Syringe Pump

Standard Operating Procedure

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This Version	2	**Status**	Final
Replaces	N/A		
Approval Date	22 July 2022	**Where**	Clinical Skills Strategy Group
Ratification Date	NA	**Where**	NA
Date of issue	25 July 2022 Minor amendment 2023	**Review date**	25 July 2025
Applies to	Clinical Staff that administer and monitor medications using a syringe pump	**Exclusions**	

CONTENTS

Introduction

All health care professionals are expected to exercise professional judgement when using guidelines/procedures. Any decision to vary from this procedure is recorded in patient records, with reason for variance and action taken.

The aim of this procedure is to provide a framework for the management of CME Medical T34 and BD Bodyguard T battery operated syringe pumps, minimising hazards and ensure effective and safe use. The Bodyguard pump is an upgraded T34 pump. They are very similar and the differences are noted in the pictures in this SOP. As you read through the document if there are any differences in operation between the pumps this will be made evident in the text.

This SOP is applicable to both types of pump. The most notable change from previous practice is that from now,
If for any reason the syringe is removed from the actuator then a new syringe of medication needs to be drawn up and reset for 24 hours.

Once removed, a part used syringe must NEVER be put back into the syringe driver

This procedure supports justification of need, clinical use, staff training and equipment management. It should be read in conjunction with the following documents, this is not an exhaustive list.

- Just in case medication
- Medical Devices
- Medicines Management procedure/policy
- Controlled Drug policy/ procedure
- Waste

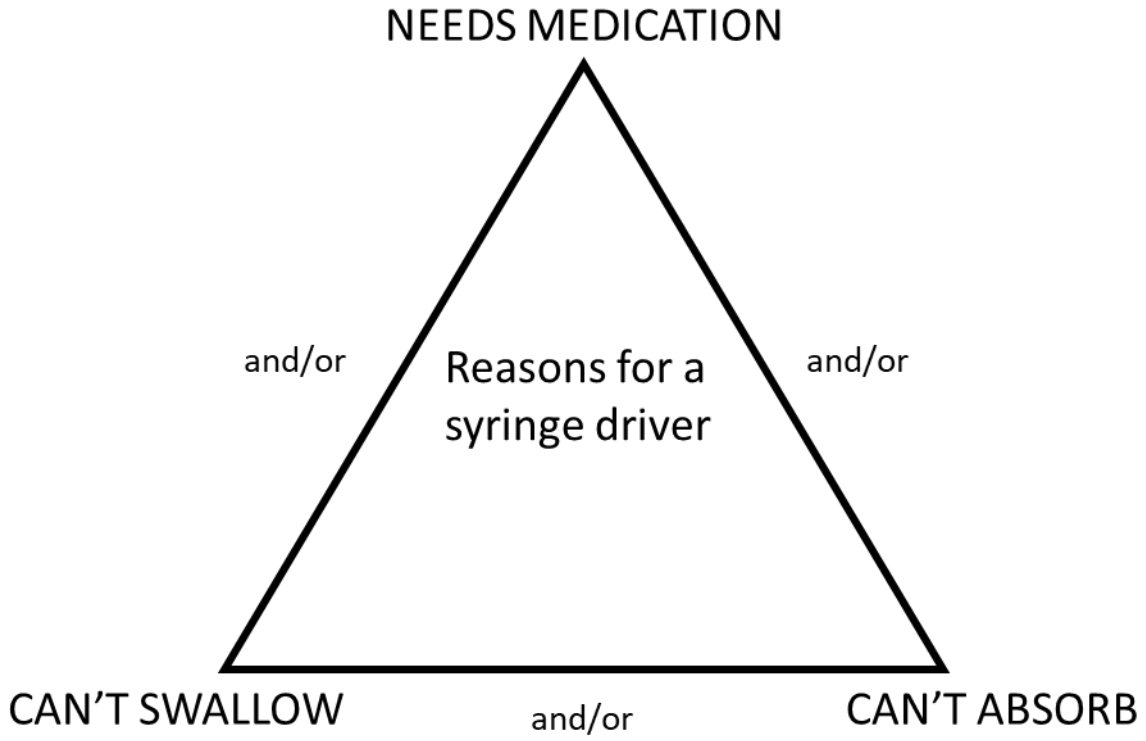
Scope

Nursing staff or medical practitioners administering medication must be registered on either the Nursing and Midwifery Council (NMC) or the General Medical Council (GMC).

