# Acute Pain Service - Manual 2018

1. **The Acute Pain Service**
   a. Introduction, staffing & ward rounds 3-8

2. **Epidural Analgesia**
   a. Additives 11
   b. Management and Troubleshooting 12
   c. Discontinuation and removal 14

3. **Patient Controlled Analgesia (PCA)**
   a. Solutions 16
   b. PCA in PACU 17
   c. Troubleshooting PCA 18

4. **Intravenous & subcutaneous opioids** 19

5. **Perineural Blocks** 20

6. **Adjuvant Analgesics**
   a. Paracetamol 24
   b. Oral opioids 24
   c. Non steroidal anti-inflammatory drugs (NSAIDs) 25
   d. Tramadol/Tapentadol/Clonidine 26
   e. Ketamine infusion 27
   f. Intrathecal opioids 28
   g. Methadone 29
   h. Lignocaine/Transdermal patches/Calcitonin 31

   **Neuropathic pain**
   i. Pregabalin 32
   j. Tricyclic Antidepressants 33

7. **Opioid Rotation** 33

8. **Discharge Planning** 34
Appendixes

Appendix I Quick Reference Guide to Infusions (Table) 36
Appendix II Epidural Disconnection 37
Appendix III Anticoagulant Guidelines 38
Appendix IV Setting up PCA/Guidelines for Management of the Patient with a PCA 41
Appendix V Upper GI ERAS protocol 2017 43
Appendix VI TKA Guideline 2017 48
Appendix VII Pain Medicine Registrar Daily Timetable 50
Appendix VIII Pumps and Programming 52

Further References


Copies of this Manual, the Appendices and Key References can be found on the hospital G Drive under:

Surgery/AAnaesthetics/Operational/APS References/APS Manual

Links from the Department website are also able to be used.

Prepared by members of the APS Team - 2018

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1. The ACUTE PAIN SERVICE

1. INTRODUCTION
The Acute Pain Service provides care for patients requiring specialised techniques for acute pain relief. The main areas of involvement are with post-operative pain relief, especially with epidural and perineural techniques or patients with complex pain problems. Liaison with the Barbara Walker Centre for Pain Management involves the APS with some chronic pain cases.

2. AIMS
This service has the following aims:

2.1 To improve post-operative pain relief.

2.2 To provide training of Anaesthetic Registrars in postoperative analgesia, especially in fulfilling the requirements of the ‘Pain Medicine’ module of the revised FANZCA

2.3 To improve communication between the Anaesthetic Department and Surgical, Medical and Nursing Staff with regard to postoperative pain relief.

2.4 To improve liaison between other clinical pain management departments including the Barbara Walker Pain Management Centre and the Caritas Christie Palliative Care Unit.

2.5 To carry out clinical research in the area of post-operative pain management.

2.6 To assist with Nursing Education with respect to Acute pain management.

2.7 To develop protocols for the various methods of pain relief.

3. METHODS OF PAIN RELIEF
The Acute Pain Service has a broad approach to postoperative pain relief and includes many different modes of analgesia.

These include:

- Epidural local and/or opioid analgesia
- Intrathecal opioids
- Perineural blocks (Paravertebral, Intercostal, and Interpleural blocks)
- Continuous perineural Infusions
- Non steroidal anti-inflammatory agents
- Opioid infusions
- Patient Controlled Analgesia
- Ketamine (subcutaneous/intravenous)
- Lignocaine (subcutaneous/intravenous)

4. STAFFING

4.1 CONSULTANT STAFF
An Anaesthetic consultant is rostered on to provide support for the Pain rounds most days of the week, or alternatively, the consultant in charge for the day (extension 4471) will provide this
support. A daily ward round or review of patients with the urgent Registrar of the day and the Acute Pain Nurse should be conducted. The late evening ward rounds are to be carried out by the urgent Registrar. The Pain Medicine Registrar will rotate into the Operating Theatre on Friday morning to complete the block list. An Anaesthetic Registrar will undertake the Saturday morning Pain round with the Anaesthetic Resident.

**Prof. David Scott** has overall responsibility for this service. **Dr Andrew Stewart** is Head of the service and **Dr Simon Scharf** is Deputy Head.

### 4.2 PAIN MEDICINE REGISTRAR

The registrar doing the pain medicine rotation has a weekly roster involving the Acute Pain Service and the Barbara Walker Pain Management Centre. This registrar is to be part of the morning APS ward rounds every day and the afternoon rounds where possible. He or she will manage inpatient referrals to any of the three pain medicine services. Other elements of the rotation include active involvement with analgesic blocks performed for persistent pain conditions and assisting with management of the APS. See Appendix VII for a more detailed description of the Pain Medicine Registrar role.

### 4.3 URGENT ANAESTHETIC REGISTRAR

The urgent registrar shall be responsible for the ward rounds each day in conjunction with the Acute Pain Nurse, and the Pain Medicine Registrar. He or she will hand-over to the night registrar at 1800hrs. The Urgent Registrar manages acute day-to-day calls and troubleshooting in conjunction with the Acute Pain Nurse.

### 4.3 ACUTE PAIN NURSE

Wendy McDonald and Kim Choate job share the Acute Pain Nurse role. Wendy works Tuesday/Wednesday and Friday from 0700-1530. Kim works Monday 0830-1700, Tuesday-Thursday from 0930-1800. They can be contacted on Pager 1173, or extension 4187 or, if urgent on extension 4427.

The role of the Acute Pain Nurse includes:

- Working collaboratively with the key members of the acute pain team in managing the acute pain care of patients on the wards
- Being responsible for delivery of nurse education in relation to acute pain management techniques
- Liaison with ward nursing and medical staff
- Education of patients and their families as required
- Participation in the development of relevant Pain management guidelines and protocols
- Participation in research activities related to the acute pain service
- Education of anaesthesia medical personnel on how to enter, maintain and refer APS pts via the online APS data base
4.4 CHRONIC PAIN FELLOW

The chronic Pain Fellow works in conjunction with APS in the management of chronic pain patients and follow-up in the Barbara Walker Centre.

5. WARD ROUNDS

These should be conducted three to four times daily at approximately 8 AM, 1.30 PM & 10 PM

On Monday mornings at 0900, a joint meeting between the registrars, nurses and consultant staff from the APS, Barbara Walker Centre for Pain Management, Department of Addiction Medicine and Palliative Care is conducted in the Department Library. The Pain Medicine Registrar in conjunction with the Urgents Anaesthesia Registrar will see the more complex patients prior to the meeting which will allow them to present patients for discussion. New referrals from or to the BWCPM or CCPC will also be discussed.

The Consultant on for the day should attend the ward round if possible. All ward rounds are to be done in conjunction with the Acute Pain Nurse when present.

An evening ward round will be done by the Night Registrar who will then hand over to the Urgent Registrar before leaving the next day.

If the Anaesthesia HMO is working on Thursday/Friday they should attend the afternoon ward round to provide continuity for weekend care of APS patients. If they are unable to attend, they should liaise with the APS nurse or Pain Medicine Registrar prior to the weekend for education and handover of relevant patients.

Duties on Ward Rounds:

Assess and record patient's current pain status/pain score/FAS score

Modify analgesic regime as appropriate

Assess and record problems, complications or side-effects

Manage these appropriately.

- N.B. many problems e.g. hypotension, relate to the overall state of the patient and involve the managing surgical unit as well

Inspect Infusion site daily

Check levels of infusion solutions/update orders

Communicate with patient’s nurse (± surgical unit) re the current plans

Document management changes/problem management in the patient's notes

Care plans should be clearly documented, especially before weekends/public holidays

All APS discharges should be clearly documented in the patient’s progress notes (see page 35 of this document for further information)
6. **NOTIFICATION/REFERRAL OF PATIENTS**

When a specialised form of pain relief is instituted by an anaesthetist that person is responsible for the notification of the Pain Registrar, Urgent Registrar or APS Nurse and for the documentation online required to refer patients to this service.

7. **DOCUMENTATION**

An *Acute Pain Service Referral* should be completed online (via anaesthesia.org.au and selecting APS online icon) using your anaesthesia roster login and password.

The infusion bags must be ordered on the *Analgesia Infusion Treatment Sheet – SV754*. The nurses on the wards cannot replace an empty bag if a properly written order is not present. The infusion rate (or changes made to the rate) should also be recorded here.

The hospital has an observation form - *Special Analgesia Observation Chart – SV 167* for use on the wards for all patients with IV Opioid Infusions, PCA, epidural analgesia, local anaesthetic and ketamine infusions. This form comprises a part of the patient's medical record - use the information on these forms to guide changes to therapy.

Nursing Standard Orders, Reportable limits and Frequent Observation Table are printed on the back.

The *Patient’s History* is the enduring record of their hospital admission, and any significant alterations in treatment, problems, complications and discharge plans must be recorded in the progress notes during ward rounds. It is also appropriate to make a brief note if you have been called by the nursing staff to see the patient.

All new patient referrals from the wards should be made by completion of the St Vincent’s Consultation form (SV000043).

8. **ORDERING of ANALGESIC SOLUTIONS**

Pharmacy will provide:

- **Epidural**
  - 0.2% Ropivacaine ± 2µg/ml or 4µg/ml Fentanyl Epidural Infusion Solution
  - 0.125% Bupivacaine Epidural Solution
  - The above solutions with clonidine or adrenaline added

Should any problems or shortages arise, then pharmacy can make up bags manually. If you need to have bags made up (to the above specifications) then call:

  **Pharmacy Sterile Preparation**: Extension 4165 (weekdays only)
9. **PATIENTS GOING TO INTENSIVE CARE or HDU**

The management of patients in ICU or HDU is under the control of that unit. APS patients in ICU should be visited at least once daily on the ward round to review their status.

Patients returning to ICU for ventilation, who have an epidural catheter in place should not receive large amounts of local anaesthetic post-operatively. Leg movement must be possible so that adequate assessment of these patients can be done.

The ICU Registrar should notify the APS Registrar or the Acute Pain Nurse when the patient is to be transferred to the ward.

10. **CHRONIC PAIN REFERRALS**

The source of Chronic Pain Referrals will generally be:

1. Patients on the Acute Round who progress to chronicity;
2. Referral from inpatient units (medical or surgical);
3. Pre-emptive i.e. patient with known chronic pain problems is discussed with APS registrar prior to their admission (e.g. at Monday Round), so a plan can be formulated.

For the APS registrar, new referrals can be a challenging area. For the benefit of all parties involved, the following approach to Chronic Pain Referrals can be of assistance: Define the scope of the problem with the person making the referral. This may include but is not limited to the following:

a. Does the patient need to be seen or has the contact been made to obtain advice?
   b. Is the patient known to Barbara Walker Centre or another Pain Specialist?

This will help delineate past history, previous treatment plans, when they are next due to be seen. It may be more appropriate that these patients are seen as outpatients at Barbara Walker or other staff therein;

   c. Is the referral appropriate?

Unfortunately, it is not uncommon for referrals to the Pain Service to be made as a last resort by the referring unit. In these cases, it is very important for the APS/Pain Medicine registrar to state his/her concerns, especially if the referral is inappropriate - and offer advice at the same time. Drug abuse, social and psychological problems of greater concern may not yet have been addressed by the treating team. Liaise early with the Chronic Pain Fellow for advice in these cases.
Having decided to see the patient, the Pain Medicine or Urgent registrar should:

d. State in what time frame he/she will attend;

e. State what he/she will likely be able to achieve for the patient on the basis of the preliminary information obtained;

The important point re: the above is to avoid false expectations on the part of the referrer.

Having reviewed the patient, the Pain Medicine or Urgent registrar should:

f. Clearly document his/her findings and plan. It is especially important to document if, when and where they will see the patient again;

g. Liaise with the Chronic Pain Fellow and/or relevant Chronic Pain Consultant for their input (as appropriate) to the case. This depends to some extent on the registrar’s level of experience. Often, simply discussing the case with a more experienced colleague clarifies the issues and identifies useful strategies. In a very complex case, be sure to involve the consultant early.

h. Re-liaise with the referring unit and advise them to make any cross referrals as the Pain Medicine registrar deems fit. It is important that the referring unit understand the Pain Medicine registrar’s role in the patient management and that delineation of responsibilities in the patient’s care is very clear.

On most days (M-F) a Chronic Pain Fellow is available to discuss or see a patient in the afternoon. Some patient’s will eventually require only once weekly reviews and/or will be referred for follow up at the Barbara Walker Centre upon discharge. A written referral by the Pain Medicine registrar needs to be faxed to the BWCPM on Fax No 4660 if further follow up is required.

11. FEEDBACK

Periodic individual feedback is provided to members of the Department using data collected from the APS online database.

