

Guidelines for Syringe Driver Management in Palliative Care in New Zealand

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Introduction

Aim

These guidelines have been developed to assist in the development of local policies, clinical guidelines, education and training programmes for the use of portable subcutaneous infusion devices (syringe drivers) in palliative care in New Zealand.

The guidelines aim to standardise information about syringe driver management in palliative care, promote safe practice, avoid unnecessary duplication of information, and support both generalist and specialist providers of palliative care. They are not intended to replace instruction manuals, clinical guidelines or organisational procedures.

Background

Palliative care is recognised as a core component of health care provision. In New Zealand, palliative care is defined as follows (Palliative Care Subcommittee 2007, page 5):

Care for people of all ages with a life-limiting illness with the aims of:

- optimising an individual's quality of life until death by addressing the person's physical, psychosocial, spiritual and cultural needs
- supporting the individual's family, whānau and other caregivers, where needed, through the illness and after death.

Palliative care is provided according to an individual's need and may be suitable whether death is days, weeks, months or occasionally even years away. It may be suitable sometimes when treatments are being given that are aimed at improving quantity of life.

It should be available wherever the person may be.

It should be provided by all health care professionals, supported, where necessary, by specialist palliative care services.

Palliative care should be provided in such a way as to meet the unique needs of individuals from particular communities or groups. These include Māori, children and young people, immigrants, refugees and those in isolated communities.

The subcutaneous 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). The main advantages of a syringe driver are that it provides continuous delivery of medication, allows several medications to be administered simultaneously and usually requires refilling only once a day. The use of syringe drivers, particularly in the last days of life, has made a significant contribution to ensuring patient comfort in palliative care (Mitten 2001).

The most common type of syringe driver in use in New Zealand have been the Graseby MS16A and the MS26. For the past 30 years, these have been used widely in hospitals, hospices, aged care settings and the community. However, the Graseby syringe drivers no longer meet the minimum international safety standards (Global Harmonisation Taskforce 2005), and Smiths Medical ceased the supply of the Graseby MS-Series to the New Zealand market in October 2007.

The Syringe Driver Advisory group was set up by the New Zealand Palliative Care Working Party in December 2007 to facilitate a smooth and safe transition to an approved alternative device.

District Health Boards of New Zealand (DHBNZ) has recommended the AD ambulatory syringe driver, distributed by Cardinal Health, as the preferred replacement syringe driver in palliative care in New Zealand (DHBNZ 2009). The only other commercially available and viable alternatives are the Niki T34 and T34L syringe drivers supplied by REM systems. Some District Health Boards (DHBs) in New Zealand had already moved to using the T34 syringe drivers before the announcement of the DHBNZ recommendation.

These guidelines have been adapted (with permission) from the *Queensland Health Guidelines for Syringe Driver Management in Palliative Care* (Centre for Palliative Care Research and Education 2006) and related discussion (Kain et al 2006). They have been developed in consultation with an expert multidisciplinary review panel. Whenever possible, the guidelines are supported with current evidence. Where evidence is not available, the guidelines have been based on expert opinion and consensus regarding syringe driver management.

Dissemination

The guidelines have been widely disseminated through DHBs and non-government organisations. They are available on the Ministry of Health website www.moh.govt.nz and the Hospice New Zealand website www.hospice.org.nz

Training

As with all medical devices, the operation of a syringe driver should only be undertaken by, or under the supervision of appropriately trained personnel and in accordance with local policies and procedures. Before setting up or using a syringe driver, staff must familiarise themselves with the manufacturer's instruction booklet.

The Hospice New Zealand Syringe Driver Competency Programme is offered by many specialist hospice palliative care services throughout New Zealand and aims to provide the knowledge and skills required to manage subcutaneous infusions in a variety of settings using a syringe driver. For more information about this programme, contact your local hospice or palliative care service, or Hospice New Zealand at www.hospice.org.nz

1 The Patient's Experience

Syringe drivers are recommended for use when it has been determined that the continuous delivery of medication will improve symptom management, and other routes for administering medicines are inappropriate or ineffective (Dickman et al 2005).

