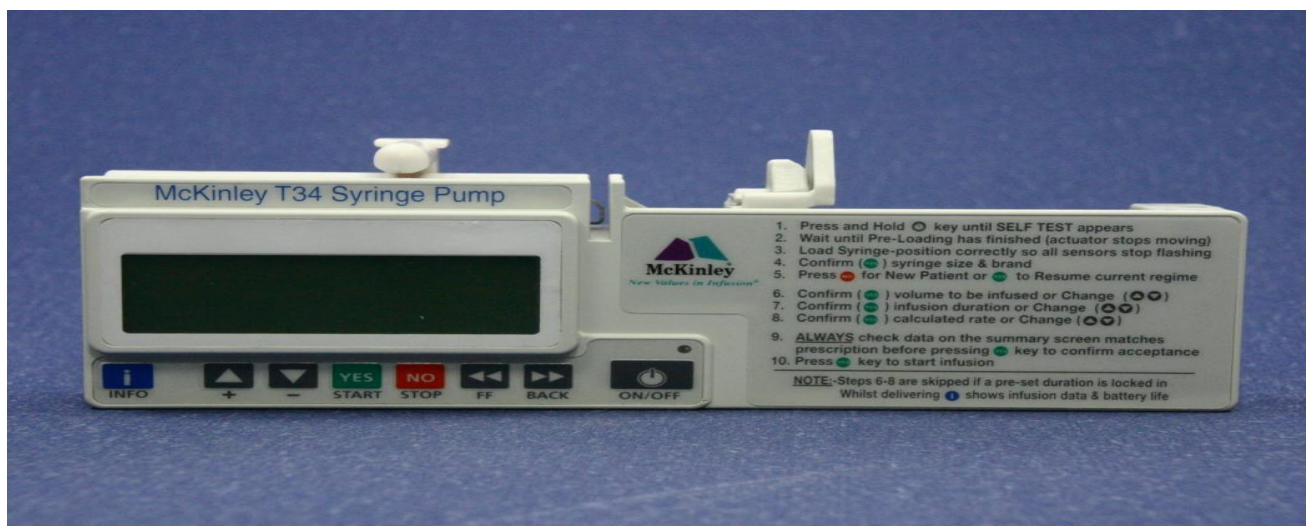


ST CATHERINE'S HOSPICE

Syringe Drivers Workbook McKinley T34



Name:

Place of Work:

Date:

Contents

1. Introduction and Learning Objectives
2. Legal, professional and ethical issues
3. Pre-operational inspection and proper set up of a syringe driver
4. Operating a McKinley T34 syringe driver
5. Troubleshooting
6. Syringe driver medication commonly encountered in palliative care
7. Reflective Practice

1. Introduction and Learning Outcomes

On completion of this workbook and workshop, you will be able to:

- discuss with patients and their families the reasons for administration of drugs using a syringe pump
- describe the uses of syringe pumps in palliative care
- discuss the drugs commonly used at the end of life
- set up and monitor a McKinley T34 pump
- troubleshoot for problems encountered whilst administering drugs via the syringe pump.

Note – Clinical competency can only be demonstrated in a clinical setting, so participants will need to arrange to be observed in their place of work by someone able to certify competency in that environment. At the end of this workbook there is also a section to assist you with your ongoing reflective practice.



Throughout the workbook you will see this picture. This is an opportunity for you to answer the questions and reflect on your own practice. We will go through these during the training.

What is a syringe driver?

A syringe driver is a portable battery-operated infusion device. In the palliative care setting, it is used to deliver drugs for pain and symptom management at a predetermined rate subcutaneously. The syringe driver should be used for patients who are unable to tolerate oral medication for whatever reason, for example, in nausea and vomiting, dysphagia, intestinal obstruction, oral disease. In addition, patients who are weak, agitated or unconscious may benefit from subcutaneous infusions.



McKinley T34 Syringe Driver

Continuous Subcutaneous Infusions in Palliative Care

Subcutaneous drug infusions using a syringe driver are used in palliative care. Drugs administered by subcutaneous infusion include opioid analgesics, antiemetics, anxiolytics, sedatives, non-steroidal anti-inflammatory drugs and anticholinergic drugs (Dickman et al, 2005).

Preparing the patient and family

It is important to recognise that having a syringe driver can be a frightening new experience for the patient and their family.

- Spend time with the patient and family explaining the procedure.
- Be aware that some people believe a syringe driver is a last resort, a sign of impending death, or a means of euthanasia. These are fears that will need exploring, providing reassurance that these fears are not true.
- Invite questions, acknowledge anxieties and reassure where appropriate
- Remember that the patient with lethargy may not have the energy to follow explanations.

