Cambridgeshire & Peterborough Integrated Care System

NHS Cambridgeshire & Peterborough

Syringe Pump Prescribing Guidance for End-of-Life Continuous Subcutaneous Infusions (Adults)

Contents

1. Introduction

1.1. A syringe pump is a small, portable, battery-operated infusion pump used to administer medicines by continuous subcutaneous infusion (CSCI) at a controlled rate over a specific length of time to achieve relatively constant concentrations of medication in the plasma.

1.2. It is useful when other routes are not appropriate to manage symptoms effectively, where two or more medicines may be required to controlled multiple symptoms and is particularly suited to palliative care.

1.3. Parenteral administration of medicines carries a higher risk than other methods and as syringe drivers are not frequently used by many staff, competencies can be difficult to maintain.

1.4. This guidance should be used in conjunction with your organisation's:

- Medicines policy.
- Medical Devices policy.
- Guides or procedures related to the syringe pump model in use at your organisation.

2. Objectives

2.1. This guidance aims to establish safe and consistent practice in the use of syringe pumps in line with national guidance, evidence and best practice, to reduce risk, minimise errors and maintain the safety of patients.

3. Scope

3.1. All settings in the Integrated Care System (ICS) where medicines are administered by CSCI via a syringe pump to adults by suitably trained practitioners, including patient's homes, residential homes, community hospitals, hospices and other clinical areas.

3.2. This guidance should not be used for continuous subcutaneous infusion of insulin or Apomorphine (for control of Parkinsonian symptoms).

4. Target Group

4.1. Registered nurses, doctors and other suitably trained practitioners involved in the prescribing, administering and monitoring of medicines given via syringe pumps and those involved in providing training on the safe use of syringe pumps to clinical workforce.

4.2. Personnels who purchase syringe pumps or who may be responsible for managing the equipment.

5. Duties and Responsibilities

5.1. Organisation providing the service:

- The organisation providing the service has responsibility for its safe delivery including the management of medicines.

5.2. Persons responsible for the service within an organisation:

- Ensure local agreements are in place to comply with medicines management.
- Ensure local arrangements are in place to comply with the risk management policies.
- Ensure the most recent version of the policy is available and accessible for use and any previous versions are removed from use.
- Ensure relevant staff has read and understood the policy.
- Ensure the staff has the necessary training and competencies, and the records are maintained.
- Ensure the organisation has an incident reporting system, so all incidents and near misses involving subcutaneous therapies, faulty pumps and lost or missing pumps are reported. Incidents must be investigated, and learning used to inform future practice. Where an incident involves controlled drugs, this must also be reported to the Controlled Drugs Accountable Officer via www.cdreporting.co.uk.
- Ensure any suspected adverse drug reactions are reported to the prescriber and the MHRA via the yellow card scheme.
- Ensure that medicines are stored, handled and administered in accordance with the organisation's medicines policy.
- Maintain records of the details of each syringe pump, including identifier number and maintenance records. The location of each syringe pump must be known and always documented. If a syringe pump cannot be accounted for, an investigation should be carried out to determine its whereabouts.
- Ensure that the manufacturer's instructions are available to staff using syringe pumps.

5.3. Registered Nurses

- Adhere to the Nursing and Midwifery Council Code of Professional Conduct at all times.
- Understand they are professionally accountable for their practice and must work within their competence.
- Ensure they have received the necessary training in relation to syringe pumps and the medicines used.
- Ensure they maintain and update their professional knowledge skills with Continued Professional Development (CPD).
- Ensure that medicines are stored, handled and administered in accordance with the organisation's medicines policy and relevant SOPs.
- Ensure that medicines are administered in accordance with an appropriately written prescription.
- If giving more than one medicine via a syringe pump, consider the compatibility of the medicines with each other and the solvent, and seek advice when necessary.
- Ensure the syringe pump is in good condition before use.
- Ensure the patient is monitored appropriately during treatment, regarding the administration of medicines, level of symptom relief, adverse effects, integrity of the

subcutaneous tissue, cannula and lines, and be aware of the appropriate action to take if a problem arises.

- Ensure the records of administration and monitoring and maintained.
- If the patient is being transferred to another care setting, ensure the necessary medicines, equipment, prescription and information are provided to enable a smooth and safe transition.
- Ensure the patient and/or carer knows who to contact if problems arise.
- Ensure that incidents and near misses involving syringe pumps (Including lost or missing pumps) are reported via the organisation's incident reporting system.
- Ensure immediate access to Adrenaline preparations is available in case of anaphylaxis during the administration of the medicines, and be able to follow the organisation's policies relating to anaphylaxis.

5.4. Prescribers:

- It is the responsibility of the prescriber to prescribe all medicines clearly and safely in accordance with the legislation and the organisation's prescribing policy, in a manner that can be readily understood by those dispensing and administering the medicines.
- Only prescribe within their own professional role and competence.
- Consider the choice of medicines in relation to the local formulary and/or guidelines, taking into consideration the availability of the medicines in a community setting.
- Seek further advice from palliative care or other specialists if necessary.
- Consider the compatibility of the medicines and solvents in a syringe pump and seek specialist advice when necessary.
- Ensure that appropriate medicines for breakthrough or "when required" administration are also prescribed with the medicines for the syringe pump.
- Ensure the patient's response and conditions are reviewed by an appropriate healthcare professional within 24 hours of commencing a syringe pump, and action any changes needed according to the patient's condition.
- Inform the patient and/or carers any changes in therapy, including aims, side effects and ensure they understand the reason for use and give consent.
- Document all changes, rationales and discussions in the patient's notes in accordance with practice guidance.
- Have a system in place to ensure patient is monitored appropriately during therapy, regarding symptom control, route of administration, side effects and integrity of the subcutaneous tissue.
- If the patient is being transferred to another care setting, ensure the necessary medicines, prescription and information are provided to enable a smooth and safe transition.
- Ensure necessary records are kept.

