Guidelines for the use of the T34TM Ambulatory Syringe Pump by CME Medical for adults in palliative care

Start Infusion?
These guidelines have been produced following extensive consultation with practitioners to support the delivery of consistent, high quality care through best practice in the hospital, hospice and community setting throughout Scotland.

Published 2015
These guidelines apply to the use of the T34TM Ambulatory Syringe Pump by CME Medical for subcutaneous infusions in adults in palliative care. Administration of medications via other routes or for indications other than palliative care and its use in paediatrics are outwith the scope of these guidelines, therefore it is recommended that other specialist reference sources be accessed.

In some acute hospitals in NHS Greater Glasgow & Clyde (GG&C), the larger, mains powered syringe pumps which are in use for intravenous infusions are also used for subcutaneous infusions in palliative care. Whilst the operational details of the T34TM Ambulatory Syringe Pump by CME Medical are not relevant in this situation, the remainder of the information in this guideline is applicable. Compatibility tables for the 50ml syringes used in these larger devices can be accessed in the palliative care folders on the relevant wards or in the national palliative care guidelines available at www.palliativecareguidelines.scot.nhs.uk;

50ml syringes are not normally used in the T34TM Ambulatory Syringe Pump by CME Medical as they do not fit in the lockbox (see page 16).

Many medicines prescribed and administered subcutaneously in palliative care are used outwith the terms of their Manufacturing License (‘off-label use’) and a small number are unlicensed. Use in this way is, however, accepted best practice and is evidenced in, and supported by, text books e.g. BNF, Palliative Care Formulary, and guidelines such as the National Palliative Care Guidelines. Whenever possible, choice of medicine should be in accordance with the current NHS GG&C Formulary.

This guideline replaces the following documents:

- Syringe Pump Guidelines CME McKinley T34 (ml/hour): for use within Argyll and Bute CHP and Clyde. NHS Greater Glasgow & Clyde and NHS Highland.
Disclaimer

While every precaution has been taken in the preparation of these materials, neither NHS Education for Scotland nor external contributors shall have any liability to any person or entity with respect to liability, loss or damage caused or alleged to be caused directly or indirectly by the information therein.

Acknowledgements

NES gratefully acknowledges the hard work and effort made by all who contributed to the development of these guidelines which were adapted, with kind permission from guidance produced by NHS Greater Glasgow & Clyde and NHS Highland.

NES funded the design and print of these guidelines which was led and developed by Anne Watson, Assistant Director of Pharmacy and Val Findlay, National Co-ordinator Pharmacy Support Staff Educational Development. Special thanks are due to the NES McKinley Pump Training Group who contributed their knowledge and expertise to this resource.

Our thanks also go to CME McKinley for kind permission to use images of the T34TM Ambulatory Syringe Pump by CME Medical within these guidelines.

NHS Greater Glasgow & Clyde have subsequently adapted and expanded this guideline to meet local practice requirements. The work was undertaken by the Therapeutics Reference group of the NHS GG&C Palliative Care Managed Care Network; representation on the group included pharmacy (Janet Trundle and Susan Addie), nursing, medical and Medical Physics staff, with input from primary, secondary and tertiary care. The full MCN membership, and hence their wider constituencies, had opportunity to comment on the final draft, which was then submitted to the Area Drug & Therapeutics Committee for approval.

Aims

The aims of these guidelines are to:

- ensure efficient and safe practice across NHS Greater Glasgow & Clyde when using the T34TM Ambulatory Syringe Pump by CME Medical
- improve the standard of care provided to patients.

It is recommended that these guidelines are easily accessible at all times and a copy kept alongside T34TM Ambulatory Syringe Pump by CME Medical equipment.
## Section 1 Introduction

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Monitoring the T34™ Ambulatory Syringe Pump by CME Medical whilst in use

Care during the infusion

How to change the syringe e.g. when an infusion is complete or a fresh syringe is prepared before a patient is transferred and no changes have been made to the prescription

How to change the line during an infusion e.g. if the line is damaged or leaks

How to change the line and cannula when medications are changed

How to change the line and cannula when a new site is required and the current infusion will be resumed after changing the site

How to temporarily stop the infusion e.g. when the patient is going for a bath, shower or MRI scan

How to stop the infusion and remove the syringe pump

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T34TM Ambulatory Syringe Pump by CME Medical

The T34TM Ambulatory Syringe Pump by CME Medical is a portable, battery operated device for delivering medication by continuous subcutaneous infusion (CSCI). Syringe pumps are a useful way of delivering medication when the oral route cannot be used for a patient and are of particular use in palliative care. If the patient is symptomatic, a subcutaneous (SC) bolus dose of medication should be given as the first option for treatment before considering setting up a syringe pump.
The T34TM Ambulatory Syringe Pump by CME Medical is most commonly used to deliver one, two or three medicine combinations at a predetermined rate via the SC route over a 24 hour period. Four groups of medicines are commonly prescribed for use in syringe pumps:

- analgesics (usually diamorphine, morphine or oxycodone)
- anti-emetics (metoclopramide, cyclizine, haloperidol, levomepromazine)
- sedatives (midazolam)
- anti-secretory drugs (hyoscine butylbromide, glycopyrronium).

Syringe pumps will not deliver better symptomatic management than the oral route unless there is a problem with absorption or administration.

Typical indications include its use in pain and symptom control where there is a problem with:

- intractable nausea and vomiting
- gastro-intestinal obstruction
- dysphagia
- head and neck lesions/surgery
- severe weakness or unconsciousness
- malabsorption
- unsatisfactory response to oral medicines (uncommon)
- severe stomatitis
- patient compliance (also consider transdermal route for analgesia).

Many patients and relatives associate the use of syringe pumps with ‘the end of life’. It is vitally important to explain the use of the syringe pump as an alternative means of delivering medication and address any concerns they may have.
Advantages include:
- acceptability and reliability
- reduced need for regular injections
- maintenance of patient mobility
- constant therapeutic drug levels over a 24 hour period
- only requires to be re-filled every 24 hours.

Disadvantages include:
- potential source of infection
- skin site reactions
- in emaciated patients or those on long term infusions, skin site availability may become an issue
- need for daily nurse visits in the community.

Safety and risk management
Subcutaneous administration of medicines carries well documented risks. Syringe pumps may be used infrequently and competency can be difficult to maintain as a result. The Scottish Executive Health Department publication provides guidance on the principles to minimise these risks (CRAG/NHS Scotland 2002): http://www.crag.scot.nhs.uk/publications/inpa.pdf

Syringe pump maintenance
Syringe pumps must be serviced regularly according to local guidance and at least annually, whether used or not, to ensure their function is maintained.

Remove syringe pumps from use immediately and send them to your local Medical Physics Department, if there is any doubt at all about their operation whilst in use.

Syringe pumps should be immediately removed from use and sent for maintenance checks, if they have been dropped, suffered fluid ingress (e.g. had fluid spilt over them, been dropped in a bath or taken into a shower) or show any signs of condensation within the unit.