The patient has a distressing symptom at the time of setting up the syringe driver

- It takes approximately four hours for medication to be effective when initially setting up a syringe driver.
- Any distressing or uncontrolled symptom at the time of setting up a syringe driver requires a PRN dose of medication.
- All PRN medication needs to be given (as prescribed) at an appropriate dose.

2. Legal, Professional and Ethical Issues

By the end of this section you will be able to demonstrate awareness and understanding of local, organisational and professional guidelines and policies; and the nurse's responsibilities in the use of syringe drivers.

Accountability

"As a professional, you are personally accountable for actions and omissions in your practice and must always be able to justify your decisions". (NMC, 2008)

Policies & Standards



ACTIVITY: In the box below highlight all the relevant policies and procedures that are relevant to the administration of medication in your clinical practice.

Relevant documents

NMC

- The Code – Standards of Conduct, Performance and Ethics (May 2008)
- Accountability Advice (April 2008)
- Advice on Delegation for Registered Nurses and Midwives (May 2008)
- Record Keeping: Guidance for Nurses and Midwives (July 2009)
- Standards for Medicines Management (August 2008)



ACTIVITY: Define the nurse's legal and professional responsibilities in the checking, preparation and administration of subcutaneous drugs.

Principles

- Treatment should be in the interest of the patient/client
- Practitioner must maintain knowledge, skill and competence
- Practitioner must acknowledge limitations
- Practitioner must not jeopardise standards and must comply with the Code
- Practitioner must recognise his/her direct and personal accountability
- Practitioner must avoid inappropriate delegation
- Clear and accurate records must be kept of treatment / interventions / observations

Implications

Practitioners are expected to have the knowledge, skills and competence in any role they undertake. Ultimate responsibility for maintaining knowledge, skills and competence lies with the individual practitioner. The employer should provide relevant training before asking an employee to undertake a particular task.

Liability

This is determined on the basis of competence, standard of care and the laws of negligence. If a practitioner has not followed the approved standard of care which would reasonably be expected of a professional and harm has been caused as a result, there would be a liability. If the nurse is found to have been negligent, he / she could be held personally liable and the employer would be found vicariously liable. If the nurse had inadequate training for the task being undertaken, the manager or person asking them to carry out the task may be liable.

Consent

Gaining valid consent prior to administering subcutaneous infusion therapy is a legal requirement and an ethical principle. Consent can be implied by participation e.g.

offering of the arm for cannula insertion or verbally. It is essential that the patient understands the proposed treatment and each nurse clarifies the patient's understanding and agreement to treatment.

Medicines Management

As a matter of basic principle, whether administering a medicine, assisting in administration or overseeing self administration, the practitioner must be satisfied that she or he:

- Has an understanding of substances used for therapeutic purposes.
- Is able to justify any actions taken
- Is prepared to be accountable for the action taken
- Is able to take the appropriate action if an adverse reaction occurs

Drug Errors

All incidents with continuous subcutaneous infusions using syringe drivers must be reported following the relevant hospice policies. An administration error could be:

- Incorrect dose of drug
- Incorrect drug
- Drug given to incorrect patient
- Incorrect route
- Expired date
- Incorrect diluent or volume of diluents
- Omission of drug
- Incorrect rate setting Incorrect syringe brand selected

Act Promptly

- Stop the syringe driver
- Assess the patient's condition, record appropriate observations

- Report the error to the shift co-ordinator / nurse in-charge
- Report the error to the Medical staff
- Complete an Drug Incident Recording Form or equivalent in your clinical area
- Inform the patient of the incident and where appropriate the patient's next of kin, if the patient consents
- Support fellow colleagues
- Document all actions
- Remain open and honest about the incident

Reporting of Adverse Incidents involving equipment

If an error is the result of a syringe driver fault it must be taken out of use and sent for service. Every health professional has a duty to see that all safety related incidents and potentially harmful products are reported to the Clinical Practice Sister, even if only suspected. The Medicines and Healthcare products Regulatory Agency (MHRA) have issued procedure guidelines for Reporting Adverse Incidents.



ACTIVITY: Describe how to report an accident / injury / error within your clinical area



ACTIVITY: Identify key aspects of risk management related to continuous subcutaneous infusion in your area.



ACTIVITY: Explain how you can minimise these risks and how you would deal with things going wrong.

3. Pre-operational inspection and proper set-up of a syringe driver

By the end of this section you should be able to demonstrate the pre-operational inspection and proper set-up of the syringe driver



ACTIVITY: What indications can you think of for using of a syringe driver?



ACTIVITY: What are the advantages of the use of a syringe driver?



ACTIVITY: What are the disadvantages of the use of a syringe driver?



