ST VINCENT'S HOSPITAL MELBOURNE

Department of Anaesthesia and Acute Pain Medicine

Acute Pain Service - Manual 2024

10. Appendices

Further References

The NHMRC document "*Acute Pain Management: Scientific Evidence Fifth Edition (2020)*" can be found on the ANZCA website.

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

G: /Surgery/Anaesthetics/Operational/APS References/APS Manual

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

Prepared by members of the APS Team – January 2024

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1. The ACUTE PAIN SERVICE

1. INTRODUCTION

The Acute Pain Service provides care for patients requiring specialised acute pain management.
The main areas of involvement are with post-operative pain relief, especially with epidural and peri-neural techniques or patients with complex pain problems.
Through liaison with the Barbara Walker Centre for Pain Management the APS is involved in the inpatient management of some chronic pain patients.

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, in order to satisfy the curriculum requirements of the 'Pain Medicine' module of the revised FANZCA

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

2.4 To improve liaison between other clinical pain management departments and primary health teams including the Barbara Walker Centre for Pain Management, Caritas Christie Palliative Care Unit and the patient's General Practitioner (GP).

2.5 To provide a nurse led APS Perioperative Pain Clinic (APS PPC) for complex pain patients having surgery

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
- Peri-neural blocks (e.g. Paravertebral, Intercostal, Femoral, Brachial plexus blocks)
- Continuous peri-neural infusions
- Non-steroidal anti-inflammatory agents
- 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 14471) will provide this support. A daily ward round or review of patients with the Pain Registrar and urgent Registrar of the day and the Acute Pain Nurse should be conducted. It is expected that the Day Urgent registrar will contact the Pain Registrar or Pain Nurse (14427), and join the Acute Pain Service (APS) at 0800 for the first pain round. During the pain round, the Urgent Registrar is expected to attend codes, and may be called away by the anaesthetist in charge. At 0900 on Monday mornings, there is a multi-disciplinary meeting and presentation. The late evening ward rounds are to be carried out by the evening HMO. 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.

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 Centre for Pain Management. 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. The Pain Registrar /Acute Pain Nurse will hand over each day to the evening HMO. 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

After meeting with the anaesthetist in charge it is expected that the urgent registrar should attend the morning APS ward rounds each day in conjunction with the Acute Pain Nurse and the Pain Medicine Registrar, or at the very least to contact the Pain Team to determine if they have sufficient resources. In hour referrals should be redirected to the Pain Medicine Registrar. After hour referrals are made to the urgents registrar, and temporised, and will be handed over to the Pain Medicine Registrar and/or the Acute Pain Nurse in the morning.

4.4 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 -Thursday 0830-1700. They can be contacted on Pager 1173, or extension 14187 or, if urgent on extension 14427.

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
- Managing all aspects of the Nurse-led APS Perioperative Pain Clinic including referrals and telehealth consults. Including liaison with the treating team, the anaesthetist and the patients GP.
- 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 patients via the online APS data base

4.5 HMO EVENING- 2200/WEEKEND COVER

From Monday – Friday the HMO should contact the Acute Pain Registrar/Acute Pain Nurse (ext 14427) at approximately 1630 for a handover. All patients with an epidural are seen three times a day which includes an evening review by the HMO.

> Epidural assessment and management is fundamental to this role.
>
> We encourage you to come along on a pain round or observe an epidural assessment with Kim or Wendy at any time. We are also happy to be contacted in the office anytime with questions or queries.

Other patients may need review, including those with complex analgesic regimes, difficult to manage pain or sedation. Each patient review should include a patient assessment, discussion with the bedside nurse and documentation of visit on the APS database. Please ensure there are adequate PCA/epidural orders for each patient. If you are unsure how to manage any patient please contact the PM Urgent Anaesthetic Registrar (ext. 14522) for advice. At the end of the shift please handover to the Night Urgent Anaesthetic Registrar the patients with an epidural and those that may be problematic. This ensures they have up to date information in case they get calls about the patient overnight.

Referrals for a new patient rarely happens in the evening. If it is a non-urgent referral, the referring person should be advised to call back during business hours, or the patient's details placed on the database for the APS registrar to follow up on in the morning. If the patient is needing urgent review, they should be asked to call the PM Urgent Anaesthetic Registrar (ext 14522) for a phone consult.

For more information about Epidural Troubleshooting and assessing for ketamine and lidocaine adverse effects please see Resources section of the APS Database

4.6 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 & 7 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 Urgent Anaesthesia Registrar (if available) will see the more complex patients prior to the meeting which will allow them to present patients for discussion. New referrals 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 evening HMO who will then hand over to the Night Registrar before leaving that 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 1**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 being 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 common for referrals to the Acute Pain Service to be made as a “last resort” by the referring unit, or because they may be unfamiliar with other assistance available. 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, and suggestions for involvement of the Addiction Medicine team may be appropriate. 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. If there is likely to be significant delay, it may also be helpful to provide temporising advice via phone;

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.