Remember – the T34TM Ambulatory Syringe Pump by CME Medical is expensive and arrangements must be made to return it to the appropriate storage location when it is not in use. Return any pumps you no longer need to the Medical Physics Department.
N.B. T34TM Ambulatory Syringe Pump by CME Medicals are sensitive to both steam and water ingress. It is recommended that they should not be taken into bathrooms and showers when patients are bathing (see ‘How to temporarily stop the infusion e.g. when the patient is going for a bath, shower or MRI scan’ on page 39 of these guidelines).

Those who manage palliative care services should ensure that maintenance arrangements for the syringe pumps are in place. A register of all such devices within each NHS Board is maintained by the Medical Physics Department who must be notified, according to procedure, of any new syringe pumps or if any have been removed from service. Further information on requirements is available from your local Medical Physics Department.

**Cleaning and Decontamination**

Carry out cleaning of the syringe pump and lockbox with a damp disposable cloth (use warm water and general purpose detergent). Dry thoroughly. If any additional cleaning is required e.g. contamination with bodily fluids or cleaning the threads of the screws the actuator moves along, contact your local Medical Physics Department and/or Infection Control Team for advice.

Do not use chemicals such as Xylene, acetone/similar solvents or Cliniwipes as this will damage components and labels. Lockboxes should not be cleaned with alcohol-based products as this causes the lockbox to become more brittle.

The syringe pump must never be submerged in water, and if it is accidentally dropped in water, it must be withdrawn from use **immediately** and sent to your local Medical Physics Department.

**Mobile phone use**

Patients should be aware that there is a small risk of mobile phones interfering with the T34TM Ambulatory Syringe Pump by CME Medical.

To reduce this risk, patients and carers should only use a mobile phone out with 1 metre of the pump as recommended by CME Medical and should preferably switch off the phone when not in use. If the patient requires to use the phone, it should be held in the opposite hand from the side where the syringe pump is situated. If the phone is left switched on it should be kept one metre away from the syringe pump.
**Incident reporting**

Systems are in place in each NHS Board to monitor and report incidents involving syringe pumps and staff should be familiar with the relevant incident reporting system and relevant documentation. All incidents must be investigated. Audit of this information, along with audit against the standards for the use of syringe pumps assists in identifying training needs.

- Report equipment incidents to the Medical Physics Department.
- Report medication incidents via the Medication error reporting route.
- When reporting, provide all relevant information which will assist investigation of the incident.

**What defines an incident?**

A clinical incident is defined as any unintended or unexpected incident, which could have or did lead to harm to one or more patients receiving healthcare. For example, clinical incidents may include incidents involving medical equipment.

A near miss incident is an occurrence that might have led to harm or damage, but did not happen due to discovery or chance. Specific examples include:

- administration of incorrect medication, dose and/or diluent
- infusions completing ahead of intended time
  - (finishing > 1 hour early, assuming a 24 hour infusion, that is approximately 5% or more early)
- infusions carrying on beyond intended time of completion (carrying on for > 1 hour late, assuming a 24 hour infusion, that is approximately 5% or more late – alternatively > 5% of the prescribed medication remaining in the pump at the end of the prescribed infusion period)
- device not alarming during an alarm condition.

**Please note** that where there is a known reason for the infusion not completing on time (e.g. the pump was stopped to enable the patient to bathe; changing the infusion set) then allowance should be given for this delay in deciding whether to report this as an incident.
The syringe and SC infusion line should be kept intact within the pump, with only the battery removed to prevent inadvertent use of the pump. The full details of the infusion, including copies of the monitoring chart, should be provided to the Medical Physics Department. Where the pump was involved in an incident involving serious harm to the patient, the clinical lead should consider contacting the Incident Reporting and Investigation Centre of Health Facilities Scotland before forwarding it to the Medical Physics Department.

**Remember** - Any device and consumable (e.g. syringe, infusion line etc) involved in an adverse incident should be `quarantined` i.e. removed from use and sent to the Medical Physics Department immediately. The syringe and SC infusion line should be kept intact with the syringe pump where possible. Where the syringe contains Controlled Drugs (CDs) contact Medical Physics Department and/or Pharmacy Department to discuss appropriate action.

**Who can report incidents?**

All healthcare staff have a professional responsibility to report an incident to their line manager as per local policy. A clear description of the incident should be reported with the following information provided:

- patient name
- Community Health Index (CHI) number
- name and dose of each medicine prescribed
- name of the diluent
- total volume in the syringe at the start of the infusion
- date and time the infusion started
- pump identification – manufacturer’s serial number, maintenance or asset number
- where the syringe pump is to be returned
- date and time of incident.
Hazard Warning Notification

All NHS Boards operate a cascade system for hazard warning notification. Individuals with responsibility for managing areas where syringe pumps are in use must ensure relevant notices are acted on and reported on.

Training

All staff using the T34TM Ambulatory Syringe Pump by CME Medical must be competent and are accountable in the use and operation of such devices. All managers should ensure that relevant training takes place (e.g. at induction) and a record of staff who are trained and competent to use such devices is maintained (The Management of Infusion Systems, SEHD, 1995).

Registered nurses are accountable for ensuring their practice is evidence based and taking appropriate action to ensure they are competent when using the syringe pump for palliative care in accordance with the Nursing and Midwifery Council (2008), The Code: Standards of Conduct, Performance and Ethics for Nurses and Midwives. www.nmc-uk.org/aArticle.aspx?ArticleID=3057 This includes seeking support from their line managers and completing appropriate training.

Competencies on the use of syringe pumps are available on the Skills for Health website at www.skillsforhealth.org.uk

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<th>Qualifications required</th>
<th>Registered nurses – currently registered with the Nursing &amp; Midwifery Council (NMC).</th>
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<td>Additional requirements</td>
<td>Has undergone training on syringe pump management for patients requiring palliative care.</td>
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<td>Continuing training requirements</td>
<td>Request supervised practice by informing manager when training is required. It is the responsibility of each individual registered nurse to ensure they keep up to date with this aspect of care.</td>
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Before setting up the T34TM Ambulatory Syringe Pump by CME Medical, it is important that discussions take place with the patient and family/carer as to the reasons for its use, how it works and how to respond to any incidents which may occur. The setting up of the syringe pump should only be undertaken by, or under the supervision of, appropriately trained personnel.
Component parts of the T34TM Ambulatory Syringe Pump by CME Medical

- Syringe Flange
- Collar Sensor
- Actuator
- Barrel Clamp
- Arm & Sensor
- Plunger Sensor
- INFO
- Scroll UP/DOWN
- Power ON/OFF
- YES/START
- NO/STOP
- Actuator Movement
  - Forward(FF)/Back
- Infusion light status indicator
  - Green (running)
  - Red (stopped)
Equipment required:
- T34TM Ambulatory Syringe Pump by CME Medical designated for palliative care use and plastic lockbox and key. The syringe pumps designated for palliative care will show: ‘Pall Care 24HR’ on the screen when switched on. The T34TM Ambulatory Syringe Pump by CME Medical is used in other circumstances for infusions running over less than 24 hours; these pumps are labelled with the name of the patient they have been configured for and must not be used for palliative care.
- Duracell® 9V PP3 alkaline battery (as per local procurement). The use of rechargeable batteries is not recommended.
- holster (for mobile patient)
- luer lok 30ml syringe
- BD Saf-T-Intima® cannula (blue) 22 gauge and 100cm infusion line with anti-siphon valve for use with T34TM Ambulatory Syringe Pump by CME Medical for subcutaneous infusions
- needleless connection system as per local guidance
- transparent surgical dressing
- syringes and needles to prepare medication
- prescribed medicines including correct diluent
- subcutaneous infusion monitoring chart
- adhesive label identifying patient and prescribed medicines
- clean tray or surface for preparation.