Choosing an appropriate cannula site

ACTIVITY: Please indicate on the manikin common sites for subcutaneous infusions. ----- →



Remember to:

- Check patient's preferred method of wearing pump before selecting infusion site
- Ensure cannula site can be readily accessed for monitoring

Choice of syringe

The McKinley T34 may be used with most brands of syringe. Dickman (2005) recommends a 20ml syringe as minimum for several reasons: a larger dilution will reduce both the risks of adverse site reactions and incompatibility and it also accommodates large doses of medications. It is therefore recommended that 20ml and 30ml syringes should be used and that they **MUST** have a luer lock (or equivalent) facility in order to avoid leakage or accidental disconnection.

The McKinley T34 syringe drivers can use different brands and sizes of syringes including 2, 5, 10, 20, 30, 35 and 50ml. The 20ml Luer Lock syringe is the recommended minimum volume syringe. See box below for suggested fill volumes.

Size of BD Plastipak syringe	Maximum fill volume advised at St Catherine's Hospice
20ml	17ml
30ml	22ml
50ml (exceptional circumstances)	34ml

A 50ml syringe is not recommended for routine use and it will not fit into the standard lockbox. It may be used for specific infusions as it will accommodate a volume of 34ml.

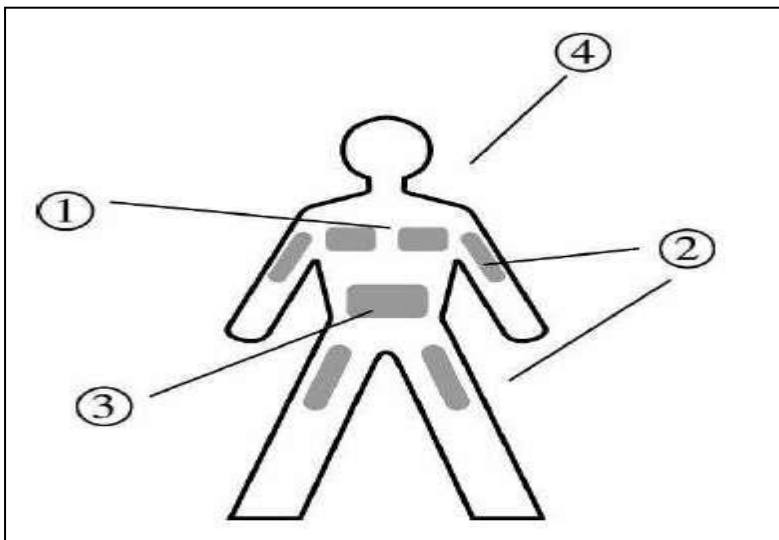
Further Information:

Choosing an appropriate cannula site

Choose a suitable site (see picture below). Where possible involve the patient in the choice of site.

Suitable sites:

1. Anterior chest wall
2. Anterior aspect of upper arm and thighs
3. Anterior abdominal wall
4. Occasionally the back



Areas which should NOT be used are:

- Lymphoedematous limbs – the subcutaneous tissues are ‘waterlogged’ with lymph fluid, which would affect absorption. There would also be increased risk of leakage or infection.
- Any site over a bony prominence or near a joint.
- The upper abdomen in a patient with an enlarged liver – there is a risk of puncturing the liver capsule
- The upper chest wall in very cachectic patients – there is a risk of causing pneumothorax.
- Previous irradiated skin area.

4. Operating a syringe driver to start an infusion

By the end of this section you should be able to demonstrate the ability to set up and operate the syringe driver

Equipment

1. Syringe driver
2. Battery (PP3 size, 9 V alkaline)
3. Cannula/ giving set
4. Luer-lok syringe of suitable size (20ml BD Plastipak is the minimum size recommended at St Catherine's Hospice)
5. Transparent IV adhesive dressing
6. Drugs and diluents
7. Needle (blue, 23G) to draw up drug
8. Drug additive label
9. Patient's prescription

STEP 1

Filling the Syringe

1. Regardless of the brand or size of syringe the same procedure should be followed.
2. Calculate the volume of the drug that needs to be drawn up.
3. Choose the appropriate size of syringe and check that it will fit the pump.
4. Draw up the required solution, including diluent, in the syringe, ensure there is no air in syringe/line.

Priming the Infusion Set If Starting a New Infusion

Attach and prime the infusion set. For the McKinley extension set, the line will take about 0.2-0.4ml to prime and will require some force to open the anti-syphon valve that is present.

Labelling

1. All syringes containing drug additives must be labelled.
2. If there is any doubt about the contents of the syringe, it should be discarded, particularly if the patient is transferred from one care setting to another.
3. Complete the label details in ink. The label must state:
 - The name of the patient for whom it is intended
 - The patient identification number
 - The date and time of preparation
 - The initials of the person preparing the contents.
 - The name and dose of all drugs e.g: morphine 15mg, haloperidol 5mg.
 - The name of the diluents.
4. Attach the label to the syringe, ensuring that it does not interfere with the mechanism of the infusion device, i.e. where there is contact with the barrel clamp arm. Place the label at the tip end of the syringe, leaving the scale visible so that it can still be read.