6. Training requirements

6.1. New healthcare professionals expected to administer medicines via syringe pump must read this policy with the associated documents on induction.

6.2. If a new member of staff has joined the organisation from another setting where they have used the same models of syringe pumps, they must be assessed for competency, in addition to reading this policy and associated documents.

6.3. Staff must seek further advice from their clinical manager if there are any aspects of the policy they do not fully understand.

6.4. Syringe pumps should **only** be used by healthcare professionals who have the necessary knowledge and skills, have had practical and theoretical training, a documented competency assessment, and are confident and competent to carry out this practice.

6.5. All healthcare professionals who have not been deemed competent in the use of syringe pumps must attend training sessions to acquire and maintain the necessary clinical knowledge and skills required.

6.6. All healthcare professionals are expected to update and maintain their competencies.

6.7. All affected staff should be made aware that practice may change to improve patient care due to changes in legislation or best practice guidance. It is the responsibility of the individuals to keep up to date with current practice, to update and maintain their competencies and keep their own record of continued professional development (CPD).

6.8. A record of any formal syringe pump training and competency assessment must be kept in the individual's personal file.

7. The Ambulatory Syringe Pumps

7.1. Within the ICS, the McKinley T34 and BD Bodyguard T are the syringe pumps recommended for administering medicines by CSCI for end-of-life adult patients, the Alaris Asena GH may be used in some organisations when the above are not available. The exact model used may vary depending on the organisation and this should be noted on transfer of care.

7.2. The "prime and load" sequence must always be used, meaning the line must be primed with the contents of the syringe before loading the syringe onto a pump.

7.3. The syringe pumps must not be used for the subcutaneous infusion of insulin or Apomorphine.

7.4. Syringe pumps and lockboxes must be stored securely within the organisation, a record of syringe pump and lockbox details must be maintained by the responsible person, and equipment must be accounted for.

8. Risk Management and Monitoring

8.1. The McKinley T34 and BD Bodyguard T syringe pumps (referred to throughout this document as the syringe pump) include several safety features to reduce risks, such as secure user codes, keypad lock, alarm, pre-set maximum rate limit and additional lockbox. To increase the safety further, the mode of operation of syringe pumps must be configured to "Lock on" and therefore the pump will deliver the syringe volume confirmed over the fixed (locked) duration of 24 hours, so the user is not required to enter numerals during infusion set up. The pump also incorporates an event log.

8.2. The syringe pumps used in adult services should be configured by relevant departments to the approved configuration within the ICS, and this can only be changed by the specified departments in the organisation by the request of the pharmacy department.

8.3. Many medicines administered via the subcutaneous route are not licensed for subcutaneous administration, therefore their use is "off label". As it is common practice to mix two or more medicines in a syringe for administration via a pump, this also creates an "unlicensed" medicine. This effective use of medicines via the subcutaneous route is accepted clinical practice and supported by the BNF guidance on prescribing in palliative care. The prescriber should be aware of their organisation's policy on unlicensed medicines and be able to explain to the patient or/and carer in lay terms if the medicines are not licensed for their proposed use.

8.4. When prescribing or administering opioids, any recent opioid dose, formulation, frequency of administration and any other pain relief prescribed for the patient must be confirmed. When a dose increase is intended, the calculated dose must be safe for the patient, dose increases should not normally exceed 30-50% of the current dose.

8.5. Prescribers and those administering the medicines should ensure that they are familiar with the usual starting dose, frequency of administration, standard dosing increments, symptoms of overdose and common adverse effects. Every healthcare professional involved in the prescribing, dispensing, administration, and monitoring of medicines has the responsibility to check the dose if safe for the individual patient.

8.6. Care must be taken when initiating opioids in patients who have not previously received them or have received only low opioid doses. Where possible, these patients should be monitored closely for adverse effects after administration of the opioid, especially after administration via a parenteral route.

8.7. Clinical areas that stock opioids must also keep an adequate quantity of Naloxone injections in case of overdose. Organisation guidelines on appropriate use of Naloxone should be available in all settings that hold stock of the item.

8.8. Where Midazolam has been prescribed for administration via syringe pump or has been held as stock in a clinical area, only the 10mg/2ml strength of the injection should be used

routinely to prevent dosing errors. If there are risks of overdosing for the patient, please consider prescribing or holding stock of Flumazenil injections.

8.9. Any incidents or near-misses concerning syringe pumps, including faulty or missing pumps, investigations and actions taken, must be reported via a web-based incident reporting system, for example, Datix. Where an incident involves controlled drugs, this must also be reported to the regional Controlled Drugs Accountable Officer via www.cdreporting.co.uk.

8.10. Learning from incidents and near-misses should be shared with relevant colleagues within the organisation. Any areas of concern will be incorporated into an annual audit.

8.11. Any device, equipment or consumable involved in an incident should be removed from use, quarantined and retained for investigation, as per organisational policy.

8.12. Medical Devices Agency Hazard and Safety warning notices relating to syringe pumps and medicines must be distributed to persons responsible. They must ensure that relevant notices are acted upon and reported on in accordance with organisational procedure.

9. Equipment and maintenance

9.1. Please refer to your organisation's documents for the clinical equipment list for syringe pumps.

9.2. Please refer to your organisation's documents for the relevant department and their contact details to obtain a syringe pump from.

9.3. All syringe pumps must be serviced annually, whether used or not, to ensure their function is maintained.

9.4. Syringe pumps should not be used if the servicing date is overdue.

9.5. Syringe pumps should be sent for maintenance checks immediately if there have been any forms of damage, for example:

- Dropped from any height.
- Had any form of fluid spilt across them or have been submerged in fluid.
- Exposure to high humidity.
- Exposure to extremes of temperature.

9.6. Syringe pumps should also be sent for maintenance checks immediately if there is any doubt as to their functional operation while in use.

9.7. Before and after each use, always check that the syringe pump is in good working condition.

10. Cleaning and Decontamination

10.1. Syringe pumps and lockboxes must be decontaminated after each patient use, if visibly soiled, before transferring to another location and before maintenance and repair.

