aspect of upper arm

Anterior aspect of thigh

Anterior chest wall

Anterior abdominal wall

Scapula region – (recommended for agitated patients only)

Patient preference is important when choosing the site

2.3 Sites to Avoid

Areas of broken skin

Areas of inflammation

Lymphodematous limbs

Abdominal ascites

Any area that has undergone radiotherapy should be avoided

2.4 Central Venous Lines (CVL)

When central lines are available, the McKinley T34 Syringe Pump can be used to give medication intravenously. Use McKinley extension sets -0.5ml priming volume.

3 Definitions

The McKinley T34 Syringe Pump is a portable battery operated device which delivers a continuous subcutaneous infusion (CSI) of prescribed drug(s) over a fixed period of time generally 24 hours, that complies with all current safety standards.

The McKinley T34 model is calibrated in ml per hour. All T34 pumps for palliative care are set up to deliver the syringe contents by CSI over a 24 hour period only. NB in exceptional circumstances your local palliative care team (via hospice) must be contacted if a shorter infusion period is required.

When the McKinley T34 is used to give medication via a CVL, you need to liaise with EBME to ensure that the pressure setting is correctly calibrated on the McKinley T34 to a pressure stetting of 320.

3.1 Choice of Syringe

The recommended syringes to use with the McKinley T34 syringe pump is Becton Dickinson(BD) Plastipak or Braun Omnifix and only these must be used.

The most commonly used syringes have been 10ml and 20ml, however it has been more recently advocated (Dickman 2005) that a 20ml syringe is the recommended minimum volume for several reasons: a larger dilution will reduce both the risks of adverse site reactions and incompatibility and it also accommodates large doses of drugs. It is therefore recommended that 20ml syringes should be used and that they MUST have a luer lock facility in order to avoid leakage or accidental disconnection.

NB : The 50ml luer lock syringe is the largest syringe that will fit the Mckinley T34 syringe pump. It allows drugs to be diluted up to approximately 34 mls volume for BD syringes. This reduces the need for a second syringe pump when giving larger volume drugs, eg metoclopramide. A 50ml syringe is not recommended for routine use (it will not fit into the standard lockbox) but may be used for specific problem infusions.

Size of BD syringe	Fill volume
20ml syringe	17ml
30ml syringe (exceptional circumstances	22ml
50ml syringe (exceptional circumstances)	34ml

4 Procedure

4.1 Equipment Required

Action - Collect necessary equipment which should be kept in a standardised box which can be decontaminated. Please see Appendix 2.

McKinley T34 syringe pump. (Ensure robust system in place to track syringe pump location).

Battery, PP3: 9 volt alkaline/lithium. (Plus spare batteries as a new battery will last for approximately 3- 4 days depending on use).

20ml luer lock BD Plastipak / Braun Omnifix syringe. (BD Plastipak seem to fit well into the pump).

Clean field.

Iml/2ml syringes and a selection of needles to draw up prescribed individual medications.

Needles Blue 23G (to be used with glass ampoules)/Needles Green 21G.

Local anaesthetic cream, eg. Emla.

Soft Serter.

Soft set (priming volume 0.2ml).

Female luer lock caps.

Ensure skin is clean. Wash with soap and water if visibly soiled.

Transparent adhesive dressing e.g. Hydrofilm.

Drug Authorisation Documentation.

Prescribed medicines / diluent.

Drug administration recording sheet / infusion label/Pump and site Monitoring chart.

Holster (only if patient is mobile).

Lockbox and key.

Sharps Box and denaturing pad.

Ensure syringe pump has been adequately decontaminated according to manufacturer's instructions. In accordance with local policy a completed Green Decontamination Status Band should have been attached to the syringe pump to indentify the device has been cleaned and is ready for use – Refer to PCT Cleaning and Disinfection Policy: NB the T34 needs to be checked yearly as a medical device. Check if it's in date - a sticker will be on the pump. Ensure date and times are correct prior to use.

4.2 Bolus Dosing

The use of soft sets does not allow bolus dosing. It is essential that the child is prescribed for a loading dose of medication via an alternative route such as buccal or intranasally. This will ensure that there is no delay in the relief of symptoms for the child.

The procedure for setting up a T34 Syringe Pump Initial Infusion is detailed in Appendix 1.

Guidelines for the subcutaneous siting of Soft Set are in Appendix 1.1

4.3 Changing the Set up of a T34 – Appendix 2

The **ONLY** setting currently being changed by senior clinicians is the time setting of the T34 by identified staff. These staff must have been instructed on the procedure to change the time so that summer and winter time changes can take place contemporaneously keeping the Event Log correct.

A datix must be completed for all adverse events.

In addition in the event that the T34 malfunctions in relation to its functionality the T43 MUST be sent immediately to MES for checking with an explanation provided. If any of the ancillary products malfunction the manufacturer must be informed.

The T34 is set for a 24 hour infusion period only.

4.4 Monitoring an Infusion in Progress

To get a summary of the infusion press the info key **once.**

Assess the stability of syringe content.

Assess the site.

Check the battery level at each visit.

Update record after each assessment.

Do Not Drop the syringe pump.

Immerse it in water.

Stick surgical adhesive tape to the syringe pump.

NB: If the syringe pump is accidentally dropped or immersed in water it should be checked as soon as possible by a qualified engineer, as this could result in the delivery of medication to the patient being altered.

Documentation and Monitoring

- Record details of preparation and commencement of infusion on recording chart.
- Date.
- Time.
- Total visual volume of syringe contents (ie drug(s) and diluents).
- Drug name(s) and batch number(s).
- Diluent name and batch number(s).
- Medical physics reference number on syringe pump.
- Signature(s) of person(s) preparing and checking.
- Site used and appearance.
- Battery level (%) Record (daily).

4.5 Appendix 3

4.6 Cleaning and Decontamination

Cleaning should be carried out with disposable detergent wipes (non alcohol) allow to dry thoroughly. The pump must not be submerged in water (and if it is accidentally dropped in water, it must be withdrawn from use immediately and sent to Medical Physics).

4.7 Appendix 4 – Common Problems

4.8 Appendix 5 – Competency Assessment for T34

5 Drugs Suitable for Syringe Pump

It is recommended that these points are always considered when preparing the T34 McKinley Syringe Pump.

Usually draw up to 17 mls.

As a general rule do not exceed 3 drugs in Syringe Pump.

We recommend drawing up individual drugs separately, in single syringes, for accuracy.

If in doubt consult palliative care team

5.1 Commonly used drugs in children

5.1.1 Diamorphine Levomepromazine (Nozinan)

Action	Strong Opioid Analgesic acts on mu receptors
Use	Severe pain, dsyspnoea or cough
Side effects	Nausea and vomiting, drowsiness, constipation, confusion, hallucinations, myoclonus, respiratory depression (unusual)
Dosage	See individual symptom care guideline or the drug administration document for babies, children and young people
Diluents	Water for Injection / Sodium Chloride 0.9%

Compatability – all commonly used drugs except dexamethasone.

5.1.2 Levomepromazine (Nozinan)

Action	Broad spectrum antiemetic. It acts on the main receptor sites involved in the vomiting pathway.
Use	Antiemetic/strong sedative effect useful in bowel obstruction.
Side effects	Sedation and postural hypotension. Irritation to the infusion site is possible.
Dosage	See individual symptom care guideline or the drug administration document for babies, children and young people
Diluents	0.9% saline must be used if it is used by itself Water for Injection can be used.

Compatability – Diamorphine, Methadone, Hydromorphone.
Purple discolouration can occur in ultraviolet light (ie sunlight) and should be discarded.

5.1.3 Midazolam (Hypnovel)

Action	Short acting benzodiazepine
Use	Sedative/terminal restlessness. Anxiolytic, anticonvulsant, muscle relaxant/myoclonic jerking, interactable hiccup.
Dosage	See individual symptom care guideline or the drug administration document for babies, children and young people
Diluents	Water for Injection / Sodium Chloride 0.9%

Compatability – Diamorphine, Ondansetron.

5.1.4 Hyoscine Butylbromide

Action	Antimuscarinic, antispasmodic and antisecretory
Use	Intestinal colic associated with bowel obstruction. Treatment of large volume vomiting that occurs with bowel obstruction. (Reduces gastrointestinal secretions) To dry terminal secretions
Dosage	See individual symptom care guideline or the drug administration document for babies, children and young people
Diluents	Water for Injection / Sodium Chloride 0.9%

Compatability – Diamorphine, Cyclizine (Appears to be incompatible - concentration dependent – suggest Glycopyrromium.