Practice Point

The medication must only be administered to the patient by the person who prepared the syringe



McKinley T34 Syringe Driver

ACTIVITY: Get to know the Syringe Driver

T34 Feature Recognition Keypad



1. INFO Key- access event log/Set Up (code protected)/battery status
2. UP/DOWN arrow keys- increase/decrease parameters/scroll options
3. YES/START key- confirms selection/starts infusion.
4. NO/STOP- step back a screen/stops infusion.
5. FF (forward)-moves actuator forward/purge facility
6. BACK-moves actuator back
7. ON/OFF

Designed by p & i associates inc.



T34- Feature Recognition Syringe Loading



1. Barrel clamp arm- (detects syringe size/width of barrel, secures)
2. Syringe ear/collar sensor (detects secure loading of syringe collar)
3. Plunger sensor (detects secure loading of syringe plunger)

Designed by p & i associates inc.





ACTIVITY: Read through this information, you will be shown and then have an opportunity to practice.

STEP 1: Pre-Loading & Syringe Placement

- Install a **fully charged disposable battery**
- Before placing the syringe into the driver ensure the barrel clamp arm is down then press and hold the “**ON/OFF**” key
- The LCD display will show “**PRE-LOADING**” and the actuator will start to move. Wait until it stops moving and the syringe sensor detection screen (Screen graphic) appears.



NOTE: During Pre-Loading the actuator always returns to the start position of the last infusion programmed.

- **Check the battery**

Press “INFO” key until the battery level appears on the screen and then press “YES” to confirm.

Verify the battery is fully charged (Above 90%). If less than 30% charge available, replace with fully charged battery. The average battery life, starting at 100%, is 3-4 days. If in the community setting, discard the battery if there is less than 40% power remaining.

STEP 2: Fitting the Syringe to the syringe driver and connecting the infusion to the patient.

PRACTICE POINT: For safety reasons, the syringe must be attached to the driver **BEFORE** connecting to the patient to avoid an inadvertent bolus dose, even when replenishing.

1. Check the patients name and wristband if used against the prescription.
2. Connect the Mc Kinley extension line securely to the syringe
3. If the actuator is not in the correct place to accommodate the syringe, leave the barrel arm clamp down and use the “FF” and “BACK” buttons on the keypad to move the actuator. Forward movement of the actuator is limited, for safety reasons; therefore repeated presses of the “FF” button may be required when moving the actuator forward. Backwards movement is not restricted.
4. Lift and turn the barrel clamp arm.
5. Seat the filled syringe collar/ear and plunger so the back of the collar/ear sits in the central rest (ensure correct placement). The syringe collar/ear should be vertical. Ensure that the scale on the syringe barrel is facing forward so that it can easily be read.
6. Lower the barrel clamp arm. Note that the syringe graphic on the screen ceases to flash when the syringe is correctly seated at all three points.



7. The syringe size and brand will then be displayed. Confirm that the syringe size and brand match the screen message. Press “YES” to confirm.



Connect the extension line to the cannula (which has already been inserted into the patient – see below for further instructions)

Practice Point:

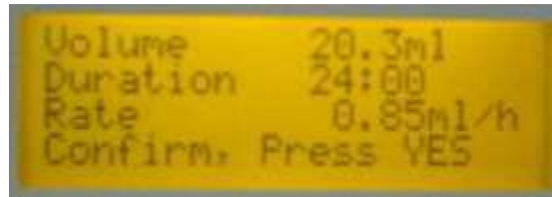
If the patient has unrelieved symptoms when the syringe driver is set up, a breakthrough dose of medication should be administered.

STEP 3: Inserting Infusion Line (if required)

1. Select appropriate site, avoiding areas where there is oedema or wounds.
2. Insert cannula, bevel down
3. Loop infusion tubing to prevent accidental traction
4. Fix with a transparent adhesive dressing

STEP 4: Starting the Infusion (New Syringe)

After the “Syringe Confirmation”, the pump calculates and displays the deliverable volume, duration of infusion (24 hours) and rate of infusion (mls per hour). (An example is below). Press “YES” to confirm or “ON/OFF” switch to return to the syringe options.



Note: **Volume discrepancy.** CME McKinley allows a 2% accuracy with the T34. With a 20ml syringe in place **this equates to +/- 0.5mls.** **If the discrepancy is > +/- 0.5ml this is considered unacceptable.** The following steps should be followed:

- Remove the syringe
- Restart the pump
- Observe the “PRELOAD” and start again
- Ensure that you have selected the corrected syringe brand

PRACTICE POINT:

The driver is programmed for 24 hours. Despite this if a previous programme is resumed in error the duration may be different. Confirmation of the correct information is vital.