*Any serious adverse events should be fed back immediately to the inserting Anaesthetist i.e back pain or neurological signs, and a Mortality/Morbidity Report (Pink Form) completed.*

12. RESEARCH

Data Collection

There is several on-going and new research projects planned in Post-Operative Analgesia in this hospital. Your help would be much appreciated in collecting some of the data during your APS rounds or nights on call.

Research Protocols

It is important that research protocols are followed, if it becomes clinically important to break the protocol, *please inform the principal research investigator* immediately.
2. **EPIDURAL ANALGESIA**

The **advantages** of post-operative epidural analgesia are:

- Potential to provide excellent analgesia
- Continuation of intra-operative therapy
- Less systemic side effects compared to IV opioids infusions
- Improvement in patient outcomes

The potential **disadvantages** include:

- Side effects from the drugs
  
  e.g.: Local Anaesthetics - Hypotension, Weakness, Numbness, Incontinence, Diarrhoea
  
  Opioids - Nausea, Pruritus, Urinary Retention
  
  Sedation, Respiratory Depression

- Catheter related complications e.g. nerve injury, haematoma, infection

Epidural Analgesia can be **safely managed** on general surgical wards provided that the following criteria are considered:

- Careful PATIENT and DOSE Selection
- Regular FOLLOW UP
- EDUCATION of Nursing Personnel
- Suitable PROTOCOLS are adhered to and updated as needed
- In-house ACUTE SUPPORT service
- Continuing REVIEW

**Sedation and Respiratory depression** are the side effects of most concern from epidural opioids. Factors related to increased risk include:

- Hydrophilic Opioids (Morphine > Pethidine > Fentanyl)
- Large Doses (absolute or relative e.g.: age)
  
  (Infusions of epidural Fentanyl should not exceed 1.5 µg/kg/hr or concentrations of 10 µg/ml)
- Repeated bolus doses
- Additional non-epidural opioids
- Residual effects of sedatives or anaesthetics
- Patients who are elderly, debilitated, obese or have pulmonary disease
- Raised intra-thoracic or abdominal pressure (increasing epidural venous pressure and also cranial CSF flow) e.g. coughing, straining, bowel distension
- Intrathecal administration (a general rule is 1/10th dose intrathecal c.f. epidural)
Note that respiratory depression may manifest as a slow or rapid respiratory rate and is almost invariably preceded by inappropriate sedation. Hypoxaemia (as monitored by pulse oximetry) is NOT a reliable early sign of respiratory depression if the patient is receiving supplemental oxygen therapy.

See ANZCA Bulletin Articles: December 2009 / February 2010 (also in APS-References on-line)

Use the yellow “Epidural” infusion stickers on the flask and lines.

Solutions used in the wards are:

0.2% Ropivacaine + 4 μg/ml Fentanyl

- This solution is more effective in the first 48 hours post-op than the 2 μg/ml solution. Consider changing to the 2 μg/ml solution after this time. Pharmacy provides this solution in 200ml bags. Administered via an REM Bodyguard® Pain Management Pump.
- Effective for most operations except lower limb orthopaedics (TKR etc.)
- Fentanyl's lipophilicity makes it relatively safe. Dose should not exceed 1.5 μg/kg/hr unless special circumstances. There is some question as to whether the benefit from epidural Fentanyl is purely from systemic absorption but current opinion favours a spinal effect from epidural Fentanyl which also potentiates spinal local anaesthetics, especially during the first 24hrs.
- Patients can usually ambulate without difficulty while receiving this solution above the lumbar level.
- Remember that lipophilic opioids need to be given at the appropriate segmental levels (as for LA) to have a spinal analgesic effect.

0.2% Ropivacaine + 2 μg/ml Fentanyl

- Fewer side effects than the stronger 4 μg/ml solution, but less effective within the first 48 hours post-op.
- Pharmacy provides this solution in 200ml bags.
- Dose of Fentanyl should not exceed 1.5 μg/kg/hr unless special circumstances.

0.2% Ropivacaine (with or without Adrenaline)

- Used epidurally when intolerance to opioids is a problem. Not as satisfactory as other methods.
- Tend to get segmental contraction. For this reason, additives such as Adrenaline or Clonidine should be combined with plain ropivacaine whenever it is used in epidural infusions.
- Suitable for axillary plexus or femoral nerve catheter infusions
- Given via a REM Bodyguard® pump.
- Dose should not exceed 0.75 mg/kg/hr except in special circumstances.

Commence at approx. 5 ml/hr for thoracic catheters and 7-14 ml/hr for lumbar catheters. In case of inadequate analgesia a 5 ml. bolus may be given, followed by an increment in the infusion rate of 1-3 ml/hr.

Other additives:
Clonidine

- Clonidine, an alpha-2 agonist, is a useful supplement for patients when:
  - There is breakthrough despite high doses of epidural local anaesthetic + Fentanyl
  - There is intolerance to Fentanyl or other opioids
  - The block is patchy
  - The patient has other painful sites and needs an IV PCA as well as their epidural
- Side effects of clonidine include sedation, hypotension and bradycardia
  - Avoid its use in unstable patients
  - Be careful with using it in the first post-operative night
- Dose (epidural)
  - Loading 150 mcg (mixed with 5 mL local anaesthetic)
  - Maintenance 300 – 450 mcg in a 200 mL bag (i.e. 1.5 – 2.25 mcg/mL) at normal infusion rates for epidurals (i.e. 4 – 16 mL/h)
- Pharmacy will make up subsequent clonidine bags (in hours) – initially you have to add it to a standard bag yourself. It can be mixed with Ropivacaine/Fentanyl.

Adrenaline

Adrenaline may be used as a supplement to epidural local anaesthetic and/or Fentanyl in the same circumstances as Clonidine.

Action

- Spinal cord alpha-2 effect
- Weak local vasoconstriction decreasing local absorption

Unlike Clonidine there is no sedative effect and hypotension is less likely. There is no systemic effect from epidural adrenaline.

Indications

- Breakthrough pain or patchy block despite adequate doses of Fentanyl/local anaesthetic
- Added to plain local anaesthetic in patients intolerant of Fentanyl/opioids or those receiving systemic opioids e.g. PCA

Dose

- Prepare as a 2 µg/ml solution (400 µg per 200 ml bag)
- Do NOT combine with Clonidine (duplicate effect)
- Pharmacy will make up subsequent adrenaline bags in hours – you may have to add it to the initial bag yourself.

Other Agents

There are no standards for the admixture of other agents e.g. midazolam. AVOID using your own cocktail - it is impossible for everyone to gain familiarity with everyone else's 'magic mixture'.
Management & Troubleshooting Epidural Infusions

A meticulous **sterile insertion technique** should be supplemented by the use of a **fixation device** (e.g.: Epi-Guard, Lock it) to avoid catheter movement or fall-out.

Once inserted, an analgesic block should be established early in the procedure, preferably with a dilute LA bolus and 100 mcg of fentanyl. The infusion should then be commenced in the OR so that the level of analgesia is established by the time the case is finished and PACU assessment will accurately reflect the level of analgesia in the ward.

1. If analgesia is inadequate, **bolus** appropriately when increasing the infusion rate. Remember that gravity and posture affect spread.

2. **Prevention is better than treatment** - do not allow the block to regress too far or it may be hard to re-establish analgesia. Ropivacaine regresses faster than bupivacaine, which is helpful when treating excessive block, but can make it difficult to control pain should the block regress.

3. Supplemental therapy can be very effective – see **Adjuvant Analgesics** on page 23.

4. If the efficacy of the epidural is in doubt, bolus the catheter with an appropriate dose of lignocaine, bupivacaine or ropivacaine and ensure an adequate block occurs.

5. **Do not persist** with an ineffective epidural - after appropriate bolusing and testing, if analgesia is still not adequate either re-site the catheter or change to an alternative technique.

6. The catheter site should be **inspected daily** (and condition recorded on APS form).

7. Consider removal of the catheter if the patient has **Temperature spikes** (>38.5°C) occurring after 24hrs or associated with a rigor, especially if the patient is not on antibiotics.

8. The need for continuing epidural analgesia should be assessed daily, but special indications should be present for maintaining the same catheter in-situ for over 72 hours.

9. Local Anaesthetic solutions may cause sufficient numbness for pressure areas to develop. Special care of heels and sacral area is needed.

10. Localised backache should be brought to the attention of the Pain Medicine Registrar this may indicate inflammation, abscess or haematoma.

11. The aim is to have patients pain free but still able to deep breathe, cough and move. Avoiding lower limb motor block is important for patient ambulation but also to be confident that there is no spinal cord compression (e.g. epidural haematoma).

12. **Epidural Disconnection** – epidural catheter disconnection is a rare but potentially serious complication of epidural analgesia. When a disconnection and contamination of the set-up occurs a risk-benefit assessment for the individual patient should be made.

- Most epidurals should be removed if disconnection is found (as per anti-coagulation guidelines)
If the epidural is reconnected, the epidural catheter should be cut down under sterile conditions, and reconnected with a new sterile filter insitu. See Appendix II. Reconnection should only occur after discussion with the APS consultant.

N.B.: Any patient who develops unexpected neurological signs (e.g. new motor block or loss of sphincter tone), new backache or the combination of a definite site infection with pyrexia should be discussed with the APS consultant and have an urgent MRI planned without delay.

Combined Spinal Epidural (CSE) Guidelines

Following initiation of the epidural infusion, some patients experience a vasovagal event. This may occur on the ward. To minimise this risk:

- CSE patients need careful attention to VOLUME (especially orthopaedic joint replacement patients where volume loss may be ongoing in the first 24h) – ensure an adequate fluid replacement regimen is in place
- Infusions should not be commenced until the patient is haemodynamically stable
- Patients should have their infusion commenced early (either in the OR or in PACU), however an infusion should not be commenced in PACU unless the block is below T4 (abdominal/vascular patients) or below T8 (orthopaedic patients).
- Infusions should be commenced without a bolus
- Ideally patients should have some return of lower limb motor function prior to commencing the infusion. In special circumstances (e.g. starting the infusion in the OR) the APS may be tasked with assessing motor function recovery so that the patient may be discharged to the ward, however follow-up of motor recovery remains the responsibility of the primary anaesthetist.

Patient Controlled Epidural Analgesia (PCEA)

The principle advantages of PCEA are that the patient can have their normal epidural infusion but if the block regresses they can immediately top themselves up (no special nursing observations are required in addition to the standing epidural infusion orders). The lack of delay should enable more stable analgesia. One of the biggest problems we have as an Acute Pain Service is being able to re-bolus patients quickly, so that further block regression occurs during the delay. When the patients are reviewed, if lots of boluses have been needed, the baseline infusion rate may need increasing.

To manage a post-operative epidural infusion with one of these pumps for PCEA:

- If used for PCEA, the patient must clearly understand how to use the button for wound pain and to report numbness or tingling in the arms or hands
- A REM Bodyguard ®pump must be available (check with Recovery Room)
- The usual solutions should be used.
- Typical settings are: Both Continuous and Bolus

<table>
<thead>
<tr>
<th>Setting</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background rate</td>
<td>6 - 10 ml/h</td>
</tr>
<tr>
<td>Bolus volume</td>
<td>5 - 6 ml</td>
</tr>
<tr>
<td>Lockout interval</td>
<td>20 mins</td>
</tr>
</tbody>
</table>
Discontinuation of Epidural Infusions

PLEASE NOTE THE REASON FOR DISCONTINUATION ON THE APS FORM

A. Indications include:
Routine, including Unit or Patient request
Local Inflammation / Infection / Pain or Systemic Sepsis
Inadequate analgesia (options include re-siting catheter or using alternative analgesic techniques)
Unmanageable Side Effects

B. Management of discontinuation and catheter removal:
Can be removed by trained nursing staff or APS staff.
After stopping the infusion, may leave catheter in-situ (if routine) until next ward round, in case therapy needs to be resumed and so that any pain on removing the catheter can be reported by the patient.

Order appropriate transitional analgesia – if transitioning to PCA, the PCA should be available for use when the epidural is turned off. Oral opioids (e.g. Endone (oxycodone) should be given at the time of removal or as soon as the patient notices any discomfort. Slow Release oral Opioids (e.g. OxyContin) may be given up to 2h prior to infusion discontinuation.

The catheter should not be removed if the patient’s coagulation status is temporarily abnormal as haemorrhage can occur on catheter withdrawal.