Some patients may view the use of a syringe driver as an invasion of their privacy. Many patients, family and whānau associate the use of syringe drivers with a poor prognosis and 'the end of life'. It is important to educate and reassure them that syringe drivers are an internationally accepted tool for administering medications to patients when other routes are inappropriate or ineffective and that their use does not, in any way, hasten death (Costello et al 2008).

Patients, family and whānau may have misunderstandings about the use of opioids, especially morphine, and exploring the associated fears, myths and misconceptions may result in better understanding (Dickman et al 2005).

Patient, family and whānau education is discussed in section 6.

2 Indications for the Use of Syringe Drivers and Prescribing Information

Main indications for use

Oral administration of medication can be inappropriate or ineffective due to:

- persistent nausea and vomiting
- dysphagia
- gastrointestinal obstruction
- poor absorption of oral medication
- weakness and/or alteration in a patient's level of consciousness (Mitten 2001).

Prescribing information

All medications given via a syringe driver should be clearly and correctly prescribed on a medication chart. Medications dispensed in the community must be by prescription and must meet the legal requirements of the Medicines Act (1981) and Medicines Regulations (1984). Many specialist palliative care services provide syringe-driver medication charts for use in the community and residential care facilities.

Calculating doses of morphine

Morphine is the most commonly used opioid in syringe drivers in New Zealand.

Patients who are not currently on any opioids

A suitable starting dose of morphine for a patient who has not previously been on any opioids would usually be 10 mg subcutaneously over 24 hours (Dickman et al 2005; MacLeod et al 2009; Twycross and Wilcock 2008).

Patients already on oral morphine

When transferring from oral morphine, the 2:1 rule is a useful guide. First, work out how many milligrams of oral morphine the patient has had in the last 24 hours (include regular and prn doses). Then divide that dose by 2 to get the subcutaneous 24-hour dose (Dickman et al 2005; MacLeod et al 2009; Twycross and Wilcock 2008).

For example, suppose a patient is taking mEslon™ 30 mg twice a day.

- The total daily dose of oral morphine is 60 mg.
- Divide the total daily dose by 2.
- This gives a subcutaneous morphine dose of 30 mg over 24 hours.

Patients on other opioids

For those patients who are on opioids other than morphine, such as methadone, oxycodone or fentanyl, refer to the local palliative care guidelines and/or seek advice from:

- a specialist palliative care practitioner (eg, a specialist pharmacist or nurse, or a palliative care doctor)
- a hospital pharmacy medicines information service
- *The Palliative Care Handbook* (MacLeod et al 2009).

Managing breakthrough symptoms

The most commonly reported symptoms at the end of life are pain, excessive secretions, restlessness, dyspnoea, nausea and vomiting (Ellershaw and Wilkinson 2003). The prescription of prn medications to manage these symptoms is recommended. Anticipatory prescribing will ensure there is no delay in responding to a symptom if it occurs.

Although both the AD and the T34 syringe drivers have the capacity to administer bolus doses, it is not recommended in palliative care due to inadequate dosing and the combination of medications in the syringe (Dickman et al 2005; Mitten 2001).

Pain

All patients should be prescribed breakthrough analgesia to have on a prn basis. If the patient is receiving morphine, the breakthrough dose should be approximately one-sixth of the current 24-hour morphine dose. Anything less may be ineffective (Dickman et al 2005; MacLeod et al 2009; Twycross and Wilcock 2008).

For example, for a patient receiving 30 mg of subcutaneous morphine over 24 hours, the prn dose for breakthrough pain would be 5 mg subcutaneously. If the breakthrough dose is to be given orally, the equivalent dose is 10 mg orally. If the 24-hour dose increases or decreases, the breakthrough dose also alters accordingly (ie, it should always be one-sixth of the current 24-hour dose).

If the patient's pain is not well managed, consider giving a breakthrough dose of morphine dose before commencing the syringe driver because morphine from the syringe driver may take up to four hours to reach therapeutic concentrations (Dickman et al 2005).

