Purpose

To establish minimum practice standards for Parathyroidectomy in patients with advanced Chronic Kidney Disease (CKD), Stage 4 and 5 CKD defined as eGFR < 30mL/min/1.73m$^2$, throughout South Metropolitan Health Service (SMHS) and Western Australian Country Health Service (WACHS). This Clinical Practice Standard (CPS) has been compiled in conjunction with the Renal Health Network and may be used in conjunction with specific site departmental requirements.

- This CPS provides guidelines for the management of patients with Chronic Kidney Disease (CKD) considered for Surgical Parathyroidectomy.
- This CPS excludes and thus does not apply to patients with Primary Hyperparathyroidism, where adenoma is the commonest pathology.

Further information relating to specialty areas including Child and Adolescent Health Service (CAHS), Women and Newborn Health Services (WNHS) and Mental Health Services can be found via healthpoint.hdwa.health.wa.gov.au.

Scope

This information is relevant for patients with advanced CKD considered for Surgical Parathyroidectomy and also includes:
- Patients undergoing dialysis (Haemodialysis and Peritoneal Dialysis)
- Renal Transplant recipients with complicated tertiary hyperparathyroidism

This Clinical Practice Standard applies to all medical, nursing, midwifery and allied health staff employed within SMHS and WACHS. All health care professionals are to work within their scope of practice appropriate to their level of training and responsibility. Further information can be found via healthpoint.hdwa.health.wa.gov.au.

Considerations

- Patients with CKD including those on dialysis pose different metabolic challenges needing a modified care adjusting for their modality of dialysis, and pre-existing bone disease.
- Patients with advanced CKD are at a greater risk of developing symptomatic hypocalcaemia after the surgery.

Procedural Information

Refer to the Caring for Australasians with Renal Impairment (CARI) guidelines
Website: www.cari.org.au
Refer to Kidney Health Australia
Website: www.kidney.org.au
Where care requires specific procedures that may vary in practice across SMHS and WACHS sites, staff should seek senior clinician advice. For further information refer to:
Operational Directive (OD)/ Information Circular (IC) Search: www.health.wa.gov.au

Staff are required to consider the following requirements and comply with the relevant Operational Directives and SMHS Policies for:

- SMHS PS: 06 Infection prevention strategies for all vascular access device
- OD 0385/12 The National Recommendations for User-Applies Labelling of Injectable Medicines, Fluids and Lines
- SMAHS RMQI: 05 Latex Minimisation Policy

For further information within this document refer to:

Staffing requirements
Equipment required
General information - parathyroidectomy
Indications for parathyroidectomy
Rationale for monitoring following surgical parathyroidectomy
Documentation
Preoperative evaluation and preparation for Parathyroidectomy
Day of Surgery - Parathyroidectomy
Immediate Postoperative management following Parathyroidectomy
Potential problems during or post procedure
Management after discharge
Clinical handover
Appendix 1: Terminology

General Information - Parathyroidectomy

- 4 small parathyroid glands with 2 each side, are embedded near the posterior lobe of the thyroid gland, and produce Parathyroid Hormone (PTH) in response to hypocalcaemia; following activation of calcium sensing receptor (CaSR) on the chief cells of the parathyroid gland
- Progressive decline in renal function is associated with elevated PTH levels (hyperparathyroidism) as a consequence of declined receptor sensitivity, increased phosphate retention and others
- Progressive increase in PTH due to advanced CKD (Secondary Hyperparathyroidism) is independently associated with a mortality and morbidity in this population. Progressive enlargement of the parathyroid glands may become autonomous, with inability to respond to normal stimuli causing increasing PTH secretion
- Failure to control the hyperparathyroidism by medical management is the most common indication for surgical parathyroidectomy
• Subtotal (removal of three and a half glands) parathyroidectomy is preferred in patients with
advanced CKD; while selective parathyroidectomy could be considered an option in renal
transplant recipients needing post-transplant parathyroidectomy

Uncontrolled secondary hyperparathyroidism on medical therapy is the commonest indication for
subtotal surgical parathyroidectomy in Stage 4/5 Chronic Kidney Disease (CKD)

Indications for parathyroidectomy:

Decision for surgical parathyroidectomy should be made by the treating renal physician,
considering the clinical benefit and risks for an individual patient.
• Persistent uncontrolled hyperparathyroidism despite optimal medical therapy with or without
hypercalcaemia and/or hyperphosphataemia
• Renal stone disease, uncontrolled itch, reduction of vascular calcification, consideration for
renal transplantation, calciphylaxis, hypercalcaemia and/or progressive loss of bone density
with background osteoporosis may be the factors considered during the decision making
process