Key points to note prior to catheter removal:
• Satisfactory alternate analgesia
• No residual lower limb motor deficit
• Patient position - lie patient on side and curled up if removal is difficult.
• Site inspection
• Catheter inspection

Important points re: anticoagulants and removal
• No coagulopathy (check INR in hepatic surgery patients – should be < 1.5)
• No active anticoagulants (see Appendix III)
  UNFRACTIONATED HEPARIN - wait 8 hours after prophylactic dose/give 2 hours after removal
  LOW MOLECULAR WEIGHT HEPARIN - wait at least 12 hours after prophylactic dose/give next dose at least 6 hours and ideally 12 hours after removal (Controversial see page 222 of APM:SE 4e).
• After therapeutic (b.d.) dosing – wait 24 hours after dose/ give 24 hours after removal in patients with normal renal function.

Patient Observations

For Observations, Reporting Levels, Standard Orders and ward management please see ‘Epidural & Paravertebral Policy on the intranet.
3. PATIENT CONTROLLED ANALGESIA (PCA)

Patient Controlled Analgesia (PCA) is a technique for pain relief where, when discomfort is felt, the patient administers themselves a metered bolus of an opioid analgesic by means of a button connected to a special 'PCA' pump. This pump can be connected to either an intravenous line or a subcutaneous infusion. This results in blood levels of opioids remaining close to or within the analgesic range, and decreases the risk of side-effects from excessive doses or pain from inadequate doses.

The pump is programmed when first set up to prevent excessive doses of opioid being administered, and appropriate patient observations are regularly made. As with any form of pain relief, regular patient assessment and appropriate adjustments are needed to get the best results.

The APS does not usually follow up patients on routine intravenous PCA (morphine & fentanyl) unless specifically indicated.

Suitable patients:

- Most post-operative patients
- Other acute pain situations (e.g. pancreatitis)
- Chronic pain
- The patient must be able to understand the method and able to press the button.

Advantages

- Patients can regulate the dose of narcotic they get to meet their individual needs
- There are positive advantages for patients to be 'in control' of some aspect of their management
- A high quality of analgesia is achievable without frequent calls to the nursing staff for supplemental doses
- The risk of over dosage is low

Disadvantages

- Requires IV access and a special IV pump (Alaris PCA Module)
- Requires extra training of staff to load, program and manage the pump
- Pre-operative education of the patient is useful
- Patient must be adequately oriented post-operatively to use the pump correctly
- Lack of analgesia delivered if patient not using PCA (i.e. when asleep)
Procedures for PCA

A. Pre-Operative

Ensure that patient is a suitable candidate for PCA:

No contra-indication to post-operative opioids e.g. head injury / allergy

Patient is able to understand explanation and give consent

PCA pumps are kept in the PACU.

Pre-Operative Instructions for PCA should be given to the patient:

These Instructions should include:

(a) The rationale for PCA
(b) The use of the machine
(c) Explanation of the safety features
(d) Explanation of the assessment - pain & sedation scores etc.
(e) Role of the nursing staff and the Acute Pain Service in the PCA
(f) Likely duration of therapy.
(g) Some explanation for relatives that only the patient may press the button

It is the responsibility of the anaesthetist to write the order form for the first three PCA bags using the correct PCA order form (Analgesia Infusion Treatment SV000754).

Current Solutions

Standard MPCA, OPCA and FPCA are double strength (see appendix 1 for PCA quick reference guide)

Fentanyl is primarily used as it is quick acting with a relatively short half-life. Dose: 1000mcg in 50mls N.Saline = 20mcg/ml. PCA bolus is 20-30 mcg however can be increased or decreased depending on patient requirements. Useful in patients with renal failure. 5 minute lockout.

Oxycodone a full opioid agonist (similar to morphine in action). Indicated when the patient has sensitivity or adverse effects to other opioids, for opioid rotation or when the transition from parenteral to oral (same drug) is required. Dose 100mg in N.Saline 50mls = 2mg/ml. PCA bolus is 1mg. However this can be increased or decreased depending on the patient’s requirements. 5 minute lockout.

Morphine – dose: 100mg in N.Saline 50mls = 2mg/ml. PCA bolus is 1mg however this can be increased or decreased depending on the patient requirements. 5 minute lockout.

Hydromorphone – This mu opioid receptor is structurally similar to Morphine but is five to seven times more potent. There is little difference overall between Hydromorphone and other opioids in terms of analgesic efficacy or adverse effects (ANZCA: Acute Pain Management: SE). Hydromorphone can be used in PCA form when the patient requires a rotation of opioid. Dose: 5mg in 50mls N. Saline = 0.1mg/ml. PCA bolus 0.2mg however can be increased or decreased depending on patient requirements. 5 minute lockout.
Paracetamol, ketamine, local anaesthetics, tramadol and NSAIDs may be used concurrently with PCA infusions and may help to reduce opioid consumption and associated side effects. In patients previously on slow release opioids this may be used concurrently at reduced dose if appropriate.

A 1 hr dose limit is recommended for sensitive or opiate naïve patients, however removing the dose limit and providing a background infusion may be appropriate for some patients, i.e.: chronic pain with opioid tolerance.

**Ordering a PCA**

Once the Anaesthetist has written the order the Anaesthetic nurse makes up the PCA syringe primes the line and has the infusion ready to use in PACU.

**B. PCA IN PACU:**

Before patient leaves the PACU:

- The Analgesia Infusion Treatment form (SV754) must be completed
- The PCA pump should be connected to the patient prior to leaving for the ward.

*It is up to the anaesthetist in charge of the case to ensure that the patient has an adequate opioid analgesic level when in PACU prior to commencing PCA. This usually means giving Morphine, Fentanyl or Oxycodone towards the end of the case and initially in PACU.*

**C. On patient return to the ward**

Patient monitoring as per the protocol, with observations recorded on the Special Analgesia Nursing Observation Chart (SV167). An ampoule of Narcan (Naloxone) 0.4mg should be available in the ward.

While the patient remains on the PCA pump:

- Patient observations are recorded as per the protocol on the Special Analgesia Nursing Observation Chart (SV167).
- Do not give any additional narcotics unless so ordered by the APS or surgical unit registrar
- The settings of the PCA pump should be verified: At each change of shift, when bag is replaced and when patient transferred between areas (i.e.: PACU to ward).
**D. Troubleshooting PCA**

1. **Inadequate Analgesia**
   - Ensure PCA pump is working effectively (i.e.: Delivery of medication and PCA button in working order)
   - Are adjuvants available
   - Does the PCA bolus need to be increased
   - Should the hourly limit be ceased
   - Does the PCA solution need to be changed (i.e.: Fentanyl to Oxycodone)

2. **Nausea and Vomiting**
   - Change to different opioid (Morphine to Fentanyl or Fentanyl to Oxycodone)
   - Change to orals
   - Cease adjuvants that may be causing N & V (i.e.: Tramadol)
   - Optimise anti-emetics

3. **Pruritus**
   - Do nothing if pruritus is mild
   - Change to different opioid (Morphine to Fentanyl or Morphine to Oxycodone)
   - Consider small dose Naloxone (40mcg)
   - Consider antihistamine with minimal sedative properties (i.e. Zyrtec)

4. **Sedation**
   - Ensure PCA has been programmed correctly
   - Consider reducing PCA bolus
   - Use adjuvants (paracetamol/NSAID/Tramadol)
   - Consider reducing/ceasing slow release opioids
   - Has the patient’s condition deteriorated? (i.e.: sepsis, renal failure)
   - Consider Ketamine

**E. Ceasing a PCA**

Information for ward medical and nursing staff on ceasing a PCA is available on the intranet – Hospital Drug Administration Protocols – Patient Controlled Analgesia (PCA)

**F. After discontinuation of PCA:**

The IV should remain in place for 3 hours.
The patient may have subcutaneous narcotics after 1 hour if required.
4. **INTRANOVENOUS & SUBCUTANEOUS OPIOIDS**

Specific IV sets are available with one way valves and side arms for use with PCA, Ketamine or post-operative opioid infusion. This set is suitable for blood or clear solutions and a pump set can be added to it if necessary.

**Continuous opioid infusion**

Opioid infusions provide a means for achieving stable blood levels of opioids without the peaks and troughs associated with intermittent intramuscular regimes. **In ICU/HDU only.**

**Advantages:**
Simple to order and set up
May use a Alaris IV infusion pump
Do not require patient co-operation or understanding

**Disadvantages:**
Requires a functioning IV line (ideally dedicated or with one-way valve in main line)
Risk overdose without supervision
Does not cope with minute-to-minute changes in analgesic requirements e.g. physiotherapy

**Implementation:**
Currently approved solutions are:

- **Fentanyl**
  1000 µg in 50ml N.Saline = 20 µg/ml
  *Usual dose Range 10-30mcg/hr*

- **Morphine**
  100 mg in 50ml N.Saline = 0.5mg/ml
  *Usual Dose Range 0.5 - 3 mg/hr*

**Subcutaneous opioids**

In certain circumstances it may be appropriate for the patient to be prescribed subcutaneous opioids. Subcutaneous morphine is the drug of choice for most patients (See Drug resources for contraindications). Repeated doses of subcutaneous opioids can have high within patient variations in absorption and duration of effect. Hence, **the subcutaneous route should not be a first line option.**
Subcutaneous opioids are rarely needed if the patient is taking diet and fluids, however short term use for severe acute pain is acceptable. Suggested dosing:

- **< 65 years – 5-10mg subcut Four hourly PRN/> 65 years – 2.5-5mg subcut Four hourly PRN**

There may be a high degree of variability in pharmacokinetics related to the subcutaneous route so the dosage should be adjusted based on individual response to treatment.

Subcutaneous fentanyl **should only be given in special circumstances** as the onset and duration can be unpredictable in some patients may lead to rapid uptake and severe respiratory depression. Small doses should be prescribed and the patient monitored closely. Suggested dosing:

- **25mcg subcut four hourly PRN**
The Pharmacy Department (2017/2018) is currently formulating a policy to restrict subcutaneous fentanyl prescribing in the ward environment unless discussed with Anaesthetics/APS.

5. PERINEURAL BLOCKS/INFUSIONS

Intercostal or Paravertebral blocks:

Indications

Ideally suited to manage the pain from traumatic rib fractures or a unilateral thoracic or upper-abdominal wound (e.g. Open Cholecystectomy or Nephrectomy). In general, epidural analgesia or paravertebral block would be the option of first choice if high quality analgesia was needed for these problems.

- Intercostal nerve blocks require intermittent (8 to 12 hourly) injections of 0.75% ropivacaine or 0.5% bupivacaine at a number of different intercostal spaces. Repeat doses given in ward with appropriate nursing help, IV access, and monitoring. A paravertebral catheter can be placed for continuous infusion and managed as for other perineural blocks (see below).

- Major risks include pneumothorax and IV injection.

- Has the advantage of simplicity, allowing concurrent opioid administration, and not requiring an infusion pump.

- Significant sympathetic blockade is unlikely.

- Can be used post-thoracotomy by a catheter threaded extra-pleurally by the surgeon prior to closure.

Interpleural Analgesia:

Appropriate for managing the pain from a unilateral abdominal wound (e.g. Open Cholecystectomy or Nephrectomy). Less effective for thoracic surgery or trauma where intercostal drainage or pleural fluid may impair the spread and absorption of the local anaesthetic.

A single (epidural type) catheter is placed through the interspace in the centre of the segmental band to be blocked through a Touhy needle using loss of resistance to saline (or other closed technique). May require a posteriorly located catheter as well (two-catheter technique).

Advantages:

- Does not require repeated needle-sticks to the patient.
- Can be maintained with intermittent boluses (6-8hrly) or by a continuous infusion.
- Allows concurrent opioid administration.
- Significant sympathetic blockade is unlikely.

Disadvantages:

- Moderately high risk of pneumothorax or pulmonary trauma.
- Not demonstrated to be consistently better analgesia than I.V. opioid infusions.

Dose for Interpleural analgesia:
**Infusion:** Ropivacaine 0.2% given at 5 - 10 ml/hr administer via a REM Bodyguard Pain Management pump.

**Bolus:** Ropivacaine 0.75% or Bupivacaine 0.5% 10 - 20 ml every 5 - 10 hrs.

**Erector Spinae Block:**
This is a new interfascial plan block which produces a multi-dermatomal sensory block. It is a reasonable alternative when conventional blocks (paravertebral, epidural) are unable to be performed.

**Potential Indications**
- Thoracic neuropathic pain (Herpes, Metastatic disease of the ribs)
- Thoracic surgery (VATS)
- Multiple rib Fractures (Hamilton, Case repost BJA, 2017)
- Breast cancer surgery (Mastectomy and reconstruction)
- Bariatric surgery – visceral pain (Chin et al, RAPM, 2017)
- Abdominal options are being explored

**Site of Action:**
This block aims to block the dorsal and ventral rami of the thoracic spinal nerves. Local anaesthetic is injected 3cm lateral to the T5 Spinous process between erector spinae and Rhomboid major muscles. Targeting the sheath deep to erector spinae muscle in the most effective approach recommended at this hospital.

