The Syringe Driver

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Syringe drivers & palliative care

S/C administration of medications using a syringe driver is a common and accepted practice in palliative care for assisting with the management of pain and other distressing symptoms when other routes are inappropriate or ineffective.

(Dickman et al, 2005)

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Patient Experience

- View use of syringe driver as an invasion.
- Perceive the device as an indicator of a poor prognosis.
- View family/whanau perceive device as indicator of ‘near death’ (Copperfield, 1996).
- Health Professionals associate device with imminent death &/or ‘right of passage’ (Dickman et al., 2005).
- UK study where one pt observed that all pts put on syringe driver died within a week (Costello, 2000).
- Facilitate patient independence (Lee, 2006; Shaw & Meek, 2007).

Evidence that pts &/or families regard sd’s as an indicator of poor prognosis or ‘near death’ and may be reluctant to use them (Copperfield, 1996).

More alarming is that many health professionals associate the device with imminent death &/or a necessity for every dying patient to have (Dickman et al., 2005).

Costello’s study reported on the hospital patient who observed that all patients in his bay who were put on a syringe driver died within a week or two. This led the pt to conclude that should he wish to hasten his own death it was necessary to increase his request for pain relief and ensure that he received continuous infusions as a means of obtaining a pain-free death.

Facilitate pt independence in terms of S/D being compact (Lee, 2006) & inconspicuous, (Shaw & Meek, 2007) as well as negating the need for regular injections which are deemed uncomfortable & inconvenient.
Challenged by new AD pumps

Reduce the need for professional contact & limiting the amount of attention patients receive. This can been seen as a drawback, despite S/D's being widely held to be the most appropriate method of controlling symptoms. This raises the question as to whether their used is always in the patients best interests.

At the end of life patients may prefer not to die attached to a piece of machinery – do we give them the choice?

The concept of advanced care planning in PC clearly highlights the importance of discussing, documenting & achieving where possible, patients preferred priority for care.

Lack of research into patient’s preferences & attitudes about the use of sd’s particularly at the end of life (Graham & Clark, 2005).

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- Drug concentrations in blood are maintained without peaks and troughs.
- Ease of use (Morgan & Evans, 2004)
- Cost effective (Graham, 2006)
- relatively safe & effective way to ensure optimum symptom management (McCormack et al, 2001; Watson et al, 2005)

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**Limitations**
- Significant number of difficulties reported (McCormack et al, 2002; Dunne et al, 2000).
- Related human error – lack of training & education (McCormack et al, 2010).
- Inappropriate drug dosage calculations and combinations (Dunne et al, 2000; Hanks et al, 2003; McLeod & Flowers, 2006).
- Poor standards of practice – unregulated practices in setting up, administering & monitoring patient have s/c infusions (Dunne et al, 2000).

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**Saying goodbye to an old friend**
- 30yrs of service.
- International safety standards, technology & expectations have changed.
- 2007 Medsafe raised safety issues (Wakefield, 2006; HDC, 2005).
- 2007 Smiths Medical ceased supply MS-series.
- ‘New kid on the block’ – Cardinal AD pump.


Point 3 – Don’t meet the ‘essential principles of safety & performance of medical Devices ‘ guidelines. These guidelines reflect international minimum standards for safety & effectiveness of medical services.

Medsafe – the NZ Medicines & Medical Devices Safety Authority Serious adverse events related to Grazeby pumps are relatively common internationally (Wakefield, 2006) and within NZ (H & D Commissioner, 2005)

Human error – people are not perfect and neither are devices (Wiklund, 2002). Problems can be caused by human error, machine error or more commonly, an interaction between human and machine due to design faults, or ‘latent hazards’.
Guidelines have been developed to assist in the development of local policies, clinical guidelines, education and training programmes to standardise information about S/D management by palliative care, promote safe practice, avoid duplicity of information and support generalist and specialist palliative care providers.

No longer meet the minimum international safety standards (Global Harmonisation Taskforce 2005) and Smiths Medical ceased the supply to the NZ market in 2009.

Nurse Practitioners- Jackie Robinson, Michal Boyd; PCCNS Helen Cleaver, PC Medical Consultant Dr Annabel Dunn; Senior Advisor for Medsafe; Cancer Control Council

Local guidelines have been written in consultation with nursing, medical & pharmaceutical input.