10.2. For McKinley T34 ambulatory pumps, follow the instructions in the Manufacturer Recommended Cleaning (MRC) Protocol to preserve pump performance. By using the MRC protocol, particles and chemical residue that could accumulate on the pump over time from normal use are removed.

10.3. Clean the pump by wiping the external pump with disposable wipes impregnated with Isopropyl Alcohol (IPA) 70% to minimise pump exposure to excessive quantities of fluids. Isopropyl Alcohol is volatile and leaves no residue upon evaporation, therefore, surfaces should dry quickly after wiping.

10.4. Do not soak or immerse any part of the pump or the pump charger in water or any other solution.

10.5. Do not spray cleaning solutions directly on pump surfaces or in potential liquid retention areas or open ports such as electrical connections.

10.6. Lockboxes should be decontaminated with alcohol wipes.

10.7. Avoid using chemicals or solvent such as acetone, xylene, ammonia, and bleach that can damage the surfaces of the instrument and make the plastic brittle for cleaning purposes.

10.8. Do not steam, autoclave, sterilise or immerse the instrument or charger in any type of fluids.

10.9. Do not allow any fluids to enter the case of the instrument.

10.10. If any additional cleaning (for example, after exposure to bodily fluids) is required, please contact Clinical Engineering for advice.

11. Lockbox

11.1. The lockbox protects the syringe pump from damage, and the syringe from displacement and tampering. The control pad panel and battery compartment can still be accessed when locked in the lockbox.

11.2. Each syringe pump should be issued with a lockbox. Syringe pumps should be placed in the lockbox during infusion in all settings, except in exceptional circumstances when a risk assessment should be undertaken and documented.

11.3. Most brand of syringes with a capacity up to 30ml will fit in the lockbox. If a 50ml syringe is required due to exceptional circumstances, specialist advice must be sought, and a risk assessment must be undertaken and documented.

11.4. Universal keys should be available in each ward area and community nurse team. Additional/replacement keys are the responsibility of the individual teams and may be cut if required. Please refer to your organisation's documents for the locations of the keys and process to follow if an additional key needs to be cut.

12. Batteries

12.1. Both BD Bodyguard T and McKinley T34 syringe pumps operate with a 9 Volt Alkaline battery.

12.2. The McKinley T34 will have a typical battery life of approximately 3 to 5 days, however, repeated key presses and activation of the screen backlight may accelerate battery depletion.

12.3. The typical battery life of the BD Bodyguard T will be approximately 25 hours.

12.4. For McKinley T34:

- The battery must be removed when not in use.
- The battery must be changed before use. If the charge remaining is below acceptable levels set by your organisation at the start of the infusion, change the battery before starting the syringe pump.
- At least one new spare battery must always be available and kept with the syringe pump and replaced when necessary. This is approximately one week's supply and allows time for the batteries to be re-ordered. The practitioner who replaces the battery will be responsible for replenishing the stock of spare batteries and this should be done as soon as the spare battery has been used.

12.5. For BD Bodyguard T:

- In order to maintain the internal clock, the battery must be left in the Bodyguard T. The battery must be checked every week to ensure it is still working when not in use. A log may be kept with the pump to record this.
- If the Bodyguard T is stored without a 9 Volt battery for several days or weeks, it may result in partial or full depletion of the 3 Volt internal battery which powers the internal real-time clock. This depletion may trigger two different issues: "Timer's battery fail" alarm and real-time clock time lag/delay.
- The battery lasts approximately 25 hours and should be replaced every day in a community setting.
- At least one new spare battery must always be available and kept with the syringe pump and replaced when necessary to allow time to re-order the batteries. The practitioner who replaces the battery will be responsible for replenishing the stock of spare batteries and should do so as soon as possible.

- Before starting an infusion with the Bodyguard T, the date and time must be verified by checking the last entry in the event log. Please refer to organisational documents for instructions if the date and time were incorrect.

13. Syringes

13.1. The pumps are calibrated for Luer Lock syringes only, therefore Luer Lock syringes must be used to secure connection to the infusion set.

13.2. The McKinley T34 and BD Bodyguard T can be used with most brands and sizes of syringes, however syringes with capacity for 20 or 30ml should normally be used (30ml syringes are preferred for irritant mixtures to maintain site integrity and for larger doses). The pump automatically recognises the make and the size of the syringe, and this must be confirmed by the user while loading. The recognised brands are BD Plastipak, Braun Omnifix, Terumo, Monoject, and Codan/Once. Other brands should not be purchased.

13.3. 50ml syringes are not recommended for routine use but may be used in exceptional circumstances with specialist advice. For example, where the solution needs to be more diluted to prevent site irritation or for large volume medicines such as Metoclopramide. Each community nurse team is equipped with a lockbox compatible with 50ml syringes and should be informed if a 50ml syringe is required for a patient.

13.4. There are limits to the maximum volume of solution that can be drawn up into the syringe so that it fits securely in the syringe pump. The actual volume is dependent on the brand of the syringe, but the following volumes can be used as a reference:

- 20ml Syringe = approximately 17 to 18ml volume.
- 30ml syringe = approximately 22 to 24ml volume.
- 50ml syringe = approximately 34 to 35ml volume.

14. Cannulae

14.1. All cannulae must have Luer Lock connectors.

14.2. A flexible polyurethane, or Teflon, safety cannula should be used for continuous subcutaneous infusion. Please refer to your organisation's clinical equipment list for the exact model.

14.3. The subcutaneous cannula can remain in situ for up to 7 days, however it should be assessed regularly. In some circumstances, for example extreme cachexia, it may be appropriate to leave the cannula in place for a longer period of time, provided the tissue integrity remains and there is no pain, swelling and erythema at the insertion site.

14.4. If a reaction occurs at the infusion site, a new cannula and infusion line should be re-sites at least 3cm away from the original site.