**Areas Blocked:** T2 to T9 in a cephalocaudal direction. 3cm lateral to the thoracic spine to midclavicular line in anterior posterior direction. The axilla and medical aspect of upper arms may also exhibit sensory blockade.

**Advantage:**
Simplicity and safety profile compared to epidural and paravertebral but is still being explored.
- No needle-pleura interaction and consequent risk of pneumothorax.
- Relatively simple in the obese patient
- Not as risky in patients with anticoagulation derangements
- Can be performed as single shot blocks or run as infusion. Single sided or bilateral.

**Disadvantages**
- New block potential still being explored
- Safety profile still being explored

**Continuous Perineural Infusions:**
Use the green regional lines and green “Local Anaesthetic Infusion” stickers on the infusion lines.

**Examples**

**Brachial Plexus** - appropriate for managing the surgery and post-operative pain from long plastic surgical upper-limb procedures (e.g. re-implantation), or major orthopaedic procedures to the forearm or hand. Axillary, Infra-clavicular, supra-clavicular or interscalene (for shoulder and upper arm analgesia).

**Distal femoral triangle block (DFTB)**
The distal femoral triangle (DFT) is the preferred location for an anterior thigh block for total knee joint replacement, as it will cover the medial femoral cutaneous nerve, nerve to vastus medialis (NVM) and saphenous nerve. These three nerves are responsible for innervating the anteromedial knee. Although
NVM is involved, this technique does not impair early mobilisation. This is a motor sparing nerve block technique. The DFTB is performed at or just proximal to the apex of the femoral triangle. The apex of the femoral triangle is defined as where the medial border of the sartorius intersects the medial border of the adductor longus. This can be located sonographically by tracing the adductor muscles along the medial thigh from proximal to distal. The NVM can be isolated with nerve stimulation and a catheter tip placed there. The term adductor canal block (ACB) should be reserved for a block that involves local anaesthetic injected into the adductor canal, defined as the region in the distal medial thigh (between the apex of the femoral triangle and the adductor hiatus) deep to the vastoadductor membrane. ACB may miss NVM as this nerve may have entered the vastus medialis. ACB is suitable for major ankle surgery that involves the saphenous nerve territory.

As DFTB is a motor sparing technique, we recommend that ropivacaine 0.5% 25 - 30 mL be used. The ED50 and ED95 for ropivacaine 0.5% for adductor canal block causing 30% quadriceps weakness is 45 - 47 mL.

Continuous catheter versus single-injection technique: a continuous infusion of local anaesthetic is preferred, however catheter placement has become a logistical challenge as placement of a catheter at the apex of the femoral triangle is in a location that the surgeons consider to be in their sterile field. The ‘simple’ logistical solution is to place the catheter at the completion of the surgery. Options to prolong the duration of a single-injection technique include adding adrenaline 2.5 mcg/mL and/or dexamethasone (4 mg per 30 mL volume is appropriate).

There are several techniques that can be utilised for providing analgesia for the posterior knee. One of these is a selective tibial block with 15 - 20 mL ropivacaine 0.2%. A dense block of the sciatic nerve is not recommended for total knee joint replacement.

Femoral Nerve - useful for painful femoral shaft problems or more often as a key component of pain relief after knee reconstruction or joint replacement. Occasionally used after amputation and placed at the nerve stump to decrease neuralgic pain.

Adductor Canal – The Femoral Nerve block may be associated with quadriceps weakness that impairs mobilisation in TKJR patients. The adductor canal block is an option that may improve early mobilisation because it does not cause quadriceps weakness. At mid-thigh the saphenous nerve and nerve to rectus femoris lie in the adductor canal. Involvement of the nerve to rectus femoris is not thought to result in any significant functional impairment. For further information re the suggested Total Knee Joint Replacement Clinical Pathway see Appendix VI – TKJ Pathway 2018

Sciatic Nerve - Appropriate for the management of Femur (sciatic gluteal level), foot and ankle surgery (sciatic popliteal level). For analgesia below the knee (posterior knee). Also for Analgesia / Sympathetic Block for diabetic gangrene, circulatory or wound healing disorders and Complex Regional Pain Syndrome (CRPS).

TAP (TransversusAbdominis Plane) – useful for patients undergoing surgical procedures via an abdominal incision. For a midline incision bilateral blocks are necessary to ensure that sensory afferents from both sides are blocked. For continuous infusions approximately 8-10mls/hr runs into each catheter. Alternatively intermittent boluses can be programmed into the REM bodyguard pump usual dose is 5-10mls 4-6 hourly into each catheter.
**Rectus Sheath** - usually placed by the surgeon at end of procedure. Can provide good intraoperative and postoperative analgesia for abdominal surgery requiring a midline incision. Ropivacaine 0.2% can be infused either by continuous infusion or intermittent bolus as for the TAP catheters (see above)

**Wound catheters** – are placed by the surgeon at the end of the procedure. They are useful in reducing abdominal wall pain not visceral pain. A popular technique for liver surgery as coagulopathy often occurs post hepatectomy. Meta-analysis of outcomes following postoperative analgesia using continuous LA wound infusions showed reduced pain scores, opioid consumption, PONV and length of hospital stay with no difference in incidence of wound infections (Liu et al, 2006). Continuous infusions of 0.2% Ropivacaine are acceptable for wound catheters (e.g.: 8mL/hr). Intermittent bolusing of 5-10mls 0.2% Ropivacaine 4-6hrly is an alternative.

For TAP, rectus sheath and wound catheters a PCA is still required for supplementation.

Suggest:

- Lock-it-plus fixation device used to secure catheters
- Ensure filter is connected and luer lock tightened
- An order for prescribed regional bolusing must be written on the Analgesia Infusion Treatment Sheet (SV754)

Catheters are placed using a specific kit. Use of ordinary IV cannula is potentially injurious to nerves because of the sharp bevel on the needle, and should be avoided.

The aim is to get anaesthesia without excessive motor blockade. Sympathetic block may be of additional benefit.

**Infusion:** Ropivacaine 0.2% given at 5 - 15 ml/hr via Analgesic Infusion pump. Clonidine (up to 3 mcg/mL) may be administered (by anaesthesia personnel).

Calculated total dose of local anaesthetic during infusions should include bolus doses **given within the last 6 hours and should not exceed:**

- **Ropivacaine** – 0.5mg/kg/h
- **Lignocaine** – 0.5mg/kg/h
- **Bupivacaine** – 0.2mg/kg/h

The **site** must be checked twice daily for evidence of swelling, inflammation or haematoma. The catheter should be **removed** prior to a patient being **heparinised**.
6. ADJUVANT ANALGESICS

The use of complementary agents is part of multi-modal analgesia and has a good pharmacological and physiological rationale and results in fewer side effects.

Paracetamol

Oral, IV (Perfalgan) 1gm every six hours
Give routinely unless contraindicated (IV paracetamol is only indicated on the wards when other routes are unavailable or inappropriate)
Ensure that a combined paracetamol dose of 4 g/24h from all forms is not exceeded

Australian guidelines recommend:

- Oral/intravenous paracetamol dosage for adults and children >12 years who weigh more than 50kg & those who weigh <50kg with no risk factors is 500mg – 1g every 4 to 6 hours up to a maximum of 4g in 24 hours.
- A dose reduction to 3g in 24 hours for patients with chronic or compensated active hepatic disease and also in elderly, frail, malnourished and underweight (<50kg) patients with eating disorders or chronic disease.
- In these patients, doses should not exceed 15mg/kg/dose every 4 to 6 hours, to a maximum of 60mg/kg daily and if dosing continues for more than 48 hours, liver function tests and INR should be monitored.

Oral Opioids

Codeine: In combined analgesics e.g. panadene / panadene forte
May be poorly tolerated (nausea, constipation)

Oxycodone hydrochloride: Absorbed completely (90%) and rapidly (20-30 min)
Usually well tolerated
Endone/Oxynorm (Rapid Release) 5-10 mg oral: 4-6 hourly
Targin/OxyContin (Slow Release) 10-20 mg oral: 12 hourly.

- The maximum dose of SR Oxycontin that should be prescribed by APS is 30mg BD, unless in consultation with the Acute Pain Medicine Registrar or a Consultant Anaesthetist.

- Where appropriate SR Oxycontin should be weaned once the acute pain phase has passed and the patient requires less breakthrough analgesia. This information should be communicated to the parent unit who can liaise with the patients GP via discharge summary or telephone call

- If the patient was taking SR Oxycontin prior to admission, in most instances it would be appropriate for the patient to keep taking this medication in addition to other analgesics such as PCA.

- If the patient is on unusually high doses of SR medications then the prescription should be checked with the prescriber before allowing this dose to be given to the patient

Morphine sulphate: Usually well tolerated
Anamorph, Morphine mixture, Ordine (Rapid Release)  
MS Contin tablets or suspension (Slow Release)  
Kapanol capsules (Slow Release)  

Hydromorphone hydrochloride: 5-7 times stronger than morphine  

Hydromorphone – Dilauidid (Rapid Release)  
Hydromorphone – Jurnista (Slow Release)

**Opioids** can be given to patients on Ropivacaine-only or Ropivacaine-clonidine infusions

**Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)**  
**Indications:**  
As a supplementary analgesic. Opioid sparing. Especially good for surgery associated with muscle trauma (leading to oedema and spasm) and head and neck surgery. Useful for shoulder-tip pain from diaphragm irritation. Try to give prior to incision.

**Precautions:**

**General**
- Avoid in renal impairment, hypovolaemia, asthma, peptic ulcer disease
- Non-selective NSAIDs should be avoided when haemostasis is critical

**COX-2 Selective NSAIDs**
- Celecoxib is the only readily available oral COX-2 selective NSAID for postoperative analgesia. On general principles, celecoxib should be used with caution in patients with unstable coronary syndromes or renal impairment.
- Parecoxib is for single-dose only. It is contraindicated in patients having coronary artery surgery and should therefore be used with caution in patients with unstable coronary syndromes.

**Indocid suppositories** (100mg 12 hrly)

The Surgical Unit must be contacted before prescribing suppositories for patients who have had low colonic anastomoses.

N.B.: Indocid suppositories **should not be used in any patients with an epidural catheter** due to the high bleeding risk potential.

**Ketorolac** (Toradol) 10-30 mg IM 6 hrly*

*prescribing information suggests  
- limiting doses in over 65 year olds to 60 mg/day  
- limiting IM dosing to 2 days

**Diclofenac** (Voltaren) 50 – 100 mg oral/PR 8-12 hrly to a maximum of 200 mg/day
**Parecoxib** (Dynastat) 40mg IV single dose (only available in OR)

Doses of Parecoxib can be prescribed for patients on the ward however the drug must be given by the Acute Pain Registrar or the Urgent Registrar

**Celecoxib** (Celebrex) 400mg orally initially, then 200 mg 12 hourly

The COX-2 selective agents have fewer GI side effects and **do not** affect platelet function give celecoxib with pre-med

**Tramadol (TRAMAL)**
- loading dose may cause nausea/vomiting so give 100 – 150 mg IV during surgery.
- maintenance 50-100mg 4-6 hrly IM/IV/PO (halve doses in elderly)
- SR Tramadol should be used in patients with chronic pain. Dose 100-200mg Bd. Onset is 60min.

**Tapentadol (Palexia)**
- Available in oral slow release (SR) and immediate release (IR) formulation
- Unlike tramadol, it has only weak effects on the reuptake of serotonin, and has no known active metabolites, as a result safer to be used in conjunction with antidepressants
- Reported to have a good side effect profile with less sedation, nausea and vomiting
- Starting dose of SR tapentadol is 50mg bd then up titrate to maximum dose of 250mg bd (ideally titrate 3rd daily)
- Starting dose of IR tapentadol is 50-100mg every four hours PRN. **Only 5 days of IR tapentadol will be provided by Pharmacy on patient discharge** (not on the PBS)
- Total daily dose of tapentadol as recommended by Seqirus (Jan 2017)
  
  Day of surgery – 700mg in total (including SR & IR)
  
  Post-operative acute pain – 600mg in total (including SR & IR)
  
  Chronic pain – 500mg in total (only SR has been studied)

**Clonidine** (see page 11 for Epidural Clonidine)
- As an additional component to other analgesia Clonidine can be useful when the patient has ongoing pain despite other agents, is anxious and sleeping poorly.
- Useful as an adjuvant for management of opioid withdrawal
- Dose: 50mcg (IV or oral) tds up to 150mcg tds. **Watch for sedation and hypotension**

**Weaning Clonidine**
- Clonidine **should not be abruptly discontinued** as rebound hypertension may occur. The dose should be weaned prior to cessation. e.g. 50mcg tds reduce to 50mcgs Bd for 3 days, then 50mcgs daily for 3 days then cease.
Continuous Ketamine infusion

NMDA receptor antagonists such as ketamine are of benefit in situations of spinal cord ‘windup’ where a hyperalgesic reaction results in increased pain perception. Low (sub-anaesthetic) doses have been known to be analgesic for some time, and can usually result in minimal dysphoric reactions.