This procedure is for registered health care professionals and support workers who check syringe pumps. In order to undertake the administration of medicines in a clinical or home setting the nurse must be on the appropriate section of the NMC register. It is the responsibility of the nurse to ensure they remain up to date with professional issues relating to the administration of medicines in accordance with the NMC guidance and that they keep up-to-date with information on medicines in use in the clinical or home setting. Additional guidance can be sought through The Palliative Care Handbooks.

1 Indications for use

There are 3 broad reasons to start a syringe pump for a palliative patient:



CAN'T SWALLOW:
Eg A patient taking regular pain relief becomes unable to swallow; the pump should start when the patient cannot take oral medication. Any delay will risk opioid withdrawal and uncontrolled pain.
CAN'T ABSORB:
Eg A patient develops vomiting, there are no reversible causes and admission to hospital is not clinically required; the pump should be started to deliver antiemetic and replace oral analgesia. Any delay will risk ongoing poor symptom control and pain.
NEEDS MEDICATION:
Eg A patient is not taking any regular medication. They are dying and have been given PRN medication. A syringe pump is started to control symptoms; the doses in this are clinically guided by the response to any PRN medication they have had.
Please note a patient who is taking regular oral opioid and cannot take it (unable to swallow or vomiting) will require a pump to replace these, irrespective of requiring PRN mediation.

2 Communicating with patients and carers

Prior to starting a syringe pump, its use is fully discussed with the patient and family. Explanation is needed about what a syringe pump is, how it works and why its use is indicated. The benefits and risks of syringe pumps are explained and informed consent for administration sought.

It must be remembered that setting up a syringe pump is routine for the clinician, but it may be a frightening new experience for patients and carer.

Patients and carers are given advice on the pump in the home setting; this advice can be supported by written guidance in the form of a a patient information leaflet, during these discussions and should cover:

- name of the pump
- how the syringe pump works
- checking of the pump whilst in use
- action to take in the event of a pump failure or fault
- individuals to contact in an emergency.

Staff ensure the patient is able to understand the information given to them and are able to give informed consent. A capacity assessment is considered and if required a mental capacity assessment is undertaken if it is felt that the patient lacks capacity, a decision in the best interest of the patient should be made for those who are unable to consent.

The clinical teams acknowledge and respect the diverse needs of patients and staff and respect these when implementing this procedure. Staff are mindful of the person's protected characteristics and cultural differences which are taken into account when implementing this procedure ensuring that it is conducted in as sensitive manner as possible which respects the patients privacy and dignity.

3 Setting up the syringe pump

Device parameters (unless indicated the instruction will cover both pump models)

Mode of operation	Lock On, Prime and Load
Delivery route	Subcutaneous
Default delivery duration	24 Hours
Syringe brands and sizes	Luer-lock syringes from of any recognised brand may be used. It is normal practice to use 20ml or 30ml syringes, although 50ml syringes may be used in exceptional cases following a risk assessment
Lock box and keypad lock use	Lock box is mandatory Keypad lock is recommended.
Mandated battery used	6LR61 coded battery is required. No brand requirement
Recommended battery change	Below 50% . Recycle the used battery as per trust guidance
What to do in event of an occlusion	Try to identify reason for occlusionWhere there is no obvious reason, it may be necessary to change the line and/or cannulaIf the syringe is removed from the body of the pump, then it must be replaced with the full 24 hour dose of medication. The pump will automatically recalibrate to deliver the dose over 24 hours. **A partly used syringe must be fully replaced. Copy to why need pump about SOP 24 hrs**
Local storage, cleaning and servicing requirements	Store in a locked cupboard **leave battery in and change every 8 weeks, even if pump is not in use (to prevent corrosion and damage to the pump). Ensure there is a local process for monitoring and rotating use of these devices.** Removing the battery for a long period of time will discharge the internal battery altering the time and date. If this happens it needs to be sent to Medical Electronics Clean with detergent wipes. Annual service

Lock on mode of operation

The mode of operation your pump is configured to is lock on: the pump will deliver the syringe volume confirmed, over the fixed (locked) duration. Once a syringe is detected and confirmed, the pump calculates the ml/hr infusion rate:

$$\frac{\text{Syringe volume}}{\text{Fixed duration (24 hrs}} = \text{ml/hour infusion rate}$$