5.1.5 Dexamethasone (Decadron)

Action	Cortiscosteriod with anti inflammatory action
Use	Nausea and vomiting due to raised intracranial pressure, intestinal obstruction Breathlessness secondary to tumour induced airway obstruction Pain (caused by nerve compressions)
Dosage	See individual symptom care guideline or the drug administration document for babies, children and young people
Diluents	Water for Injection / Sodium Chloride 0.9%
Note	**use alone as will precipitate with other drugs** 7 times more potent than prednisolone (blood glucose levels can be raised, all patients) 2mgs dexamethasone = 15mgs of prednisolone

5.1.6 Cyclizine (Valoid)

Action	Antihistamine blocks histamine receptor in vomiting centre.
Use	Useful antiemetic if nausea and vomiting is caused by radiotherapy to head and neck, raised intracranial pressure, or vagus nerve stimulation eg bowel obstruction. Useful if worse on movement.
Side Effects	Adverse effects include: dry mouth, drowsiness, restlessness, urinary retention.
Dosage	See individual symptom care guideline or the drug administration document for babies, children and young people
Diluents	Water for Injection only. **Incompatable with Sodium Chloride 0.9%**

Compatability – Diamorphine, Haloperidol
(Cyclizine appears to be incompatible with Buscopan, concentration dependent).

NB Crystallization may occur in higher doses.

6 Drugs not suitable for use in a syringe pump

6.1 Diazepam (Valium)

Precipitation and tissue necrosis

6.2 Chlorpromazine (largactil)

Skin sensitivity

6.3 Prochlorperazine (stemetil)

7 Symptom Care management[1]

How will it be disseminated to relevant staff? As part of implementation, consideration should be given to what training, education and support needs there are.

7.1 The ‘Core 4’ Group of Symptoms and Drugs in Terminal Care

A range of drugs are available to support symptom control in the final days of life. However it is likely that only a small number will be required to control the most common symptoms as the last days of life approach. These symptoms and drugs can be thought of as the ‘Core 4’ group. It is wise to become very familiar with all aspects of the use of the most commonly used drugs, moving to use other drugs where indicated in the individual child as needed. If the use of these additional drugs is not as familiar to you, then advice on their use should be sought immediately. Where discharging a child, it is wise to check on the receiving teams’ usual practice in symptom control.

7.2 What are the 'Core 4' Group of Symptoms & Drugs?

The child's drug management will often have been rationalised and reduced in the final days. Symptoms most commonly requiring support will include Pain, Nausea and Vomiting, Terminal Agitation/Seizures and Secretions. As the end of life approaches, medication may need to be given as a 24 hour continuous infusion by syringe driver, although the need for this should always be assessed and patients only transferred from existing treatment if clinically indicated. Often, only one or two drugs will be required in the syringe driver although more may be used as necessary provided that in-solution compatibility permits. The drugs discussed below may be given in combination in solution via syringe driver, although it should be recognised that compatibility should always be confirmed, and may be limited as the number of drugs and their concentration in solution increases. Hyoscine, is usually given transdermally, rather than via syringe driver.

7.2.1 Pain

Please see Appendix 5 for the flow diagram. Diamorphine is indicated for opiate-responsive pain. Due to its solubility it will be the opiate of choice for administration via syringe driver for children whose pain has previously been well managed with oral, rectal, transdermal or sublingual opiate preparations.

The dose via syringe driver should be based on that previously delivered by other drugs and routes, taking account of the effect of relative potency of both the drugs and routes of administration. Ensure that any increased doses are assessed as being necessary and appropriate.

Breakthrough analgesia should be prescribed. It should be available in the most appropriate formulation and at a dose that reflects the dose delivered via the syringe driver and the potency of the 'breakthrough opiate' relative to that of Diamorphine.

Remember to still consider using non-opioid drugs such as paracetamol, or, eg, NSAID for their beneficial combined effect with opiates in neuropathic pain or adjuvant non-opioid analgesics such as anticonvulsants where appropriate and not contraindicated.

See Drug Formulary and Algorithms sections of the West Midlands Children and Young Peoples' Palliative Care Toolkit and the BNF for Children.

7.2.2 Nausea and Vomiting

Please see Appendix 6 for the flow diagram. *Cyclizine* is often considered the anti-emetic of choice for use in a syringe driver. It will often have been previously effective when given orally or rectally during the earlier stages of care. Care should be taken since solubility in combination with Diamorphine is limited. See West Midlands Children and Young Peoples' Palliative Care Toolkit Syringe Driver Considerations.

Cyclizine is particularly effective in managing nausea and vomiting that is of vestibular origin, and acts at the level of the vomiting centre. This will not always be the underlying cause of the nausea and vomiting, and at times, cyclizine may not therefore be effective or the drug of choice.

Levomepromazine is a very useful second line antiemetic when first line treatment has been ineffective. It is however, often considered as *first* choice rather than cyclizine in the terminal care setting. This is due to its broad spectrum of action, allowing it to be effective for nausea and vomiting resulting from all common triggers. This makes it particularly useful when the nausea and vomiting may have several, or unidentified, triggers in what is often complex morbidity in the final days.

Its potential sedative and anticholinergic effects must be considered.

Doses and indications are outlined in the drug doses and algorithms sections of the West Midlands Children and Young Peoples' Palliative Care Toolkit and BNF for Children.

7.2.3 Terminal Agitation and Seizures

Please see Appendix 7 for the flow diagram. *Midazolam* is well recognised as being helpful in managing seizures. It will often be selected to add to the syringe driver when a child has required two doses of Buccal Midazolam within 24 hours for unremitting seizures, and those doses have had good effect.

It is also helpful in persistent agitation in the terminal stages. In such situations its dose range is lower than for the management of seizures

Its potential to cause sedation must be considered, both alone and in the light of the other drugs the child is receiving.

Doses and indications are outlined in the drug doses and algorithms sections of the West Midlands Children and Young Peoples' Palliative Care Toolkit and BNF for Children.

7.2.4 Excess Secretions

Please see Appendix 8 for the flow diagram. *Hyoscine hydrobromide* is a useful drug to help control the upper airway secretions that often gather in the final hours of life and can cause noisy, rattly breathing.

It can often be successfully introduced in the early stages of increased secretions using the transdermal patch formulation. It can also be given by continuous infusion by syringe driver if needed.

Alternatively, *Glycopyrronium* may be used to help control the upper airway secretions.

Doses and indications are outlined in the drug doses and algorithms sections of the West Midlands Children and Young Peoples' Palliative Care Toolkit, and BNF for Children.

Note: With the exception of *Diamorphine*, none of the drugs discussed above is licensed for use in children for the stated indications.

For further information and guidance on symptom care management, please see http://www.act.org.uk/page.asp?section=417&sectionTitle=West+Midlands+Children+and+Young+People%27s+Palliative+Care+Toolkit, then follow the link for Managing Children's Palliative Care http://www.act.org.uk/core/core_picker/download.asp?id=582

For children with oncology conditions please refer to the child or young person's INDIVIDUALISED SYMPTOM CARE GUIDELINES.

8. Opioid Conversation Guide – Appendix 9

These equivalencies are intended to be used as a guide only as studies show a range of values.

Patients may metabolise different drugs at varying rates and monitoring during conversion is required.

Dose titration may be needed to avoid insufficient or excessive dosing. ADD IN 2*

8.1 Equivalent Dose Ratios for Strong Opioids

For information about medicines please refer to:

The association of Paediatric Palliative Medicine Master Formulary 2011 (WMPPC Toolkit)

9. Summary

The McKinley T34 Syringe Pump can provide a safe and effective method of infusion therapy providing the user adheres to the recommendations enclosed.

9.1 Points to remember

Always ensure that the syringe pump is checked annually for performance accuracy (MES)

Use the recommended syringes, batteries, etc.

Do not use the syringe pump if you are uncertain of how to use it.

Make sure you use a 20 ml luer lock syringe for the infusion unless exceptional circumstances such as larger volume of drugs.

If in doubt look in the Instruction Manual / seek further advice.

Never use a damaged syringe pump.

Please see Appendix 10.

Further reading and Helpful Websites

www.palliativedrugs.com www.cancernursing.org.uk www.palliativedrugs.com

West Midlands Paediatric Palliative Care (WMPPC) Toolkit
http://www.act.org.uk/page.asp?section=417&sectionTitle=West+Midlands+Children+and+Young+People%27s+Palliative+Care+Toolkit

CME McKinley Online Training System training site
http://www.mckinleymed.co.uk/online- training/index.php?accesscheck=%2Fonline-training%2Ftrainer.php

All practitioners need to register on this site and use the SCPCT Trust access Password : **staff**

This training should be accessed prior to the practitioner accessing The SCPCT A Practical session on how to set up a T34 Syringe pump with certificate obtained.