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 circumstance 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

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°) 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 in-situ. 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

Background rate	6 - 10 ml/h
Bolus volume	5 - 6 ml
Lockout interval	20 mins

Discontinuation of Epidural Infusions

PLEASE NOTE THE REASON FOR DISCONTINUATION ON THE APS Database

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

Anticoagulants and removal

- Ensure no coagulopathy INR 1.3 or less (check INR in hepatic surgery patients – should be 1.4 or less)
- No active anticoagulants **(see Table Appendix IIIb)**
- Note: LMWH should be dose adjusted in renal impairment (Creatinine Clearance <30); if not dose adjusted, longer periods of time required e.g. waiting 24 hrs instead of 12 hrs
- After **therapeutic LMWH** (1mg/kg B.D.) dosing – wait 24 hours after dose in patients **with normal renal function** (may need longer if significant renal impairment). They can have therapeutic LMWH 4 hours after removal.
- For **Unfractionated heparin infusion** – wait 6 hours after cessation and ensure normalisation of APTT prior to manipulation or removal of epidural. Unfractionated heparin infusion can be started/restarted 1 hour after catheter manipulation/removal without a bolus. Consider waiting 24 hours if there was a traumatic puncture.

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, oxycodone & 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 is 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: 10mg in 50mls N. Saline = 0.2mg/ml. PCA bolus 0.2mg however can be increased or decreased depending on patient requirements. 5 minute lockout.

Buprenorphine – dose 1500mcg in N.Saline 50mls = 30mcg/ml. PCA bolus dose is 1ml. 10 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

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)

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

Pruritus

- Do nothing if pruritus is mild
- Change to different opioid (Morphine to Fentanyl or Morphine to Oxycodone)
- Consider small dose Naloxone (40mcg, may need repeating so if effective consider as PRN)
- Consider antihistamine with minimal sedative properties (i.e. Zyrtec)

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. INTRAVENOUS & 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 leading to rapid uptake and severe respiratory depression. Small doses should be prescribed and the patient monitored closely. Only APS/ PCCS/ ICU/Renal/ Anaesthetics Consultants and Registrars may prescribe and manage as per SVHM *Guideline for Opioid Analgesic Use in the Acute Setting.* Note ED occasionally prescribe in ED, these orders should be ceased if patient is on ward.

Suggested dosing: **25mcg subcut four hourly PRN**

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.

Extrapleural 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 Extrapleural analgesia:

Infusion: Ropivacaine 0.2% given at 5 - 10 ml/hr or Autobolus regime. 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 plane block which produces a multi-dermatomal sensory block. It is a reasonable alternative when conventional blocks (paravertebral, epidural) are unable to be performed (e.g. Anticoagulated patients may be suitable on a case by case basis).

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 (may vary on insertion location): ~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.

When blocked bilaterally, may anaesthetise midline anteriorly – but unilateral block usually ends at mid clavicular line as above due to anterior intercostal branch crossover.

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 coagulation derangement/on anticoagulants
- Can be performed as single shot block or catheter inserted to run as infusion. Unilateral or bilateral blocks can be performed as indicated

Disadvantages

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

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 (Transversus Abdominis Plane) – useful for patients undergoing surgical procedures via an abdominal incision. For a midline incision bilateral blocks are necessary to ensure that crossover sensory afferents from contralateral 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. Ropivicaine 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). 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, luer lock tightened and tegaderm covering connections

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 or Boluses?

It is the decision of the inserting anaesthetist to either prescribe a background infusion with prn boluses or programmed intermittent boluses (Autobolus) which can be delivered by the pump. For spaces that accommodate more volume we would recommend using programmed intermittent boluses. Current ERAS protocols for UGI surgery utilise the programmed intermittent bolus mode. See Appendix V.

Programmed Intermittent Boluses

There is evidence to suggest this mode provides superior pain relief by providing a larger volume of LA on a regular basis. The rate depends on the number of catheters inserted and the weight of the patient.

The following protocols are programmed into our REM pumps

1 catheter – 20ml bolus every 4hrs (1ml/hr background) with a prn nurse initiated 10ml bolus per hour

2 catheters – 20ml bolus every 6hrs (1ml/hr background) with a prn nurse initiated 10ml bolus per hour

2 catheters (low weight < 50kg) – 10ml bolus every 6 hrs (1ml/hr background)

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.

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. panadeine / panadeine 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.

- *Slow release opioids are not recommended for use in the management of patients with acute pain. In most patients, the pain intensity will decrease reasonably rapidly over a few days. Patients who are already taking a slow-release opioid prior to admission, including those in opioid substitution programs are tolerant to and physically dependent on that opioid. Their slow release opioid should be continued.*
- *In postoperative or post traumatic patients with prolonged pains state, it may sometimes be useful to introduce a slow release opioid in a previously opioid naïve individual on a temporary basis. Communication with the primary care provider (including Rehabilitation Services) or general practitioner about the temporary basis of the prescription is essential (http://www.anzca.edu.au/resources/endorsed-guidelines/position-statement-on-the-use-of-slow-release-opioid) March 2018*

Morphine sulphate: Usually well tolerated

Anamorph, Morphine mixture, Ordine (**Rapid Release**)
Kapanol capsules (**Slow Release**)
MS Mono (**Slow Release**)

Buprenorphine: Potentially an option for patients NBM, as sublingual absorption/bioavailability is reasonable

Temgesic lozenges (**Rapid Release**)
Norspan patches – specialist advice before commencing (**Slow Release**)

Hydromorphone hydrochloride: 5-7 times stronger than morphine

Hydromorphone – Dilaudid (**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 (Usually given in OR/PACU)

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.