Indications:

- Chronic pain syndrome
- Including neuropathic pain, phantom limb pain, severe unresponsive cancer pain
- Severe acute post traumatic or postoperative pain, difficult to manage with systemic opioids due to side effects or tolerance
- As a supplement to local anaesthetic infusions when trying to avoid opioids (e.g.: patients with history of severe nausea and vomiting)
- Use as the sole analgesic agent postoperatively in situations where opioids are contra-indicated and local anaesthetic impracticable (needs adjuvants)
- Opioid withdrawal (on request by BWCPM or DOAM)

Precautions:

- Pre-existing high levels of opioid may result in respiratory depression when ketamine is added to the regime.
- Hallucinations and delirium may occur, especially at higher doses. A patient who is relatively immobile and slow to verbally respond may be experiencing these phenomena. Dose reduction and benzodiazepines are appropriate. Midazolam (1mg) can be added to the solution if needed.
- Irritation at the subcutaneous infusion site due to the pH of ketamine requires the daily re-siting of the cannula (or more often if the patient complains of discomfort).
- Overdose may result in dissociative anaesthesia, sympathetic stimulation, amnesia and emergence dysphoria.

Dosage and Administration:

Ketamine is a Schedule 8 drug. An Alaris pump with a locked box (available in PACU) is used and the preparation strength is **2mg/ml** (e.g. 200mg Ketamine made up to 100 ml with N.Saline).

A two way extension line (see below) must be connected to the Alaris line. This extension is necessary to provide free flow protection, an anti-syphon valve and a side arm for fluids.

Initial rate: **0.05 mg/kg/h**. Optimal effects are usually achieved by 0.1-0.15 mg/kg/h. Make dose adjustments 2-4 hourly. Titrate the infusion to effect, decreasing if hallucinations or other side effects occur.

Bolus: In some patients a bolus may be ordered by the Anaesthetist (which is nurse initiated) on the Analgesia Infusion Treatment Sheet (SV 754).
Paracetamol, opioids (or epidural analgesia), local anaesthetics, tramadol and NSAIDs may be used concurrently with ketamine infusions and may help to improve analgesia and reduce side effects.

Ketamine and additional PCA giving sets may be ‘piggybacked’ together with the maintenance line connected above the other 2 lines.

**Cessation of Ketamine**

The decision to cease the ketamine infusion should be made in consultation with APS. When ketamine is being used in conjunction with opioid infusions, the order in which the infusions are weaned should be discussed with APS. Generally Ketamine should be weaned to 2-3mls/hr before being turned off.

For detailed use in oncology and chronic pain states, the BWCPM or Caritas Christi consultant should be contacted.

**Intrathecal (SPINAL) Opioids – Single Shot:**

A single dose of intrathecal morphine can provide high quality analgesia for 12-24 hours in many patients. Each patient will receive a single dose of 100 to 300 mcg of morphine intrathecally. Observations must be monitored closely for 24 hours postoperatively due to the continued presence of opioid in the cerebrospinal fluid, which may cause respiratory depression up to 18 hours later due to cranial migration of the morphine to the brain stem.

**Side effects** to observe for post intrathecal morphine include the following;
- Sedation
- Respiratory depression
- Nausea (common)
- Pruritus (very common)
- Urinary retention

**Ongoing Management**

An analgesic plan must be written up in advance for when the spinal morphine wears off – this includes non-adjuvant opioids or in appropriate patients, an opioid PCA. See also Appendix V of this document for Upper GI patients in the ERAS program.

A yellow alert sticker is to be placed on the drug chart, front of the clinical pathway or admission notes. The Anaesthetist is to place stickers on appropriate documentation in the Operating Suite.

A A4 sign to be placed at the head of the patient’s bed (by nursing staff) that alerts all staff that the patient has been given intrathecal morphine and indicating when the 24 hour postoperative period has finished.

**Observations** For frequency of observations see the Special Analgesia Nursing Observation Chart (SV 167)

An APS online referral is to be completed. Urgent Anaesthetic Registrar to be notified of the patient so they can be monitored closely.

**Observations on the Ward (by nursing staff)**
Observations to be recorded on Special Analgesia Nursing Observation Chart - For 24 hours postoperatively record the following:

- ½ hourly standard RPAO (for first 4/24)
- Oxygen Saturation  Hourly for the first 20 hours
- Respiratory Rate  Hourly for the first 20 hours
- Sedation Score  Hourly for the first 20 hours

then these observations are to be done 4 hourly thereafter.

No opioids are to be given to the patient within the first 18 hours unless ordered by the Anaesthetic Registrar/Consultant.

In the event of Respiratory Depression/sedation, the standard orders on the back of the Special Analgesia Nursing Observation (SV167) Chart apply

Analgesic Supplements to intrathecal opioids:

Tramadol  IV or oral 50-100mg 6/24
Paracetamol  1000mg 6/24
Celecoxib  400mg initial dose then 200 mg 12 hourly/Parecoxib 40mg in OR or PACU

If the patient gets breakthrough pain after 18hrs post op, consider OxyContin (10-20mg) orally BD (rapid onset then slow release). If early breakthrough pain Day 0, consider Ketamine Infusion or FPCA.

Methadone

Methadone is a synthetic mu-opioid receptor agonist. It also has NMDA receptor antagonist activity. Its relative potency with regard to other opioids is complex.

Indications

Methadone is indicated for relief of severe pain (acute or chronic), detoxification treatment of narcotic addiction, in opioid rotation and temporary maintenance treatment of narcotic addiction.

Methadone has several distinct advantages compared with other opioids:

- Methadone has no active metabolites
- Methadone’s long duration of analgesia with chronic use allows less frequent dosing than with other opioids
- Methadone is highly lipophilic, making it amenable to many routes of administration.

Pharmacokinetics

Absorption/Distribution: Oral methadone is readily absorbed (oral bioavailability is >80%) and very long-acting. By comparison, its bioavailability is nearly 3 times that of morphine and its half-life is about 10 times greater than morphine.
Methadone is highly lipophilic and is quickly distributed to tissues including the brain, gut, kidney, liver, muscle, and lung. Between doses, plasma concentrations are maintained by this tissue reservoir.

**Half-life:** Peak plasma concentration occurs on average 2.5-4 hours following ingestion. While the half-life of methadone may be 30 hours, the duration of analgesia is much shorter.

**Elimination:** Both methadone and its inactive metabolites are eliminated in urine and faeces.

**Pharmacodynamics**

Methadone binds to Mu (μ), Kappa (κ), and Delta (δ) opioid receptors, producing analgesia as well as typical opioid side effects.

While methadone has a potency equivalent to morphine specifically for μ-opioid receptors, the clinical effectiveness of methadone increases with chronic dosing.

There is no predictable relationship between methadone plasma level and pain relief.

Methadone inhibits re-uptake of serotonin and noradrenaline. Methadone is also an antagonist of N-methyl-D-aspartate (NMDA) receptors which can help prevent central sensitization and reduce opioid tolerance.

**Dosage and Administration**

Prescribing of Methadone for pain management must be done in consultation with an APS Consultant and someone that is experienced in the dosing and conversion from other opioids.

**IV**
- Onset time within 1 hour

**Oral**
- Available as liquid (generally used for drug addiction)
- Tablets (Physepton) i.e.: used as analgesic in divided doses

**Titration & Monitoring**

For opioid naïve patients started on 2.5 mg of methadone bd or tds

For patients transitioned from other opioids (<200 mg/day of morphine oral equivalent), an increase of 5 mg per dose is recommended.

For patients previously receiving 200-500 mg/day of morphine oral equivalent, the recommended increase is equal to the initial methadone starting dose.

Patients must be monitored for side effects during the transition to methadone, particularly respiratory depression, as this remains the chief hazard associated with methadone.

**Special Situations**

**Elderly** – Methadone clearance does not appear to be affected by age. However, there may be an exaggerated response to methadone in the elderly. Suggest a lower starting dose in the elderly.
**Renal and/or Hepatic Failure** – Unlike morphine, the metabolism of methadone produces no active or toxic metabolites. Only a minor fraction of methadone is cleared by the kidneys. Except in end-stage renal failure, it is usually unnecessary to adjust the dose of methadone because of renal disease.

For patients with severe **chronic liver disease**, the elimination half-life of methadone increases. However, mean plasma concentrations and dose-adjusted mean plasma concentration do not significantly differ from patients with mild or moderate liver disease and no dose adjustments are typically required for this degree of hepatic failure.

**Cardiac Conditions** – QT interval prolongation and serious arrhythmia (*torsades de pointes*) have been observed during treatment with methadone.

**Subcutaneous Lignocaine**

**Subcutaneous Lignocaine infusion for Neuropathic pain** – for known or suspected neuropathic pain or as an additional analgesic when standard therapies do not provide adequate pain relief. For current policy see **Hospital Drug Administration Protocols**. For further advice contact Dr Andrew Stewart, Dr Simon Scharf, Dr Craig Ironfield, Prof David Scott or Chronic Pain Consultants from Barbara Walker Centre.

**Transdermal patches**

With transdermal delivery systems or skin patches the drug is released slowly through the skin into the dermis. The drug is then absorbed into the systemic circulation. Patches are commonly used in the treatment of cancer and chronic pain. Onset and offset times are slow and this makes short-term titration impossible, hence they are unsuitable for the management of acute pain. With transdermal Fentanyl (Durogesic) the time to peak blood concentration is generally between 24-72 hours after initial patch application.

**Transdermal Buprenorphine** has particularly slow onset achieving a steady state by Day 3, after removal of the patch concentration decreases by about 50% in 12 hours.

- Transdermal patches do not suit sweating patients and should not be placed over scar tissue.
- In most instances patients referred to APS with a transdermal patch in situ should have the patch left in situ and analgesic requirements managed in addition.
- Instances in which the patch may be removed include excessive sedation.
- For patients taking **sublingual Buprenorphine**, Addiction Medicine suggest withholding the medication in the acute post-operative phase and using standard analgesics as necessary, then reintroduce the Buprenorphine (liaising with AM) once the acute pain has subsided.

**Calcitonin**

For rescue analgesia in CRPS, severe neuropathic pain/phantom pain, crush fractures.

- Peptide hormone that regulates calcium homeostasis
- Has analgesic properties, mainly via modulation of serotonergic activity in pain pathways of CNS
- Salmon calcitonin is more potent than other forms of calcitonin, therefore reproduced as a synthetic drug for pharmaceutical use

**Salmon Calcitonin & CRPS**
• Conflicting evidence but meta-analysis concluded benefit in treatment of CRPS
  o Dose used = 300-400 IU/day (intranasal/IM)
  o However more recent study (RCT) showed calcitonin no more effective than paracetamol
    in improving pain and function in CRPS over 2 month period - Dose used = 200 IU/day
    (intranasal)
• More potential for side effects at higher dose (pruritis, epigastric pain, headache, vertigo,
  hypocalcaemia)
• NB. Dose used for Paget’s disease of bone = 50-100 IU s/c 6 times weekly; for postmenopausal
  osteoporosis = 200 IU intranasal daily
• Western Australia Therapeutic Advisory Group’s (WATAG) Guidelines for the Treatment of
  Neuropathic Pain 2013 – (endorsed by Prof David Scott) – recommends:
  o Dosing of 100 IU daily as SC injection or IV infusion (in 100ml normal saline over 1 hour)
  o Prophylactic anti-emetics
  o Repeat daily for at least 3 days

Magnesium

There is Level 1 evidence that Magnesium administered intravenously either as a single intraoperative
  dose or as a continuing infusion reduces postoperative pain scores and opioid consumption.

Magnesium sulphate has been the formulation used most frequently. The single intravenous dose used is
  30-50mg/kg as a bolus.

We do not have a hospital policy for continuous intravenous infusion of magnesium for analgesia and so it
  is not currently recommended.