If there is no volume discrepancy, start infusion:

1. Driver screen prompts ‘START INFUSION’.



Check the line is connected to the driver.and press ‘YES’ to start the infusion.

2. When the pump is running, the screen will display “Time remaining”, “Rate” e.g 0.66ml per hour and “Pump delivering”. (**This is an example rate**)



3. The green LED indicator flashes every 32 seconds.

PRACTICE POINT

If the infusion has not been started and a button has not been pressed for more than two minutes, an alarm will sound and the message “Driver Paused Too Long Confirm, Press YES” will show on the LCD display. To stop the alarm, press “YES” and continue programming the infusion.

STEP 5 - Keypad Lock

The T34 allows all users to lock the operation of the keypad during infusion. This function should be routinely used to prevent tampering with the device.

1. Lock the keypad after starting the infusion, pressing and holding “INFO” key until a chart is displayed showing a progress bar moving from left to right. Hold the key until the bar has moved completely across the screen to confirm the lock has been activated.
2. Although the keypad lock is on the following buttons are still active: NO/STOP, YES/START, INFO.



3. To deactivate the Keypad Lock: (Driver must be infusing)

Repeat the above procedure. The bar will now move from right (lock) to left (unlock) and a beep will be heard.

Practice Point

Always fully turn off the T34 by removing the keypad lock and turning off between inserting new syringes and between patients to ensure that the syringe driver recalibrates

STEP 6 - Lockboxes

Lockboxes may be used when there is a risk that a patient or relative may tamper with the syringe driver and contents.

Please note: a 50ml luer-lok syringe will not fit into a lockbox.

STEP 7 - Documentation

Record following details on the prescription sheet:

1. Date
2. Time
3. Volume registered on LCD
4. Rate in mls/hour
5. Signature
6. Site appearance
7. If new site, record and include reason
8. Prescription matches label

STEP 8: Checking

Check infusion one hour after set-up and in accordance with your local policy.

Check:

- Rate has not been altered.
- Volume remaining in the syringe. Calculate the volume infused to assess whether driver is delivering medication at approximately the desired rate.
- Solution in the syringe and the line for cloudiness, precipitation or colour change, and presence of large air bubbles (tiny ones not significant).
- Green LED light is flashing every 32 seconds and that the bottom line of the LCD display is alternating between “<<<<driver delivering” and make/size of syringe.
- Line is securely attached to syringe and cannula and not leaking, and line not kinked or trapped.
- Infusion site for redness, swelling, discomfort/pain, leakage of fluid.

Action points after monitoring

Action must be taken, and documented, in the event of:

1. Discrepancies in the actual and expected infusion rate (CME McKinley,
2. Signs of incompatibility
3. Blockage of infusion line
4. Damage to syringe barrel or tip

STEP 9: Pausing the infusion

This is not good practice and should only be used in exceptional circumstances, such as, in response the “occlusion alarm”. Please see Appendix on troubleshooting. However if you do need to temporarily stop the infusion follow the instructions below.

How to stop the infusion temporarily

This is not good practice and should only be used in exceptional circumstances, such as, in response the “occlusion alarm”. Please see Appendix 2

Temporary interruption of infusion e.g. bathing

1. Press “STOP”.
2. Press and hold “OFF” button until a beep is heard; the screen will go blank.
3. ***Do not remove syringe from driver.***
4. Disconnect the line from the cannula and follow infection control guidelines cap the end of the line and cannula with a universal bung.

Resuming the Infusion

1. Check that the prescription, syringe label and patient details match, to ensure that this is the correct syringe for this patient.
2. Reconnect the line to the syringe on the driver.
3. Press and hold the “ON” button until a beep is heard. The screen will request confirmation of syringe size and syringe brand.
4. Press “YES” to confirm. If the syringe size and brand do not match, scroll with up and down arrows until the correct selection appears, then press “YES” to confirm.
5. The screen will display:



Press “YES to Resume” the previous program

6. The screen will display “*Remaining volume, duration and rate of infusion*”
7. Press “YES” to confirm. Screen will display “*Start Infusion*” Press “YES” to confirm.

STEP 10 – Stopping the infusion and removing the syringe driver

When the infusion is complete and the syringe is empty, it will stop automatically and the alarm will sound. If the syringe driver is no longer required for the patient, press “OFF” and then remove the battery from the syringe driver.