Local Contact for Advice

Dr Andrew Cowley, Consultant Paediatrician,	
Lead Clinician for Paediatric Palliative Care	- 01743 261 073
Macmillan Nurse, RSH (Office Hours)	- 01743 492 452
Macmillan Nurse, BCH (Office Hours)	- 0121 333 8684
Community Children's Nursing Team	- 01743 450 855
	- 07710 645 408
Hope House Hospice	- 01691 671 999
Medicine information at RSH	- 01743 261 175 Office hours

9.2 Syringe Pump Box Contents Checklist – Appendix 10

9.3 T34 Competency-Based Assessment – Appendix 11

9.4 Guidelines for the Subcutaneous Siting of Soft Set – Appendix 12

10 References

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Pearson ML, (1996) Guidelines for prevention of intravascular device – related infections. Hospital Infection Control Practices Advisory Committee. Infection Control Hospital Epidermiol, 17(7): 438 – 473.

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Appendix 1 - Procedure for setting up a T34 Syringe Pump Initial Infusion

	Action	Rationale
1	Prepare the patient and explain procedure.	To ensure adherence to the Mental Capacity Act 2005 and Consent for examination and Treatment (DOH 2009).
2	Document consent has been obtained and the action is in the patients best interest	
3	Ensure no interruptions whilst setting up the pump	To concentrate fully.
4	Gather equipment/prepare flat working surface on a clean field.	To ensure everything needed to carry out the procedure is available on a clean field.
5	Check patient specific direction/check drug balances	To ensure drug balances are correct.
6	Decontaminate hands and put on single use non-sterile vinyl gloves	To adhere to infection prevention and control guidance.
7	Draw up prescribed drugs and dilutants to 17mls fill volume into 20ml luer-lock syringe and prime the Soft set this is approximately 0.2ml volume.	To ensure a consistent and auditable approach to the setting up of the pump.
8	Complete and attach drug label to the syringe so plunger and content remain visible.	To ensure that information on which drugs are being administered can be quickly found and a visual check of the amount of volume administered can be made.
9	(a) Insert the Soft set into the patient having agreed the most appropriate site with the patient (refer to appendix 3). Apply transparent dressing taking care not to cover the clamp with the dressing. Ensure the Soft set line is then **CLAMPED.** (b) **If attaching to a CVL, adhere to local policy using aseptic non touch technique (ANTT)** (NB: Practitioners who wish to insert the prepared syringe into the pump prior to inserting the soft set into the patient must do so with caution to ensure no loss of medication during the process. 9c) Dispose of sharps in accordance with Trust policy. Ensure a new battery is inserted prior to commencing process below (Disposal of used batteries via Estates,	(a) Choosing a site most appropriate for the individual patient will reduce patient anxiety and the risk of complications. A transparent dressing will allow for the insertion site to be visualized. (b) To prevent infection (c) For safety and infection prevention.

	Shelton).	

	Action	Rationale
10	Ensure barrel clamp is down	To ensure the pump can undertake the pre-loading check.
11	Press on/off key to power up. The display screen will display : ▪ Screen one “McKinley T34” ▪ Screen Two Pre-Loading ▪ Screen Three Occlusion, Max rate, Program lock ON, Battery Status ▪ Screen Four Load Syringe	The pump goes through pre-loading process (back actuator moves backwards and returns to previous start position).
12	Press blue Info key, Press yes to check battery level., which must be over 35% and wait for the load syringe screen to return. Press the blue info button again using the down arrow key scroll down to Events Log and press YES this will show ▪ Event no. ▪ Date and time in 24 hour clock ▪ Volume change ▪ Press info – details Once the check has been made press NO and the pump will shortly display the LOAD SYRINGE screen.	If level displayed is 35% or less the battery will need to be changed. The screen will revert to “load syringe” if no other buttons are pressed.
13	Lift and turn barrel clamp 180 degrees.	This will allow for the professional to adjust the actuator ready to fit the syringe.
14	Align syringe over pump so syringe collar and plunger fit in the correct position move the actuator to sit the plunger at the correct position using the forward and back keys. Press plunger firmly down into position.	To ensure the syringe will slot into position easily and is fitted correctly. **The full syringe should always be loaded into the pump unattached to the patient to ensure no risk of an inadvertent bolus from a full syringe.**
15	Replace the barrel arm clamp back to start position. The screen will display 20ml BD Plastipak OR 20ml Braun Omnifix. The screen can be changed by pressing the (+) or (-) key. Once the right syringe has been identified press “YES” to confirm. The next screen will display Volume, Duration, Rate, Confirm : Press YES	To allow pump to recognize the type of syringe being used.
16	RELEASE the CLAMP.	To ensure free flow of syringe content.

	Action	Rationale
17	The screen displays “Start Infusion?” Press green Yes Key. The screen will then display the Time remaining, Rate, PUMP DELIVERING all should be checked for accuracy before commencing the infusion. The infusion must not be commenced if the information displayed is incorrect.	To ensure that it is safe to start the infusion.
18	Hold blue info key down to put keypad lock on and watch the movement of the line from the Lock OFF to ON.	To prevent any accidental pressing of the keys.
19	Put pump in lock box and lock	For safety.
20	Remove gloves and wash hands with soap and water	To adhere to infection prevention and control guidance
21	Single patient use holsters should be given to patients who are ambulatory	To allow the patient to mobiles safely with the syringe pump.
22	Record start volume/rate of infusion/battery level and time of end of infusion.	To abide by NMC codes of practice
23	The relatives / carers need to be given contact numbers to access professional help over a 24 hour period. Guidance for the changing of batteries and dealing with alerts and alarms should be provided where appropriate.	To ensure access to help throughout a 24 hour period.

	Action	Rationale
	Procedure for changing the SYRINGE ONLY Follow steps 1- 6 above. Check drug balances are correct. Draw up prescribed medications in 20ml luer lock syringe to 17mls. Unlock the syringe driver box Press blue info key and hold to unlock the key pad. Check display settings and record any remaining syringe content. Press INFO key again to check battery level. IF 35% or less you will need to change the battery Press red stop key **PRESS OFF KEY** **Apply CLAMP to soft set** Remove completed syringe from T34 and dispose in sharps box with denaturing pad. Attach new syringe. Follow Steps 8-23 above. **Ensure clamp has been released before commencing the infusion**	**To prevent inadvertent loss of medication from prepared syringe.** **To ensure that the infusion has infused correctly and run to time.** **To prevent inadvertent use of resume function.**

Appendix 2 - Starting an Infusion

STARTING AN INFUSION

Scenario

Pump default settings:	Lock ON, duration 24 hrs
Syringe:	20ml BD Plastipak syringe/Braun Omnifix.
Volume to be delivered	17mls

POWER UP

Ensure Barrel Clamp down & no syringe in place:
(First 3 screens display during actuator movement)

McKinley T34
Version N 105CAT

Pump details

McKinley T34
Version N 105CAT

The actuator is moving to the place, at the start of the previous infusion

Pump default settings are displayed

McKinley T34
Version N 105CAT

When actuator has stopped: Use the FF/back keys to move the actuator to the correct position for syringe loading.

(Ensure barrel clamp is down).

Syringe graphic flashes. When syringe detected in all 3 points, flashing stops & the next screen is displayed automatically.

20ml BD Plastipak
Select Press YES

If incorrect syringe size/brand displays, use keys to scroll for the one required.

Volume 17.0ml
Duration 24.00 rate 0.71ml/h

Infusion summary is displayed. **Carefully check all settings. Match the prescription before pressing YES to confirm.**

Start infusion?

Press YES to start the infusion when ready to do so.

Time running 24.00
Rate 0.5ml/hr

Running screens will alternate during infusion

Time remaining 23:59
Rate 0.71 ml/hr

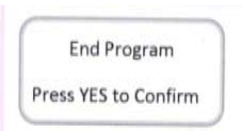
MONITORING WHILST INFUSING

Press INFO KEY **once**:

17.00 VI 0.0

Press INFO KEY **once**:

END OF INFUSION



Programme is complete.

When the pump detects a problem four things occur.