Choice of Syringe
The T34TM Ambulatory Syringe Pump by CME Medical is calibrated in ml per hour. Syringe pumps will be set to recognise only one type of syringe - please ensure you are familiar with the type of syringe that is used in your area. The standard delivery period for a CSCI in palliative care is 24 hours. It is recommended that 30ml syringes are used and these MUST be luer lok. The maximum practical fill volume in a 30ml syringe is 22ml. 50ml syringes may be used in exceptional circumstances, under the guidance of a palliative care specialist, however the lockbox currently supplied with the syringe pump cannot hold syringes larger than 30ml. The maximum practical fill volume in a 50ml syringe is 34ml.
Documentation

All measurements are in millilitres (ml).

Record list:
- Asset number on the syringe pump
- Date and time
- Flow rate in ml per hour
- Battery power percentage (see page 27)
- Diluent name and batch number
- Medicine name(s) and batch number(s)
- Total volume (ml) medicines and diluent
- Site used and appearance
- Appearance of solution in syringe (clear, not cloudy)
- Signature(s) of person(s) preparing and checking

Note that after commencement of the infusion, all measurements of the volume of solution in the syringe must be accessed via the INFO button.

Drug Calculations

Practice Point: Calculate the volume of the drug that needs to be drawn up from the concentration of the preparation you have and the prescribed dose (unless the drug comes in a powder formulation), do not count the number of ampoules as a final check, use the volume. Ampoules have an overage in addition to the volume stated on the label.

Note: If the drug is only available in a powdered form and the dose is less than the full amount in the ampoule, you will need to measure accurately the amount of water used for reconstitution, and calculate the volume of solution to be taken out to give the required dose.
Example 1

If you add 0.5ml of water for injection to a 100mg ampoule of diamorphine, and then make the solution up to 1.0ml, you will have a solution containing 100mg diamorphine in 1ml. If only 80mg is required, then 0.8ml should be drawn up in the syringe and the remainder discarded. One method of calculating this is:

\[
\text{Volume required (ml) = } \frac{\text{what you want (dose in mg)}}{\text{what you've got (dose in mg)}} \times \text{volume you've got (ml)}. \\
\text{i.e. volume required = } \frac{80\text{mg}}{100\text{mg}} \times 1.0\text{ml} = 0.8\text{ml}
\]

Example 2

Once you have dissolved the diamorphine, make the volume up to a figure which makes it easy to calculate the volume to withdraw. If you wanted 20mg from a 30mg ampoule, it would be difficult to do this with 1.0ml as you need two thirds of this. If you make the volume up to 3.0ml, the calculation is easy.

\[
\text{i.e. volume required } = \frac{20\text{mg}}{30\text{mg}} \times 3.0\text{ml} = 2\text{ml}
\]

The same calculation applies to other drugs, but make sure you use consistent units (e.g. mg or micrograms) throughout the calculation.

Example 3

A dose of 5mg of levomepromazine has been prescribed. The ampoules are 25mg in 1ml. You need to calculate the volume of the injection to measure. Using the same formula as Example 1:

\[
\text{Volume required (ml) = } \frac{\text{what you want (dose in mg)}}{\text{what you've got (dose in mg)}} \times \text{volume you've got (ml)}. \\
\text{i.e. volume required = } \frac{5\text{mg}}{25\text{mg}} \times 1.0\text{ml} = 0.2\text{ml}
\]
Example 4

Metoclopramide 60mg by subcutaneous infusion has been prescribed. The ampoules contain 10mg in 2ml.

\[
\text{Volume required (ml) = what you want (dose in mg) ÷ what you’ve got (dose in mg) x volume you’ve got (ml).}
\]

\[
i.e. \text{volume required} = \frac{60\text{mg}}{10\text{mg}} \times 2.0\text{ml} = 12\text{ml}
\]

You can use the same formula for doses in micrograms, but ensure you use micrograms for both what you want, and what you have got.

Preparing the syringe

It is considered good practice to make the solution as dilute as possible to reduce the likelihood of drug incompatibility and minimise site irritation. For some drugs, which are supplied as relatively dilute solutions, e.g. metoclopramide 10mg in 2ml, there may be little or no space in the syringe for additional diluent when larger doses are used.

Remember if the prescription is changed, you must prepare a new syringe. NEVER add an additional medicine to the syringe after the infusion has commenced.

- establish the final volume required and select the appropriate size of luer lok syringe, normally 30ml, remembering that the maximum volume which will fit in the pump is 22ml
- in exceptional circumstances, under the guidance of a palliative care specialist, the use of a 50ml luer lok syringe (filled to 34ml) may be considered, but it will not fit in the lockbox. Consider the risks and seek advice before using a 50ml syringe.
- complete all relevant documentation including a label (see page 22 for information on labelling the syringe)
- wash hands as per hygiene policy
For a single drug in the syringe

- draw up the prescribed medication and compatible diluent [dilute to the maximum volume the syringe will take when fitted into the syringe pump (22ml for a 30ml luer lok syringe)].

For two drugs in the syringe

- check compatibility
- draw up the opioid (if one is prescribed) into the luer lok syringe; if diamorphine is used, it will need to be reconstituted with diluent, usually water, first. If neither of the drugs is an opioid, draw up one of the other prescribed drugs into the luer lok syringe. Then, dilute to an appropriate volume (total volume less volume of second drug).
- draw up second drug into a separate syringe of appropriate size and leave needle attached
- pull back plunger on first syringe to beyond final intended volume, and add second drug carefully through the luer end
- draw a little air into syringe, invert it gently several times to mix the contents, and then expel air, taking care not to expel any of the medication
- attach the completed drug additive label.
For three drugs in the syringe

- check compatibility
- this should be attempted only when evidence of stability exists, or on the advice of a palliative care specialist when other option, e.g. a second syringe pump, is not available or patient is cachectic with few available sites
- proceed in a similar manner to above, diluting two of the drugs as far as possible before adding the third
- if dexamethasone or cyclizine are included in the mixture, add them last once the other two drugs are diluted as far as possible (because they are the commonest causes of incompatibility)
- draw a little air into the syringe, invert it gently several times to mix the contents, and then expel air, taking care not to expel any of the medication
- attach the completed drug additive label.

The following points should be taken into account when using syringe pumps:

- protect the syringe from direct sunlight whenever possible
- carry out a visual inspection of the solution within the syringe at each monitoring check (at least daily) and discard if evidence of crystallisation, precipitation, cloudiness or change in consistency
- avoid mixing medicines in one syringe if compatibility data is not available; do not mix more than three medicines unless on the advice of a palliative care specialist
- do not infuse the contents of the syringe pump over a period longer than 24 hours.
Labelling the syringe

Ensure the label does not interfere with the mechanism of the syringe pump, i.e. where there is contact with the barrel clamp arm. The label should be attached to the syringe as a 'flag' as this will assist with not obscuring the syringe markings and allow the syringe to be viewed accurately during the infusion.