14.5. All details of the cannula must be documented.

15. Infusion Lines

15.1. The infusion line and length depend on the patient and their nursing needs. However, the line should have a small priming volume below 0.5ml (this is due to larger volumes may result in more of the dose being lost in the dead space), be latex free incorporate an anti-siphon/free flow valve and fit securely in the lockbox.

15.2. The infusion line must be changed every time there is a change to the patient's prescribed medicines or doses, and when a new infusion site is required due to site inflammation, irritation and pain.

15.3. If there are no changes to the prescription, the same line can be used for up to 72 hours providing it is still viable (for example, not kinked, damaged, or occluded).

15.4. All details of the infusion line must be documented.

15.5. When a new line is attached, the tubing must be primed with the syringe contents before loading the syringe into the pump.

15.6. The decision to use the "prime and load" method was taken to reduce to number of steps required during set up. However, when the line is primed before loading, the patient will receive slightly less of the prescribed dose over 24 hours, as some will be lost in the dead space of the line.

16. Event Log

16.1. The event log shows a complete time and date stamped record of the last 512 pump events along with a record of pump status (volume infused, rates, etc) at the time of the event. Events recorded include hourly self-testing when an infusion is running and certain key presses.

16.2. The event log data cannot be deleted or altered, and it is not patient specific, therefore the 512 records stored are likely to span multiple patients recently treated with a specific pump. Each event is assigned a new number, and the pump stores the last 512 events in its memory, the oldest event will be deleted each time a new event occurs.

16.3. If required, the event log can be downloaded, saved, and printed via a software held by the Clinical Engineering department at CUH or NWAFT, in order to help investigate clinical incidents and check pump configuration.

16.4. To view the event log:

- With the keypad unlocked, press "STOP" then "INFO" to access the Info menu.
- Scroll down using the ↓ (down) arrow to "Event Log" and press "YES".
- The most recent event displays:
    - Line 1: Assigned event number.

- Line 2: Date and time of the event.
- Line 3: Pump event (key press).
- Line 4: Option to view further information on this event.

- Use ↑ (up) and ↓ (down) arrow keys to scroll up and down to view different events and details of the events.

17. Indications and Considerations for use of Syringe Pumps

17.1. Indications for using a syringe pump include:

- Dysphagia and inability to swallow oral medicines.
- Nausea and vomiting.
- Gastrointestinal obstruction.
- Oesophageal obstruction.
- Malabsorption of medicines.
- Severe weakness.
- Unconsciousness or coma.
- In lieu of repeated intermittent bolus injections.

17.2. Syringe driver will not deliver better symptomatic management in comparison to the oral route unless there is a problem with absorption or administration. Therefore, syringe drivers should not be viewed as a convenient alternative to oral or rectal medication. Where patients can take regular oral medication and there is thought to be no problem with absorption, there is no theoretical benefit of giving medicines via a syringe driver.

17.3. The decision to use a syringe pump should be taken in consultation with the patient or carer.

18. Patient information and consent

18.1. Written and verbal information must be provided so that patients and their loved ones have a clear understanding of why a syringe pump is being recommended and how it will benefit the patient. For example, an information leaflet for patients and carers regarding syringe pumps should be provided with verbal advice.

18.2. Many patients and their loved ones will associate the use of syringe pumps with dying. It is important for the healthcare professional to explain the rationale for use of the syringe pump as an alternative means of delivering medicines and address any concerns they may have. It may be helpful to provide the ICB information leaflet to allow patients and their loved ones time to process.

18.3. An understanding of the advantages and disadvantages to the patient may be beneficial:

Advantages:

- Reliable method to administer medicine when patient unable to swallow or has absorption issues.
- Increased comfort with reduced need for repeated injections.
- Consistent plasma concentrations of medicine without peaks and troughs.

- Being able to control multiple symptoms at the same time with a combination of medicines.
- Only requires charging once daily.
- Portable and compact allowing mobility and independence.

Disadvantages:

- Fear that the syringe pump means imminent death.
- Technical issues
- Unwanted skin reactions/infection at the administration site.
- Reduced flexibility with daily prescription of medicines.
- Incompatibility of medicines.
- Psychological dependence.

18.4. The benefits and risks of syringe pumps should be explained to the patient and consent is required to proceed.

18.5. The patient, their family/carers should be made aware of the following points:

- Possible side effects, adverse reactions and how to recognise complications.
- What to do in the event of an adverse event or if the syringe pump experiences technical issues.
- Care and Handling instructions for the syringe pump:
    - Do not get the pump or cannula site wet. It is imperative that the pump does not get wet as this can affect the normal operation of the pump. If the pump is accidentally dropped in water, it must be withdrawn from use immediately and sent to the relevant departments for repair.
    - Do not drop the pump or expose it to heat or bright sunlight. Direct Sunlight may affect the functionality of the pump, if being used in direct sunlight, it should be placed in a suitable light-resistant pouch.
    - Do not tamper with the syringe pump.
    - Ensure the syringe pump is well supported when the patient is mobile. For example, placed in a pocket or a holster.
    - Do not place the syringe pump at a higher level than the infusion site as siphonage (free flow) may occur.
    - Contact details for advice or in an emergency including out of hours.

19. Prescribing

19.1. All medicines should be prescribed in accordance with the organisation's Medicines Policy.

19.2. For further information on medicines, doses, conversions, and compatibilities, refer to your organisation's documents, the Palliative Care Adult Network Guidelines or seek specialist advice from your local palliative care team.