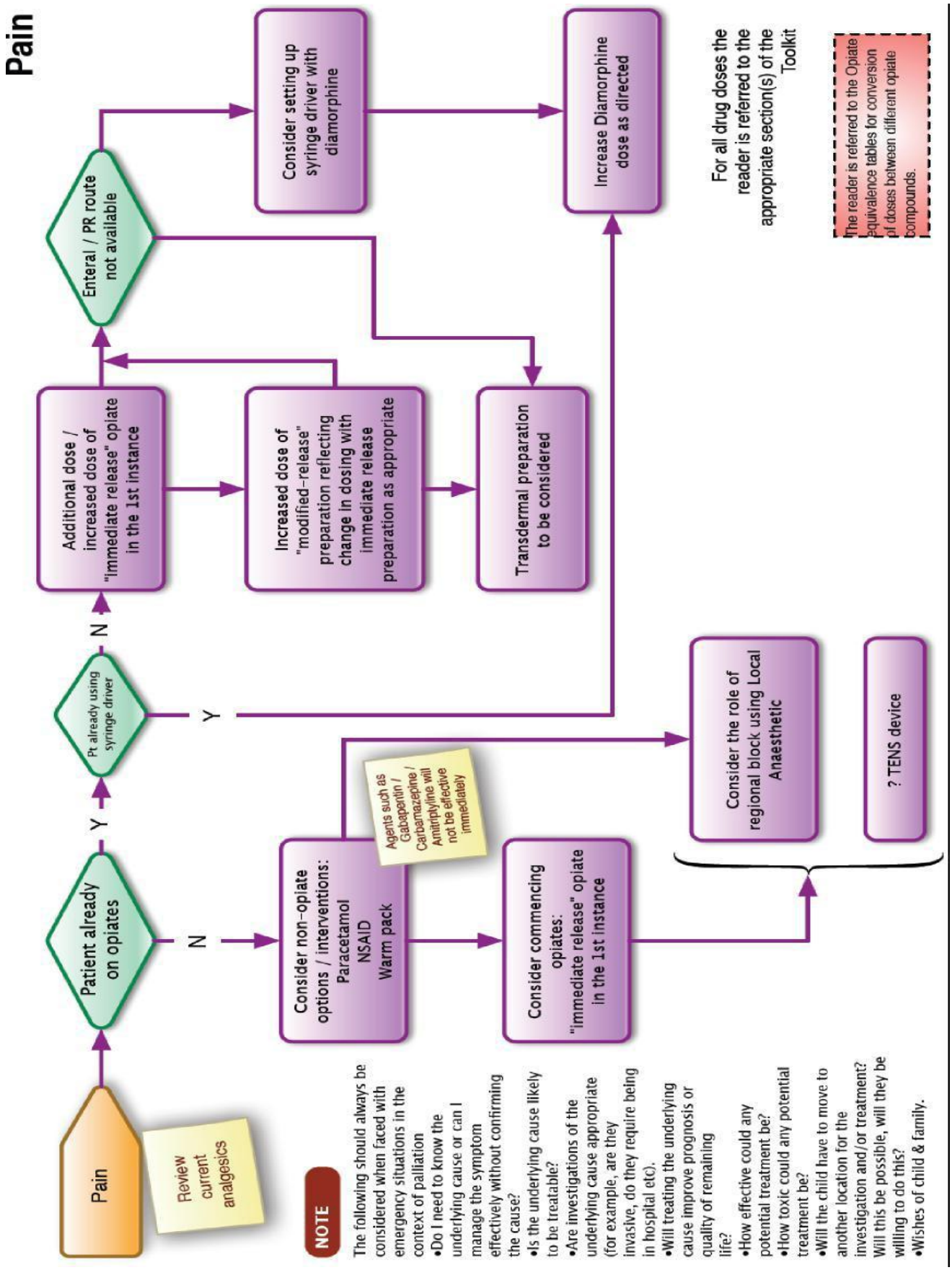
1. The infusion stops
2. An audible alarm is activated
3. A message appears on the display screen indicating the cause of the alarm
4. The LED indicator turns RED ALARM CONDITIONS - The alarm will sound for the following reasons:

LCD Display	Alarm type	Possible Cause	Action
Occlusion or Syringe Empty Occlusion/ Syringe Empty Check Line & Syringe Press YES to Confirm	Audible and visual alarm.	Patient cannula/line blocked, kinked. Occlusion. Infusion has finished.	Remove occlusion and restart as per page 23. Flush/change cannula as per local policy. End of program, switch pump off.
Syringe Displaced Syringe displaced, Check Syringe, Press YES to Confirm	Audible and visual alarm. Intermittent beep.	Syringe has been removed or displaced.	Check and confirm syringe seated correctly and resume infusion. Syringe flanges need to be in the vertical position at all times.
Pump Paused Too Long Pump Paused Too Long Confirm, Press YES	Audible and visual alarm Intermittent beep.	Pump left or no key presses detected for 2 minutes.	Start infusion, continue programming or switch off.
Near End Near End	Audible and visual alarm. Intermittent beep.	15 minutes from end of infusion.	Prepare to change syringe or switch off.
End Program End Program Press YES to Confirm	Audible and visual alarm. Intermittent beep.	Infusion complete.	Pump will alarm. Press 'YES' to confirm end of program and 'OFF' to switch pump off.
Low Battery Low Battery	Visual alarm.	Battery is almost depleted (30 minutes left).	Prepare to change battery and resume infusion.
End Battery Battery End	Visual alarm.	Battery is depleted.	Change battery and resume infusion.

Appendix 3 – Common Problems

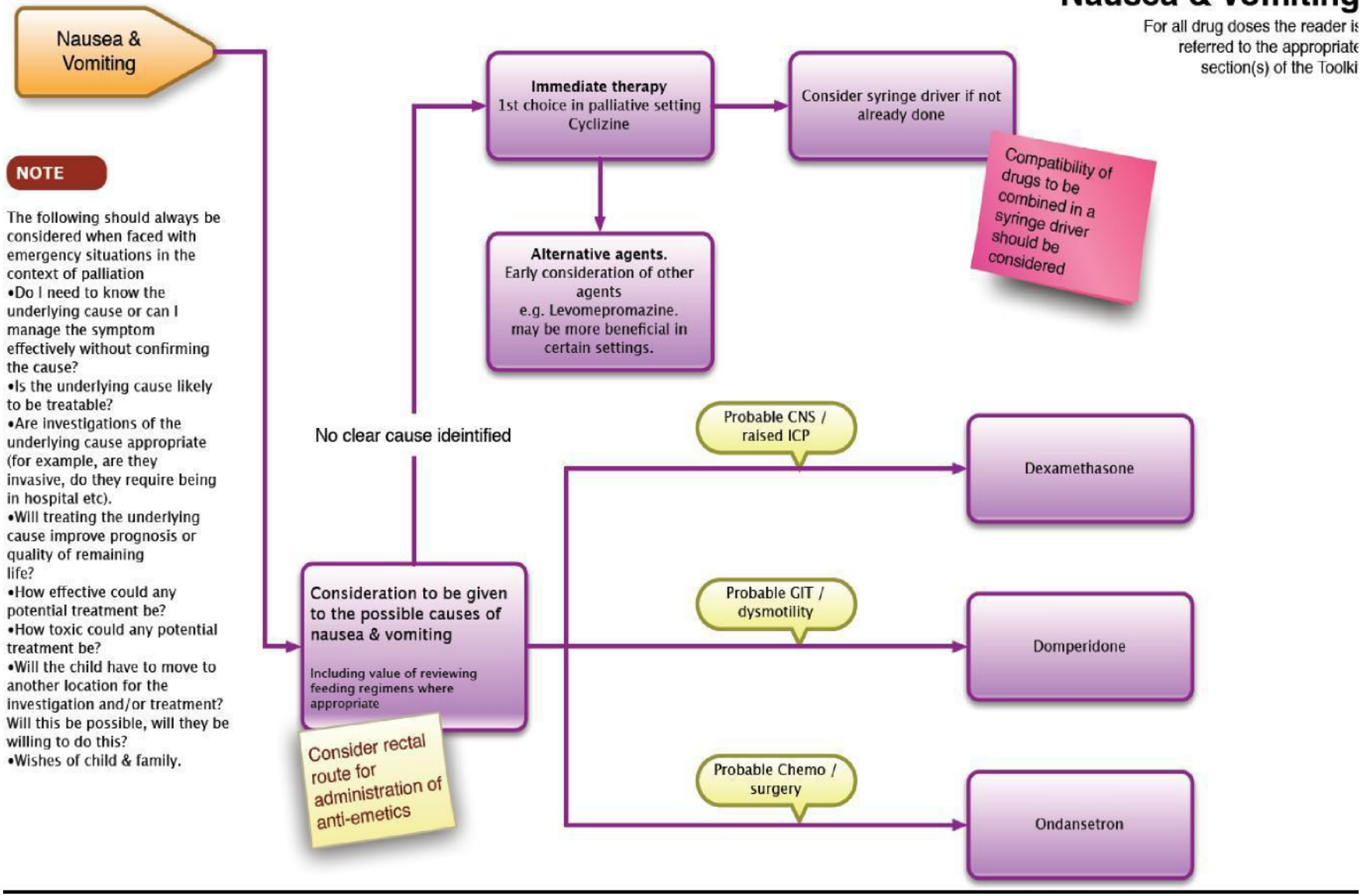
Fault	Possible Cause	Action
The pump will not start.	1. No battery present. 2. Battery inserted incorrectly. 3. Battery is depleted/very low. 4. Pump is faulty.	1. Fit a battery. 2. Re-align battery terminals. 3. Fit a new battery. 4. Service required.
Infusion ended early/going too quickly.	1. Wrong syringe brand confirmed during set up/incorrect volume measured by pump. 2. Pump faulty or incorrectly calibrated.	1. Stop infusion and discuss with doctor. Set up a fresh infusion. Ensure correct understanding of user/educate. 2. Service/calibration required.
The pump has stopped before emptying syringe.	1. Exhausted battery. 2. Faulty pump.	1. Fit new battery, turn pump on, confirm syringe size and brand select to resume infusion. 2. Return for service.