- If the infusion is to be stopped before the syringe is empty, it should also be disconnected at the syringe end from the patient for safety reasons before the syringe is taken off the driver. A syringe that is not empty must **never** be taken off the driver while connected to the patient.
- Wipe the machine casing with a sanitising wipe (e.g. Clinell) before issuing to another service user (do not immerse driver in water).
- Dry and replace in packaging if no longer required for use
- Dispose of any remaining medication as per local policies
- Dispose of syringe and tubing as single use items
- Document the following information in the patient notes:
 - Time/reason
 - Whether cannula has been removed
 - Condition of the infusion site

PRACTICE REMINDER: DO'S and DON'TS

DO check the battery daily

DON'T drop the syringe driver

DON'T immerse in water

DON'T stick surgical adhesive tape to the syringe driver

NB If the syringe driver is accidentally dropped or immersed in water, send if for servicing. Failure to do so could put the patient at risk.

5. Troubleshooting



By the end of this section you should be able to review syringe driver maintenance and troubleshooting considerations and discuss the appropriate management.

EXERCISE:

Consider each of these potential clinical scenarios, using the information below to help problem solve.



You check the syringe driver and it is running but the needle site is red, painful and swollen. What would you do?



The alarm is sounding what are all the possible reasons for this?



You are checking the syringe driver and notice that it is running fast, what could the possible reasons for this and what would you do?



You are checking the syringe driver and notice that it is running slow, what could the possible reasons for this and what would you do?



You are checking the patient's syringe driver during the infusion and they tell you that they are in pain. The syringe driver has morphine sulphate 30mg in it. What would you do?



You are checking the syringe driver pump and notice that the contents appears cloudy and there are bits floating in it. What would you do?

INFORMATION: - Alarms and Troubleshooting

Troubleshooting

Needle-site problems	Action
<ul style="list-style-type: none"> • pain/discomfort • swelling • erythema • leakage of fluid • bleeding • poor absorption 	<p>Site Irritation</p> <ul style="list-style-type: none"> • Change site (use a new extension line when changing site). • Discuss possible change of medication with doctor (cyclizine and levomepromazine commonly cause site reactions). • Dilute medications to a larger volume in new syringe. • Consider separating into 2 syringe drivers. • Consider infection. • Consider an alternative route of administration of medication(s). • For severe site reactions that persist despite usual measures such as increased dilution of medication(s), consult palliative care specialist for advice on treatment options.
Equipment problems	Action
<ul style="list-style-type: none"> • the alarm sounds • the green LED does not flash • the syringe driver has got wet or been dropped • crystallisation • air in the tubing • pump will not start 	<p><u>McKinley T34 Driver Alarm Conditions</u></p> <p>When the driver detects a problem four things occur:</p> <ul style="list-style-type: none"> • The infusion stops. • An audible alarm is activated. • A message appears on the display screen indicating the cause of the alarm. • The LED indicator turns RED. <p><u>Alarms sounding – see below in separate table.</u></p>

	<p><u>Precipitation, cloudiness or colour change in syringe contents or line</u></p> <ul style="list-style-type: none"> • Stop infusion and inform prescriber. • Seek advice from pharmacy if possible. • Issues to check and discuss with prescriber include: <ul style="list-style-type: none"> ○ Compatibility information ○ Diluent (seek advice from a pharmacist) ○ Dilute to a larger volume ○ Separating into 2 syringe drivers or give one medication as a SC bolus • Keep away from sunlight and heat. • Advise patient on keeping syringe driver away from hot pack/heat pad or hot water bottle. <ul style="list-style-type: none"> • Commence new infusion at a different site with new cannula and extension line.
<p>Infusion appears fast possible causes</p>	<p>Action</p>
<p>(FAST – running more than 1 hour AHEAD of time)</p> <ul style="list-style-type: none"> • wrong syringe brand • pump faulty 	<p>IF MAJOR OVER-INFUSION, STOP INFUSION, CHECK THE CONDITION OF PATIENT AND SEEK MEDICAL ADVICE. REPORT AS A MEDICATION INCIDENT, QUARTINE THE EQUIPMENT AND SEND FOR EXAMINATION.</p> <ul style="list-style-type: none"> • Check the rate setting and calculations. • Check the correct syringe brand or size has been selected. • Change the entire syringe driver for a new one and send original for servicing. • Check that the syringe driver is not positioned higher than the infusion site

Infusion appears slow possible causes	Action
<ul style="list-style-type: none"> • blockages • battery exhausted • pump faulty 	<p>Check the rate setting is correct.</p> <ul style="list-style-type: none"> • Check the syringe driver light is GREEN and flashing. • Check the battery level and renew if below 50% • Check the correct (luer lock) syringe brand or size has been selected. • Check that syringe is inserted correctly into syringe driver • Check if syringe driver has been stopped and restarted for any reason. • Check contents of syringe and line - is there any evidence of crystallisation/ kinking of tubing? • Check cannula site - is this red/hard/lumpy/sore? <p>Change cannula site if necessary. Consider further dilution of drugs to minimise irritation by setting up a fresh syringe. Consider metal allergy if using nickel needle- recommended practice is to use a Saf-TIntima.</p> <ul style="list-style-type: none"> • If syringe driver continues to run slowly, change syringe driver and send for servicing. <p>Complete incident form.</p> <ul style="list-style-type: none"> • Check rate of infusion at regular intervals.
Uncontrolled symptoms	Action
<ul style="list-style-type: none"> • assess possible causes • consider the medication • seek specialist advice 	<p>Separate subcutaneous injections should be prescribed for breakthrough symptoms.</p> <p>Regular use of breakthrough medication indicates a need for reassessment of patient.</p>

Alarms

The pump will alarm at the completion of the infusion, if the syringe is displaced, if there is an occlusion, when the pump has been paused too long and when the battery is low.