19.3. The prescriber must:

- Prescribe all medicines and diluents for administration subcutaneously via the syringe pump on approved prescription stationery using the approved medicine name. The prescription needs to be signed and dated.
- Provide appropriate documents to accompany the syringe pump prescription. This would be a syringe pump prescription chart in an inpatient setting and the End-of-Life Care Medicines Administration Record Chart (EOLC MAR) in a community setting. The EOLC MAR chart is available in the Ardens Prescribing template and electronically, to request a copy, email cpicb.prescribingpartnership@nhs.net.
- If more than one syringe pump is required, use a separate prescription chart to prescribe each pump. If two or more EOLC MAR charts are in use, they must be labelled accordingly and cross-referenced.
- If supplies of medicines need to be obtained from a community pharmacy, a FP10 prescription form should be used. Prescriptions for parenteral Schedule 2 controlled drugs (For example, Morphine and Oxycodone) and Midazolam (Schedule 3) are subject to the requirements of the Misuse of Drugs Regulations 2001.
- When prescribing medicines for syringe pumps, the prescriber may wish to use the 7+7 rule to decide the quantity of medicines prescribed. The 7+7 rule means that sufficient amount of medicines should be prescribed to cover 7 daily doses and an additional 7 PRN doses. Caution should be exercised with Controlled Drugs.
- If unusual medicines or strength is required, it is advisable to check with the supplying pharmacy before writing the prescription to ensure the required medicine is available and it is preferable to prescribe the medicines on separate FP10s so they can be dispensed individually from different pharmacies if needed. Most medicines can be ordered in for the same or next day by community pharmacies.
- Consider the compatibility of medicines with each other and diluents in a syringe driver, if unsure, seek specialist advice. For further details please refer to the compatibility of medicines section.
- The prescription must include:
    - Full details of the patient and their identifiers.
    - Allergy status.
    - Approved name of each medicine.
    - The starting dose and dose range over 24 hours.
    - A compatible diluent.
    - The route of administration.
    - Signature and printed name of the prescriber, an electronic signature via the EPS is acceptable.
    - Date of the prescription.

19.4. In an existing pump, if a medicine is not required initially but it is anticipated that it may be needed soon, the dose range should start at zero and the starting dose needs to be specified. For example, if Morphine is anticipated to be required as pain relief, the dose range should state “0-10mg” to reflect this information, with the starting dose specified as

5mg, so the nurses will know to administer 5mg of Morphine when the patient start experiencing pain as a symptom.

19.5. A syringe pump should not normally be prescribed more than 72 hours before it's needed. It is not usually appropriate to anticipate an individual patient's requirements for continuous subcutaneous infusion of medicines too far in advance. However, this may vary in individual patient and a personalised approach should be used.

19.6. A syringe pump prescribed more than 72 hours ago may still be valid. Please seek advice from the Palliative Care Hub (111 option 4) or the specialist palliative care team if you are unsure.

19.7. Where a range has been prescribed, ensure the range and the maximum dose in 24 hours is appropriate for the individual patient. It is recommended that the upper dose in the range is normally no more than double the lower dose in the range for example, 10mg to 20mg, 20mg to 40mg. If, following advice from a specialist, the dose prescribed is higher than the maximum recommended on the chart, this should be documented on the chart.

19.8. Additional information on medicine and dose selection or titration may be added to the chart to help clarify the prescription.

19.9. A healthcare professional should review the patient's condition within 24 hours of commencement, and then as dictated by the patient's condition.

19.10. When setting up the first syringe pump, a separate subcutaneous STAT dose can be administered to ensure symptoms are controlled as it will take 4-6 hours for the medicines delivered by the pump to reach therapeutic levels and provide symptom relief.

19.11. If converting opioids from other routes follow the organisational guidelines and if in any doubt or require further information, please seek specialist advice. Any recent opioid dose, formulation, frequency of administration and any other analgesic medicines prescribed for the patient must be confirmed. Where an increase in opioid dose is intended, the calculated dose must be safe for the patient. Dose increases of opioids are not normally more than 30 to 50% of the current dose.

19.12. If a change to the medicines or dose is required, do not alter or cross off the existing medicines. A completely new MAR prescription section must be written. To discontinue, the prescriber must put a diagonal line through the remaining administration boxes and sign and date. This is to preserve administration records.

19.13. After conversion of treatment, the patient should be closely monitored, and the dose must be titrated against symptom relief.

19.14. Consider the need for reduction in subcutaneous dose where previously there has been poor absorption of oral medicines. For example, vomiting and bowel obstruction.

19.15. It is best practice for patients on opioid patches to leave the patches in place (and continue to change as normal) and use the syringe pump to provide additional pain relief.

19.16. Breakthrough (PRN) doses for each medicine included must be prescribed and recorded in the "As required" section of the chart. Doses should reflect the dose in the syringe pump. For Opioids, the PRN dose is usually one sixth of the 24-hour dose of the opioid and must take into consideration if the patient has an opioid patch in situ.

19.17. If the patient is being converted back to an oral modified release preparation, the continuous subcutaneous infusion should be stopped when the first dose of the oral modified release opioid is administered. The patient may require more frequent breakthrough (PRN) doses until therapeutic levels are established.

19.18. If there are any doubts or concerns about the prescribing and administering of medicines, or if further information is needed, please seek specialist advice.

20. Diluent

20.1. Water for Injection or Sodium Chloride 0.9% injections may be used as the diluent for most subcutaneous infusions.

20.2. The Community Nursing Team do not carry any stock of diluents, therefore when prescribing a syringe pump for a patient, a diluent must also be prescribed.

20.3. The advantages and disadvantages of each diluent are as follows:

Water for injection

Advantages:

- Compatible with all medicines.

Disadvantages:

- Hypotonic.
- May cause infusion site pain.
  May cause skin reactions.

Sodium Chloride 0.9%

Advantages:

- Isotonic.
- Less likely to cause pain.
- Less likely to cause infusion site skin reactions especially with some medicines such as Levomepromazine.

Incompatibilities:

- Cyclizine.

21. Compatibility of Medicines

21.1. There are various problems associated with mixing medicines in the same syringe including:

- Non-visual degradation leading to decreased efficiency. The rate of degradation can be increased by other medicines which alter pH and can be caused to exposure to light and heat.
- Crystallisation and precipitation which occurs when an insoluble product is produced due to a drug interaction.

21.2. Syringes and lines containing mixtures of medicines should be observed for signs of physical incompatibility. Signs include Crystallisation, precipitation, cloudiness, colour change.