Appendix 4 – Pain

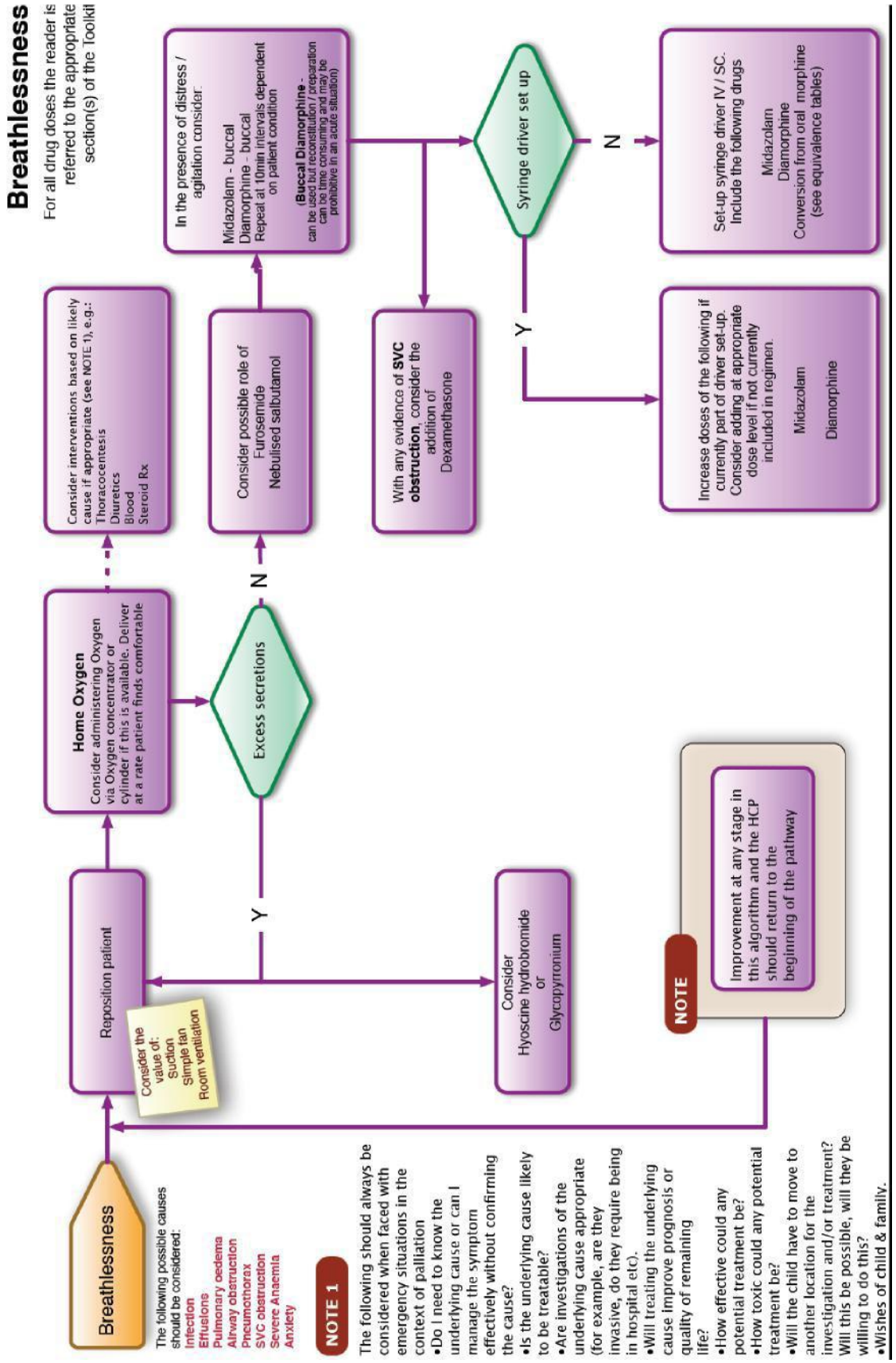


Nausea & vomiting

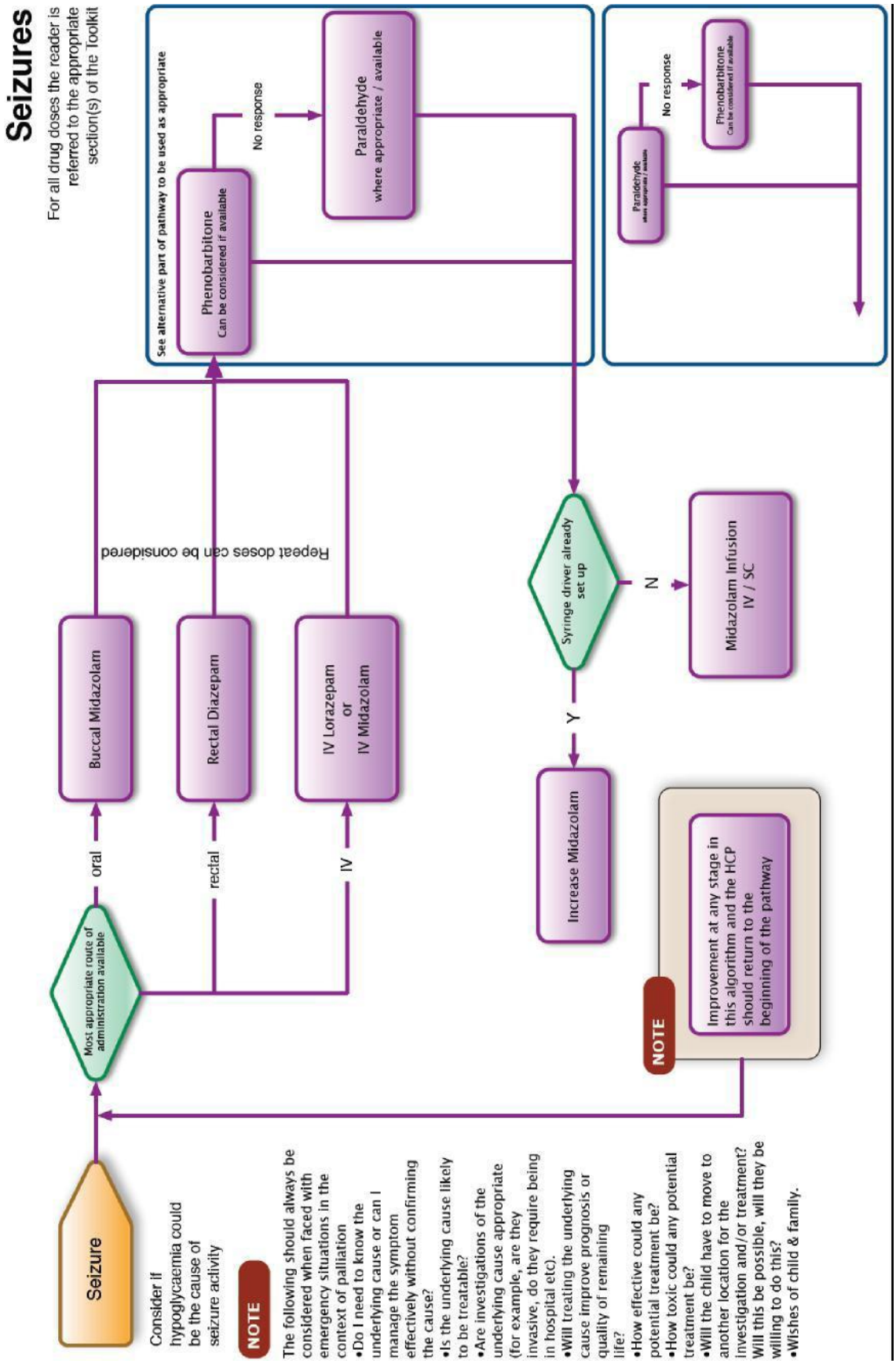
For all drug doses the reader is referred to the appropriate section(s) of the Toolki



Appendix 6 – Breathlessness



Appendix 7 – Seizures



Appendix 8 – T34 Competency-Based Assessment

CME McKinley

T34 COMPETENCY-BASED ASSESSMENT
Access level: LOCK ON

SCENARIO:

You are required to administer a drug infusion using a T34 syringe pump.