Neuropathic Pain

Patients with neuropathic pain features, phantom limb pain or possible nerve injury should have
  a multi-modal regimen at optimal dose which includes drugs such as paracetamol, NSAID’s and
  tramadol (or tapentadol). In addition:

• 1st line: Pregabalin
  o The majority of patients with evidence of neuropathic pain should first have a trial of
    pregabalin
    ▪ Start 75mg nocte uptitrating to twice daily or 25-50mg nocte for elderly +/- renal
      impairment)
    ▪ May be increased to 300 mg/day, given in 2 to 3 divided doses, after an interval of 3-
      7 days
    ▪ Maximum dose of 600 mg/day after an additional 7-day interval
  o Pregabalin would be continued post-discharge if symptoms continue
  o Pregabalin is preferred over gabapentin in patients who require more rapid titration, and for
    it’s easier twice daily dosing
  o Adverse effects
    o Sedation, dizziness and somnolence
    o Ataxia and gait disturbance
    o Oedema
    o Association with suicidality
• **2nd line: Tricyclic antidepressant (TCA)**
  - Start at low dose (e.g. amitriptyline or nortriptyline 10-25 mg nocte)
  - **Adverse effects** – 25% patients do not tolerate the adverse effects
    - Sedation or drowsiness – daily nocte dose helps reduce this side effect
    - Dry mouth, blurred vision, constipation, urinary retention
    - Severe adverse effects include arrhythmias and heart block – caution in patients with a history of cardiac disease or elderly
  - **Contraindications**
    - Prior hypersensitivity
    - Patients taking monoamine oxidase (MAO) inhibitors in the last 14 days
    - Patients taking cisapride – potential for increased QT interval and increased risk of arrhythmia
    - Patients taking other medications which could potentially cause neuroleptic malignant syndrome or serotonin syndrome
    - Patients who have recently had a heart attack

• **Condition specific**
  - Serotonin/noradrenaline reuptake inhibitors (SNRI’s) for e.g duloxetine – for painful diabetic neuropathy and fibromyalgia
  - Carbemazepine – trigeminal neuralgia
  - Calcitonin – for acute phantom limb pain and other neuropathic pain conditions, requires consultant input.
  - Topical lignocaine – for localised peripheral neuropathic pain e.g. post-hepatic neuralgia

**Carbamazepine**
- Used in patients with a definite clinical neuropathic pain syndrome
- Evidence for use in trigeminal neuralgia
- Consider use *preoperatively* in those at high risk e.g. amputation
- Dose 100 mg tds increasing to 300 mg tds

7. **OPIOID ROTATION**

Opioid rotation (using an opioid that is different from the preadmission opioid) may also be of use in the acute setting (traditionally used in the treatment of chronic non-cancer pain and cancer pain). The concept is based on the rationale that the different opioids do not act to the same degree on different opioid receptor subtypes and are metabolised differently, and also takes advantage of the fact that cross-tolerance is likely to be incomplete (Acute Pain Management, 2010).

When rotating from Morphine PCA to Fentanyl PCA standard settings can be used.

When rotating from one opioid to another,
1) Calculate the total 24 hour dose of the current opioid. Remember to include all regular doses and PRN’s
2) Convert this dose to the equivalent 24 hour oral morphine dose. (Always convert to oral morphine first).
3) Calculate the 24 hour dose of required opioid
4) It is recommended that the new opioid dose be reduced by 30% to allow for cross-tolerance. Divide the final amount into a dosage schedule throughout the day
5) Patients should be monitored closely when a change is made from one opioid to another (St Vincent’s Pharmacy Bulletin, No 94 2011)

For further information see Faculty of Pain Medicine FPM/ANZCA Opioid Calculator App

8. DISCHARGE PLANNING

Whether a patient is discharged from the APS or from the hospital it is imperative that an analgesic plan has been communicated to the parent unit and the patient. A weaning regime for opioid medications is necessary for many patients which may need to be communicated to the GP directly especially for complex patients. Slow release opioids such as Oxycontin/Targin/Tapentadol /MS Contin should be weaned before discharge. If not possible, then a weaning regime should be discussed with the parent unit so that it can be communicated to Pharmacy in the discharge script.

All pain medication and a weaning plan must be clearly documented in the patients history once discharged from the APS. This should include

- A List of current pain medications
- Dose adjustments and dates that these should occur if known, or review dates if weaning predictability not evident
- Documentation of follow up requirements should be made clear i.e.: GP / BWCPM long-term or sub-acute clinic appointments
- Documentation of any phone conversations with pts local GP or Pharmacists prior to discharging patient

Upon discharge from APS a note must also be documented on the patient’s medication management plan (SV000691) under Medication Changes During Admission (back page of the form)

e.g.: “On discharge, please consider APS recommendations from (insert date here)”.

Furthermore, the APS will endeavour to provide a discharge letter to the patient’s GP if they meet the following criteria:

- Patient requiring > 2 weeks of APS management
- Patient not taking opioids pre-operatively however discharged home on slow release opioids and/or neuropathic agents
- Patient at risk of substance abuse
- Patient commenced or rotated to methadone
- Patient referred to Specialist Pain Clinic on discharge
9. REFERENCES

- APS Manual 2017
## APPENDIX I

### Table 1. PCA quick reference guide

<table>
<thead>
<tr>
<th>Drug</th>
<th>Drug Amount</th>
<th>Final Volume</th>
<th>Final Concentration</th>
<th>Bolus doses</th>
<th>Lockout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketamine</td>
<td>200mg</td>
<td>100ml</td>
<td>2mg/ml</td>
<td>0.1-0.2mg/kg/h</td>
<td>5mins</td>
</tr>
<tr>
<td>Lignocaine</td>
<td>2500mg</td>
<td>50ml</td>
<td>50mg/ml</td>
<td>1.0mg/kg/hr</td>
<td>2.0mg/kg/hr</td>
</tr>
</tbody>
</table>

### Table 2. Adjunct analgesic infusions quick reference guide

<table>
<thead>
<tr>
<th>Drug</th>
<th>Drug Amount</th>
<th>Final Volume</th>
<th>Final Concentration</th>
<th>Infusion starting rate</th>
<th>Max infusion rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl</td>
<td>1000mcg</td>
<td>50ml</td>
<td>20mcg/ml</td>
<td>20mcg (10-30)</td>
<td>5mins</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>100mg</td>
<td>50ml</td>
<td>2mg/ml</td>
<td>1mg (0.5-2)</td>
<td>5mins</td>
</tr>
<tr>
<td>Morphine</td>
<td>100mg</td>
<td>50ml</td>
<td>2mg/ml</td>
<td>1mg (0.5-2)</td>
<td>5mins</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>5mg</td>
<td>50ml</td>
<td>0.1mg/ml</td>
<td>0.2mg</td>
<td>5mins</td>
</tr>
</tbody>
</table>
Appendix II - Guideline for Management of Epidural Disconnection

Epidural Troubleshooting

**Disconnection**
- Cover both ends with sterile tegaderm

- Disconnection of catheter between skin & filter
  - Unwitnessed ★
    - Notify APS
    - Check for elevated bleeding risk*
      - Risk Not Elevated
        - Remove epidural catheter
      - Risk Elevated
        - Monitor for delayed risk of Epidural infection / Epidural abscess
  - Witnessed ★★ Disconnection

- Disconnection between pump & filter
  - Maintaining asepsis
    - Replace filter and pump line

When troubleshooting epidurals:
- Check epidural is connected & running
- Epidural infusion rate and concentration as prescribed
- Insertion site: catheter depth, dressing intact, tenderness
- Check dura mater with ice (spinal block)
- Check motor block (Bromage score)

Reconnection should only be considered after discussion of case with APS Consultant

- Check local anaesthetic level in tubing must be visible within 12.5 cm of disconnected end
- Clean catheter with betadine – 10 cm either side of proposed cutting point (Do not use product containing chlorhexidine)
- Allow betadine to dry and cut 25 cm from disconnection point & attach a new filter★★

- Recomence infusion
  - A bolus may be required to reestablish block

* Elevated bleeding Risk – Ensure INR < 1.3, APTT < 36, Fibrinogen ≥ 100 (If platelets less than 100 discuss with consultant). No Prophylactic LMWH within 12hrs and heparin within 6 hours. If on therapeutic dosing consult with APS/on call consultant or inserting anaesthetist

** If the cut down of the catheter makes securing the catheter impractical then remove as if Unwitnessed disconnection

★Unwitnessed – infusion line not sighted to be intact within last 2 hours

★★ Witnessed disconnection – or infusion line sighted to be intact within last 2 hours
APPENDIX III

Low Molecular Weight Heparins in conjunction with Regional Anaesthesia.

Introduction

Widespread use of epidural and spinal subarachnoid techniques over many decades has established their safety in patients with normal coagulation. A number of reviews have determined the risk of epidural haematoma associated with epidural or spinal anaesthesia at less than 1:190,000. Previous studies have established that with meticulous care, the concurrent use of controlled dose intraoperative heparin or warfarin with neuraxial anaesthesia appears to be safe. When epidural haematoma have been reported, over 60% of cases are associated with some form of coagulopathy.

Low Molecular Weight Heparins (LMWHs) are effective in reducing deep venous thrombosis in surgical patients—especially in high risk procedures such as knee surgery. Potential disadvantages of LMWHs are a longer half-life (compared with Unfractionated Heparin (UFH), different potencies between agents and the inability to easily measure residual activity (ACT and APTT are little affected by LMWHs. Anti-Xa levels are needed).

The problem

Initial experiences with these new agents when they were first introduced into Europe and Australia were not associated with increased epidural haematoma incidence. However, the introduction of enoxaparin (Clexane, Lovenox) into the USA has been associated with over 50 reports of epidural or spinal haematoma development. This resulted in the generation of an FDA Public Health Advisory on 15th December 1997, which was to raise clinicians’ awareness of the risk of epidural haematoma and LMWH, to point out the increased risk if other anticoagulants were active and to advise frequent monitoring or assessment. (http://www.fda.gov/medwatch/safety/).

Of note:

- the majority of cases were elderly female orthopaedic patients
- the presence of cord compression was detected by motor effects only in 40% of cases (i.e. no back pain) and occurred up to three days after catheter removal
- the perception that the lack of a monitoring requirement means that LMWHs are safer is false
- dosing regimens differed between Europe and the USA

There have been a number of articles and editorials subsequent to this - examining the reasons why the European and North American experiences differed and raising the risk versus benefit concerns related to epidurals and anticoagulation. The conclusions drawn by Horlocker are reasonable and consistent with the protocols of most Acute Pain Management Services in Australia.
Patient, Anaesthetic, and LMWH Dosing Variables Associated With Spinal Hematoma:

1. **Patient factors**
   - Female sex
   - Increased age
   - Ankylosing spondylitis or spinal stenosis
   - Renal insufficiency

2. **Anaesthetic factors**
   - Traumatic needle/catheter placement
   - Epidural (compared with spinal) technique
   - Indwelling epidural catheter during LMWH administration

3. **LMWH dosing factors**
   - Immediate preoperative (or intraoperative) LMWH administration
   - Early postoperative LMWH administration
   - Concomitant antiplatelet or anticoagulant medications
   - Twice-daily LMWH administration

In brief, the **most important factors** with LMWH use and neuraxial block are:

- an awareness of the presence and pharmacology and indications of the drugs
  - with enoxaparin, significant Anti-Xa activity is still present 12 hours after a 40 mg dose. Twice daily (12 hourly dosing results in virtually no window for catheter removal and subsequent clot formation).
  - dalteparin (Fragmin) has low Anti-Xa activity 12 h after a 5000 unit dose

- consider carefully the presence of drugs and factors which may additionally alter the patient’s coagulation status, including renal impairment which will prolong the effect of LMWHs.
- in individual patients, consider whether LMWH offers any advantage over UFH

- appropriate timing of drug therapy
  - insert epidural catheters at least 12h after a prophylactic dose of LMWH (it is preferable to delay the initial LMWH therapy until 6 - 12 h after catheter insertion) or 24 h after a therapeutic dose (e.g. b.d. dosing).
  - remove (or manipulate) epidural catheters at least 12 h after a dose of LMWH and withhold subsequent dosing for 6 - 12 h

- careful and appropriate monitoring of patients
  - use postoperative infusion mixtures and rates of infusion which do not usually result in leg motor block
  - Regularly assess patients neurologically, especially for motor block. This should continue until the patient is ambulant or for 2 - 3 days after catheter removal
  - should cord compression by epidural haematoma occur, diagnosis and evacuation within 8 hours is most likely to result in neurological recovery

It is recognised that Deep Venous Thrombosis and Pulmonary Embolism is a major cause of morbidity and mortality in surgical patients, especially those having high risk procedures. It is also recognised that epidural anaesthesia and analgesia is associated with a lower incidence of DVT than GA in these patients. Thus consideration for initiation of LMWH therapy once catheter removal has occurred would be reasonable.
The Hospital Policy on the management of antithrombotic agents in the perioperative period has detailed recommendations on when these medications should be ceased prior to neuroaxial and other procedures and when they can be recommenced.