The following details are required on the label:

- patient name
- CHI number
- medicine name(s)
- dose of each medicine
- diluent name
- total volume in ml
- date and time prepared
- initials of the individual preparing the syringe.

<table>
<thead>
<tr>
<th>Patient's Name:</th>
<th>CHI No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drugs</td>
<td>Dose</td>
</tr>
<tr>
<td>Diluent</td>
<td>.........................</td>
</tr>
<tr>
<td>Total Visual Volume (ml)</td>
<td>Date/Time Prepared (discard after 24 hrs)</td>
</tr>
</tbody>
</table>

FOR SUBCUTANEOUS INFUSION  
(discontinue if cloudiness or precipitate occurs)
Choice of cannula
The BD Saf-T-Intima® cannula, shown below, is the choice of cannula for SC medications.

The rationale behind this preference is:
- Site reactions are less common than with a metal needle
- Insertion is less traumatic
- Needle stick injury is reduced to patient and staff
- Less expensive than alternatives
- Can remain in situ longer than other devices

Practice point
- The BD Saf-T-Intima® is suitable for administering SC boluses and SC infusions.
- The BD Saf-T-Intima® cannula has a dead space of 0.2ml. It does not matter that the cannula itself will not be primed as this very small quantity of air will be absorbed subcutaneously.
- Drugs therefore require to be flushed through with at least 0.2ml of appropriate diluent.
- It is highly recommended that a luer lok syringe is used for all bolus injections and flushes to avoid possible leakage.

Preparation for insertion of SC cannula
- BD Saf-T-Intima® 22 Gauge cannula (blue)
- Usual IV transparent dressings
- Non-sterile gloves
Choosing a suitable infusion site

Where possible, involve the patient in the choice of a suitable site. Both the outer upper arm and upper thigh are commonly used, but avoid the upper arm in bedbound patients who require frequent turning. In other patients, the chest or abdomen may be more suitable. Avoid the chest wall in cachetic patients (danger of causing pneumothorax). The scapula may be considered for confused or delirious patients who may pull on the line.

Acceptable SC cannula insertion sites are shown below
Procedure

1. Wash hands as per hand hygiene policy.
2. Explain procedure to patient and gain consent.
3. Ensure the skin is clean. Wash with soap and water if visibly soiled.
4. Put on gloves.
5. Remove needle cover and inspect needle and cannula, then gently rotate the white safety barrel of the cannula 90 degrees and back, from left to right before insertion. This will ensure that the guidewire and needle do not stick to the extension set and cannula respectively when the needle is withdrawn as this can cause the cannula to concertina in situ.
6. Pinch skin between thumb and forefinger to ensure the SC tissue is identified.
7. Insert cannula at a 45-degree angle bubble surface face down. Secure insertion site with a transparent semi-permeable dressing. Whilst holding ‘butterfly’, remove introducer (needle) in a smooth single movement. Do not re-insert. If unsuccessful use another cannula. If blood appears in the cannula insert a new one in another site.
8. Dispose of needle in sharps container as per local policy.
9. Remove and dispose of clamp on the BD Saf-T-Intima® to avoid accidental occlusion.
10. Write date of insertion of cannula on dressing.
11. Document date, time and site of cannula insertion on monitoring chart.
12. Wash hands as per hand hygiene policy.
13. Replace removable bung with an appropriate needle free device. Change the needle free device after 7 days if the cannula is still in situ. Document change on monitoring chart.

Note: Check site at each visit for erythema, pain or swelling: remove the cannula according to the procedure on page 26 when any of these signs are present. Document the findings of check on monitoring chart.
**Removal of cannula**

The SC cannula can remain in situ for up to 7 days or longer if there is no pain, swelling or erythema at the insertion site.

- Document removal of cannula in nursing notes.
- Once the cannula is removed, cover the site with a small adhesive dressing if any leakage appears.

**Note:** Before discontinuing SC route and cannula is removed, symptoms must be well controlled and patient able to tolerate oral medications.

If a local reaction occurs, a new cannula should be inserted at a different site. If this recurs then consider diluting the medicine(s) further. The site need not be changed for up to 7 days; however it should be regularly assessed (see page 33 - Monitoring the T34TM Ambulatory Syringe Pump by CME Medical) whilst in use. In some exceptional circumstances e.g. extreme cachexia it may be appropriate to leave the cannula in place longer provided the integrity of the site remains.

The following sites should be avoided:

- oedematous areas including lymphoedematous limbs (poor drug absorption and increased risk of infection/exacerbation of oedema)
- bony prominences (poor absorption and discomfort)
- irradiated sites (may have poor perfusion and hence poor drug absorption)
- skin folds, sites near a joint and waistband area (movement may displace cannula: discomfort)
- broken skin.

**Subcutaneous bolus (as required) injections**

In palliative care, the SC route is preferred as it is less painful than IM and can also be utilised as a continuous infusion.

Use a separate BD Saf-T-Intima® cannula to administer SC bolus (as required) doses of medication.

Replace removable bung with an appropriate needle free device once Saf-T-intima has been sited. Document the change in the nursing notes.
The product licence for many injectable medicines does not specifically cover SC administration, however most of the medicines we need to give SC are safe to be given by this route (refer to Palliative Care Guidelines).

When administering SC bolus injections, refer to practice points on page 30.

**Battery power**

Always check the battery power before commencing the infusion. Press the INFO key until the battery level option appears on the screen and then press YES to confirm. The average battery life, commencing at 100%, is approximately 3-4 days depending on use. If the battery power has less than 40% life remaining at the start of an infusion then consideration should be made to discarding the battery and installing a new one (as recommended by McKinley). The battery should be removed from the syringe pump when not in use.

**Fitting the syringe to the syringe pump**

Before placing the syringe into the pump, ensure the barrel clamp arm is down then press and hold the ON/OFF key until the `pump identification` screen appears. The identification screen briefly shows the pump model, software version and `PALLCARE 24HR` (note that syringe pumps in Clyde and Argyll & Bute will have this wording added by Medical Physics at their next service).
The LCD display will indicate ‘Pre-Loading’ and the actuator will start to move. Wait until it stops moving and the syringe sensor detection screen (syringe graphic) appears.

During ‘Pre-Loading’ the actuator will return 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 clamp arm down and use the FF or BACK keys on the keypad to move the actuator. Forward movement of the actuator is limited, for safety reasons; therefore repeated depressions of the FF key may be required when moving the actuator forward. Backwards movement is not restricted.

To avoid an inadvertent administration of a bolus dose, the syringe must be attached to the pump before being connected to the patient.

When fitting the syringe to the syringe pump:
- check the patient’s name (and wristband if used) against the prescription, according to the local medication policy
- lift the barrel clamp arm and seat the filled syringe collar/ear and plunger so the back of the collar/ear sits in the central slot (ensure correct placement). The syringe collar/ear should be vertical with the scale on the syringe barrel facing forward
- click the syringe plunger into the actuator. This may require some pressure.
- lower the barrel clamp arm. The syringe graphic on the screen ceases to flash when the syringe is correctly seated at all three points.
Section 2: Setting up the syringe pump

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- the syringe size and brand option will then be displayed as shown below

![Syringe Size Selection](image)

- if the syringe size and brand match the screen message, press the YES key to confirm.