For the purpose of training, the candidate used the following criteria:

The drug is to be delivered over a period of: _____ *Hours - (pump default setting)*

Syringe size used: _____ *ml*

Syringe make used: _____

Total fluid volume in the syringe is: _____ *ml*

Priming volume of line is: _____ *ml*

	PERFORMANCE CRITERIA ACHIEVEMENT THROUGH CANDIDATE DEMONSTRATION, FACILITATOR OBSERVATION AND/OR QUESTIONING *The candidate achieved these outcomes because she/he has:*	✓ achieved X not achieved
1.0	**START UP** Ensured that all equipment is available and serviceable, checked that:	
1.1	The device is clean and visually intact	
1.2	The device is appropriate for the intended use and the mode of operation is identified	
2.0	Correctly prime/prepare infusion equipment:	
2.1	Checked that the syringe and extension set are appropriate and compatible for the device and the drug delivery	
2.2	Manually primed an infusion set	
3.0	Powered up the device:	
3.1	Checked that a syringe is **not** loaded and the barrel clamp arm is down on the device	
3.2	Installed the appropriate battery (6L.R61)	
3.3	Turned the device on	
3.4	Observed the completion of the pre-programmed start-up sequence (actuator movement)	
3.5	During pre-programming, checked the LED display to confirm the default settings of the device	
3.6	Checked the battery power available is sufficient to run the device for the prescribed duration	
4.0	Ensured syringe placement and detection:	
4.1	Visually aligned the 3 syringe sensors to syringe and used the FF/back keys to adjust as necessary	
4.2	Correctly loaded the syringe: ensured the syringe is placed in the 3 detection areas fully and observed LCD screen to confirm correct placement	
4.3	Checked that the device had correctly identified the syringe brand and size and taken appropriate action if necessary if not identified correctly	
5.0	Verify set parameters:	
5.1	Reviewed the summery screen: Checked LCD screen for correct duration of infusion (volume, duration & rate)	
5.2	Observed "start infusion?" screen	
5.3	Checked that the administration set was connected to the patient access port and the clamp was released (if not already done so)	
5.4	Correctly commenced the infusion and observed the "running screen"	

CME McKinley

	MONITORING	
6.0	Correctly accessed/explained the **INFO KEYS** to:	
6.1	Single press to view: volume infused & volume to be infused	
6.2	Double press to view: battery status	
6.3	Revert to default running screen	
6.4	Activate/deactivate key pad lock	
7.0	Demonstrated awareness/performed checks/or action to be taken in relation to audible/visual **ALERT**:	
7.1	Near end of infusion	
7.2	Low battery	
8.0	Demonstrated awareness/performed checks/or action to be taken in relation to audible/visual **ALARMS**:	
8.1	Occlusion	
8.2	Syringe empty	
8.3	Syringe displaced	
8.4	Pump paused too long	
8.5	End battery	
	CLOSE DOWN	
9.0	Correctly closed down and dismantled the device (assuming duration completed):	
9.1	Checked device/tubing disconnected from access device	
9.2	Removed syringe from device and returned barrel clamp to down position Turned the device off	
9.3	Demonstrated safe removal of disposables	
9.4	Correctly removed the batteries ready for storage	
9.5	Cleaned/decontaminated /stored the device as per local policy/manufacturer instructions	

Use this space to add any additional comments on the assessment. Please ensure that each comment relates clearly to a numbered performance criterion.	
No	

Though not part of the assessment for starting up, monitoring and closing down of the device in the correct sequence, the user must be aware of other features that are available, the prompts that can appear and action to be taken in certain circumstances.

FEATURE: Purge option

*In order to eliminate/reduce slack (visible spaces at the syringe collar & plunger loading points) and ensure a faster start up time (time to reach the programmed infusion rate), the user can purge the system (**once only**) up to up to the default setting of 0.2ml).*

To use this option after syringe confirmation:

a. Press FF key

b. Ensure the patient is NOT connected to the set & Press Yes to confirm.

d. Press and Hold the FF key until the slack is removed and/or purge is completed

e. Press STOP to return to programming screens when purge is completed.

PROMPT: Pump paused too long

Activated after 2 minutes if the device remains paused: Pause can be continued by pressing the "yes" key.

Options available: re-pause, restart the infusion or turn the device power off.

PROMPT: "Resume"/"new programme" screen

If the pump was stopped and turned off before the last program reached "End Program" the Resume prompt screen will appear (e.g. if, during an infusion, the pump was powered off to change the battery). Press NO to continue programming the new regime.Press YES to resume current programme.

ACTION TO: Silence the alert/alarm noise before troubleshooting

Press "yes" key to silence the alert/alarm noise for 2 minutes (device is paused). Observe screen to indicate the reason for the alert/alarm.

Date completed: …… Candidate name: ……

Attach this completed sheet to your learning portfolio

Appendix 9 – Syringe Pump Box Contents Checklist

Syringe Pump (SP) Box Contents Checklist	**Number Required in box**	**Tick Present on issue to Patient**
T34 McKinley SP	2	
Lockable SP Box	2	
Batteries (9 volt)	2	
Soft sets Soft Serter	5 1	
20ml luer lock syringes (either Becton Dickinson Plastipak or Braun Omnifix)	10	
1ml syringes	10	
2ml syringes	10	
Filter needles (Must be used to draw up medication from glass ampoules)	10	
Green needles 21G	10	
Sterile water 20ml	10	
Sodium Chloride 20ml	5	
Sharps Box yellow top	1	
De-naturing absorbent pad for sharps box	1	
Drug labels to be attached to syringe	5	
Semi-permeable clear film dressing 10x12.5cm	5	
Non-sterile gloves (medium)	1 box	

SP box contents checked		
SP box issued to patient		
SP box returned		

In Binder within SP box

- McKinley T34 Syringe Pump Instruction Manual
- Soft set insertion guidelines
- Guidelines for the administration of drugs
- Symptom Control Guidance
- WMPPC toolkit
- Spare Drug Administration Sheets
- Evaluation sheets

Other supplies

- BNF – most up to date
- Aprons/Gloves
- Key for lock box
- Scissors
- Dressing Tape
- Skin plasters
- Gauze
- Detergent cleaning wipes
- Stethoscope
- Suction equipment
- Pen

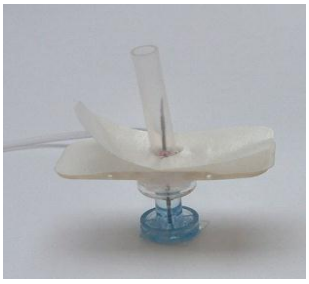
Appendix 10 - Subcutaneous Infusion Set

Equipment required

- Prepared medication in luer lock Syringe
- Local skin anaesthetic cream (if required)
- Sharps bin
- ChloraPrep Frepp 1.5ml Applicator (Chlorhexidine Gluconate 2% w/v and Isopropyl alcohol 70% v/v)
- Appropriate size Sof-Set Subcutaneous Infusion Set
- Apron
- Non sterile gloves
- Purell alcohol hand rub

Micro QR (Quick Release)

Short Catheter (6mm)



Twin Tape Cover

QR (Quick Release) Connector

Standard

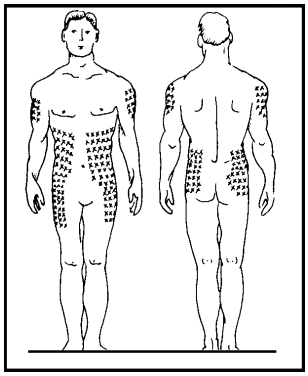
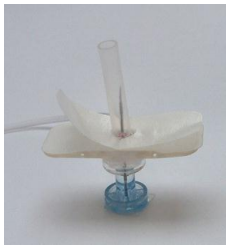
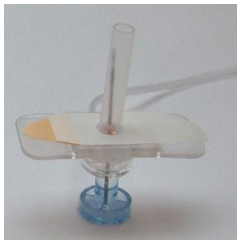
Long Catheter (9mm)

