Using a 2nd Edition T34™ Syringe Driver to Deliver a Continuous Subcutaneous Infusion in Palliative Care
Aim of Session

• To understand the use of Continuous Subcutaneous Infusions (CSCI) within palliative care
• To identify the indications for using a syringe pump
• To identify medications commonly used
• How to use a T34™ syringe pump (syringe driver) and demonstrate the ease of continuous subcutaneous infusion.
What is a Syringe Driver?

- A syringe driver is a small, portable battery-powered pump.
- It administers drugs subcutaneously by continuous infusion. This is often referred to as a continuous subcutaneous infusion (CSCI).
- For administering drugs when the oral route is difficult or inappropriate.
- It offers an alternative route of drug administration with little impact on patient mobility or independence.
- By maintaining steady drug plasma levels, a syringe driver may improve symptom control.

- Whilst syringe pump are usually associated with symptom management during a patient's dying phase, they can be a successful, targeted intervention in early as well as late stages of end of life care.
- They can also be useful for acute symptom management, and for short and long-term use at home as well as in hospitals.
Clinical Reasons For Commencing a Syringe Pump in Palliative and End of Life Care

- End of life patients (weak, cachetic)
- Dysphagia
- Pain control
- Relief of persistent nausea & vomiting
- Control of restlessness or agitation
- Relief of anxiety
- Control of convulsions
- Control of excessive bronchial secretions
- Severe oral tumours, sores or infections
- Intestinal obstruction
- Unconscious or sedated patient
- Patient preference

Not always associated with end of life scenarios

Contra-indications:
- Severe peripheral oedema
- Coagulation disorders
- Poor peripheral circulation
Individual Care Plan

• Prior to starting a syringe driver its use should be fully discussed with the patient and family/carers. Explanation is needed about what a syringe driver is, how it works and why its use is indicated.
• Setting up a syringe driver may be routine for the clinician, but it may be a frightening new experience for patients and their carers.
• 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.
• Reassurance that syringe drivers do not always mean that death is imminent.
• Explanation that a syringe driver allows the symptoms associated with the process of dying to be managed, but does not speed up the process of dying.
• Explanation the potential need to administer additional medicine via other routes, e.g. at initiation, for breakthrough symptoms
• Provide a patient information leaflet where available
• What to do and where to get advice if the syringe driver is not working properly, or symptoms are not controlled.
Advantages of using CSCI via a syringe pump

- Alternative route of administration when the oral route is unmanageable
- Effective symptoms control due to steady plasma drug concentrations without peaks & troughs
- Allows management of multiple symptoms through the use of combinations of medicines given via a single route
- Single route of administration minimises need for repeated injections or multiple oral medicines
- Subcutaneous administration of medicines is more comfortable for the patient than intramuscular injections (particularly if the patient is cachetic)
- The ability for patients who are still mobile to remain so, and once set up enables more independence
Disadvantages of using CSCI via a syringe pump

• Medication requirements must be anticipated for a 24hr period and can result in a loss of flexibility in dosing.
• If symptoms change, top up injections may still be required
• Lack of reliable compatibility data for some mixtures.
• Local site reactions may be encountered with the use of the CSCI. Some of the reasons for infusion site reactions could be for the following reasons\(^2\):
  – Infection
  – An allergic response to the needle, which maybe nickel
  – The presence of glass particles from the ampoule
  – A chemical reaction in the tissue
  – pH of the solution
• Patients (and their carers) may see the use of a syringe pump as a final step before death
Advantages of Using Continuous Subcutaneous Infusion (CSCI) (No peaks or troughs in plasma drug levels)
What Drugs Are Used in a T34™ Syringe Driver For Symptom Control?