- if the syringe size and/or brand do not match, scroll with UP or DOWN keys

![Scroll Keys](image)

until the correct selection appears, then press the YES key to confirm.

Note - Serious incidents have been reported involving uncontrolled flow of medication when the syringe has not been correctly or securely fitted to the syringe pump

Connecting the SC infusion line to the syringe

There are two different situations which can occur:

1. A new SC infusion line is required because:

- a line is not currently in situ

- the existing line needs to be replaced, e.g. if the line is damaged or leaks or a change in prescribed medication (see page 37).

2. A line is already in situ and can continue to be used.
Practice points with the extension line

- The line has a small priming volume of 0.5ml.
- There is an integrated anti-siphon valve for added safety.
- Manually prime the line, load on to the T34TM Ambulatory Syringe Pump by CME Medical and then connect to the Saf-T-Intima®. The Saf-T-Intima® will not be primed but this is not a problem for SC use and is only 0.2ml, therefore there will only be a very short delay before the patient receives the medication.
- To connect the syringe to the line, it is recommended to turn the set until fully connected without applying pressure and then to turn the set a further quarter turn to ensure that the connection is secure. Be vigilant for leaks at the connection.
- Change the infusion line every seven days if the combination of medications does not change.

Starting the infusion

If the patient is symptomatic, a SC bolus dose of medication should be given at the same time as commencing the syringe pump.

After confirming the syringe type, the next screen message that appears is displayed below:

```
Volume       21.8ml
Duration     24:00
Rate         0.91ml/h
Confirm, Press YES
```

Example Figures only
The pump calculates and displays the total volume, duration of infusion (24 hours) and rate of infusion (ml per hour).

- The calculated volume, duration and rate should be checked before pressing YES to confirm or ON/OFF to return to the syringe options.

After pressing YES the next screen message that appears will be:

**Start Infusion?**

- check the line is connected to the pump and patient
- press YES to start infusion
- when the syringe pump is running, the green LED indicator (above the ON/OFF switch) flashes and the screen displays

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

The T34™ Ambulatory Syringe Pump by CME Medical allows users to lock the operation of the keypad during infusion. The function should be routinely used to prevent tampering with the device. To activate the keypad lock, 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 has been activated.

When the keypad lock is activated the INFO, YES/START and NO/STOP buttons are still active.

To deactivate the keypad lock (pump must be infusing) repeat the above procedure. The ‘progress’ bar will now move from right (lock on) to left (lock off) and a beep will be heard.

Every T34™ Ambulatory Syringe Pump by CME Medical will be supplied with a lockbox. After starting the infusion, check the syringe pump is set correctly and place it in the relevant box. Universal keys are supplied to each ward/community nurse. Replacement keys and lockboxes, if required, are the responsibility of individual teams.

Warning!!! – To reduce the risk of syphonage, the syringe pump should be placed at the same level as, or lower than, the infusion site.
Monitoring the T34TM Ambulatory Syringe Pump by CME Medical whilst in use

It is recommended best practice, in both the hospital and community setting, when a syringe pump is set-up, reloaded or re-sited to observe the syringe pump during the first 15 minutes to ensure it is functioning correctly. Further monitoring checks should be carried out:

- a minimum of 4 hourly within in-patient settings
- at each visit by a nurse in the community setting – the frequency of this will depend on factors such as other nursing needs of the patient, the willingness or ability of the patient/carer to assist in monitoring, risk of instability of medicine mixture.

The following monitoring checks should be carried out and documented on the Subcutaneous Infusion Monitoring Chart, as follows:

- record the time the syringe pump is checked
- check the infusion site for:
  - redness
  - swelling
  - discomfort/pain
  - leakage of fluid
- check the medication is controlling the patient's symptoms
- check the solution in the syringe and the SC infusion line for cloudiness, presence of large air bubbles (small ones not significant), precipitation or colour change
- record the flow rate and check it is correct
- press the INFO button once and record the volume of solution to be infused (VTBI) and the volume infused (VI) and check from this information that the syringe pump is delivering the medication at the desired rate. It is also best practice to visually check the syringe to confirm volume to be added
- check the battery light is flashing. There is no need to record the battery percentage as this has been carried out already as part of the daily set up.
- record the location of the infusion site when the syringe pump is set up and when the line is changed (this reduces disturbance to the patient during monitoring)
- when the infusion site is changed, record the reason in the `Notes` section
- at each check inspect the SC infusion line to ensure that it is securely attached to both the syringe and the patient and that it is not leaking, kinked or trapped. If there are any problems, then they must be documented.

The individual carrying out the monitoring checks should document and sign the relevant sections of the monitoring chart. If any checks are not carried out e.g. site check to prevent disturbing the patient whilst asleep, record this and the reason on the monitoring chart. **If any checks indicate a problem e.g. the infusion is not running at the expected rate, the appropriate action must be taken and documented in the `Notes` section.** If an infusion is discontinued before it is complete e.g. because of a change in dose or medicine, document the amount of solution remaining and destroyed (ml) on the monitoring chart.

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.

Action must be taken and documented in the event of:
- significant discrepancies in the actual and expected infusion rate
- signs of incompatibility
- blockage of the SC 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 reaction.
Care during the infusion

Whilst the syringe pump is in use, the patient and relative/carer should be aware of:

- how to take care of the syringe pump e.g. avoid spillages of liquids or dropping the pump and to report if the green light stops flashing or the alarm sounds
- avoiding the use of a mobile telephone within 1 metre of the syringe pump. Although there are no confirmed reports of mobile telephones interfering with the operation of the syringe pump, following this advice will help reduce any risk.
- ensuring the syringe pump is well supported when the patient is mobile e.g. placed in a pocket or holster
- who to contact when a problem occurs. Their involvement should be assessed according to individual needs, as not all are able/wish to be involved.

How to change the syringe

e.g. when an infusion is complete or a fresh syringe is prepared before a patient is transferred and no changes have been made to the prescription.

NOTE: The pump MUST be switched OFF using the ON/OFF button to ensure the infusion rate is recalibrated once the new syringe is fitted.

When an SC infusion line is already in situ and re-siting is not required:

- stop the infusion by pressing the STOP button
- deactivate the keypad lock by pressing and holding the INFO button
- switch the pump OFF by pressing and holding the ON/OFF button
- disconnect the SC infusion line from the previous syringe before removing the syringe from the pump. Normally the syringe will be empty, but occasionally it may not. This ensures that the patient does not receive an inadvertent bolus dose when the syringe is removed.
- remove the previous syringe from the pump and attach the new one
- programme the infusion on the pump
check the SC infusion line is full of fluid and connect it to the new syringe ensuring the luer lok is fully screwed on to the thread of the syringe tip

if there is a delay in re-attaching the syringe to the SC infusion line, the line should be capped with a universal red bung

record on monitoring chart any volume to be discarded from the previous syringe.