References


APPENDIX IV

PCA (Setting up, Guidelines for Management, PCA Definitions)

Setting up the PCA pump (in PACU or on patient return to the ward):

(i) The Alaris PCA pump should be loaded with the prescribed opioid and programmed according to the Analgesia Treatment Form by two accredited staff, who both sign the form when verified.

(ii) The pump should be connected to either:

(i) a dedicated IV line

(ii) the side arm of an IV line with a one way valve in the main line, located proximal to the side arm (to prevent opioid solution reflux up the main line should the catheter or main line become obstructed)

GUIDELINES FOR MANAGEMENT OF THE PATIENT WITH PCA

1) Oxygen - should be given by mask or nasal cannulae until the patient is reviewed by the Acute Pain Service or surgical staff. N.B. Pulse Oximetry is not an adequate monitor for respiratory depression in a patient receiving supplemental oxygen therapy.

2) IV access - The IV should remain in place for 3 hours after ceasing PCA

3) Other Standard Orders for Observations, Monitoring, Infusion Rates and management of problems are on the Special Analgesia Nursing Observation Chart (SV167) which accompanies every patient.

4) Ambulation and Showering

There is no contra-indication for a patient receiving PCA to ambulate or shower. Careful sitting out and assisted ambulation are required in order to avoid postural hypotension.

PCA Definitions

Patient Initiated PCA Bolus: The patient presses the button attached to the PCA pump which will deliver the pre-set bolus amount of opioid into the IV, provided that the lockout interval has not been exceeded and the 1 hour dose limit has not been exceeded.

Lockout Interval: This is the length of time following a Patient Initiated Bolus dose during which the pump will not respond. It records all such attempts, however, so that dose adjustments can be made later to meet the patient’s needs.

It is necessary to have a 5 minute interval so that the effect of the Bolus dose can be appreciated before a supplement is given.

Background Infusion: Some patients require a continuous infusion of opioid as well as the PCA bolus doses. The pump can provide this, but evidence at present suggests that this is not an
advantage for the majority of patients, and does not reduce their bolus dose opioid requirements nor substantially improve their analgesia. Special consideration are those patients on long term SR opioids that become nil by mouth. These patients may require a background infusion of opioid to prevent withdrawal.

**1 Hour Dose Limit:** This provides a ceiling on the amount of opioid that the patient can self-administer over 1 hour. Not essential but a useful 'safety net'.

**Loading Dose:** On initiation of PCA, if a patient has inadequate analgesia, or if a delay occurs before a bag can be changed, a Loading dose can be given (independent of the full pump re-programming sequence). Usually, 2-3 mg of Morphine is sufficient.
APPENDIX V

Department of Anaesthesia and Acute Pain Medicine
St Vincent’s Hospital Melbourne
CLINICAL RESOURCE

Acute Pain Protocol for Upper GI patients in the ERAS program

Version 4 (Dec 2017)

Purpose:

To streamline and maintain a consistent approach to post-operative analgesic techniques in patients having major upper GI surgery. The aim is to fit in with the ERAS program, and provide increased consistency for surgeons, the acute pain team and other staff involved in post-operative care of these patients.

This sub-speciality has a large number of different anaesthetists doing the lists.

The protocol described below allows for individual preferences and variation. We should aim for improved consistency with specific regard to:

- Which patients go to ICU/HDU
- Protocol for ropivacaine infusions as part of a continuous wound infiltration technique
- Dose of intrathecal morphine, and choice of other opiate to use with ITM (should be fentanyl)
- Duration of post-operative epidural and CWI infusions (the Acute Pain Service will manage transition from TEA/CWI to oral analgesia on day 3)
- Terminology – surgical placed catheters are to be specified as either “Extra-pleural catheters” or “Continuous wound infiltration”

It is recognised that a proportion of patients will have more complex issues, including chronic pain and opiate tolerance, that may make the time-frames suggested below difficult to achieve.

Patient education:

- All ERAS patients should receive appropriate education about post-operative analgesia; the majority of these patients will be referred to Anaesthesia Pre-admission Clinic.

Post-op ICU/HDU:

Gabe Snyder December 2017
• All Whipple’s operations and other major open upper GI resections who have a TEA should go to HDU/ICU post-operatively for haemodynamic and other monitoring; they should all have a CVC inserted
• All open liver resections should go to HDU/ICU post-operatively
• All oesophagectomy patients should go to HDU/ICU post-operatively
• Other patients should go on a case by case patient

Protocol for Intrathecal Morphine (ITM):
• Dose to be 200-250mcg if < 70 years old and 100-150mcg if > 70 years old
• If other opiate is used intraoperatively it should be fentanyl
• Other management consistent with current APS Manual, in particular hourly sedations scores and respiratory rate monitoring for 24 hours, and supplemental O2
• Post-op fentanyl PCA (20-30mcg boluses), and this can be used immediately in PACU
• Very low threshold for HDU/ICU – all liver resections should go to HDU/ICU

Protocol for continuous wound infiltration (CWI):
• Device – Infiltralong (available from Greta Hall, kept near OR 7)
• Insertion – the surgeon should place it in to the posterior rectus sheath or between internal oblique and transversus abdominis
• A single catheter should be inserted when possible. Large wounds may require 2 catheters.
• Intra-op loading (if no epidural) – 40 ml of 0.5% ropivacaine (20-30 ml if small/frail)
• Post-op management (if no epidural) – continuous infusion of ropivacaine 0.2% at 10ml/hr; chart bolus of 8ml each 30 minutes; 4 hour maximum limit of 60 ml; dose reduce if small/frail (see table 1)
• Patients with two separate catheters should be connected to two separate pumps in which case the above rates should be the total doses
• Day 3 – plan removal of wound catheters
• Partial or total epidural failure should be managed by running the CWI catheter either on its own, or concurrently with the epidural catheter; total local anaesthetic dose should not exceed 15ml of ropivacaine 0.2% per hour

Table 1 – infusion protocol for ropivacaine 0.2% via continuous wound catheters

<table>
<thead>
<tr>
<th></th>
<th>Normal patient</th>
<th>&lt;50kg or frail</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 wound catheter</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loading dose in theatre</td>
<td>40 ml 0.5% ropivacaine</td>
<td>20-30 ml 0.5% ropivacaine</td>
</tr>
<tr>
<td>Continuous infusion rate</td>
<td>10 ml/hr ropi 0.2%</td>
<td>8 ml/hr ropi 0.2%</td>
</tr>
<tr>
<td>Bolus *</td>
<td>8 ml ropi 0.2% each 30 minute</td>
<td>5 ml ropi 0.2% each 30 minute</td>
</tr>
</tbody>
</table>

Gabe Snyder December 2017
2 CWI catheters (each one to be numbered; each one needs its own ropivacaine infusion chart)

<table>
<thead>
<tr>
<th></th>
<th>Loading dose in theatre</th>
<th>20 ml 0.5% ropivacaine in each catheter</th>
<th>10-15 ml ropivacaine 0.5% in each catheter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous infusion rate</td>
<td>5 ml/hr ropi 0.2% via each catheter</td>
<td>4 ml/hr ropi 0.2% via each catheter</td>
<td></td>
</tr>
<tr>
<td>Bolus *</td>
<td>4 ml ropi 0.2% via each catheter each 30 minutes</td>
<td>3 ml ropi 0.2% via each catheter each 30 minutes</td>
<td></td>
</tr>
</tbody>
</table>

* the Acute Pain Team should be contacted if > 2 boluses are required

**Table 2 - Transitioning from TEA to CWI on the ward in circumstances where it is felt that systemic analgesia alone will be inadequate**

<table>
<thead>
<tr>
<th>Time</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 am on day 3</td>
<td>Epidural infusion to cease; epidural catheter to remain in situ; follow APS LMWH guidelines – ie withhold prophylactic LMWH for 12 hours before removal; platelets and clotting should be checked, especially with liver resections Consideration given to starting oxycodeone/naloxone with a loading dose at this point</td>
</tr>
<tr>
<td>11 am on day 3</td>
<td>APS review of patient to assess whether oral analgesia is going to be adequate and consideration given to commencing CWI, or to removing the CWI catheters; if appropriate a plan for timing of removal of epidural catheter will be made (A minority of patients will require recommencement of epidural infusion)</td>
</tr>
</tbody>
</table>

**Protocol for thoracic epidural (TEA) management:**

- Patients should have a CVC placed and ICU have agreed to accept these patients for low dose vasopressor/inotropes as required
- R2F4A2 for initial infusion, changing to R2F2A2 after initial 200ml bag
- Early failure needs to be recognised (before discharge from the recovery room) and an alternative technique chosen, or the epidural needs to be re-inserted
- For oesophagectomy patients - if the epidural is not providing thoracic analgesia or the patient is unable to deep breath and cough then the extrapleural catheter should be loaded with 6ml of R2 and then a continuous infusion commenced. Some patients may end up having the epidural catheter and the paravertebral catheter running concurrently. The total dose of local anaesthetic should not exceed 15 ml of ropivacaine 0.2% per hour.
- CWI catheters should be inserted by the surgical team as well in these patients and used in the event of epidural failure or to help transition patients off TEA on day 3
- Day 3 - plan transition from epidural to oral analgesia (or CWI in a minority of cases) on the morning of day 3; analgesia failure at this point can be managed by restarting the epidural, commencing CWI, or using intravenous opiate/ketamine and adjuncts

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**Ketamine:**

- Patients may require ketamine in combination with CWI catheters or PCA
- Commence as per guide in current APS manual
- Any patient who is opioid tolerant should have a ketamine infusion

**Other analgesics:**

- Paracetamol 1g qid which should be dose-reduced if there is significant liver disease or malnutrition
- NSAIDs at the discretion of the anaesthetist and APS

**Open Hepatic Resections:**

<table>
<thead>
<tr>
<th>Pre-operative</th>
<th>Intrathecal morphine 200-250mcg (100-150mcg if &gt; 70 years old)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intra-operative</td>
<td>Fentanyl as required (avoid oxycodone/morphine)</td>
</tr>
<tr>
<td></td>
<td>Parecoxib if no contraindication</td>
</tr>
<tr>
<td></td>
<td>CWI catheter insertion with loading dose</td>
</tr>
<tr>
<td></td>
<td>(TEA may be appropriate for specific patients)</td>
</tr>
<tr>
<td>Post-operative</td>
<td>HDU/ICU for all open hepatic resections</td>
</tr>
<tr>
<td></td>
<td>CWI until day 3</td>
</tr>
<tr>
<td></td>
<td>FPCA (may need to change to OPCA after 24 hours when ITM has worn off)</td>
</tr>
</tbody>
</table>

**Whipples and other major upper GI resection including gastrectomy:**

<table>
<thead>
<tr>
<th>Pre-operative</th>
<th>TEA insertion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intra-operative</td>
<td>TEA by continuous infusion</td>
</tr>
<tr>
<td></td>
<td>CWI catheter insertion without loading dose</td>
</tr>
<tr>
<td></td>
<td>Parecoxib if no contraindication</td>
</tr>
<tr>
<td>Post-operative</td>
<td>TEA until day 3 as above</td>
</tr>
<tr>
<td></td>
<td>APS to manage transition from TEA to oral analgesia, or CWI as required</td>
</tr>
</tbody>
</table>

**Oesophagectomy:**

<table>
<thead>
<tr>
<th>Pre-operative</th>
<th>TEA insertion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intra-operative</td>
<td>TEA by continuous infusion</td>
</tr>
<tr>
<td></td>
<td>Parecoxib if no contraindication</td>
</tr>
<tr>
<td></td>
<td>Insertion of extrapleural catheter by surgeons without loading dose</td>
</tr>
<tr>
<td>Post-operative</td>
<td>Effectiveness of epidural to be assessed in PACU</td>
</tr>
<tr>
<td></td>
<td>Plan to run TEA with aim to remove on day 3 or 4</td>
</tr>
<tr>
<td></td>
<td>Consideration given to using R2A2 with a OPCA</td>
</tr>
<tr>
<td></td>
<td>If pain scores ≥ 5 (in chest) and/or patient unable to deep breathe and cough then the extrapleural catheter should be loaded with 6ml of R2</td>
</tr>
</tbody>
</table>

Gabe Snyder December 2017
and a continuous infusion commenced. A decision about whether to run the epidural catheter concurrently will be made on a case by case basis. High opiate consumption after day 5-7 should prompt review by the APS and consideration of a supplemental technique such as an erector spinae block.
Appendix VI

TOTAL KNEE JOINT REPLACEMENT
ANAESTHETIC CLINICAL PATHWAY

Introduction: Clinical pathways can improve outcomes decreasing variability in care resulting in reduced postoperative pain, cost and length of stay (1). Acute pain management can be optimized by use of multimodal systemic analgesia and regional anaesthesia (2). Improved acute pain control is linked to reduced risk of chronic pain at 12 months (3).