3 Equipment Guidelines and Management Principles

There are two types of syringe driver currently available and suitable for use in palliative care. Both comply with the international safety standards for infusion devices. They are the AD ambulatory syringe driver and the Niki T34 and T34L. The recommended device for use in New Zealand is the AD ambulatory syringe driver, which is distributed by Cardinal Health (DHBNZ 2009).

Both types of syringe driver are portable, battery-operated devices calibrated in **millilitres per hour**. This is a significant point of difference to the Graseby syringe drivers, which delivered medication in millimetres per hour.

To maintain clinical safety and minimise risk of errors, regional collaboration and communication between all users is crucial. Standardisation at a regional level is recommended. The same device should be used to maintain clinical safety as patients move between care settings.

Up to 31 December 2009, there will be a variation across the sector in the syringe driver used, that is, Graseby MS16A, Graseby MS 26, AD Ambulatory or Niki T34. From 1 January 2010, users should be aware that there will be two different syringe drivers routinely in use palliative care in New Zealand.

Management principles

A syringe driver should only be operated by, or under the supervision of, appropriately trained personnel and in accordance with local guidelines and procedures. Before setting up or using a syringe driver, staff must familiarise themselves with the manufacturer's instruction booklet and locally developed clinical guidelines. Following are the operating management principles.

General

- The standard delivery period for a continuous subcutaneous infusion in palliative care is 24 hours.
- Luer-Lock® syringes should be used to prevent accidentally disconnecting the tubing from the syringe.
- Only 10, 20 or 30 mL Luer-Lock® syringes should be used for 24-hour infusions, even though the AD syringe driver can accommodate a 5 mL syringe.
- Medications should be drawn up as accurately as possible.

Syringe volumes

There is no definitive evidence to indicate how much diluent should be used. However, it is best practice to make the solution as dilute as possible to reduce the likelihood of drug incompatibility and minimise site irritation (Dickman et al 2005; Mitten 2001).

Both the AD syringe driver and the Niki T34 automatically detect the syringe brand, size and volume and set the rate to deliver the infusion over the required time period. As a result, there are no set syringe volume requirements. The maximum volume the AD syringe driver can accommodate is 30 mL. The recommended maximum volume deliverable by the Niki T34 when used in conjunction with a lockbox is 24 mL.

- It is recommended that volumes be standardised locally to maintain clinical safety as patients move between care settings.
- High-volume medications such as metoclopramide, oxycodone and fentanyl will often need to go into a 30 mL syringe. To reduce the need for more than one syringe change in a 24-hour period, it may not be possible to add much, if any, diluent.
- Irritant medications such as methadone, cyclizine, ketamine and high doses of dexamethasone will often need to go into a 30 mL syringe in order to ensure adequate dilution.
- If there is doubt about appropriate syringe volume, check with a specialist palliative care practitioner or a hospital pharmacy medicines information service.
- Syringes should be clearly labelled with completed 'medication added' labels.

Priming

- The AD syringe driver has a safety check screen that asks, 'Does the extension set still need to be primed?' If the user selects YES and uses the AD to prime the extension set, the first syringe will finish early. In palliative care, it is recommended that infusion lines be primed using this function.
- The T34 syringe driver requires the user to hand prime the extension set.
- It is best practice to prime a new infusion line when the cannula is changed and when there is a change in the medication prescribed so that the new medication concentration is delivered without delay (Mitten 2001).

4 The Selection, Preparation and Continuing Care of the Site

Site selection

Site selection will depend on whether the patient is ambulatory, agitated and/or distressed. If possible, the patient should be involved in site selection. The chest or abdomen is generally the preferred site, specifically the upper anterior chest wall above the breast but away from the axilla. This site is preferred because it is easily accessible, rarely oedematous and permits easy inspection by the caregiver. If the patient is cachectic, the abdomen may be a more appropriate site. The upper arm can be used, but it makes it difficult for the patient to lie on their side. If the patient is distressed or agitated, using the area around the scapula may be useful to minimise the risk of dislodgement (Dickman et al 2005; Mitten 2001).