Tramadol (TRAMAL)

- Available in oral slow release (SR) and immediate release (IR) formulation
- Loading dose may cause nausea/vomiting so give 100 – 150 mg IV during surgery
- Maintenance dose if IR 50-100mg 4-6 hrly IM/IV/PO (halve doses in elderly)

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
- Caution when using frequent dosing in patients with cardiovascular risk factors
- 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 Addiction Medicine Unit)

Precautions:

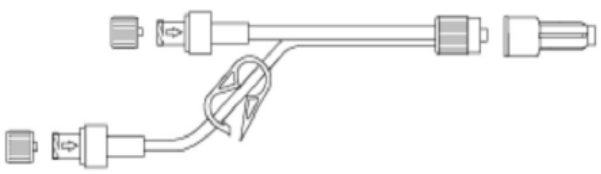
- Pre-existing high levels of opioid may result in respiratory depression when ketamine is added to the regime.
- Hallucinations and delirium may occur, especially at higher doses. A patient who is relatively immobile and slow to verbally respond may be experiencing these phenomena. Dose reduction and 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/ mg/kg/h. Make dose adjustments 2-4 hour tions 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.

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.

No other opioids are to be given to the patient within the first 18 hours unless ordered by an anaesthetist/anaesthetic registrar.

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.

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

These observations are to be done 4 hourly thereafter.

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 or tapentadol, **Paracetamol & 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, immediate release opioid should be prescribed. 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 bioavailabilty 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 Opioid Replacement Therapy)

Tablets (Physeptone) i.e.: used as analgesic in divided doses

Titration & Monitoring

Intravenous - *If methadone is given intraoperatively for postoperative analgesia the monitoring is the same for intrathecal morphine – i.e. hourly observations for 12 - 24 hours. Careful consideration needs to be given to the use of supplemental opioids or sedating analgesics over this time. The frequent QT prolongation is also of concern and needs particular care when other drugs (eg droperidol) are administered as well. It is advised that a baseline QTc be measured on all proposed patients before administration.*

Oral - 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, 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 reintroducing the Buprenorphine (liaising with Addiction Medicine) 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
    - Dose used = 300-400 IU/day (intranasal/IM)
    - 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:
    - Dosing of 100 IU daily as SC injection or IV infusion (in 100ml normal saline over 1 hour)
    - Prophylactic anti-emetics
    - 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

Neuropathic pain is now defined by the International Association for the Study of Pain (IASP) as 'pain caused by a lesion or disease of the somatosensory nervous system.' 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, tramadol or tapentadol. In addition:

Drug treatment for neuropathic pain – updated recommendations from the International Association for the Study of Pain (2018)

Recommendation	Drugs
First-line	• SNRI - duloxetine, venlafaxine • Tricyclic antidepressants • Gabapentin, pregabalin

Recommendation	Drugs
Second-line	• Capsaicin 8% patches • Lidocaine (lignocaine) patches • Tramadol
Third-line	Strong opioids

- **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
- **Pregabalin**
        - Start 25- 50mg for elderly/renal impairment or up to 75mg nocte
        - 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
    - Pregabalin may need to be continued post-discharge, however if symptoms continue and there is no improvement pregabalin should be weaned and ceased.
    - Pregabalin is preferred over gabapentin in patients who require more rapid titration, and for it's easier twice daily dosing
    - Pregabalin is an anxiolytic, there is emerging evidence of significant pregabalin abuse (Australian Prescriber, June 2018)
    - **Adverse effects**
        - Sedation, dizziness and somnolence
        - Ataxia and gait disturbance (risk of falls)
        - Oedema, weight gain
        - Association with suicidality

- **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, 2020).

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

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 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

- Acute Pain Management: Scientific Evidence Fifth Edition 2020
- APS Manual 2023
- Australian Prescriber
- Horlocker, T et al (2018) Regional Anesthesia in the Patient Receiving Antithrombotic or Thrombolytic Therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (Fourth Edition). Anesthesia and Pain Medicine April 2018, Vol 43 Issue 3, p263-309
- *Langevin, PB, Gravenstein, N, Langevin, SO, Gulig, PA. Epidural Catheter Reconnection. Safe and Unsafe Practice. Anaesthesiology 1996: 85 883-8.*