21.3. Do not mix more than three medicines in a syringe pump unless specialist advice from the palliative care team or pharmacist is obtained and documented.

21.4. If in doubt about the compatibility or stability of medicine combinations, consider separating the medicines into two pumps or use alternative methods of administration.

21.5. Some long-acting medicines can be given as a single subcutaneous injection once a day. For example: Levomepromazine.

21.6. It is preferable to give Dexamethasone as a daily bolus dose in the morning, as if given by a syringe pump over 24 hours, it may result in disturbed sleep.

21.7. Dexamethasone frequently causes precipitation when mixed with other medicines, therefore it should be administered in a separate syringe pump or by a separate once daily injection as above.

21.8. Larger volumes of diluent may reduce compatibility problems and site irritation.

21.9. Refer to Palliative Care Adult Network Guidelines on which medicines can be mixed in syringes and their compatibilities or seek specialist advice.

21.10. Medicines that must not be given by subcutaneous infusion include antibiotics, steroids, Prochlorperazine, Chlorpromazine and Diazepam.

22. Infusion site selection

22.1. Insert the cannula subcutaneously.

22.2. The site should be chosen with consideration of the patient's preferences.

22.3. The best sites include:

- Upper chest (Avoid in cachectic patients due to risk of pneumothorax).
- Upper outer arm or thigh (Avoid in bedbound patient who require turning).
- Abdomen (Avoid upper abdomen in patients with enlarged liver due to risk of puncturing the liver capsule).
- Scapula (May be considered for patients who are confused or delirious at risk of pulling on the line).

22.4. Sites to avoid:

- Areas of oedema, swollen tissue, ascites and lymphedema.
- Skin folds, joints and the waistband area.
- Areas of broken, infected, irritated or bruised skin.
- Skin that has been irradiated in the previous six weeks.
- Bony prominences or near a joint.
- Areas with excessive hair.

22.5. Exercise caution in patients with tendency to bleed.

23. Care of the cannula and site

23.1. The nurse must:

- Check and observe the site and the patency of any device before, during and after administration, and report or act on any concerns.
- Rotate the site as required. Each site may be used for up to seven days; however it should be assessed regularly for integrity. In some circumstances, such as extreme cachexia, it may be appropriate to leave the cannula in place for longer provided the integrity of the site remains.
- Ensure the cannula is removed at the end of treatment.
- Ensure the patient or their carer is aware of the measures to take in event of displacement of the cannula and has the patient information leaflet.

23.2. If a local reaction occurs, a new cannula and infusion line should be used and re-sited. The new site must be at least 3 centimetres away from the previous site.

23.3. The cannula should be changed and re-sited if a different combination of medicines is used which are incompatible with the medicines used previously. In cachectic patients and when a syringe pump has been in use over a long period of time, alternative sites may be very limited. If the existing site is viable and the medicines are compatible, continued use of the site may be in the patient's best interest.

23.4. The infusion line must be changed every time there is a change to the patient's medicines or doses, and when a new infusion site is required due to site irritation, inflammation, or pain (using the organisation's Visual Infusion Phlebitis score guide).

23.5. All details of the cannula and infusion line must be documented.

24. Preparation of medicines

24.1. For detailed instructions on how to set up a syringe pump, please refer to your organisation's SOP.

24.2. The nurse(s) administering the medicines via syringe pump must:

- Ensure they have the knowledge and understanding of the medicines to be administered including indication for use and any special monitoring requirements, contra-indications, and complications of treatment.
- Be satisfied with the prescription and dose, ensuring it is clear, unambiguous, and appropriate for the patient's condition. Delay administration and seek advice if there are any doubt regarding the prescriber's instructions or the patient's condition.
- Titrate the dose according to the patient's response/symptom control. If a dosage range has been prescribed, start with the lowest dose unless otherwise specified. Ensure the actual dose administered is recorded. Seek advice if needed before administering any medicines.
- Discuss with the prescriber at the earliest opportunity if the patient required multiple dose increases over a short period of time.
- Check the patient has no known allergies or sensitivities to the prescribed medicines.
- Ensure the area in which the syringe pump is prepared is clean, uncluttered, and free from interruption and distraction.
- Assemble all equipment before starting, check that all the medicines have been stored correctly, are intact and in date before using.
- Consider the formulation and compatibility of medicines and diluents prescribed and seek further advice if necessary.
- Establish the final volume required and select the appropriate size of syringe.
- Draw up the prescribed medicines and compatible diluent as directed by the prescription in accordance with the organisation's SOP.
- Ensure the contents of the syringe are mixed well and examine the solution carefully to ensure it appears to be free from crystals, precipitation, particles, cloudiness and contamination and the syringe is intact. If the medicine crystalises, precipitates, appears cloudy or discoloured, discard the medicine and seek advice from pharmacy.
- Label the syringe to ensure the contents can be easily identified.
- Protect the contents of the syringe from heat and direct sunlight whenever possible. Direct sunlight may affect the functionality of the pump and the stability of some of the medicines. The pump should be placed in a suitable light resistant pouch if being used in direct sunlight.
- Discard any surplus medicines in accordance with the organisation's health and safety policies. The medicine must never be retained for future use. Ampoules and vials should never be used to prepare more than one syringe unless specifically labelled by the manufacturer for multi-dose use.
- Not use/keep the contents of the syringe for longer than 24 hours.

- Prepare a new syringe and connect to a new infusion line when the prescription has been changed. Do not add additional medicines to the syringe after the infusion has been commenced or attempt to change the rate of the infusion.
- Handle all medicines including controlled drugs in accordance with the organisation's Medicines Management policy.

24.3. Labelling

- The syringe must be labelled according to local policy, but should include the following information:
    - Patient's name.
    - Patient's date of birth.
    - Patient's NHS number, if known.
    - The name of the diluent.
    - Total volume of solution drawn up in millilitres.
    - Date and time the syringe was prepared.
    - Initials of the person who prepared the syringe.
- The label must not interfere with the mechanism of the syringe pump and should not be attached to the barrel of the syringe at the point where the barrel clamp is applied. When attaching the label, it must not obscure the visual scales which may be viewed during the infusion.