Consider the A’s

- Analgesics
- Antiemetics
- Antispasmodics / Antisecretory
- Anxiolytics / Antipsychotics
CSCI Drugs That May Be Used In Palliative Care For Symptom Control

*(Refer to your local Palliative Formulary)*

<table>
<thead>
<tr>
<th>Use</th>
<th>(Example) Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analgesic</td>
<td>Morphine sulphate, Diamorphine, Oxycodone, Alfentanil and Fentanyl</td>
</tr>
<tr>
<td>Antiemetic</td>
<td>Metoclopramide, Haloperidol, Levomepromazine, Cyclizine</td>
</tr>
<tr>
<td>Anxiolytic</td>
<td>Midazolam</td>
</tr>
<tr>
<td>Antisecretory</td>
<td>Glycopyrronium, Hyoscine Butylbromide, Hysocine Hydrobromide</td>
</tr>
<tr>
<td>Antipsychotic</td>
<td>Haloperidol, Levomepromazine</td>
</tr>
<tr>
<td>Other</td>
<td>Dexamethasone (may precipitate, so generally given in a 2\textsuperscript{nd} dedicated driver), Octreotide</td>
</tr>
</tbody>
</table>
Prescribing Analgesia Medicines For The Syringe Driver:

NB Also refer to local Palliative Formulary Guidelines

- Convert the patient's previous 24-hour oral medicine requirements (including regular and "as needed" doses) to the equivalent subcutaneous dose.\(^4\)
  - Usual starting Morphine dose for subcutaneous infusion is calculated as:
  - Morphine – use half the total 24-hour oral dose. Use 1/3 of the total 24-hour dose when the patient is old or frail, or if there is a known or suspected renal impairment.

- For opioid-naive patients, an example of an initial starting dose would be 10mg morphine subcutaneously over 24 hours.
- Breakthrough dose: Prescribe 1/6 of the total 24-hour dose for breakthrough pain, to be given by subcutaneous route.
- Titration: Re-evaluate pain control every 24 hours and increase dose by 1/3 or equivalent of cumulative breakthrough morphine requirements over the previous 24 hours if pain persists.
Generally, incompatible drugs cause precipitation and thus cloudiness in the syringe.

Drugs Not Recommended For Use In Syringe Pumps (CSCI) As They Could Be An Irritant:\(^5\):
- Diazepam
- Prochlorperazine
- Chlorpromazine
- Buscopan Co

**Mixtures to Avoid:\(^6\):**
- Cyclizine and saline – it will crystallise and stop the infusion
- Cyclizine and Metoclopramide (antagonistic and incompatible)
- Cyclizine and Hyoscine (crystallises - often in the night)
- Metoclopramide and Hyoscine (antagonistic and incompatible)
- Avoid more than 1mg Dexamethasone combined with other medicines.

For further information of compatibility of drugs via CSCI:
- [https://www.palliativedrugs.com/](https://www.palliativedrugs.com/)
- Dr Andrew Dickman – The Syringe Driver Textbook* (Referenced at end)
Diluent

- Sterile water (water for injection) and Normal Saline (NaCl 0.9%)
- For most drug combinations, sterile water is the suggested diluent, as there is less chance of precipitation, but it is hypotonic and may be associated with pain at the infusion site.
- Normal Saline 0.9% should be used for levomepromazine, ondansetron and octreotide.
- Once mixed, syringes should be observed for any signs of precipitation or discoloration.
Selecting The Infusion Site

- Anterior aspect of upper arms
- Anterior aspect of thighs
- Anterior chest wall
- Anterior abdominal wall
- Scapula region

Inappropriate Sites:

- In close proximity to a joint or bony prominences
- Avoid skin folds, broken, oedematous, infected or recently irradiated skin.
- Areas of inflammation
- Areas with excessive scarring
- Areas with tumours
- Do not site in abdomen if patient has ascites
- Do not site in anterior chest wall in cachetic patients
You should also remember the following

- If possible, check the patient's preferred method of wearing the pump before selecting the infusion site.
- Avoid upper arm site in bed-bound patients who require assistance with turning.
- Irrespective of which site is used, check the infusion site regularly.
- Refer to local policy whether butterfly cannula or Saf-T-Intima™ to be used.
- If possible, use plastic cannula as they cause less site irritation than metal cannula.
- Change the insertion site every 72hrs or earlier if required. *(Refer to your local syringe driver policy and procedure)*
What is the T34™ Syringe Pump?