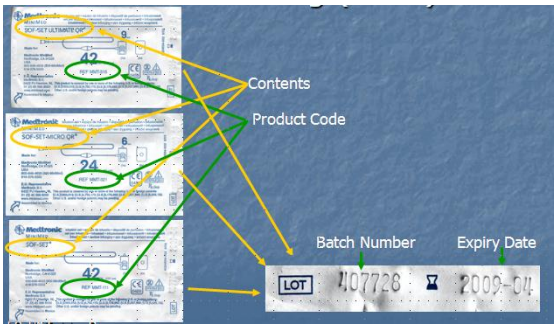
Single Tape Cover (white)

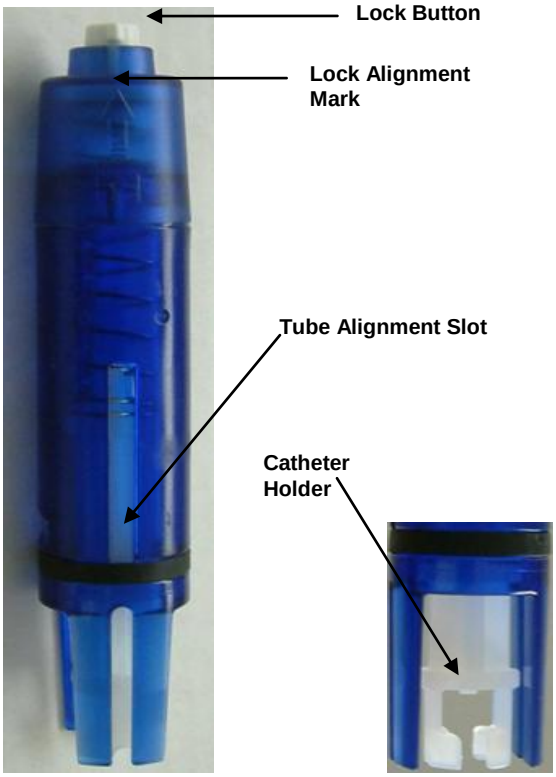
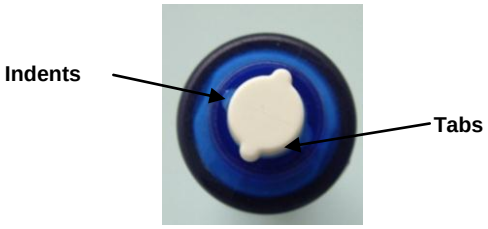
Pink Tab (not to be removed)

An Aseptic Non-Touch Technique (ANTT) must be used when undertaking this procedure

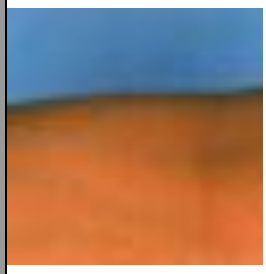
It is best practice for invasive procedures to be carried out using the Aseptic Non-Touch Technique (Pratt at el, 2007).

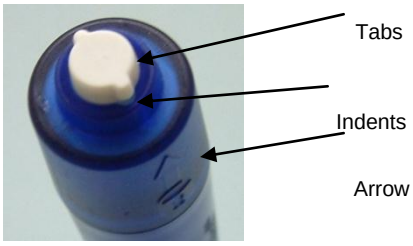
	Action		Rationale/Evidence
1	Explain and discuss the procedure with the child and family.	1	To ensure that the child and family understand the procedure and to gain consent. (Hope House Consent Policy, 2008).
2	Select an infusion site and apply an anaesthetic cream (if required). 	2	A small number of people experience discomfort when first inserting the Sof-Set subcutaneous infusion set. The Sof-Set may be used in any location where there is considered to be sufficient tissue depth, (usually those areas illustrated opposite). **NB: The Sof-Set is not recommended to be inserted into the chest wall.** (Applied Medical Technology, 2008).
3	Select the appropriate Sof-Set size:   Sof-Set (Short Catheter 6mm) Sof-Set (Long Catheter 9mm)	3	In small or emaciated children, care should be taken that the catheter is the appropriate length, i.e. a Sof-Set short catheter 6mm can be used for a child who may have insufficient subcutaneous depth. (Applied Medical Technology, 2008).

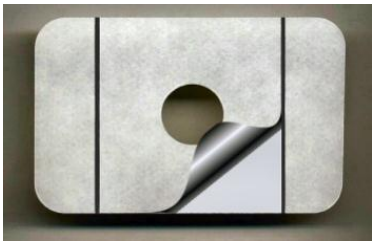
	Action		Rationale/Evidence
4	Once the appropriate Sof-Set size has been chosen, check the packaging for damage and the expiry date.  **NB: Occasionally the needle guard may be dislodged in transit. This does not jeopardise the sterility of the Sof-Set. However, careful handling is required to prevent needle stick injury.**	4	To ensure sterility of the Sof-Set. **<u>DO NOT USE</u>** if damaged, opened or out of date. (Applied Medical Technology, 2008).
5	Wash hands using soap and water. Dry hands thoroughly. Put on an apron and a pair of non sterile gloves.	5	Hand washing has been identified as the single most significant procedure in preventing cross-infection. (Hope House Infection Control Policy, 2006). (Gould & Drey, 2008).
6	Check and prepare the medication to be administered to the child in the chosen luer lock syringe and attach an additive's label. Attach the Sof-Set to the luer lock syringe and prime. Set up the prepared syringe of medication on the syringe driver.	6	To ensure the correct dosage. (Hope House Medicine Policy, 2009). The priming volume of the Sof-Set = 0.1ml. (Applied Medical Technology, 2008). Refer to the Mckinley T34 Syringe Pump training pack or guidelines for the use of the Alaris Infusion Pump.

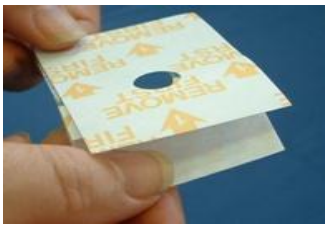
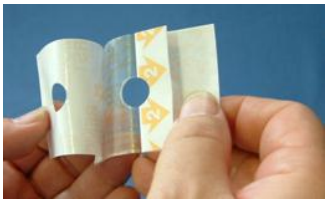
	Action		Rationale/Evidence
7	**Use the Sof-Serter to insert the Sof-Set Subcutaneous Infusion Set.**  **Step 1** Lock the Sof-Serter prior to loading the Sof-Set. The Sof-Set is **LOCKED** by rotating the white button so that the tabs are not aligned with the indents, as indicated below.  	7	It has been reported that using the Sof-Serter for the insertion of the Sof-Set provides a secure placement and it is more comfortable than using the manual technique. (Applied Medical Technology, 2008) This is a safe technique to prevent needle stick injury. (Applied Medical Technology, 2008).

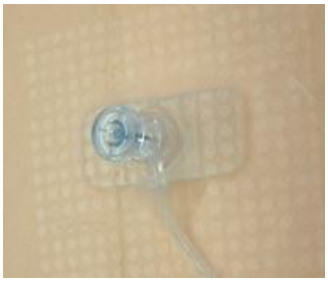
	Action		Rationale/Evidence
8	**Step 2** Grasp the Sof-Set at the point where the tubing connects to the needle housing and then slide the blue head of the introducer needle into the carrier, with the tubing exiting through one of the tube alignment slots on the side of the Sof-Serter. **NB: At this point the Sof-Set will be sitting loosely within the Sof-Serter.**   **Step 3** Push the Sof-Set down into the body of the Sof-Serter until there is an audible click. 	8	To ensure the Sof-Set is secured correctly in the Sof-Serter. (Applied Medical Technology, 2008). To ensure safe insertion of the Sof-Set using the correct technique. (Applied Medical Technology, 2008).
9	If you can go directly to the child's bedroom, without contaminating your gloves i.e. not opening doors or having to expose the infusion site, there is no need to change gloves. Apply Purell alcohol gel to the gloved hands and allow to dry. If your gloved hands are contaminated or the child's infusion site needs to be exposed, remove gloves, re-clean your hands using soap and water. Dry hands thoroughly and put on a clean pair of non-sterile gloves.	9	Reduces transmission of micro-organisms. (Hope House Infection Control Policy, 2006). (ANTT, 2009).