Equipment required

- Ensure required equipment is available, clean, in date and packaging is visually intact
- Syringe pump fit for purpose, clean and visually intact, has been serviced within its annual service date and is in a lockable plastic case with access to appropriate key
- A disposable carrying cover for mobile patients only
- **PP3 9 volt alkaline battery plus 2 spare batteries** (please note that with normal use a battery is expected to last **2** days depending on the number of times the display function keys are accessed)
- In the community the battery is changed at **50%** battery life (this will cover a 24 hour infusion).
- An appropriate safety set, such as the BD Saf-T-Intima system will reduce the risk of metal allergies and needle stick injuries
- A 20ml syringe is the recommended size of choice, however 30ml can be used if more appropriate for prescribed medication. In most cases a 20ml luer lock will afford- appropriate drug dilution (reducing the risk of adverse drug reactions and incompatibility) whilst minimising the volume of fluid absorbed
- Prescribed medication required and prescribed diluents (check the integrity of packaging and expiry dates on all medications and diluents)
- Medicine additive label
- Occlusive dressing
- Approved waste disposal container.

Lock on: prime and load start up sequence

- Explain the rationale for the procedure to the patient/carer
- Gain and document consent
- Provide the opportunity for patient/carer to express concerns and ask questions
- Provide patient syringe pump information leaflet if appropriate
- Check the prescribed medication against the prescription record
- Reflect on own clinical and pharmaceutical knowledge of the medication prescribed for use within the syringe pump or any prescribed bolus/stat doses (the clinician has accountability to ensure that all the medication administered is suitable for the route intended and within an appropriate dose range and in accordance with clinical need)
- Draw up the prescribed medication and diluents in the appropriate size syringe. It is considered best practice to make the solution as dilute as possible to reduce the likelihood of drug incompatibility and minimise site irritation.

The maximum volume that can be accommodated in each syringe size is as follows: Syringe Size	Final Volume
20ml syringes	17mls
30ml syringes	22mls
50 ml syringes	34 mls

NB: A 50ml luerlock syringe may be used with the syringe pump. When a lockable case is unavailable, a documented risk assessment must take place and a discussion with the medical team to ensure safe practice. In exaeptional circumstances if loackable case not

available A 50ml syringe MUST only be used following a dynamic documented risk assessmentand in discussion with the senior Multi Discpilinary Team (MDT)

- The solution in the syringe should be clear and free from precipitation and crystallization.
- Attach a completed drug additive label to the syringe. All sections are completed clearly in black ink, take care not to obscure the scale on syringe or the sensor on the barrel clamp. Under no circumstances must an unlabelled syringe be fitted to a syringe pump.
- Appropriate documentation of Controlled Drug use are completed as per setting
- Dispose of all ampoules and additional equipment used at this stage in an approved waste disposal container and in accordance with the Waste Management Policy

4 The syringe pump

Three point contact recognition and syringe loading: (T34)

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, housed in the actuator, (detects secure loading of syringe plunger)

Diagram illustrating the three contact recognition points T34

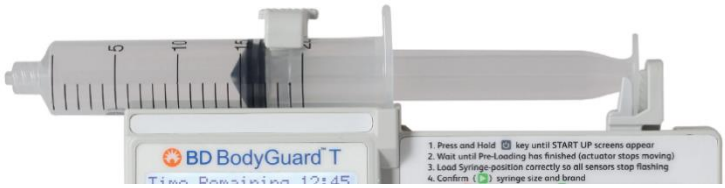


Diagram illustrating the three contact points BD Bodyguard T

T34 Keypad

- INFO. Access event log/Set Up (code protected)/battery status, keypad lock
- UP/DOWN Arrow keys- scroll through options
- YES/START Key- confirms selection/starts infusion
- NO/STOP infusion Step back a screen/stops
- FF (forward) Moves actuator forward
- BACK Moves actuator back
- ON/OFF

Repeat as above for Bodyguard

T 34 Keypad

BD bodyguard T key pad

5 Preparing the syringe pump

- Check the maintenance date of the syringe pump. If past the maintenance date do not use and return to the estates department. Obtain another syringe pump.
- Install **a new** battery.
- Before placing the syringe onto the pump ensure the barrel clamp arm is down then press and hold the 'ON/OFF' key until the LCD [liquid crystal display] is activated.
- The LCD will show 'preloading' and the actuator will start to move. Wait until it stops and the syringe detection screen appears (below).

NB. During preloading the actuator always returns to the start position of the last infusion programmed.