APPENDIX I

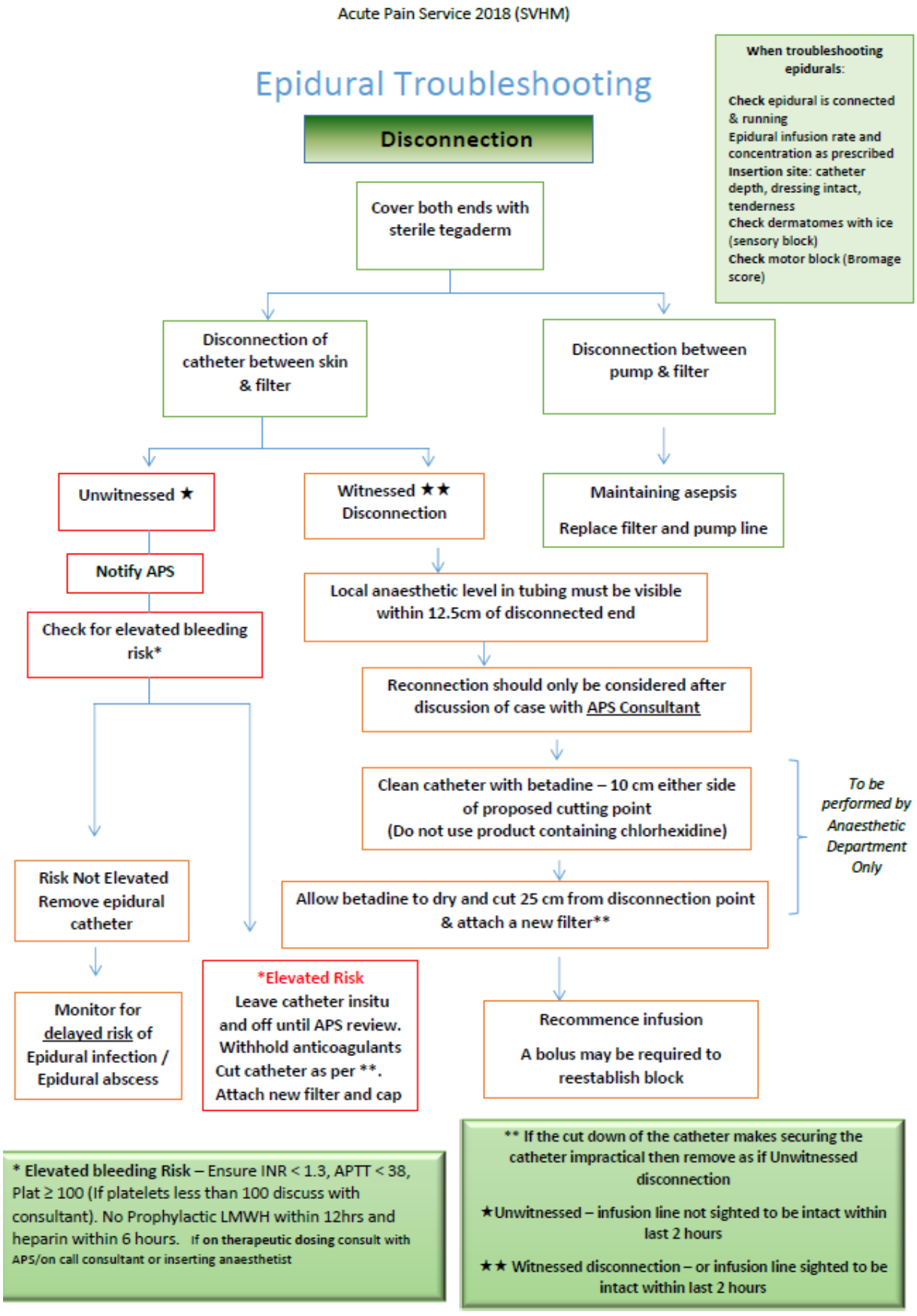
Drug	Drug Amount	Final Volume	Final Concentration	Bolus doses	Lockout
Fentanyl	1000mcg	50ml	20mcg/ml	20mcg (10-30)	5mins
Oxycodone	100mg	50ml	2mg/ml	1mg (0.5-2)	5mins
Morphine	100mg	50ml	2mg/ml	1mg (0.5-2)	5mins
Hydromorphone	10mg	50ml	0.2mg/ml	0.2mg	5mins
Buprenorphine	1500mcg	50ml	30mcg/ml	30mcg/ml	10 mins

Table 1. PCA quick reference guide

Drug	Drug Amount	Final Volume	Final Concentration	Infusion starting rate	Max infusion rate
Ketamine	200mg	100ml	2mg/ml	0.1-0.2mg/kg/h	0.3mg/kg/hr
Lidocaine	2500mg	50ml	50mg/ml	1.0mg/kg/hr	2.0mg/kg/hr

Table 2. Adjunct analgesic infusions quick reference guide

Appendix II - Guideline for Management of Epidural Disconnection



APPENDIX IIIa

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 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 **prophylactic** dose of LMWH or 24 h after a **therapeutic** dose (e.g. b.d. dosing), and withhold subsequent dosing for 4 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 for 24 hours 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.

See:
http://intranet/Policies/Medication%20Administration%20Policies/Management%20of%20Antithrombotic%20Agents%20in%20the%20Perioperative%20Period.pdf

References

Kietaibl, S., Ferrandis, R et al (2022) Regional anaesthesia in patients on antithrombotic drugs: Joint ESAIC/ESRA guidelines: European Journal of Anaesthesiology

Horlocker, T., Vandermeuelen, E, et al (2018) Regional Anesthesia in the Patient Receiving Antithrombotic or Thrombolytic Therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (Fourth Edition)

Narouze, S. et al. (2015). Interventional Spine and Pain Procedures in Patients on Antiplatelet and Anticoagulation Medications. Guidelines from the ASRA, the ESRA, the APS, the INS, the NANS and the WIP. *Regional Anaesthesia and Pain Medicine.* May/June, Vol. 40. Issue 3. P. 182-212.