- Used in both homecare and hospital settings.
- Used for all common infusion routes and with the most common syringe brands and sizes.
- Lightweight, compact and fully ambulatory.
- Code protected programmes that are configured and locked into the pump memory and can only be accessed by authorised personnel or technicians.
- 512 memory Event Log.
- Volume detection and automatic calculation of infusion rate and volume detected in ml/hr.
- Three point syringe detection feature, each with displacement alarm.
- Powered by a 9V (6LR61) type battery.
Starting / Setting Up a T34™ Syringe Pump

• **NB Also refer to local syringe driver policy and procedure**

• The standard delivery period for a CSCI is 24 hours.

• Up to a maximum of 4 drugs can be mixed\(^7\) *(Refer to your local palliative formulary)*

• Medicines administered via a syringe driver may take some time to achieve steady state. Use prn medications to relieve symptoms if necessary during this period

• When continuing drug and switching from oral to CSCI at equi-effective doses a steady state may already exist

• It is considered good practice to make the solution as dilute as possible to reduce the likelihood of drug incompatibility and minimise site irritation.

• Protect the contents of the syringe from light with a holster. Be aware of increased heat (putting under pillows, electric blankets at home)
Choice of Syringe

- The T34™ syringe pump is calibrated in ml per hour.
- It is recommended that only Luer-Lock tip syringes are used.
- The minimum recommended size is 20ml for palliative care.
- T34™ lockbox cannot hold syringes larger than 30ml. Therefore either a 20ml or 30ml are the recommended use.

- It should be noted that different brands of syringes will have different recommended maximum volumes and local guidance should be adhered to at all times.

  General rule of thumb in most palliative care policies:
  - 30ml Luer-lok™ syringe, the maximum volume of fluid is 22ml
  - 20ml Luer-lok™ syringe is used, the maximum volume of fluid is 17ml
20ml and 30ml Luer-Lok™ BD Plastipak Syringes
(2ml to 50ml most common syringes can be used in a T34™)
A 20ml or 30ml syringe will allow the T34™ syringe driver and syringe to fit within a T34™ Lockbox
**T34™ Keypad (2nd Edition)**

- INFO: access event log, Set Up (code protected), battery status, keypad lock.
- UP/DOWN arrow keys - scroll through options
- YES/START key – confirms selection / starts infusion
- NO/STOP – step back a screen / stops infusion
- FF (forward) – moves actuator forward
- BACK – moves actuator back
- ON/OFF – powers pump on and off
## T34™ Top of Pump

### TOP OF PUMP: SYRINGE FITTING

<table>
<thead>
<tr>
<th>No.</th>
<th>Area</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Barrel clamp arm</td>
<td>Detects syringe barrel loading and secures syringe in place.</td>
</tr>
<tr>
<td>2.</td>
<td>Collar sensor</td>
<td>Detects correct loading of the syringe collar.</td>
</tr>
<tr>
<td>3.</td>
<td>Plunger sensor</td>
<td>Detects correct loading of the syringe plunger.</td>
</tr>
<tr>
<td>4.</td>
<td>Lead screw</td>
<td>Moves actuator.</td>
</tr>
<tr>
<td>5.</td>
<td>Actuator</td>
<td>Drives the syringe plunger to deliver syringe contents.</td>
</tr>
<tr>
<td>6.</td>
<td>Guide rails</td>
<td>The two guide rails support the actuator position.</td>
</tr>
</tbody>
</table>
Prior To Use

• Ensure the device is clean, visually intact, appropriate for intended use, and within service date.

• Follow your local policy with regards to changing battery (usually if below 40% at start of infusion)

• Prepare syringe as per prescription and local policy, attach drug label. Attach syringe to an extension set and manually prime. **Do not connect to patient at this stage.**
How To Use A T34™ Syringe Pump

Production pump images

• CME T34 3rd edition

• BD T 3rd edition

• CME T34 2nd edition
Resources for T34™ 2nd Edition


- http://training.cmemedical.co.uk/quickstart/index.html

- www.cmemedical.co.uk/training/clinical-training/clinical/elearning/
References

• 1, 4, 5, 6 https://www.palliativedrugs.com/