Alarm Alert	Possible Causes	Action
Occlusion	Infusion set/ cannula blocked	<ul style="list-style-type: none"> • Switch off syringe pump • Check line for compression, kinking or crystallisation of contents • Restart syringe pump • If alarm sounds again, Switch off syringe pump • Gather equipment needed to re-prime line • Switch on syringe pump with syringe in place • Remove syringe and prime line • Replace syringe. You will need to move actuator using “FF” button • Select/ confirm syringe size • Press “YES” to resume • Check infusion rate is as before (Time and volume will have dropped) • Press “YES” twice to confirm, then restart the pump
Syringe empty	Pump has reached the “minimum travel” position	<ul style="list-style-type: none"> • Turn pump off • Replenish
Syringe displaced	One or more of the syringe detection sensors is not detecting the syringe	<ul style="list-style-type: none"> • Check syringe and re-seat as necessary
Pump paused too long	Pump has been left in “ STOP ” mode with no key pad presses detected for two minutes	<ul style="list-style-type: none"> • Start the infusion • Continue programming or turn the pump off if not needed
Near End*	Infusion will end soon (usually 45 mins before completion)	<ul style="list-style-type: none"> • Prepare to change syringe

Alarm Alert	Possible Causes	Action
	time, depending on syringe)	
End programme	Infusion complete	<ul style="list-style-type: none"> • Prepare and insert new syringe
Low Battery*	Battery is almost depleted	<ul style="list-style-type: none"> • Change the battery

Other Troubleshooting Issues

Fault	Possible Causes	Action
Pump will not start	<p>No battery present</p> <p>Battery is in the wrong way</p> <p>Battery is depleted/ very low</p> <p>Pump is faulty</p>	<ul style="list-style-type: none"> • Fit a battery • Realign battery terminals • Fit a new battery • Service required
The infusion is going too quickly/ ended early or too slowly/ volume remaining in syringe at end of infusion	<p>Wrong syringe brand confirmed during set-up.</p> <p>Pump faulty or incorrectly calibrated</p> <p>Check for evidence of tampering</p>	<ul style="list-style-type: none"> • Re-train user to prevent repeat of this event • Service/ calibration required • Check condition of patient and refer to medical team • Complete incident form • Assess symptom management and administer appropriate medication
The pump has stopped before emptying the syringe	<p>Exhausted battery</p> <p>Blocked/ trapped infusion set</p>	<ul style="list-style-type: none"> • Fit new battery • Turn pump on • Confirm syringe size and brand • Select “RESUME” to continue infusion • Clear occlusion

6. Syringe driver medication commonly encountered in palliative care

To ensure common symptoms in the terminal phase eg pain, secretions and agitation are anticipated and can be managed using anticipatory drugs

Consider:

- which medicines can be stopped
- which need to be continued or replaced (established analgesics, anti-emetics, anticonvulsants) for ongoing symptom control possibly by continuous subcutaneous infusion (CSCI) in a syringe driver
- many tablets can be prescribed as oral liquids
- what drugs need to be made available as PRN (as needed) medicines: prescribe and give all injections by subcutaneous route (SC)

5 common medications used in end of life care:

ANALGESIC: provides background and breakthrough (as needed) analgesia

ANTI EMETIC: continue existing anti-emetic if effective

ANTISECRETORY: provide as needed and start CSCI as soon as any rattle starts

RELAXANT / SEDATIVE: for agitation

ANTICONVULSANT: Midazolam 20 - 30mg/24hours by CSCI is usually sufficient to manage seizures which have required anticonvulsants

Analgesics	Anti-emetics	Anti-secretory	Sedation	Others
Morphine	Cyclizine	Hyoscine	Midazolam	Dexamethasone
Sulpahte	Metoclopramide	Butylbromide (Buscopan)	Levomepromazine	Ondansetron
Diamorphine	Haloperidol	Hyoscine	Haloperidol	Octrotide
Oxycodone	Levomepromazine	Hydrobromide		
Alfentanil		Glycopyrronium		