Appendix III b

MANAGEMENT OF ANTI-COAGULANTS AND ANTI-THROMBOTIC MEDICATIONS IN CONJUNCTION WITH NEURAXIAL PROCEDURES

MEDICATION	PRIOR TO NEURAXIAL	WHILE CATHETER IN SITU	PRIOR TO REMOVAL	AFTER REMOVAL[#]
Agents for Prophylactic Anticoagulation				
Subcutaneous unfractionated (UF)-heparin **Daily dose <10,000 units**	Withhold for at least 6 hrs	Do not give heparin until >1 hr AFTER insertion	Withhold for at least 6 hrs PRIOR to removal	Wait at least 1 hrs AFTER removal
Low Molecular Weight Heparin (LMWH)	Withhold at least 12 hrs 24 hrs if CrCl <30ml/min	Do not give LMWH until 12 hrs AFTER catheter insertion	Withhold for at least 12 hrs PRIOR to removal 24 hrs if CrCl <30ml/min	Wait at least 4 hrs AFTER removal
Rivaroxaban	Withhold at least 24 hrs If renal impairment, see below*	Not recommended	Not recommended	Wait at least 6 hrs AFTER removal
Apixaban	Withhold at least 36 hrs If renal impairment, see below*	Not recommended	Not recommended	Wait at least 6 hrs AFTER removal
Dabigatran	Withhold at least 48 hrs If renal impairment, see below*	Not recommended	Not recommended	Wait at least 24 hrs AFTER removal
Agents for Therapeutic Anticoagulation				
IV UF-Heparin **Daily dose 10,000-20,000 units**	Withhold for at least 12 hrs PRIOR to insertion. Document normal APTT pre-procedure	Do not give until at least 1 hr post insertion (Wait longer if there was a 'bloody tap')	Withhold for at least 12 hrs PRIOR to insertion. Check normal APTT	Wait at least 1 hour AFTER removal (Consider waiting 24 hrs if there was traumatic puncture)
IV UF-Heparin **Daily dose >20,000 units**	Withhold for at least 24 hrs PRIOR to insertion. Document normal APTT pre-procedure	Do not give until at least 1 hr post insertion (Wait longer if there was a 'bloody tap')	Withhold at least 24 hrs PRIOR to removal	Wait at least 1 hour AFTER removal (Consider waiting 24 hrs if there was traumatic puncture)

MEDICATION	PRIOR TO NEURAXIAL	WHILE CATHETER IN SITU	PRIOR TO REMOVAL	AFTER REMOVAL[#]
LMWH	Withhold for at least 24 hrs PRIOR to insertion 48 hrs if CrCl <30ml/min	Do not give until at least 12 hrs AFTER catheter insertion	Withhold for at least 24 hrs PRIOR to removal 48 hrs if CrCl <30ml/min	Wait at least 4 hrs AFTER removal
Warfarin	Warfarin should be withheld or reversed until INR < 1.5 prior to procedure	Contraindicated	Ensure INR < 1.5	Wait until at least 4 hrs AFTER removal
Direct Oral Anti-coagulants (DOACs)	72 hrs	Not recommended	Not recommended	Wait at least 6 hrs AFTER removal

* If CrCl < 30ml/min, longer delays are required
# A longer delay may be required if there are multiple punctures or traumatic insertion of spinal/epidural catheter

DOSING REGIMES FOR PROPHYLACTIC AND THERAPEUTIC AGENTS		
Medication	**Prophylactic Doses**	**Therapeutic Doses**
Low Molecular Weight Heparins (LMWH)		
Enoxaparin (Clexane®)	40 mg once daily	1mg/kg BD or 1.5 mg/kg once daily
Dalteparin (Fragmin®)	5000 international units once daily	100 international units/kg BD
Danaparoid (Orgaran®)	750 units 12 hourly	As per haematology unit
Factor Xa inhibitor		
Fondaparinux (Arixta®)	2.5 mg once daily	5 mg, 7.5 mg or 10 mg once daily (Weight dependent)
Direct Oral Anticoagulants		
Dabigatran (Pradaxa®)	150mg or 220 mg daily	150mg BD
Apixaban (Eliquis®)	2.5mg BD	10mg BD for 7 days, then 5mg BD
Rivaroxaban (Xarelto®)	10mg daily	15mg BD or 20mg daily

	When to cease PRIOR to insertion	When to resume AFTER catheter removal
Antiplatelet Agents		
Aspirin	No restriction	No restriction
Non-aspirin NSAIDs	No restriction	No restriction
COX-2 NSAIDs	Do not need to be ceased prior to neuraxial procedures	No restriction
Clopidogrel	At least 7 days prior	Recommence after catheter removal
Prasugrel	At least 7 days prior In low bleeding risk procedures, contact Anaesthetist - Cessation may not be necessary	Recommence 6 hrs after catheter removal
Ticagrelor	At least 7 days prior In low bleeding risk procedures, contact Anaesthetist - Cessation may not be necessary	Recommence 6 hrs after catheter removal
Dipyramidamole	At least 2 days prior if high bleeding risk procedure	Recommence 24 hrs after catheter removal

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

Acute Pain Protocol for Upper GI ERAS patients

Version 5 (Feb 2022)

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, ward nurses, 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 post-operative opiate with ITM (should initially be a FPCA)
- Duration of post-operative epidural and CWI infusions (the Acute Pain Service will manage transition from TEA/CWI to oral analgesia on day 3)

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 patients having major upper GI resections are mandatory referrals to PAC-Anaesthesia. They will receive education on analgesia and components of the ERAS program in this and other settings.