**How to change the line during an infusion**

e.g. if the line is damaged or leaks

- Temporarily stop the infusion: press the STOP key, disable the keypad lock by pressing and holding the INFO key. **N.B. Do not switch off the syringe pump.**
- Disconnect the line from the cannula and attach an appropriate needle free device to the end of the cannula
- Remove the line from the syringe and discard in accordance with local policy

**N.B.** To avoid inadvertent bolus administration, a syringe that is not empty must never be taken out of the syringe pump whilst connected to the patient.

- Attach the new SC infusion line to the syringe and ensure that the luer lok is fully screwed onto the thread of the syringe tip
- Remove the syringe from the pump and prime the tubing with the syringe pump contents until the fluid just shows at the tip
- Advance the actuator if necessary and place the syringe in the pump
- Confirm the syringe make and size
- Leave the device in place, and re-attach the line
- Press YES to resume the programme
The screen will display Volume Duration and Rate. Before recommencing the infusion, check against the monitoring chart that the rate has remained the same. Press YES to confirm, and the screen will display ‘Start Infusion’. Press YES to confirm.

Document the time the SC infusion line was changed on the monitoring chart.

**N.B.** Priming the line results in a slightly reduced volume in the syringe and because the infusion rate remains the same, the infusion will finish slightly early.

**How to change the line and cannula when medications are changed**

It is considered good practice to change the SC infusion line and use a fresh site when the patient’s prescribed medication has been changed. This practice avoids compatibility issues and a delay in the patient receiving their new medication.

A change of site and Saf-T-Intima® cannula will also depend on the patient’s condition. In cachetic patients and when a syringe pump has been in use over a long period, alternative sites may be very limited. If the existing site is viable and the medicines are compatible, continued use may be in the patient’s best interest.

**Important note:** If the medicines or doses are changed then a completely new infusion is commenced, and the pump must be switched off, using the ON/OFF button, rather than temporarily stopped. Follow the procedures for inserting a cannula, priming the infusion line, fitting the syringe to the pump and commencing the infusion.
How to change the line and cannula when a new site is required AND the current infusion will be resumed after changing the site

Note: This is not the procedure to follow when a new syringe is being commenced.

- Temporarily stop the infusion: press the STOP key, and disable the keypad lock by pressing and holding the INFO key. **N.B. Do not switch off the syringe pump**
- Remove the cannula from the patient

**N.B.** To avoid inadvertent bolus administration, a syringe that is not empty must never be taken out of the syringe pump whilst connected to the patient.

- Remove the line from the syringe pump and discard the cannula and line in accordance with local policy
- Attach the new SC infusion line to the syringe and ensure the luer lok is fully screwed into the thread of the syringe tip
- Remove the syringe from the pump and prime the tubing with the syringe pump contents until the fluid just shows at the tip
- Advance the actuator if necessary and place the syringe in the pump
- Confirm the syringe make and size
- Insert a new cannula at a fresh site and connect to the SC infusion line, see page 25 for guidance
- Press YES to resume the programme
- The screen will display Volume Duration and Rate. Before recommencing the infusion, the nurse must check against the monitoring chart that the rate has remained the same. Press YES to confirm, and the screen will display ‘Start Infusion’. Press YES to confirm.

**N.B.** Priming the line results in a slightly reduced volume in the syringe and because the infusion rate remains the same, the infusion will finish slightly early.
Document the time the cannula and SC infusion line were changed on the monitoring chart.

*When a new skin site is required e.g. due to inflammation and pain, a new SC infusion line and cannula must also be used.*

**How to temporarily stop the infusion**

*e.g. when the patient is going for a bath, shower or MRI scan*

It is recommended that T34TM Ambulatory Syringe Pump by CME Medicals should not be taken into bathrooms and showers when patients are bathing. The syringe pumps are sensitive to both steam and water ingress. Damage may occur which could result in pump failure. Some syringe pumps have had to be written off because of water damage. The T34TM Ambulatory Syringe Pump by CME Medical cannot be used when a patient is having an MRI scan; follow this procedure to temporarily stop the infusion.

- Disengage the keypad lock by holding down the blue **INFO** key
- Pause the infusion using the red **STOP** button
- Switch the syringe pump off using the **ON/OFF** key
- Disconnect the line from the cannula
- Attach a needle free device to the end of the cannula and a sterile universal red bung to the end of the line
- Do not remove the syringe from the syringe pump
- The syringe **must** be clearly labelled so that it can be easily identified
- Store the syringe pump, syringe and line safely while not in use e.g. in a patient's own lockable bedside medicine locker, in a CD cupboard in a ward/clinical area or out of the reach of children in the patient's own home
- Note the time the syringe pump was stopped on the monitoring chart
When the patient is ready to be reconnected to the infusion

- Check the patient's details and prescription against the label on the syringe according to local medication policy
- Remove the red bung from the end of the infusion line and reconnect it to the needle-free device on the cannula
- Switch the syringe pump on using the ON/OFF key
- Confirm the syringe make and size

The following screen message will display:

![Screen message](image)

- Select 'Press YES to Resume' as this will continue the previous programme and allow the infusion to be completed

**WARNING – If the NO key is pressed, the syringe pump interprets this as a completely new 24 hour period and the remaining contents of the syringe would be delivered over the next 24 hours from confirming 'Start infusion?'. The patient would not therefore receive the prescribed dose. If the NO key has been pressed in error, discard the remainder of the syringe contents and prepare and set up a new syringe.

- The user should check that the infusion rate has remained the same as the previous entries noted on the Subcutaneous Prescription and Monitoring Chart and record the details in the monitoring section.
- Press YES to confirm, then YES to restart the infusion
- Record the time that the patient was reconnected to the infusion on the Subcutaneous Infusion Prescription and Monitoring Chart. Assess patient to determine whether a SC bolus of medicines may be needed if symptoms have become uncontrolled.
How to stop the infusion and remove the syringe pump

When the infusion is nearing completion, a warning will be shown on the LCD display screen 15 minutes before the end of the infusion. When the infusion is complete and the syringe is empty, the pump will stop automatically and an alarm will sound. If the syringe pump is no longer required for the patient, press YES to confirm the end of the infusion, disable the keypad lock and press and hold the ON/OFF switch ensuring the pump is switched off.

If the infusion is to be stopped before the syringe is empty, it should also be disconnected from the patient for safety reasons. A syringe that is not empty must never be taken off the syringe pump whilst connected to the patient. If the infusion is to be stopped before the syringe is empty, disconnect the pump from the patient before removing the syringe from the pump.

Clean the pump and lockbox as detailed under Cleaning and Decontamination on page 10 (do not immerse the syringe pump in water). Dry and replace in packaging if no longer required for use.

What to do if a patient dies when their syringe pump is running

Stop the syringe pump by pressing the STOP button and remove the cannula as soon as possible. Switch off the syringe pump by disabling the keypad lock and then press and hold the ON/OFF button.