Inappropriate sites include:

- lymphoedematous or ascitic areas
- areas where there is broken skin
- areas that have recently been irradiated
- areas with infection
- bony prominences
- in close proximity to a joint
- areas with tumours
- skin folds
- the anterior chest wall in cachectic patients
- areas of inflammation
- areas with extensive scarring (Dickman et al 2005; Mitten 2001).

Site preparation and insertion

Plastic cannulae or metal butterfly needles can be used, but Vialon™ cannulae are associated with reduced site irritation, improved site longevity and a reduction in the incidence of needle stick injuries (Dickman et al 2005; Mitten 2001). The BD Saf-T-Intima™ has a Vialon™ cannula and is commonly used in New Zealand.

It is important to refer to locally developed protocols for site preparation and insertion used within individual organisations.

When preparing the site and inserting the cannula/needle:

- use aseptic technique
- insert the cannula/needle at an angle of approximately 30 degrees (Mitten 2001)
- cover the insertion site with a transparent dressing to allow inspection
- ensure the insertion date is documented.

Reducing site irritation

Many factors contribute to site reactions, such as the tonicity and pH of the injectable medication, infection and the presence of a foreign body. Specific medications used in palliative care that may cause site irritation include cyclizine, levomepromazine, methadone and ketamine. Techniques that are likely to minimise site irritation include:

- using a larger syringe to ensure a more dilute solution
- using normal saline (0.9%) if not contraindicated by the drug, instead of water, for injection
- adding 1 mg of dexamethasone to the syringe if compatible with other medications
- using a Teflon™ or Vialon™ cannula.

(Dickman et al 2005; Morgan and Evans 2004)

The longevity of the site can vary considerably from 1 to 14 days. Many variables influence this, such as the type of medication and the cannula/needle used. Rather than relying on a timeframe for resiting the infusion, the onset of a site reaction should dictate the timing (Mitten 2001; Morgan and Evans 2004).

Site inspection

Meticulous site inspection is essential to the early identification and prevention of site-related complications and should be performed as part of routine care. Any site problems can potentially cause patient discomfort, interfere with drug absorption and compromise effective symptom management. When inspecting the site, check for leakage, irritation, inflammation, infection and needle/cannula displacement (Mitten 2001).

5 Medications and Diluents

Medications

Pain is the symptom most commonly managed by subcutaneous infusion, but the use of syringe driver devices is not limited to analgesic administration. Medications to control other symptoms such as nausea, vomiting, agitation, delirium and excessive secretions can also be prescribed by continuous subcutaneous infusions.

Commonly, two to three (and occasionally up to four) medications may be mixed in a syringe for subcutaneous infusion. In New Zealand, most palliative care services do not combine more than three medications in one syringe. An important safety consideration before mixing any medications together in a syringe is to check for compatibility information. The more medications that are mixed together, the greater the risk of precipitation, reduced efficacy and increased local toxicity. However, it has been reported that a wide variety of medications can be used in different combinations with no clinical evidence of loss of efficacy (Dickman et al 2005; MacLeod et al 2009).

Stability problems can be minimised by diluting the mixture to maximum volume. The infusion should be delivered over a maximum time of 24 hours; stability and sterility cannot be guaranteed after this time. The contents of the syringe and infusion set should be protected from direct sunlight. If compatibility is an issue, the use of two syringe drivers should be considered (Dickman et al 2005).

Medications commonly used in syringe drivers in New Zealand

These include:

- morphine sulphate/tartrate (an opioid)
- haloperidol (Serenace™, an antipsychotic/antiemetic)
- midazolam (Hypnovel™, a short-acting benzodiazepine)
- metoclopramide (Maxolon™, a prokinetic antiemetic)
- clonazepam (Rivotril™, a benzodiazepine)
- hyoscine butylbromide (Buscopan™, an antimuscarinic)
- cyclizine (Valoid™, an antiemetic)
- oxycodone (OxyNorm™, an opioid)
- methadone (an opioid)
- levomepromazine (Methotrimeprazine, an antipsychotic, sedative, analgesic, antiemetic).