PATHWAY GOALS

<table>
<thead>
<tr>
<th>Decrease Pain</th>
<th>Improve early mobilisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease hospital length of stay</td>
<td>Decrease in-hospital falls</td>
</tr>
<tr>
<td>Decrease cost</td>
<td>Decrease surgical site infection</td>
</tr>
</tbody>
</table>

PREOPERATIVE PLANNING

Preoperative education Preconditioning Optimise medical conditions
Trainee to:
Make pre-admission contact with patients and/or their relatives
Review online medical record and investigations Check consent/site marking 1 hour prior
Hospital and holding bay admission times Communicate with anaesthetic nurse

PREOPERATIVE ANALGESIA

Age 70 years or over: Tapentadol SR 50 mg, Paracetamol 1 g
Age < 70: Tapentadol SR 50 mg, Paracetamol 1 g

PERIPHERAL NERVE BLOCKADE

1. Preferred: Continuous (distal) Femoral triangle block, 15 mL of ropivacaine 0.375—0.5% and selective tibial block. (20 mL ropivacaine 0.2%). For information on PNB technique refer to: www.dropbox.com/sh/3xiua09b0eixr8/AACybnueCz0PEGAXO70yjkCoa?dl=0. Alternatively go to: G:\Surgery\Anaesthetics\Operational\ANAES DEPT - Registrar Tutorial Programs\Regional Anaesthesia\QuickHitsMay2017. Also refer to in same folder Femoral_FemoralTriangle_AdductorCanal_Genicular_ForDepartment

2. Optional: Continuous femoral nerve block (CFNB) - initial injection 10 – 20 mL ropivacaine 0.2%, initial infusion rate 6 mL/hour and selective tibial block or (sciatic nerve blockade) 20 mL ropivacaine 0.2%.

INTRAOPERATIVE PHARMACOLOGY

- Dexamethasone 4mg IV  Spinal anaesthesia preferred
- Parecoxib 40 mg (note contraindications)
- Tranexamic acid 1 gm

IN PACU

Commence local anaesthetic infusion (ropivacaine 0.2%) in at PACU 6mL/hr.
If VAS between, 3 and 7: repeat preoperative oral analgesia.
If VAS greater than or equal to 7: IV opioid PCA or repeat block

INTRA VENOUS FLUID ADMINISTRATION

First 18 – 24 hours

1. If feasible, restrict intraoperative fluids to 1–1.5 L (if tourniquet used)
2. Consider Albumex 4% 500 mL over 4 hours
3. Hartmanns 1 litre over 12 hours
4. Albumex 4% 250 mL if urine output < 30 mL/hr in 2 consecutive hours

Morning of postoperative day one

Cease IV fluids and remove indwelling bladder catheter

MULTIMODAL SYSTEMIC ANALGESIA

Paracetamol 1 gm QID
Tapentadol SR 50 mg b.d. (increase to 100 mg b.d. if required) (for 7 days then review)
Tapentadol IR 50 mg q4h and/or Oxycodone IR 5 – 10 mg q3h p.r.n.
Celecoxib 200 mg b.d. (for 3 – 7 days then review)
Contraindications to selective cyclooxygenase inhibitors—renal impairment, coronary stent
Adjust to age, weight and co-morbidities
If VAS greater than or equal to 7; IV opioid PCA, review functionality of regional technique
Gabapentin (consider a nocte dosage, to minimise daytime drowsiness)
Commence aperients postoperative day 1

VARIATION

For Chronic pain, consider
- Ropivacaine 0.375% as injectate (but communicate to surgeons/ward staff)
- Multimodal regional anaesthesia (e.g. epidural/peripheral nerve block)
- Ketamine infusion commence 0.1 mg/kg/hour
- Add or substitute Oxycodone SR 10–20 mg b.d to Tapentadol

OTHER COMPONENTS

DVT prophylaxis
Infection prevention
Early mobilisation
Quality standards and improvement metrics
Engagement of nursing and allied health
Mobilisation: it is expected that patients ambulate on day of surgery (especially if AM case)
Continuous femoral triangle blockade should continue to postoperative day 2, there is no
need to reduce infusion rate to assist with ambulation
APPENDIX VII

Pain Medicine Registrar / Daily Timetable - Duties

MONDAY

0800: Brief round of acute patients with Urgents Registrar – the main duty for the APS Registrar is to flag any particularly problematic patients for discussion at the Grand Round.

0900: Grand Round – Head of Pain Service, APS Registrar, Urgents Registrar, Acute Pain Nurse, Chronic Pain Fellow, Chronic Pain Consultant, Palliative Care Consultants/Registrar and Addiction Medicine representative. All patients currently under the care of the Pain Service (i.e. acute and chronic pain patients) are discussed as concisely as possible. The APS Registrar will present the chronic/more complex cases whilst the Urgents Registrar may present the remainder. Following the meeting, a bedside round occurs. All of the patients including acute and chronic that have been discussed in the meeting should be seen. This meeting is important for a number of reasons, not limited to the following:

1. Complex patients can be discussed, including those yet to be admitted to hospital;
2. The large number of different people/disciplines allows for exchange of ideas/knowledge, referrals can be made etc...
3. Problems that have occurred (e.g. over the weekend), be they systemic or otherwise, can be addressed.

1300: Afternoon round with APS Nurse – It is prudent to commence the afternoon round early to allow time to document plans carefully in our notes/patient histories in complex cases, ensure that infusion orders are up to date, troubleshoot any problems and give a targeted handover to the Urgents Registrar.

TUESDAY

0800: Acute patient round with Urgents Registrar and APS Nurse. It is at the APS Registrar’s discretion whether or not to see all patients together or divide the workload (in most instances, the latter is preferred), with discussion of any issues at the end of the round.

1300: Afternoon off. APS Nurses attend afternoon round liaising with Urgents Registrar.

WEDNESDAY

0800: Acute patient round with Urgents Registrar and APS Nurse.

1000: Multi-disciplinary meeting at Barbara Walker Centre aim to attend once per rotation. Chronic Pain Fellow to be rostered to APS morning pain round.

1300: Round with the APS Nurses.

THURSDAY

0800: Acute patient round with Urgents Registrar. APS nurse will join you at 0930am.

The chronic pain nurse will usually book Dr Safa Hamza and Dr Gavin Weeks’ lists.
FRIDAY

0800: Urgents Registrar undertakes pain round with APS nurse and liaises with APS Registrar (unless of course there is no list). Attend the Department before the start of the Block List to discuss with Urgents Registrar and APS Nurse the acute patients and their plans especially the complicated ones.

0800-0900: See patients on the block list in holding bay, perform pre-procedure questionnaires, and plan for sedation.

0900-1230: Block List (weekly).

1200-1300: Post-block follow-ups in PACU/Barbara Walker Centre.

1300: The Pain Registrar and Weekend Registrar attend the afternoon pain round with Consultant/APS nurse. On Fridays, it is especially important that plans for the weekend are clearly documented on the APS online program, discussed with treating team where relevant and also documented in patient histories as appropriate.

SATURDAY

0800: Anaesthetic registrar and resident attend morning pain round.

SUNDAY

0800: Weekend resident attends the morning pain round liaising with urgent registrar if required.
**APPENDIX VIII**

**PUMPS and PROGRAMMING**

**Alaris – PCA** All PCA modalities are programmed into the guard rails of the Alaris PCA. The Alaris PCA module is used with a dedicated Carefusion PCA IV line and a 50ml syringe.
Patient History:

1. Press CHANNEL SELECT key.
2. Press OPTIONS.
3. Press PATIENT SELECT.
   Note: The top of the Patient History screen displays:
   - the exact time frame for the patient historical data (e.g., 09:00 - 10:00)
   - time past history was last cleared.
4. Press ZOOM key (time interval) as appropriate and review drug totals.
5. To clear patient history, press CLEAR HISTORY and then press YES or NO.
6. To view 24 hour totals, press 24 hTotals.
   Note: This is a moving window of time, meaning that after 24 hours the Patient History rewrites.
7. Press EXIT and then press START.

PCA/Monitoring Trend Data:
Not: This function requires use of Alaris® PCA monitoring module(s).
1. Press CHANNEL SELECT on monitoring module.
2. Press OPTIONS.
3. Press PCA/Monitoring Trend Data.
4. To exit, press MAIN.
5. Press MAIN SCREEN.

Change PCA Pause Alarm Limits:
1. Press CHANNEL SELECT key on PCA module.
2. Press OPTIONS.
3. Press PCA Pause Limits.
4. Select desired parameter and enter value.
   Note: If acceptable range value is not within the hospital's defined range, a prompt is provided.
5. Follow on-screen prompts.
6. Press CONFIRM and press START.

Responding to PCA Pause Alarm:
1. Always follow hospital protocol.
2. Press CONFIRM.
   Note: Main screen shows "PAUSED" The Alaris® PCA module cannot be restarted until patient's monitoring values have been re-established and are within hospital established limits.
3. Press START.
   Note: To view time and patient PCA pause value that caused the PCA module to pause, access Drug Event History.

Disabling and enabling PCA Pause Alarm:
1. Press CHANNEL SELECT key on PCA module.
2. Press OPTIONS.
3. Press PCA Pause Limits.
4. Select Disable SpO2 or Disable ETCO2.
5. Press CONFIRM.
6. Press START.
   Note: To enable a PCA Pause function, follow steps 1-3 then press Enable SpO2 or Enable ETCO2.

Change Dose Request Cord audio and light setting:
1. Press CHANNEL SELECT key.
2. Press OPTIONS.
3. Press Dose Request Set-up.
4. Select desired Dose Cord Profile.
   (1 = light flashes, 2 = light on, 3 = light off)
5. Press CONFIRM then press START.

To attach the Dose Request Cord:
Align the red markings on both the Alaris® PCA module and Dose Request Cord.

To detach the Dose Request Cord:
Hold the body of the connector on the Dose Request Cord and pull straight away from the Alaris® PCA module, without twisting or turning.

Detaching the Alaris® PCA Module:
Use PCA key to unlock door. Locate black lever inside at bottom left and depress. At the same time, hold the Alaris® PCA module and move the bottom of the Alaris® PCA module away from the Alaris® PCA unit.

Troubleshooting:
Alarms, errors, messages
Note: During an alarm state, the Alaris® PCA module is no longer influencing.

Incorrect concentration or dosing:
An incorrect concentration or dosing parameter may have been programmed which could result in an excessive volume or dose being delivered.
1. Remove syringe.
2. Verify the concentration listed on syringe matches concentration (DRUG AMOUNT and DEVIANT VOLUME) programmed into PCA module.
3. Reprogram.
   Note: This message can be the result of an incorrect DRUG AMOUNT and/or DEVIANT VOLUME entry or can occur if a hospital-established Guardrails® limits are very wide.
   Be sure to enter either a drug amount per 1 mL or total drug amount per total volume. For example, a 30 mL syringe with concentration of 1 mg/mL can be entered in one of 2 ways:
   - DRUG AMOUNT 1 mg
   - DEVIANT VOLUME 30 mL
   Or
   - DRUG AMOUNT 30 mg
   - DEVIANT VOLUME 1 mL

Maximum Limit Reached:
Programmed maximum limit has been reached over time period specified. Infusion paused until time limit has expired. Alarm message Max Limit Reached will scroll in channel message display on the Alaris® PCA module. To silence safety alarm tone, press SILENCE key. The Alaris® PCA module will remain silent.

Near End of Infusion Alert (NEOA):
Alert message Near End alternates with remaining VTI on the screen until syringe is empty. Alert message will scroll in channel message display on the Alaris® PCA module. The Alaris® PCA module remains functional and will continue infusing. To silence safety alert tone, press SILENCE key. The Alaris® PCA module will remain silent until the Syringe Empty alarm sounds. When programmed in PCA Dose Only mode, the Green indicator light illuminates only when a PCA dose is being delivered. When programmed in PCA Dose and Continuous mode, the Green indicator light remains illuminated. Yellow indicator light will flash during NECI Alert.

Syringe empty:
Alarm message Syringe Empty will scroll in channel message display on the Alaris® PCA module. To silence safety alarm tone, press SILENCE key. The Alaris® PCA module will remain silent approximately two minutes and will re-sound.
REM Bodyguard

All perineural and epidural infusions will run on the REM Bodyguard 595 pump. The infusion sets will be colour coded:

- Yellow = epidural
- Green = perineural