Patient Monitoring

Individualised management plan to be documented in the patients' health records as soon as is
practicable. At a minimum the plan must consider:
• Patient history and diagnosis for clinical conditions, medications, psychosocial and cultural
factors that could influence observations
• Presence of comorbidities and treatment
• Frequency and specific observations
• Site requirements, patient education and consent
• Any restriction to intervention associated with advance health directives (AHD) or similar
Rationale for monitoring following surgical parathyroidectomy

- The incidence of “hungry bone” syndrome leading to profound hypocalcaemia immediately after surgical parathyroidectomy is high, and rigorous monitoring of serum calcium is mandatory.
- Nadir of serum calcium levels after parathyroidectomy usually occurs within 2-4 days after surgery. Stabilisation of serum calcium levels may take a few weeks.
- Subtotal parathyroidectomy offers lower incidence of postoperative hypocalcaemia and lower requirements for calcium and calcitriol; as compared to total parathyroidectomy.
- Oral calcium and Vitamin D supplements is appropriate in asymptomatic patients with corrected serum calcium levels >1.8mmol/L.
- Relapse of hyperparathyroidism is not, with increased incidence in patients with nodular hyperplasia as compared to diffuse hyperplasia.
- Although haemodialysis patients are better accessible for post-surgical monitoring, other patients should be closely followed until stabilisation (usually up to 2 months).

Documentation

Failure to accurately and legibly record, and understand what is recorded, in patient health records contribute to a decrease in the quality and safety of patient care.

Refer to SMHS Documentation CPS via [healthpoint.hdwa.health.wa.gov.au](http://healthpoint.hdwa.health.wa.gov.au)

Document all findings in the site specific forms and patient health record:
- Clinical assessment of patient
- Investigations and interventions
- Responses to interventions
- Actions initiated for medical review of patient
- Pharmacological management
- Pain treatment outcomes
- Information on patient education provided

Parathyroidectomy Procedural Guideline

Key points prior to commencing any procedure

- Consider cultural, ethical and communication requirements
- Explain the procedure/s to the patient, family and/or carer and gain appropriate consent
- Patients are consulted and informed of the risks of dialysis related treatment in a hospital setting and how a collaborative approach will assist with preventing complications
- Patients should be given verbal/ written education on the prevention or management of CKD and associated signs and symptoms
- Patients are informed of the possible side effects of medications prescribed, including anticoagulant therapy
• Review patient history and diagnosis for clinical conditions, medications and psychosocial factors that could influence observations
• Refer to previous observation parameters if available for comparison

Preoperative Evaluation and Preparation for Parathyroidectomy

Refer to site guidelines and policies regarding Preoperative patient preparation for surgery. Refer to Documentation CPS and Observations – Physiological CPS at: healthpoint.hdwa.health.wa.gov.au

Confirmation of appropriate medical management:
Prior to enlisting the patient for surgical parathyroidectomy, ensure:
• Decision to proceed with surgery is clarified by the treating renal physician
• Assessment of the surgical risks and indication for surgery is discussed with the patient
• Underlying potential treatable causes of secondary hyperparathyroidism as compliance with medications, treatment of hypocalcaemia and/or hypomagnesaemia, and treatment of 25-hydroxy Vitamin D deficiency are addressed
• Preoperative vocal chord check will be performed during the Endocrine Surgery consultation.
• Assess patient for clinical fitness for surgery and dialysis adequacy

Booking the date of surgery:
• Inform the date of surgery to renal team, dialysis unit to plan for preoperative dialysis
• Request pre-operative bloods on day of surgery marked as “URGENT” on the request form. May include but id not limited to:
  • Serum calcium
  • Phosphate
  • Parathyroid Hormone (PTH)
  • Magnesium
  • 25 OH Vitamin D
  • Coags
  • FBP
• Refer to local site policies and procedures regarding Blood Sampling for the Dialysis Patient - Phlebotomy and Cannulation procedures

• Refer to: Vascular Access Devices Management CPS,

Preoperative medication adjustments:
• Cease: cinacalcet (Sensipar®) 10-14 days prior to surgery
• Continue: Regular phosphate binders [i.e. calcium carbonate (Calsup®, Caltrate®), magnesium, sevelamer (Renagel®) and/or lanthanum carbonate (Fosrenol®)]
• Initiate: Start or increase dose of Calcitriol to 2.0mcg (2 x 0.25mcg caps QID) daily orally for at least 4 days prior to surgery. Increase Caltrate 3600mg (2 x 600mg tablets TDS) for at least 7 days prior to surgery.
• Liaise with clinical pharmacist to ensure stock of intravenous calcium (calcium chloride or calcium gluconate as per site guidelines).
• Ensure patients considered for surgical parathyroidectomy have normal or high serum calcium, persistently elevated PTH, normal 25-hydroxy Vit D levels and normal serum Magnesium levels