Medications contraindicated for use in a syringe driver

Medications such as prochlorperazine, diazepam and chlorpromazine are specifically contraindicated for use in subcutaneous infusions due to severe localised reactions (MacLeod et al 2009).

Diluents

The choice between water for injection and normal saline (NaCl 0.9%) as a diluent is a matter of debate. The literature is divided, with some recommending water for injection as the preferred diluent, citing stability and solubility reasons, but recent literature recommends normal saline as the diluent because it is isotonic and therefore less likely to contribute to the development of site reactions.

Palliative care pharmacists in New Zealand have suggested that sterile water should continue to be used as the preferred diluent rather than normal saline because there are fewer medications that are incompatible with water. However, normal saline can be used for most drugs, the main exception being cyclizine (Dickman et al 2005; MacLeod et al 2009; Mitten 2001). Some specific drugs should be diluted with normal saline (eg, levomepromazine and ketamine) (MacLeod et al 2009).

There is a need for these ambiguities to be addressed by further research given the lack of clinical evidence or recommendations regarding diluents.

6 Patient, Family and Whānau Education Needs

Patient, family and whānau education promote safety and understanding of the syringe driver as a means of providing improved symptom management. Patient and family education should include:

- careful explanation and education about the syringe driver itself
- reassurance to alleviate misunderstandings or fears about the use of a syringe driver
- details on safety aspects of the syringe driver
- suggestions for ways to incorporate a subcutaneous infusion into everyday life (eg, carrying the syringe driver and showering)
- clear advice about what the patient, family and whānau should do if they are concerned the syringe driver is not functioning properly
- clear advice about the management of unrelieved symptoms and the use of breakthrough medication (Costello et al 2008; Mitten 2001).

Patient, family and whānau involvement in loading and operating syringe drivers should not be routinely expected and should only be undertaken at the discretion of the clinicians involved after careful consideration and discussion with the patient, family and whānau.

The use of a syringe driver patient information leaflet is recommended.

The patient experience is discussed in section 1.

7 Patient Assessment and Monitoring, and Syringe Driver Trouble Shooting

Patient assessment

Thorough patient assessment is important when caring for patients with a subcutaneous infusion. The patient and the syringe driver should be assessed at least four-hourly in care settings such as a hospital, hospice or residential aged care facility and at each nurse visit in primary care settings. Patients requiring medication delivered via a syringe driver should where possible have a daily visit from an appropriate health professional. Following are the main principles of patient assessment.

- Assess symptom management.
- Carefully inspect the site for signs of inflammation and site reaction.
- Ensure the infusion line is securely attached to both the syringe and the needle/cannula and the line is not kinked.
- Carefully inspect the syringe and infusion set for signs of precipitation or crystallisation.
- Check the syringe driver screen for rate, volume to be infused (VTBI), total volume infused (TVI), and time and battery remaining.

Documentation

Always ensure organisational policy is followed to maintain complete documentation. Syringe driver monitoring and observation charts should be available from local specialist palliative care services.

Trouble shooting

The use of only one type of syringe driver within a region is recommended to prevent confusion between devices, which may result in errors. In order to solve any problems that may occur, an understanding of the normal functioning of the device is important, including alerts and alarms.

A logical sequence of investigations should be implemented if the infusion is not proceeding correctly; for example:

- Is it a problem with the syringe driver?
- Is it medication precipitation?
- Is it a site reaction?

(Mitten 2001)

Conclusion

The use of syringe drivers in palliative care to manage symptoms is standard and accepted practice. There are many benefits for the patient in terms of effective management of symptoms and convenience. However, as with other infusion delivery devices, they are not without their risks and limitations and must be used knowledgeably.

Syringe drivers may cause concerns and fears for some patients, families and whānau because they may be associated with disease progression. These guidelines are intended to promote a standardised approach to syringe driver management in palliative care in New Zealand, thereby minimising practice errors and promoting patient safety.

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