Clinical Indications for use
- Poor absorption of oral medication
- Persistent nausea and vomiting
- Gastro Intestinal obstruction
- Swallowing difficulties
- Comatose patient
- Oral / rectal route not tolerated
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Common drugs used in CSCI's

- **ANALGESICS:** Morphine, Methadone, Oxycodeone, Fentanyl
- **ANTI-EMETICS:** Metoclopramide, Haloperidol, Cyclizine 
  Levomepromazine / Methotrimeprazine (Nozinan)
- **ANTI CHOLINERGIC:** Hyoscine Butylbromide (Buscopan) 
  Hyoscine Hydrobromide
- **SEDATIVES:** Midazolam, Clonazepam
- **ANTI-EPILEPTICS:** Phenobarbitone
- **STEROIDS:** Dexamethasone

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**Drugs & Diluents**

- Wide variety of drugs in many combinations
- More drugs that are mixed together greater the risk of precipitation & reduced efficacy.
- 2-3 drugs is recommended best practice
- Check compatibility of drugs eg: (MacLeod et al 2009)
- Morphine is the most commonly used opioid in S/D's in NZ
- Choice between water and normal saline 0.9%

**Eg:** MacLeod et al is Palliative Care Handbook (4th Ed) 2009

Choice b/w H2O & N/S 0.9% is a matter of debate with literature being divided.
Recent literature recommends N/S as the diluent because it is isotonic and therefore less likely to contribute to the development of site reactions Palliative Pharmacists in NZ have suggested that H2O should continue as the preferred diluent rather than N/S b/c there are fewer medications that are incompatible with H2O. Cyclizine, levomepromazine and ketamine should be used with N/S (MacLeod, et al 2009)

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**Considerations when using s/c medications via syringe driver**

- Converting from oral → s/c route with well controlled symptoms. Commence S/D 1-2 hrs prior to effect of oral medications wearing off
- For poorly controlled symptoms commence S/D immediately & use PRN doses to achieve control of symptoms. Takes about 3-4 hours before the S/D reaches therapeutic concentrations
- Always prescribe appropriate PRN doses of medication
Managing breakthrough symptoms

Most commonly reported symptoms:
- Pain
- Restlessness & Agitation
- Nausea & vomiting
- Respiratory Tract Secretions
- Dyspnoea

PRN anticipatory prescribing will ensure there is no delay in responding to a symptom if it occurs.

Pain

- All patients should be prescribed breakthrough analgesia to have on a PRN basis.
- If on Morphine, the breakthrough dose should be approximately one-sixth of the current 24hr dose. Any less may be ineffective. Reference to BMJ 1996;313;1986. Mehta JL, et al. 2009. Eg: sc Morphine 30mg over 24hr. PRN dose for breakthrough pain = 5mg sc.
- If the 24hr dose increases or decreases, the breakthrough dose also alters accordingly (ie one-sixth).

Patient & Family Education Needs

- Pt / family / whanau education promotes safety & acceptance of SD
- Pt / family / whanau education includes:
  - Explanation & education about what the device will do
  - Advantages & possible disadvantages
  - Safety aspects
  - Ways to incorporate a SD into their daily life
  - Troubleshooting guidelines
Other…

- New Cardinal pumps able to take more volume thus reducing need for 12hrly pumps (max 30mls).
- Calculations
- No longer need to use checking sheet as with Graseby pump BUT advise to record time of commencement of pump and volume in clinical notes.
- Basic concepts remain the same.
- Palliative care website resource – MOH

1. Calculations:
   - Morphine 30mg + Haloperidol 2.5mg over 24hrs via CSCI
   - Metoclopramide 60mg + Morphine 10mg over 24hrs
   - Midazolam 60mg + Morphine 60mg over 24hrs - would previously have been too much volume for graseby, now can be used over 24hrs via cardinal pump.
   - Oxycodone 300mg/24hrs

Site selection, preparation & maintenance

- Good depth of s/c fat,
- Not near a joint,
- Easily accessible e.g chest/abdomen
- Variability in longevity of sites
- Select & use rotating sites
- Site reactions due to:
  - pH of solution
  - Tonicity of medication
  - Infection
  - Prolonged presence of a foreign body

General principles for appropriate site selection – area with good depth s/c fat, not near a joint, easily accessible
Longevity of site vary 1-14 days, medications & type of cannula can influence this
Site selections will be influenced by whether the patient is ambulatory, agitate and/or distressed
Chest & abdomen preferred sites
Inflammation - drug irritation or cannula (metal v plastic)
Infection - infrequent e.g cellulitis
Leakage - older sites (older sites 7days +) - absence of inflammation
Bleeding
Swelling
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- **Dual platform**
  - Dual platform – 2 different devices being used across some regions eg: AD cardinal and NIKI
  - Need to alert DON’s to emphasise the clinical risk and request their leadership in developing systems and processes to manage this risk.
  - It is likely that a workgroup will be set up to look at this and a regional approach be adopted.
  - Aged care facilities to be kept informed.
  - Dual platforms are significant for ACH as it has a number of regional services discharging patients outside the AGHB.

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- **Syringe volumes**
  - No definitive evidence to indicate how much diluent should be used.
  - It is recommended that volumes be standardised locally to maintain clinical safety as pts move between care settings.

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- **References**