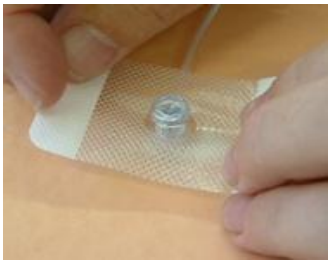
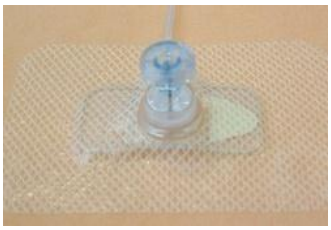
	Action		Rationale/Evidence
10	**Preparation of the Infusion Site**  Cleanse the infusion site with a ChloraPrep Frepp (1.5ml applicator) as illustrated below: Hold the applicator as shown, being careful not to touch the sponge. Pinch the wings together. You will hear a 'pop' as the ampoule breaks. Hold horizontal to aid even spread of the solution through the sponge.  Gently press the applicator against the skin and apply the antiseptic using repeated gentle up and down, back and forth strokes for 30 seconds.  Leave for approximately 30 seconds, allowing the area to air dry completely before proceeding. Discard the applicator after a single use.	10	Chlorhexidine based solutions are recommended to disinfect the skin and help prevent infections prior to invasive procedures, i.e. subcutaneous infusions, injections, peripheral cannulation. (Pratt et al, 2007). Active substances in a ChloraPrep Frepp (1.5ml applicator) is Chlorhexidine Gluconate (2% w/v) and Isopropyl Alcohol (70% v/v). The inactive ingredient is purified water. (Enturia, 2009). ChloraPrep Frepp is not licensed for use on babies less than 2 months of age, as it can cause irritation and be absorbed into a baby's skin. (Enturia, 2009). Clinical evidence argues in favour of antiseptics with sufficient friction to ensure a deeper penetration of the epidermal layers, as well as cracks and fissures of the skin. (Crosby et al, 2001). (Enturia, 2009).

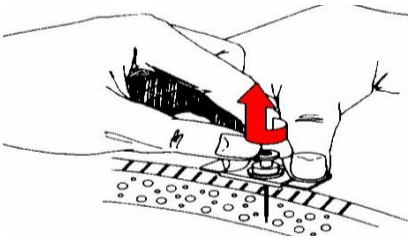
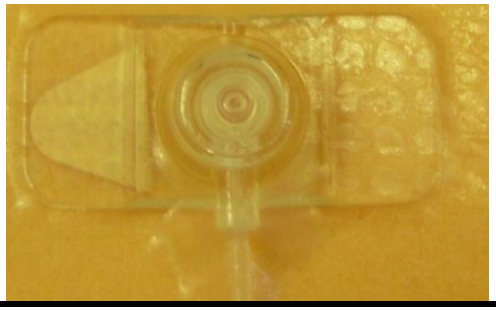
	Action		Rationale/Evidence
11	**Insertion of a Sof-Set Subcutaneous Infusion Set using the Sof-Serter** **Step 1** Unlock the Sof-Serter. The Sof-Serter is unlocked when the tabs on the white button are aligned with the arrow and the indents on the top of the device.  **Step 2** Pinch a fold of skin and hold the Sof-Serter vertically onto the surface of the skin. Press the white button and the Sof-Set will be released into the tissue.  **NB: There must not be any evidence of blood present in the Sof-Set after insertion.**	11	This helps to stabilise the skin to enable a quick and smooth insertion. (Applied Medical Technology, 2008). Evidence of blood in the Sof-Set indicates that a capillary has been punctured. If this has occurred, the Sof-Set must be removed and re-sited at least 1inch away from the previous insertion, to prevent cross infection. (Applied Medical Technology, 2008).

	Action		Rationale/Evidence
11	**Step 3** To remove the Sof-Set from the Sof-Serter, place a finger on both sides of the Sof-Set wings to hold it in place. Gently, lift up the Sof-Serter to unseat the blue head of the introducer needle from the catheter holder of the Sof-Serter.  Rotate the Sof-Serter 90° and slide the catheter holder off the introducer needle. **NB: To disinfect the Sof-Serter and prevent cross infection, the Sof-Serter must be cleaned thoroughly with a disposable disinfection wipe (Sani-Cloth CHG 2%) in between each use.** Do not remove the introducer needle before securing the Sof-Set with a sterile, adhesive, transparent, semi-permeable polyurethane dressing.	11	To prevent dislodgement of the Sof-Set. (Applied Medical Technology, 2008). To prevent cross infection (Hope House Infection Control Policy, 2006). To prevent dislodgement of the Sof-Set. (Applied Medical Technology, 2008).
12	**Securing the Sof-Set** There are two types of adhesive dressings that are included with each Sof-Set. These are: **White Adhesive, Transparent, Semi-Permeable Polyurethane Dressing**  This dressing has a greater adhesion than the IV3000 adhesive dressing. However, there have been several reported incidences of skin reactions associated with this dressing.	12	Correct selection of an adhesive dressing is important. (Applied Medical Technology, 2008). Check the Child's Medicine Administration Record for any allergies to specific dressings. An adhesive, transparent, semi-permeable, polyurethane dressing is important in preventing trauma and the extrinsic contamination of the site of entry. (Pratt et al, 2007).

	Action		Rationale/Evidence
13	**Dressing Changes** This dressing should be changed every 7-days, or sooner if it is no longer intact, or moisture collects under the dressing. ChloraPrep Frepp (1.5ml applicator) should be used to clean the skin around the Sof-Set, if dressing changes are required.	13	To prevent infection. (Pratt et al, 2007) The Epic 2 guidelines recommend the use of 2% Chlorhexidine in 70% Isopropyl Alcohol (ChloraPrep) to clean the skin in between dressing changes. This solution has been proven to be effective for skin antisepsis. (Larson, 1988). (Pratt et al, 2007).
14	**Instructions on how to Secure the IV3000 Adhesive Film Dressing**  Hold the dressing with the 'Remove First' side uppermost.  Remove the 'Remove First' cover completely.  Hold the dressing by the non-adhesive edge and partially remove cover '2'.  Place the dressing, adhesive side down over the Sof-Set.	14	

	Action		Rationale/Evidence
14	 Remove cover ‘2’ and smooth the dressing over the Sof-Set and the surrounding skin.  Remove cover ‘3’and smooth the dressing over the Sof-Set and the surrounding skin.  Ensure the dressing is as smooth as possible over the infusion site.	14	To ensure that the Sof-Set is secured into position. (Applied Medical Technology, 2008).

	Action		Rationale/Evidence
15	**Instructions on how to Secure the White Adhesive Film Dressings:**  Peel off the white centre liner paper.  Turn the dressing over, adhesive side down. Place the hole of the dressing over the blue head of the introducer needle and secure in place.  Pull off the two end liner papers  Following removal of the two end liner papers, smooth down the adhesive dressing over the Sof-Set and surrounding skin.	15	To ensure that the Sof-Set is secured into position (Applied Medical Technology, 2008)

	Action		Rationale/Evidence
16	**Removing the Introducer Needle** When the Sof-Set has been secured into position with the chosen adhesive dressing, the introducer needle can be removed. To remove the introducer needle, place a finger on each side of the Sof-Set wing and a finger on either side of the introducer needle.  Rotate the introducer needle half a turn and pull the needle straight out. Discard the introducer needle into the sharps bin. Sof-Set secured into the skin. 	16	This makes withdrawal of the introducer needle easier, as less friction is caused. (Applied Medical Technology, 2008) To prevent needle stick injury and to ensure appropriate disposal of sharps. (Hope House Infection Control Policy, 2006)
17	Commence the infusion to be administered via the Sof-Set as prescribed.	17	
18	Remove gloves and apron. Wash hands with soap and water and dry thoroughly.	18	Reduces transmission of micro-organisms. (Hope House Infection Control Policy, 2006). Effective hand hygiene is important both before and after glove use, as bacterial counts will have rapidly increased in the warm, humid environment created under gloves. (Larson, 1989).

	Action		Rationale/Evidence
19	Record and document the procedure in the child's daily diary. Including the size, batch number and expiry date of the Sof-Set.	19	To maintain accurate records. (Hope House Health Records and Information Management Policy and Procedures, 2008).
20	**Re-Insertion of the Sof-Set Subcutaneous Infusion Set** The Sof-Set subcutaneous infusion set can remain in situ for 5 days. However, if there is no evidence of redress or swelling, the Sof-Set can remain in situ for a maximum of 7 days. Rotate the infusion site for the re-insertion of the Sof-Set. Repeat actions No 1-16 for re-insertion of a Sof-Set Subcutaneous Infusion Set.	20	In this specific situation, a clinical assessment must be made and documented to reflect this decision. If the Sof-Set remains in situ for longer than 7 days, there is a higher risk of inflammation or infection being caused at the infusion site. (Applied Medical Technology, 2008). To protect skin integrity, a new Sof-Set must not be placed within 1 inch of the previous site. To ensure correct insertion. (Applied Medical Technology, 2008).