- If the actuator is not in the correct position to accommodate the syringe, leave the barrel arm clamp down and use the 'FF' or 'BACK' buttons on the keypad to move the actuator. Forward movement is limited for safety; therefore, repeated presses of 'FF' may be required. Backwards movement is not restricted
- Check the battery level. Press 'INFO' key repeatedly until the battery level appears on the screen and then **press 'YES' or green play button to confirm**. Verify that there is sufficient battery to last the next 24 hrs**. Discard the battery if it has less than 50% life remaining**. The average battery life is approx. **2** days.

6 Fitting the syringe to the pump

- **Ensure the line is not connected to the patient**
- If required, manually prime the infusion set. The priming volume should be no more than 1.5mls. If using a saf-t intima cannula (blue) the cannula will not require priming, as it has a dead space of 0.2ml which will have only minimal impact on the patient for S/C use.
- Lift the barrel clamp arm. Seat the filled syringe collar so the back of the collar sits against the back of the central slot. The syringe collar should be vertical so as to engage the sensor. The syringe plunger should engage the sensor in the actuator housing.
- Lower the barrel clamp arm
- The diagram shows a syringe correctly placed with arrows indicating the location of the 3 sensors.

Diagram showing the three sensors of the syringe pump

BD Bodygaurd T sensors

- The syringe graphic on the screen ceases to flash at each point as the syringe is correctly seated.
- Confirm that the syringe brand and size match the screen message. **Press 'YES' to confirm** or scroll with up '+' and down '-' arrows to view other syringe choices until correct one indicated and then **Press 'Green Button Picture Yes ' to confirm**.

7 Setting the infusion parameters [new patient]

- After the syringe confirmation the following screen appears.
- The pump is defaulted to run over 24 hrs. It calculates and displays the deliverable volume, divides it by 24hrs and automatically calculates the rate. **Press 'YES GREEN BUTTON PICTURE' to confirm**.

NB. The pump is not infallible and info displayed on the screen should always be checked and confirmed by the operator.

8 Setting the infusion parameters [same patient]

This screen (above)will appear in the following circumstances:-

- The pump is stopped, turned off and restarted without the syringe being moved.
- The pump stops because of a flat battery
- The pump is stopped, but NOT turned off and the syringe removed and replaced with or without the actuator being moved.
- The syringe is displaced and then correctly repositioned.

9 Insertion of subcutaneous needle/cannula

- Cannulas are inserted after assessing patient for the most suitable site. Ideal sites would contain sufficient subcutaneous tissue (such as the upper arm or thigh), be clean, and free from lymphoedema or tattoos.

- Wash hands according to the hand hygiene policy and infection control policy.
- A fold of skin is lifted between thumb and forefinger to elevate the subcutaneous tissue and the cannula inserted using the appropriate method.
- The cannula tubing should not transverse the cannula site and should be secured using a semi-permeable clear dressing.

10 Starting the syringe pump

Syringe pump screen prompts 'START INFUSION?'

Check the line connection to the patient's cannula and press 'YES' to start infusion.

When the pump is running the screen displays:

- Top line – infusion duration time remaining is displayed
- Main line – infusion rate is displayed in mls/hour
- Bottom line – alternates between syringe size/brand and the message **'<<<<<<pump delivering'**
- Green LED indicator flashes

NB. If the syringe pump is stopped there is a continuous light rather than a flashing light. There is no sound when the pump is running.

11 Keypad and box lock

The keypad can be locked whilst the infusion is running. This function is routinely used to prevent tampering.

To activate; with the pump infusing, press and hold the '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 and a beep is heard to confirm the lock is activated.

NB. Only the STOP/NO, (Green and red icons add in) START/YES and INFO buttons are now active.

To deactivate; repeat the above procedure. The bar will move from right [lock] to left [unlock] and a beep is heard.

The lockable box should be used at all times. Key locations are available in the local guidance.

12 Monitoring the syringe pump

- Check for physical damage to the pump and/or accessories
- The LCD display screen to confirm the pump is still infusing
- The green light flashes intermittently (a continuous red light on T34 and yellow on BD Bodyguard T indicates the infusion is paused)

- To view volume to be infused (vtbi) and volume infused (vi) press Info key once
- To view battery level press INFO key twice
- Complete Real time monitoring of syringe pumps as per Appendix A

13 Monitoring the infusion site

The infusion site should be observed at each contact in the community or every 4hrs in any inpatient setting, for signs of inflammation (erythema or reddening) or poor absorption (a hard subcutaneous swelling). The infusion site should be renewed if these symptoms occur.

If reactions occur consider the following:

- the type of medication and diluent, ensure correct diluent and solution
- Change the infusion cannula to non-metallic type, if one not already in use.
- the type of site dressing
- If there is more than one type of drug in the pump, consider separating and starting second pump.