24.4. Priming the infusion line

- When a new line is attached, the tubing must be primed with the syringe contents before loading the syringe into the syringe pump.
- The "prime and load" sequence must be used to ensure that the pump delivers the remaining contents of the syringe over 24 hours, so the infusion does not finish early. The decision to use the "prime and load" method was taken to reduce the number of steps required during set up. However, when the line is primed before loading the patient will receive slightly less of the prescribed dose over 24 hours as some will be lost in the dead space of the line. The larger the priming volume of the infusion line, or the smaller the volume of solution in the syringe, the greater percentage of the dose will be lost. For example, if the syringe volume is 18ml and the infusion line priming volume is 1ml then 5.5% of the dose is lost in the line.
- The nurse setting up the syringe pump must document whether the line has been primed on the prescription chart.

24.5. Administration

- All medicines should be administered in accordance with the organisation's Medicines Management policies and the associated SOPs.
- Staff must use an aseptic non-touch technique for preparing the managing invasive devices such as syringe pumps.

- The medicines must only be administered to the patient by the person who prepared the syringe.
- The patient's identity, allergy status and the prescription must be re-checked before administration commences.
- During "pre-loading" the pump performs a self-test and deletes the previous settings from the memory. This pre-load must be performed every time a new syringe is loaded.
- For safety reasons, the syringe must be loaded into the pump before connecting to the patient to avoid administration of an inadvertent bolus dose.
- Never take a syringe that is not completely empty off the pump if it is still connected to the patient. The infusion line must be disconnected before removing the syringe to prevent the free flow of medicines into the patient and a bung should be added to the line to prevent the loss of the content.
- After starting the infusion, once the nurse has checked that the syringe pump is set up correctly, the control panel keypad must be locked, and the pump should be places securely in the lockbox. For safety reasons, the keypad lock does not affect the operation of the "Start" and "Stop" keys, so that the infusion can be stopped in an emergency. The "Info" key is also not affected to allow monitoring of the infusion.
- The display screen messages and settings must be read and checked carefully at every step to ensure the pump has been set up correctly.
- The syringe pump must not be placed at a higher level than the infusion site as siphonage may occur.

24.6. Administration of breakthrough/as required (PRN) doses.

- The subcutaneous line and cannula used for the syringe pump must not be used for administration of subcutaneous PRN doses.
- If a subcutaneous PRN dose is required whilst the syringe pump is in progress, it must be administered via a separate cannula or subcutaneously by injection.
- If a patient is requiring PRN doses as frequently as hourly, then specialist palliative care team should be contacted for advice.

25. Documentation

25.1. A clear, accurate and immediate record must be made on the prescription chart or in the patient's notes of:

- Details of insertion and removal of the cannula:
  - Details of the cannula (For example, type and size).
  - Time and date the cannula is inserted, removed, or changed, and the reason for change.
  - The site used and observations of the site.
- Details of the infusion line:
  - Details of the line (For example, type and size).
  - Time and date the line was changed, and the reason for change.
- Syringe pump/equipment details (according to local policy but may include):
  - Pump's assigned number.

    - Battery percentage.
    - Size of syringe.
    - Flow rate in millilitres per hour.
- Syringe contents:
    - Medicine name.
    - Diluent name.
    - Dose of each medicine in the syringe.
    - The total volume of solution drawn up in millilitres.
    - The date and time infusion commenced.
    - The signature and printed name of the nurse setting up the syringe pump.
- Details of monitoring (see monitoring section):
- All entries must be signed and dated.
- Records must be kept of the strength and the quantity of the injectable Controlled Drugs received, administered and wasted in accordance with the organisation's medicines management policy, and SOPs for Controlled Drugs.

26. Monitoring

26.1. In all settings, when a syringe pump is set up, reloaded or re-sited, the registered nurse must observe the syringe pump for the first 15 minutes to ensure it is functioning correctly.

26.2. A healthcare professional should then carry out the monitoring checks as follows:

- A minimum of every four hours in inpatient settings or as per organisation's policy.
- At each visit made by a nurse in community settings. The frequency of this will depend on factors such as other nursing needs of the patient, willingness, or ability of patient/carer to assist in monitoring, and risks of instability of drug mixture.

26.3. The healthcare professional must check the following:

- The patient:
    - The medicines are controlling the patient's symptoms.
    - There are no signs of adverse effects due to toxicity or overdose (For example, effects of opioid toxicity such as confusion, pin-point pupils, visual and auditory hallucinations, sedation, twitching, plucking at the air or myoclonic jerks).
    - There are no signs of leakage, bleeding, redness, tenderness, pain, or pus at the infusion site.
- The syringe pump:
    - The infusion line is securely attached to both the syringe and the patient and that it is not leaking, kinked, or trapped.
    - The solution in the syringe and the infusion line for cloudiness, presence of large air bubbles (small ones not significant), precipitation, crystallisation, or colour change.
    - The infusion rate is correct, and the volume to be infused on the INFO page corresponds to the volume remaining in the syringe.
    - The correct amount has been infused at the point of monitoring.
    - The LED light is flashing. (A red light indicated the pump has been paused.)

26.4. In areas where the infusion is monitored every four hours, such as an inpatient setting, if the battery percentage is less than 40% on set up, it will need including in the four hourly check.

26.5. Document the date and time of any monitoring and the details of the syringe pump monitoring chart or in the patient's notes.

26.6. If any checks are not carried out (for example, site check) to prevent disturbing the patient whilst asleep, record this and the reason on the monitoring chart or on the patient's notes.

26.7. If any checks indicate a problem, appropriate action must be taken and documented. For example:

- Significant discrepancies in the actual and expected infusion rate, or the incorrect volume of medicines remaining in the syringe.
- Signs of incompatibility.
- Blockage of the infusion line.
- Damage to the syringe barrel or tip, or the presence of a large amount of air, which may indicate the syringe barrel has cracked.
- Site reactions.