Diluents and Compatibility

- Drugs in syringe drivers are generally prepared with a diluent, commonly water for injection or Sodium Chloride 0.9%
- Watson et al (2011) Palliative Adult Network Guidelines 3rd Edition recommends: - water for injection as the diluent of choice with specific exceptions. For example:-
 - Sodium Chloride is the diluent of choice for Ketamine and Diclofenac

Drug conversions

Oral Morphine		Subcutaneous Morphine		Subcutaneous Diamorphine		Oral Oxycodone		Subcutaneous Oxycodone		Subcutaneous Alfentanil	
24 hr total dose (mg)	4 h dose (mg)	24 hr total dose (mg)	4 h dose (mg)	24 h total dose (mg)	4 h dose (mg)	24 h total dose (mg)	4 h dose (mg)	24 h total dose (mg)	4 h dose (mg)	24 h total dose (mg)	
30	5	15	2.5	10	2.5	15	2.5	7.5	1.25 - 2.5	1	
60	10	30	5	20	2.5 - 5	30	5	15	2.5	2	
120	20	60	10	40	5 - 7.5	60	10	30	5	4	
180	30	90	15	60	10	90	15	45	7.5	6	
240	40	120	20	80	10 - 15	120	20	60	10	8	
360	60	180	30	120	20	180	30	90	15	12	
CONVERSION FACTORS											
Oral Morphine to SC Morphine : divide by 2					SC Morphine to SC Oxycodone: divide by 2						
Oral Morphine to SC Diamorphine : divide by 3					Oral Morphine to SC Alfentanil: divide by 30						
Oral Morphine to oral Oxycodone: divide by 2					SC Morphine to SC Alfentanil: divide by 15						
Oral Oxycodone to SC Oxycodone: divide by 2					SC Diamorphine to SC Alfentanil: divide by 10						

References and further reading

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CME McKinley T34

Core Skills Framework

Name:Title:

Employer:Date of Assessment/Discussion:

Participant will demonstrate proper practical knowledge, theory of operation and clinical application of the Mckinley T34 Syringe Driver.

Clinician Self-Assessment

Core Skill	Yes/No	Signed
<p>1. <u>Demonstrate pre-operational inspection and proper set-up of the McKinley T34</u></p> <ul style="list-style-type: none"> a. Define the pump used. b. Define the application for use of this syringe pump. c. Identify the components on the syringe pump d. Identify common infusion sites. e. Explain which sizes of syringe can be used. f. Explain why a luer lock should be used. 		
<p>2. <u>Demonstrate the ability to operate the McKinley T34</u></p> <ul style="list-style-type: none"> a. Collect appropriate equipment b. Check syringe pump is clean and visually intact c. Correctly prime/ prepare infusion equipment d. Install the appropriate battery e. Power up device f. Check barrel clamp arm is down on the device without a syringe in place g. Turn on the syringe pump and observe the completion of the pre-programmed start-up sequence h. Check LCD display to confirm the default settings of the device. At St Catherine's hospice, all syringe pumps are set to run over 24 hours. i. Check the battery power available is sufficient to run the device for the prescribed duration j. Visually align the three syringe sensors to the syringe and using the "FF"/"back" keypads to adjust 		

Core Skill	Yes/No	Signed
<p>as necessary</p> <ul style="list-style-type: none"> k. Correctly load the syringe, ensuring it is fully placed in the three detection areas and check the screen to confirm correct placement l. Check that the syringe pump has correctly identified the syringe brand and size, taking appropriate action if needed, pressing “Yes” to confirm m. Check displayed volume and ensure that it corresponds within 2% to visual assessment . Eg: With a 20ml syringe this equates to +/- 0.5ml. n. Check infusion rate o. Check infusion set is securely attached to cannula and patient p. Check screen shows “pump delivering” and LED light is flashing q. Lock keypad using “info” button 		
<p>3. <u>Monitoring an infusion in progress</u></p> <p>Press (one press) “info” button to view “volume infused” and “volume to be infused” (VTBI)</p>		
<p>4. <u>Review McKinley T34 maintenance/troubleshooting considerations and appropriate actions</u></p> <ul style="list-style-type: none"> a. Review care and cleaning of the Syringe Driver. b. Review battery life and type c. Explain possible causes for the following: <ul style="list-style-type: none"> i) The infusion ended early. ii) The infusion has ended late. iii) The infusion has stopped. iv) The syringe driver will not start. v) The indicator light is no longer flashing but the motor runs. <p>State the conditions which will cause the syringe driver to alarm</p>	d.	

CME McKinley T34

Reflective Debrief with Supervisor

Reflection and Observation 1	Reflection and Observation 2
Date of discussion:	Date of discussion:
Clinician Signature:	Clinician Signature:
Supervisor	Supervisor
Name:	Name:
Role:	Role:
Signature:	Signature:
Action Plan for ongoing reflection, learning and review:-	