If a site is renewed due to inflammation or reddening, the old syringe pump site should be monitored regularly for sign of infection.

14 Documentation and record keeping

This will be specific to local documentation procedure.

Tracking of pumps -This will depend on location

Yeovil District Hospital

Loan request via SYMBIOX

Pump delivered to ward

Pump no longer required

Return to equipment library or fill in Transfer form if patient leaving YDH

Musgrove Park Hospital, Acute Site

Loan request to equipment library

Pump delivered to ward

Pump no longer required

Pump collected by Equipment Coordinator

Return logged into equipment library F2 database.

Community (hosptials and patients homes

Nurse informs hub of pump number and patient NHS number

Nurse takes pump to person's house/ bedside

Hub emails End of Life Care Coordination Centre (EOLCCC)

EOLCCC input details onto F2 database

Pump no longer required

Nurse returns pump to hub.

Hub email EOLCCC that pump is returned to hub.

St Margarets Hospice

Discharge facilitator is responsible for signing any syringe pumps out in the green syringe pump tracking forms folder located in ward office

The patient is sent home with a label attached jiffy bag to enable return by District Nurses once syringe pump is no longer required.

The label is marked for attention of Discharge Facilitator who will then sign the pump back in with the asset number of the pump and lockable case.

15 Effectiveness of therapy and breakthrough pain

The effectiveness of symptom control is closely monitored and recorded using a pain assessment and management tool. The clinician should reassess the patient at each visit. If breakthrough pain or other symptoms occur the patient is offered additional medication in a suitable form. Advice can be obtained from specialist palliative care teams.

To avoid repeated injections an indwelling subcutaneous cannula (BD Saf-T-Intima) can be inserted and used as a giving set for additional medication for the patient's comfort.

PRN SC medications for breakthrough pain to treat the five common symptoms at the end of life (pain, nausea, breathlessness, agitation and noisy breathing) should be prescribed for anyone who has syringe pump.

If breakthrough analgesia is being used frequently the dosage of pain control is reviewed with the prescribing clinician before the syringe is reprimed

16 Pump programming, resume or new syringe or closing down and removing syringe pump

A syringe pump and infusion set must only be removed by a registered nurse. A syringe that is not empty must NEVER be taken off the syringe pump while connected to the patient.

Discontinuing a syringe pump to restart a new infusion, infusion site not changed:

- Press the "INFO" button and record the date, time, volume infused and the volume remaining
- Press STOP to stop this infusion
- Press "OFF" to turn off the syringe pump
- Prepare syringe with medicine(s) as per prescription and local policy, attach medicine label
- Power on and observe pre-loading (point 6)
- Attach prepared syringe to the infusion set

Discontinuing a syringe pump to restart a new infusion, infusion site changed:

- Press the "INFO" button and record the date, time, volume infused and the volume remaining
- Press STOP to stop this infusion
- Press "OFF" to turn off the syringe pump
- Prepare syringe with medicine(s) as per prescription and local policy, attach medicine label
- Follow procedure for setting up a new syringe pump above (point 6)

If the syringe is removed from the barrel arm you MUST Prepare a new 24 hour infusion and discard the previous unfinished syringe

Discontinuing a syringe pump when no longer required:

- When the infusion is complete and the syringe is empty the pump will stop automatically and the alarm sound
- If the infusion is to stop before the syringe is empty, it is disconnected at the syringe end from the patient for safety reasons before the syringe is taken off the pump
- If the syringe pump is no longer required for the patient, press the "INFO" button and record the date, time, volume infused and volume remaining

- Press STOP to stop this infusion
- Press "OFF" to turn off the syringe pump
- Remove the battery and return the syringe pump in a clean and ready to use condition
- Remove the cannula and cover the site with a dressing if required
- Dispose of and record any medication remaining in the syringe
- Dispose of remaining waste and equipment used in accordance with the waste policy
- Ensure entries are clearly documented, and signed.

Discontinuing a syringe pump when the patient dies whilst the syringe pump is running:

Once a person has been recognised as having died, the pump can be stopped
Once death has been verified, the pump can be removed
If there are any concerns relating to the circumstances of death, the pump should not be removed **until there has been a discussion with the Coroner.**

17 Problem solving

If the pump locks out for unknown reason: Press OFF. Press ON. Press Resume.