Post-op ICU/HDU:

- All Whipple's operations and other major open upper GI resections should go to HDU or 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, unless it is a small resection in a young or otherwise healthy patient
- All oesophagectomy patients should go to HDU/ICU post-operatively
- Laparoscopic surgery patients do not automatically go to HDU/ICU

Protocol for Intrathecal Morphine (ITM):

- Dose to be 200-250mcg if < 70 years old and 100-150mcg if > 70 years old
- Other management consistent with current APS Manual, in particular hourly sedations scores and respiratory rate monitoring for 24 hours
- Post-op fentanyl PCA (20-30mcg boluses), and this can be used immediately
- Very low threshold for HDU/ICU – **all open liver resections receiving ITM should go to HDU**

Protocol for continuous wound infiltration (CWI):

- The preferred device is the "Infiltralong"
- Insertion – the surgeon should place it in the posterior rectus sheath or between internal oblique and transversus abdominis; it should not be placed in the pre-peritoneal plane
- 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 – we have pumps pre-programmed with an autobolus; you will need to choose either the 1 catheter, 2 catheter or 2 catheter (low weight) options (see table 1)
- Patients with two separate catheters should be connected to two separate pumps and use the 2 catheter protocol in Table 1
- 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 anaesthetic dose should not exceed 15ml of ropivacaine 0.2% per hour and will need to be lower in low weight, malnourished or other complex patients.

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

1 wound catheter	Loading dose in theatre	40 ml 0.5% ropivcaine
	Background infusion rate	1 ml/hr ropi 0.2%
	Auto-Bolus	20 ml ropi 0.2% 4 hourly
	Manual bolus (for break thru pain)	10 ml ropi 0.2% 1 hourly
2 wound catheters (each one to be numbered; each one needs its own ropivacaine infusion chart)	Loading dose in theatre	20 ml 0.5% ropivacaine in each catheter
	Background infusion rate	1 ml/hr ropi 0.2% via each catheter
	Auto-Bolus	20 ml ropi 0.2% 6 hourly via each catheter
	Manual bolus (for break-thru pain)	10 ml ropi 0.2% 1 hourly
2 wound catheters in a < 50kg patient (each one to be numbered; each one needs its own ropivacaine infusion chart)	Loading dose in theatre	10-15 ml 0.5% ropivacaine in each catheter
	Background infusion rate	1 ml/hr ropi 0.2% via each catheter
	Auto-Bolus	10 ml ropi 0.2% 4 hourly via each catheter
	Manual bolus (for break-thru pain)	Call APS

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

9 am on day 3	Epidural infusion to cease; epidural catheter to remain in situ; follow APS LMWH guidelines – i.e. withhold *prophylactic* LMWH for 12 hours before removal; platelet count and clotting should be checked, especially with liver resections Consideration given to starting oxycodone/naloxone with a loading dose at this point
11 am on day 3	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)

Protocol for thoracic epidural (TEA) management:

- Majority of 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 adequate thoracic analgesia or if the patient is unable to deep breathe and cough then the extrapleural / paravertebral catheter which the surgeon will have inserted should be loaded with 6-10ml of ropivacaine 0.2%, and then a 2 catheter autobolus program should be commenced. A minority of patients may require both the epidural and paravertebral catheter.
- 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; ileus, constipation and nausea can be significant side-effects and cause difficulty with the ERAS programs;

Ketamine:

- Patients may require ketamine in combination with wound catheters, epidural 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, however a single intra-op dose of parecoxib will be appropriate for the majority of patients

Open Hepatic Resections:

Pre-operative	Intrathecal morphine 200-250mcg (100-150mcg if > 70 years old)
Intra-operative	Fentanyl as required Parecoxib if no contraindication CWI catheter insertion with loading dose (TEA may be appropriate for specific patients, but is not part of the standard protocol)
Post-operative	HDU or ICU CWI until day 3 FPCA (may need to change to OPCA after 24 hours when ITM has worn off)

Whipples and other major upper GI resection including gastrectomy:

Pre-operative	TEA insertion
Intra-operative	TEA by continuous infusion Wound catheter insertion without loading dose Parecoxib if no contraindication
Post-operative	TEA until day 3 as above APS to manage transition from TEA to oral analgesia, or CWI as required

Oesophagectomy:

Pre-operative	TEA insertion
Intra-operative	TEA by continuous infusion Parecoxib if no contraindication
Post-operative	Effectiveness of epidural to be assessed in PACU TEA with aim to remove on day 3 or 4 Consideration given to using R2A2 with a OPCA If pain scores > 5 (in chest) and/or patient unable to deep breathe and cough then the extrapleural catheter should be loaded and used (see above) A ketamine infusion may be required, especially for a 3-stage oesophagectomy with a cervical incision High opiate consumption after day 5-7 should prompt review by the APS and consideration of supplemental techniques such as an erector spinae block

Laparoscopic cases that convert to open:

Pre-operative	NA
Intra-operative	CWI insertion with loading dose Parecoxib if no contraindication
Post-operative	CWI until day 3 FPCA Consideration given to ketamine infusion

Audit and data collection:

In addition to routine data collection by the APS, we will be auditing compliance with this protocol as part of the ERAS audit. Results will be presented at 6 monthly intervals.

This Clinical Guideline is to be used in conjunction with existing St Vincent's Hospital and ANZCA Policies.

APPENDIX VI

ST VINCENT'S HOSPITAL MELBOURNE

Dept. Anaesthesia and Acute Pain Medicine

ERAS Analgesia Protocol for Elective Colectomy

Version 2017.01 date published 25/5/2017
Authors: T Phan, C Scarff, D Scott, on behalf of the department of Anaesthesia and Acute Pain Medicine

This Enhanced Recovery After Surgery (ERAS) protocol covers the pain management for elective colectomies. Clinician preference and individual patient requirements would inform the final management plan. However, much of the protocol is to formalise what is already considered best practice and sensible. All contra-indications, relative or absolute, need to be considered in relation to any drug or therapy suggested in the guidelines.

The aims of pain management in ERAS patients are to focus on improving mobility while limiting impairment of function. Analgesia needs to be established effectively with a view to limiting side effects of analgesic drugs and regional techniques. Transition to oral analgesia should be done as soon as is practicable.

Period	Laparoscopic colectomy, or Lap assisted	Open colectomy
Preop		Epidural[1]: Load with 10 – 15 mL 0.2% Ropivacaine + 100 ug fentanyl. Commence post-op preparation (as per APS guidelines[1]) of Ropivacaine 0.2% + Fentanyl + adrenaline while intraop.
Intraop	Paracetamol 1g IV Parecoxib 40mg IV[2]	
	Opioid IV (eg. morphine or fentanyl)	
	TAP or other fascial plane block (single shot or catheters) if converting to open	TAP or other fascial plane block if epidural contraindicated or inadequate
	Anti-emetics as per PONV guidelines[3]	
Recovery	Opioid titration by PACU nurses	Assessment and management of optimal block. Prompt referral for review if inadequate epidural block.[4]
	Ketamine infusion if pain not responding to usual doses of opioid: refer to APS [5]	
Postop	PCA opioid: cease when tolerating oral diet and can transition to oral analgesia.	Epidural solution: as per APS guidelines. Cease on D2 post op if practical.

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 if available, 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.

1330: 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 evening HMO r.

TUESDAY

0800: Acute patient round with Consultant Anaesthetist 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.

1330: Afternoon round with APS Nurse.

WEDNESDAY

0800: Acute patient round with Consult Anaesthetist 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.

1330: Round with the APS Nurses.

THURSDAY

0800: Acute patient round with Consultant Anaesthetist and APS nurse.

The chronic pain nurse will usually book the Interventional Pain list for Friday am.

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. Pain Medicine Registrar afternoon off.

1330: The Weekend Registrar undertakes the pain round with the 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.

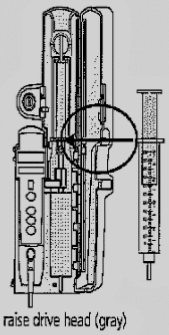
APPENDIX VIII

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.

Alaris® PCA module pocket guide

Warning: before loading or unloading syringe, always turn off fluid flow to the patient using tubing clamp. Uncontrolled fluid flow can occur when administration set is not clamped or turned off and may cause serious injury or death.



Loading the syringe:

1. Pull syringe barrel clamp out, rotate it to left, gently release it.
2. Twist gripper control clockwise to raise drive head (gray) to its fully extended position.
3. Insert syringe by sliding flat edges between barrel flange grippers (see drawing).
4. Lock syringe in place by closing barrel clamp. To close barrel clamp, pull out and rotate it to right.
5. Twist gripper control clockwise, gently lower drive head, release gripper to lock plunger in place.

Priming the Syringe using the Alaris® PCA module:

Note: *Do not prime while attached to patient.*

1. **Prime** soft key is available only after Syringe Type and Medication selection (prior to infusion mode selection).
2. At Infusion Mode screen, press **OPTIONS**, then press **PRIME SET WITH SYRINGE**.
3. Press and hold **PRIME** key to prime tubing.

Programming guide

Initial set-up:

1. Load syringe with administration set attached.
2. Press **SYSTEM ON KEY**.
3. Select **Yes** or **No** to **"New Patient?"**
4. Select appropriate profile.
5. If required, enter patient identifier or press **EXIT**.
6. Press **CHANNEL SELECT** key.

Operator Precautions: For proper operation of the Alaris® System the user must be familiar with the features, disposables, administration sets, set-up and programming.