26.8. If an infusion is discontinued before it is complete, for example, due to a change in dose or medicine, document the amount of remaining solution in millilitres remaining and destroyed on the monitoring chart or in the patient's notes. If there is still some solution in the syringe, it must be clamped and disconnected from the patient before removing it from the syringe pump to avoid administration of an unintended bolus dose.

26.9. In the community setting, the patient and/or carer must be given clear guidance on what to do and who to contact in the event of a problem arising. The patient information leaflet for syringe pumps provides space for this information to be recorded.

27. Complications/Adverse Effects

27.1. Any adverse or suspected adverse reaction must be reported to the prescriber as soon as possible. The details should also be documented in the patient's records. If necessary, the nurse may discontinue the syringe pump.

27.2. Local site reactions may be caused by:

- Glass particles.
- Infection.
- Sterile Abscess.
- Allergic response to nickel needles.
- Chemical reaction in subcutaneous tissue.
- Tonicity of solution.
- pH of the solution.

Reactions are more likely to occur if the site is older than 72 hours or if certain medicines are used, for example, Cyclizine, Levomepromazine and high doses of Morphine.

27.3. Site reactions may be reduced by:

- Diluting the solution as much as possible in a larger syringe.
- Using a different diluent.
- Rotating the site.
- Using a non-metal cannula, or different type of cannula.
- Changing the medicines or combination of medicines.
- Separating the medicines into two syringe pumps.

28. Disposal

28.1. The syringe, complete with remaining contents and line must be disposed into a yellow rigid sharps bin in accordance with the organisation's Waste Management policies. The contents of the syringe and line must not be discharged.

28.2. The date, time and amount of solution remaining in the syringe must be recorded in the patient's records and the entry signed by a nurse.

28.3. In inpatient settings, disposal of a syringe containing Controlled Drugs must be signed and witnessed by an appropriately trained practitioner according to the organisation's policies.

28.4. Any unwanted medicines must be handled in accordance with the organisation's Medicines Management policy.

28.5. In a community setting, a family member should return unused medicines to a pharmacy for disposal as soon as possible. In exceptional circumstances, the registered nurse may return the medicines in accordance with the organisation's Medicines Management policy and Controlled Drugs SOPs.

28.6. Medicines are prescribed for the named patient only and must never be used for any other patient.

29. Safe Transfer Between Settings

29.1. When a patient is being transferred between settings, the infusion *must* not *be discontinued* whilst the transfer is taking place.

29.2. A record of any pumps transferred with patients must be kept and the manager must ensure that all pumps are recovered as soon as possible and can be accounted for, at all times.

29.3. Details of the prescription and the necessary medicines and diluents must be transferred with the patient.

29.4. When transferring a patient to an inpatient setting, the community nurse should inform the ward that a syringe pump is in use so that the ward can ensure a pump is available and it can be changed on arrival. Arrangements must be made with the ward to retrieve the pump as soon as possible.

29.5. When transferring a patient from an inpatient setting:

- The nursing staff must notify the community nurses or nursing home to ensure that a syringe pump and other equipment are available or can be obtained.
- The medicines in the syringe should be renewed before the patient is transferred to ensure they do not run out during the transfer.
- The inpatient pump must be sent with the patient and strict arrangements must be made to have the syringe pump exchanged within an appropriate timescale and returned as soon as possible.
- A copy of the discharge prescription must be sent to the patient's community nurse and GP surgery.
- If using a McKinley T34, the battery power must be at least 40%.
- If using a BD Bodyguard T, the battery must be replaced with a new one.
- Patients must not be discharged with the Alaris Asena GH.

29.6. When a patient is transferred from an outside setting/agency, the syringe pump in use must be exchanged as soon as possible and the pump returned to the owner.

29.7. If a patient is transferred to a setting outside of the organisation where a different pump is in use, remove the lockbox as they will not have the key to unlock it and provide basic instruction on how to turn off and disconnect the pump.

29.8. In all cases, when exchanging the syringe pump, a new syringe must be made up.

30. Advice and Specialist Information

30.1. For further information on the use of syringe pumps, medicines, doses, conversions and compatibilities, refer to Palliative Care Adult Network Guidelines, or seek specialist advice.

30.2. Specialist advice is available from:

- Palliative Care Hub, available 24 hours a day, 7 days a week: 111 Option 4 or 07919877241
- Arthur Rank Hospice, Cambridge: 01223 675777
- Thorpe Hall Hospice, Peterborough: 01733 225900

30.3. Staff may only provide technical advice on syringe pumps if they have the necessary knowledge and competence required for the device.

30.4. All advice given or received must be fully documented.

30.5. Technical problems with the pumps should be directed to the Clinical Engineering Department at Addenbrooke's Hospital.

31. References

BD T34 Quick user guide Lock on (Prime and Load) Infusion Technical Documentation - BD

CME Medical UK Ltd. T34 Advanced user workshop – Lock On Mode – Device use and training resources

CME Medical UK Ltd. T34 Device user workshop – Lock On Mode – Device use and training resources

CME Medical UK Ltd T34 Operation Manual

British National Formulary

Dickman A. Schnieder J. The Syringe Pump Second 3rd Edition Oxford University Press

Twycross R. Wilcock A. Palliative Care Formulary

National Patient Safety Agency, Patient Safety Alert 20, Promoting safer use of injectable medicines, March 2007 NPSA/2007/20

National Patient Safety Agency, Rapid Response Report Safer ambulatory syringe drivers, December 2010 NPSA/2010/RRR019

The Royal Marsden Hospital Manual of Clinical Nursing Procedures

Care Quality Commission: Essential Standards

Policy for the use of the T34 McKinley or BD BodyGuard T Subcutaneous Infusion Device in Adult Palliative Care, Version 4, North West Anglia Foundation Trust

T34 McKinley subcutaneous infusion of medications, Cambridge University Hospitals

Document Ratification Details

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