Alerts and Alarms
• When an ALERT is activated: The infusion continues. 2-3 beeps are heard approximately every 3-4 minutes • A screen message indicating the cause of the alert displays intermittently with the infusion running screen • *Alerts activate approximately 15-30 minutes prior to infusion and battery end* • When an ALARM is activated: The infusion stops • A continuous audible alarm activates (this will continue until either the YES key is pressed to mute or the problem is rectified) • A screen message displays to indicate the cause of the alarm. The infusion status indicator light turns red • *Press the YES key to silence the alarm noise for 2 minutes (device is paused) and read screen prompt which indicates the cause.*

Troubleshooting		
Screen	Description	Implication/action
Low battery	Alert: Battery is almost depleted	Prepare to change battery
Program nearly complete	Alert: Infusion will end soon	Prepare to change syringe or turn pump off
Pump paused too long	Alert: Pump has been left STOP mode (on hold) for 2 minutes	Either start the infusion, continue pause or turn the pump off
End battery	Alert: Battery is depleted	Change battery
End program/syringe	Alarm: Infusion is complete	Close down or start new infusion
Syringe displace, check syringe	Alarm: One or more of the syringe detection sensors is not detecting	Check screen messages for assistance Check the syringe and re-seat as necessary

Occlusion check line & syringe	Alarm: Pt access device is either blocked, occluded, clamped or kinked	Replace access device, release the clamp or un-kink the set

NB. The pump alarms if an internal system fault has been detected and the unit inoperative.

The screen information and user prompts vary, depending on the cause of the fault:

- Power the pump off and then power on again, this may rectify the problem.
- If the problem cannot be rectified: Power the pump off and remove from patient

Follow local fault reporting procedure and/or contact your authorised medical engineering department for advice if necessary. (If possible, record the code number (if available) and a summary of the fault.

Alarm activated in patient's homes

If a visit is not possible at that time, advise the patient or carer to:

- press the green YES key to silence the alarm for 2 minutes (device is paused) or
- press the red STOP key and then power on/off key or
- press the power on/ off key and then remove the battery

On visiting the patient: Power on

- Check screen message display to indicate cause of alarm
- Follow resume or new syringe procedure

18 Maintenance and repair of the pump

All syringe pumps are included on the asset register. Planned maintenance is carried out annually. It is the responsibility of the user to ensure that any device used has been serviced in accordance with local guidance.

The pump must be kept dry at all times. Syringe pumps are wiped clean with detergent wipes. **Warning**: cleaning with organic solvents, e.g. surgical spirit, or abrasive cleaners, may damage some of the plastic parts. Never dip or immerse the syringe pump in liquid or try to sterilise it with steam or gas.

If there is any uncertainty about the functioning of the pump or obvious damage it should be withdrawn from use immediately and advice on further action sought from the appropriate equipment maintenance department.

Appropriate action is taken in response to any safety warnings or medical/clinical bulletins, appertaining to syringe pumps.

19 Adverse incidents

All adverse incidents or near misses involving the use of syringe pumps is reported according to local incident reporting processes.

20 Monitoring of compliance with standard operating procedure

Adverse incidents are monitored by team managers at local level and any trends identified, discussed at directorate govenence with relevant action taken. Incident reports from **RADAR** are collated and reviewed at EOL governance group. Themes are collated and addressed through the EOL education program.

Audits of the use of syringe pumps are undertaken countywide.

21 Training and assessment

Healthcare professionals who use syringe pumps receive initial training and complete the competency assessment. Any competent assessor can sign off an individual who demonstrates the competencies from any organisation in the county.

22 Acknowledgements

- Somerset NHS Foundation Trust
- Yeovil District Hospital NHS Foundation Trust
- Cumbria Partnership NHS Foundation Trust – Specialist Palliative Care Service, South Lakes and Furness
- Graphics reproduced with kind permission of McKinley Medical Ltd

APPENDIX A

Real time monitoring of syringe pumps

Please complete this data collection for each syringe pump change. It takes less than a minute and will provide valuable data that will make a difference to patients and staff.
Please scan the QR code over leaf (just "look" at it with your phone's camera and it will open)
OR click on this link https://forms.office.com/r/qs5uQruKuE
each time you replenish a syringe pump
Please complete the date using the calendar function, add the NHS number and the 3 questions:

- Is the pump running to time: Yes if on schedule, no if early or late
- Is there adequate symptom control: Yes if the person's symptoms are well controlled. No if the doses in the pump need to be changed
- Have there been any call outs as a result of an issue with the pump: Yes if it had stopped or tissued, no if there was a call for a review of symptoms, or JIC meds given.