On the subcutaneous infusion monitoring chart, record the date, time and amount of solution (ml) remaining in the syringe and destroyed and also the signature(s) of the person present and any witnesses.
Practice point
Refer to the NHS Greater Glasgow & Clyde Palliative Care Guidelines for advice on assessing symptoms, details of medicines used subcutaneously, and dose conversion from other routes of administration.
All medicines administered via the syringe pump should be clearly and correctly prescribed according to local policy and procedures. The following information must be included:

- patient demographic details
- any known allergies
- medicine name (generic in CAPITALS)
- dose over 24 hours
- diluent
- route of administration
- duration of SC infusion
- prescriber's signature.

In addition, it is good practice to prescribe opioid doses in words and figures.

The person preparing the medication should check the following:

- prescription
- compatibility of medicines prescribed
- diluent
- infusion volume required
- size of syringe required.

Practitioners administering a medicine that they have not previously used by the SC route should be aware that:

- absorption may be slower than the intramuscular (IM) route
- irritant medicines may cause a greater inflammatory reaction SC than IM
- the recommended maximum volume at a single injection site for a bolus injection is 2ml
- absorption will be severely limited in patients who are `shocked`, hypovolaemic or oedematous.

Additional ‘as required’ bolus doses of medication should always be prescribed on the appropriate prescription chart and be available for administration when required.
When a maintenance 24 hour opioid dose is changed, the breakthrough dose should also be adjusted accordingly. A Saf-T-Intima® cannula may be inserted and left in situ for administering breakthrough doses. It may be worth considering alternative medicines and routes e.g. morphine suppositories.

It remains the responsibility of each individual practitioner to ensure that the medicine(s) prescribed are suitable for continuous subcutaneous infusion and are stable under these conditions.

Remember - All medicines not administered to the patient should be accounted for.

**Starting syringe pumps in relation to stopping opioids by other routes of administration**

If the syringe pump is commenced when the patient’s pain is well controlled then a loading dose of opioid is not necessary. If the patient’s pain is not well controlled, give a subcutaneous breakthrough dose of opioid at the same time as starting the syringe pump. This should be approximately 1/6th of the 24 hour dose prescribed in the syringe pump. (Recommended best practice SIGN Guideline 106; further information available from NHS GG&C or Lothian palliative care guidelines (http://www.palliativecareggc.org.uk/index.php?action=cms.clinical_info) or in end of life situations, Guidance for Person Centred Care at End of Life/Scottish Palliative Care Guidelines.

Start the syringe pump immediately if:
- the patient is not currently on any opioid OR
- the patient is receiving opioid on an ‘as required’ basis OR
- the patient is receiving immediate release oral opioid preparation e.g. Sevredol®
Patients on modified release oral opioid preparation e.g. MST®
Discontinue the prescription for the modified release preparation. Ideally, start the syringe pump when the next dose of modified release preparation would have been due, but particularly in the community setting, this may not be a convenient or safe time. A decision on an appropriate time should be based on the clinical status of each individual patient e.g. consider renal function.

Patients on Fentanyl Patches (end of life)
Do not discontinue the fentanyl patch. Refer to the NHS GG&C Palliative Care Guidelines section entitled ‘Fentanyl patches in the last days of life’, and for further advice, speak to a pharmacist or palliative care specialist.

Stopping syringe pumps in relation to starting opioids by other routes of administration

When oral treatment is to be started
If an oral modified release or immediate release preparation is being commenced, the continuous subcutaneous infusion should be stopped when the first dose of modified release or immediate release oral opioid is administered. The patient may require breakthrough medication more frequently until therapeutic levels are reached. If further advice is required, seek guidance from a palliative care specialist.

When Fentanyl Patches are to be started
Refer to ‘Starting a Fentanyl Patch’ in the NHS GG&C Palliative Care Guideline ‘Fentanyl patches in Palliative Care’ and seek advice from a palliative care specialist.
There are various problems associated with mixing medication in the same syringe, which include:

- degradation of the drug(s) which can lead to decreased efficacy. The rate of degradation may be increased by other drugs which can alter the pH of the mixture. Direct sunlight and heat can also cause degradation of the drug.

- crystallisation/precipitation. This can occur through formation of an insoluble product of a drug interaction, or because a drug alters the pH of the solution rendering a 2nd drug insoluble, or because of an interaction between the drug and the diluent.
Drugs combinations

Where drug combinations (commonly an analgesic and an antiemetic) are used, further criteria must be met:

- the drugs must be compatible with each other
- the diluent must be compatible with the drugs used.

Information about single drug infusions and the stability and compatibilities of drug combinations which can be administered via the T34TM Ambulatory Syringe Pump by CME Medical are available from the Palliative Care Guidelines at www.palliativecareguidelines.scot.nhs.uk and in the A4 and A5 printed versions.

Drug combinations outwith those listed in the Palliative Care Guidelines or in this document should only be used on the recommendation of a palliative care specialist, or on the advice of a pharmacist. The advice given should be documented clearly in the patient's notes and on the appropriate section of the monitoring chart.

If in doubt about compatibility/stability of medicine combinations, consider using an additional pump or an alternative route of administration. Seek specialist advice (contact details for palliative care pharmacists and specialist teams are at the front this guideline).

Evidence for the chemical stability of other combinations may not be available, but physical stability data in some literature may be used to inform the choice of combinations. Data usually comes from observations made in clinical practice, often in specialist palliative care units, and is reported as combinations which appear to be physically stable in that they do not change colour or precipitate and appear to be clinically effective.

Medicines NOT suitable for subcutaneous use

The medicines listed below must not be administered by the SC route as they may cause tissue necrosis:

- antibiotics
- diazepam
- chlorpromazine
- prochlorperazine
The use of medicines out with a manufacturer’s licence

The use of medicines out with a manufacturer’s licence or "off label use" is common practice in palliative care e.g. administration by the SC route, but carries additional responsibilities for prescribers, pharmacists and nurses. Such use can be supported by local policy/guidance and specialist palliative care services.
Common problems