This guide includes selected information and suggestions and is not intended to be comprehensive instructions for the set-up and operation of the Alaris® System. For complete instructions along with Warnings and Cautions, refer to Alaris System Directory for Use (vii).

carefusion.com

CareFusion

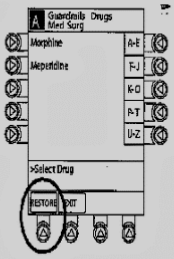
7. Set key to **PROGRAM** position.
8. Confirm time of day or change time if necessary.
9. Select correct syringe type and size. Press **CONFIRM**.
   Note: *If installed syringe is not listed, press* ***ALL SYRINGES*** *and select correct syringe type and size.*
10. Select correct medication and concentration.
11. At Infusion Mode screen, press **OPTIONS**, then press **PRIME SET WITH SYRINGE**.
12. Press and hold **PRIME** key to prime tubing.
    Note: *Do* ***not*** *prime while attached to patient.*
13. Press **EXIT** when priming is complete.
14. Select desired Infusion Mode and follow on-screen prompts to enter dosing parameters.
15. Close and Lock door.
16. Attach administration set tubing to patient.
17. Review and verify settings.
18. Open tubing clamp.
19. Press **START**.

Programming the Alaris® PCA module with PCA Pause Protocol enabled:

1. Perform steps 1-10 of initial set-up and then continue with following steps.
2. Review Clinical Advisory *Attach an Alaris® SpO_2 or Alaris® $EtCO_2$ Module Now.*
3. Press **CONFIRM**.
   Note: *If a monitoring module is not attached and started, PCA Pause Protocol will* ***not*** *activate.*
4. Press **NEXT** key to verify medication parameters.
5. Review Advisory *PCA Pause Limits Should be reviewed.*
6. Press **PAUSE LIMITS** to review the settings or press **CONFIRM**.
7. Select desired Infusion Mode and follow onscreen programming prompts.

Change syringe and use Restore feature

1. Press **PAUSE** on PCA module.
   Note: *Always clamp administration set and disconnect from patient before changing syringe.*
2. Use PCA key to unlock door, remove syringe, press **SILENCE**.



3. Attach new syringe to tubing and load new syringe in to PCA module.
4. Set key to "Program" position and close door.
5. Press **CHANNEL SELECT** key.
6. Select and Confirm correct syringe type and size.
7. If using same drug, dosing units and concentration then press **RESTORE**.
8. Verify that drug, concentration and dosing parameters are correct.
9. Lock door and open tubing slide clamp.
10. Review settings and press **START**.

Change program/mode:

1. Press **CHANNEL SELECT** key.
2. Press **PROGRAM**.
3. Set key to "Program" position or enter authorization code (if enabled).
4. Press **CHANGE MODE**. Select desired infusion mode and follow onscreen prompts.

Give a clinician bolus dose:

1. Press **CHANNEL SELECT** key.
2. Press **Bolus Dose**.
3. Set key to "Program" position or enter authorization code (if enabled).
4. Enter bolus dose amount and lock door.
5. Press **CONFIRM**.
6. Review settings and press **START**.

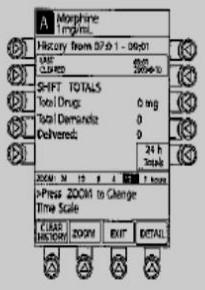
Beginning of shift/Summary Review:

1. Press **CHANNEL SELECT** key and verify settings.
2. Press **START** key.

Access drug event history:

1. Press **CHANNEL SELECT** key.
2. Press **OPTIONS** then press **DRUG EVENT HISTORY**.
3. Press **EXIT** and then press **START**.

Patient history/24 hr. history:



1. Press **CHANNEL SELECT** key.
2. Press **OPTIONS**.
3. Press **PATIENT HISTORY.**
   Note: *The top of the Patient History screen displays*
   - *the exact time frame for patient history. History from ##:## - ##:##*
   - *time that 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 h Totals**.
   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:

Note: *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 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 **RESTART.**
   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 SpO_2** or **Disable $EtCO_2$.**
5. Press **CONFIRM.**
6. Press **START.**

Note: *To enable PCA Pause function, follow steps 1-3 then press* ***Enable SpO_2*** *or* ***Enable $EtCO_2$.***

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 latching 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® PC Unit.

Troubleshooting

Alarms, errors, messages

Note: *During an alarm state, the Alaris® PCA module is no longer infusing.*

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 DILUENT VOLUME) programmed into PCA module.
3. Reprogram.

Note: *This message can be the result of an incorrect DRUG AMOUNT and/or DILUENT VOLUME entry or can occur if 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/1mL can be entered in 1 of 2 ways:

- *DRUG AMOUNT 1 mg*
- *DILUENT VOLUME 1 mL*

  Or
- *DRUG AMOUNT 30 mg*
- *DILUENT VOLUME 30 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 (NEOI):

Alert message **Near End** alternates with remaining **VTBI** 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 NEOI 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/wound and epidural infusions will run on the REM Bodyguard 595 pump. The infusion sets will be colour coded:

- Yellow = epidural
- Green = perineural/wound