Note: When assessing whether an infusion ended early or late, allowance should be made for tolerances in the syringe pump, start-up time and recording the start time. A tolerance of 5% (equivalent to 1 hour for 24 hour infusions), should be allowed, see page 9 as this has already been explained earlier in the document more fully.
<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The pump will not start</td>
<td>No battery present.</td>
<td>Fit a battery.</td>
</tr>
<tr>
<td></td>
<td>Battery inserted incorrectly.</td>
<td>Re-align battery terminals.</td>
</tr>
<tr>
<td></td>
<td>Cap on battery terminal.</td>
<td>Remove cap.</td>
</tr>
<tr>
<td></td>
<td>Battery is depleted/very low.</td>
<td>Fit a new battery.</td>
</tr>
<tr>
<td></td>
<td>Pump is faulty.</td>
<td>Service is required.</td>
</tr>
<tr>
<td>Infusion ended early/late</td>
<td>Drug incompatibility or site problems.</td>
<td>Assess patient and discuss with healthcare staff.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If ended late, check if PRN (as required medication) is needed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to control symptoms.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the pump is continuing to infuse beyond the prescribed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>time - stop infusion. Assess why and resolve cause. Set up a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>new infusion if required.</td>
</tr>
<tr>
<td></td>
<td>Disconnection of syringe, SC infusion line or cannula.</td>
<td>Check placement of syringe, SC infusion line and cannula.</td>
</tr>
<tr>
<td></td>
<td>Wrong syringe brand confirmed during set up/incorrect</td>
<td>Set up a new infusion.</td>
</tr>
<tr>
<td></td>
<td>volume measured by syringe pump.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Syringe pump placed &gt; 75cm above infusion site.</td>
<td>If user error – seek appropriate training.</td>
</tr>
<tr>
<td></td>
<td>This can lead to siphonage if the syringe is not</td>
<td></td>
</tr>
<tr>
<td></td>
<td>secured.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air is present in the syringe.</td>
<td>Check syringe barrel to see if it is cracked. A cracked</td>
</tr>
<tr>
<td></td>
<td></td>
<td>syringe can lead to siphonage. If syringe is cracked, stop</td>
</tr>
<tr>
<td></td>
<td></td>
<td>infusion and remove syringe, assess patient before commencing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a new infusion.</td>
</tr>
<tr>
<td></td>
<td>The syringe pump is faulty.</td>
<td>Send syringe pump for servicing.</td>
</tr>
<tr>
<td>Fault</td>
<td>Possible cause</td>
<td>Action</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Infusion is running slow</td>
<td>The syringe pump may have stopped.</td>
<td>Check if the infusion has stopped at any point. Assess patient and discuss with healthcare staff. If ended late, check if PRN (as required) medication is needed.</td>
</tr>
<tr>
<td></td>
<td>Cannula site requires to be changed.</td>
<td>Set up a new infusion.</td>
</tr>
<tr>
<td></td>
<td>Pressure/kinking on the SC infusion line or cannula.</td>
<td>Check placement of the syringe, SC infusion line and cannula.</td>
</tr>
<tr>
<td></td>
<td>Disconnection of syringe, line or cannula.</td>
<td>If user error – seek appropriate training.</td>
</tr>
<tr>
<td></td>
<td>The syringe pump is faulty.</td>
<td>Send syringe pump for servicing.</td>
</tr>
<tr>
<td>Cannula sites require frequent changes</td>
<td>Irritation from prescribed medication.</td>
<td>Use a larger syringe and a more dilute solution of drug. Check diluent and potential alternatives for prescribing with pharmacist/specialist palliative care team.</td>
</tr>
<tr>
<td></td>
<td>Cannula insertion technique.</td>
<td>User error – seek appropriate training.</td>
</tr>
<tr>
<td>The pump has stopped before the syringe has emptied</td>
<td>Exhausted battery.</td>
<td>Fit new battery, turn syringe pump on, confirm syringe size and brand and then resume infusion.</td>
</tr>
<tr>
<td></td>
<td>The syringe pump is faulty.</td>
<td>Send syringe pump for servicing.</td>
</tr>
</tbody>
</table>
Precipitation, cloudiness or colour change in syringe contents or line

In the event of the syringe or SC infusion line contents precipitating, becoming cloudy or changing colour the infusion should be stopped. Discussions should take place with the prescriber or pharmacist around:

- compatibility information
- diluent (seek advice on most appropriate dilutant)
- diluting the medicine(s) in a larger volume
- separating the medication into 2 syringe pumps or give one medicine as a SC bolus
- ensuring the syringe pump is kept away from sunlight and heat as well as hot pack/heat pad or hot water bottle.

Commence a new infusion at a different site with a new cannula and SC infusion line required.

When a combination appears to be incompatible, please notify a palliative care pharmacist. The information required is drug(s), dose(s), diluent, and total volume of infusion.

Syringe pump alarm conditions

When the alarm sounds the syringe pump will automatically stop infusing and continue alarming until the problem has been resolved. It is important that patients/carers and relatives are made aware of this and where to seek advice and help in the event of this occurring e.g. local community nursing teams or out of hours nursing services.

When the syringe pump detects a problem, the following occurs:

- an audible alarm is activated
- the infusion stops
- the display indicates the nature of the problem
- the LED indicator turns red.

### Display | Cause/Action
--- | ---
**Pump paused too long** | Pump was left unattended in stopped or programme mode for more than two minutes. When appropriate, start the infusion (checking rate prior to doing so), continue programming or switch pump off.

**Occlusion** | Occlusion can be related to drug or site factors e.g. drug incompatibility. Check for trapping or kinking of the SC infusion line. Check cannula and that the patient is not lying on the cannula insertion site. When satisfied press . Check if the pump has been placed lower than cannula site which can increase the risk of alarming. If not resolved re-site cannula. Then if still not resolved send for servicing.

**Syringe displaced** | Syringe not correctly fitted/displaced. On screen message identifies which sensor to check.

**Near End** | Infusion nearly complete. Infusion does not stop. Prepare to change syringe.

**End programme** | Infusion complete. Change syringe or remove infusion if pump discontinued.

**Syringe empty** | Infusion stops. Check intended time for completion. Change syringe.

**Low battery** | To alert user- the infusion does not stop. Change battery, do not stop or switch off pump, resume infusion.

**End battery** | Battery depleted. Infusion stops. Change battery and resume infusion.

**Technical error messages e.g. ’System error’** | Follow the instructions on the screen e.g. ‘Switching pump off and on may resolve the problem’. If this does not resolve the problem then contact Medical Physics Department for further advice.
Sources of further advice
The first point of contact will often be your local colleagues, including:

**Primary Care**
- Community nurses
- Macmillan GP facilitators
- Macmillan Clinical Nurse Specialists
- Marie Curie Clinical Nurse Specialists
- Specialist Palliative Care Pharmacists

**Acute hospitals**
- Macmillan Clinical Nurse Specialists
- Marie Curie Clinical Nurse Specialists
- Palliative Care Clinical Pharmacists
- Specialist Palliative Care Teams
- Medicines Information Pharmacists
- On-call Pharmacists
- Medical Physics Department
- Consultant Medical Staff

**Hospices**
- Specialist Palliative Care Teams

**Internet resources**
- www.palliativecareguidelines.scot.nhs.uk
- www.palliativecareggc.org.uk

Specialist Palliative Care Services in NHS GG&C
Guidelines for the use of the T34TM Ambulatory Syringe Pump by CME Medical for adults in palliative care

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CHI  Community Health Index
CRAG  Clinical Resource and Audit Group
CSCI  Continuous Subcutaneous Infusion
IM  Intramuscular
LCD  Liquid Crystal Display
LED  Light Emitting Diode
NMC  Nursing and Midwifery Council
SC  Subcutaneous
SEHD  Scottish Executive Health Department
WFI  Water For Injection

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Datix – Managers guide to approving and managing incidents, Version 7, July 2009


NHS Greater Glasgow and Clyde, August 2008. Guidelines for the Use of Subcutaneous Medications in Palliative Care for Adults – Primary Care and Hospices.

NHS Greater Glasgow and Clyde Palliative Care Guidelines, 2010.


NHS Greater Glasgow and Clyde Palliative Care Guidelines, 2010.

NHS Highland and Highland Hospice Syringe Pump Guidelines 2006


NHS Tayside, June 2009. Policy for Subcutaneous Administration of Medicines by the McKinley T34 Syringe Driver.

Palliative care drug information online
http://www.palliativedrugs.com

Palliative Care Guidelines
http://www.palliativecareguidelines.scot.nhs.uk


Skills for Health  www.skillsforhealth.org.uk