Day of Surgery - Parathyroidectomy

Admission:
• Assess patient for clinical fitness for surgery and dialysis adequacy
• Ensure patient is commenced on oral calcitriol and ceased cinacacet prior to the surgery
• Check biochemistry collected on the day of surgery for:
  • Calcium
  • Phosphate (PO4)
  • PTH
  • Magnesium
  • Vitamin D
  • Potassium
• Ensure postoperative management plan is ready and accessible for clinical staff
• Intraoperative insertion of Central Venous Catheter (CVC) should be considered in selective patients who are either at high risk for postoperative hypocalcaemia; or have difficulties in frequent postoperative blood sampling and urgent intravenous (IV) medication administration access
• Transplant recipients: Should have their usual medications, including immunosuppression, even when fasting on the morning of surgery
• Postoperative medications (including prn) to be charted by MO:
  • Oral Calcitriol: (0.25mcg capsules x 2 capsules) TDS; calcium citrate is absorbed with or without meals
  • Usual phosphate binders, prescribed with meals, if serum phosphate (>1.6mmol/L)
  • All transplant immunosuppressive medications in transplant recipients
  • Oral Calcium: SandoCal (calcium carbonate 1000mg tablet) x 1 TDS; calcium carbonate is best absorbed when taken with meals
  • Oral Magnesium: Magnesium 500mg (1.64mmol) tablet x 1 BD, OR Magnesium Forte® 400mg (16.3mmol) tablet x 1 BD if hypomagnesemic
Immediate Postoperative Management following Parathyroidectomy

Perioperative hypocalcaemia, laryngeal nerve injury and threatened airway due to haematoma are immediate postoperative concerns that require close monitoring.

**Postoperative care:**
- Nurse patient with a head elevation of >30° for 24 hrs post operation
- Apply ice pack to neck wound intermittently if swelling observed
- Administer all routine postoperative care such as oxygen therapy, observations, drain care and acute pain management as per site policies and protocol and document in patient’s health record
- Surgical drain should only be removed after surgical review (usually after 24 hours)
- Inform the MO if amount is excessive or frank bleeding is noted at the surgical site or drain
- Ensure a stitch cutter (or staple remover) at the patient’s bedside - in case of an emergency initiate MET call. Stitch cutter to be used under direction of Medical Officer.

Refer to **Medical Emergencies CPS** via: [healthpoint.hdwa.health.wa.gov.au](http://healthpoint.hdwa.health.wa.gov.au)

- The patient may have renal diet and fluids when tolerated as ordered by the Medical Officer (MO)
- Do not withhold oral Calcium supplements

**Normal Corrected Serum Calcium remains acceptable target after surgery following parathyroidectomy. This is likely to require oral supplements and/or short term IV Calcium supplementation.**

**Monitor for clinical signs of hypocalcaemia postoperatively:**
Signs and symptoms (early to late) may include:
- Paraesthesias of mouth and extremities
- muscle spasms; cramps in hands or feet
- **Tetany**
- **Chvostek’s and Trousseau’s sign**
- Seizures; Coma if left untreated
- ECG abnormalities; Arrhythmias
- Hypotension; Cardiac Failure
Refer to site specific guidelines and policies regarding Postoperative observations and care following surgery.

Refer to Documentation CPS and Observations – Physiological CPS at:
healthpoint.hdwa.health.wa.gov.au

Patient education:
- Patients are to be instructed to notify the nurse immediately if they experience any difficulty breathing, as this maybe an early sign of complications such as airway obstruction (stridor)
- Respiratory problems in the postoperative period are relatively uncommon, however they can be life threatening and diagnosis must be prompt

Monitoring and Management of Serum Calcium levels:
- Administer oral calcium and vitamin supplements as prescribed by MO
- Oral calcium supplements should be taken between meals, to maximise absorption.
- Contact the renal medical team with blood results as soon as results become available, for any changes to treatment
- Doses may be titrated according to corrected serum calcium, phosphate, bicarbonate and/or clinical need as per Medical Officer instruction

**Calcium Replacement: In an Emergency Situation**

As directed by MO:
- A 10mL ampoule of calcium gluconate 10% contains 89 mg (2.2mmol) of elemental calcium
- Administer 10mL of 10% calcium gluconate in 10mls Normal Saline over 4-5 minutes as a slow bolus as a slow bolus. (In emergency situations, this could be given undiluted in peripheral secure venous access)
- May repeat another one dose if patient remains symptomatic with hypocalcemia
- IV calcium may cause hypotension if given rapidly (Cardiac monitoring is advised if readily available)
- IV calcium bolus can cause severe injection site skin necrosis if extravasated (ensure IV cannula is not tissued prior to infusing Calcium via a peripheral vein)
- If ongoing calcium infusion is necessary this should be delivered via CVC or PICC line – refer to suggested regimes for IV calcium infusion and Vascular Access CPS
Suggested Blood sampling:
May be varied in individual patients if necessary (No recommendations can be made to alter dialysate Calcium levels for patients receiving Haemodialysis)

Biochemical monitoring schedule:

<table>
<thead>
<tr>
<th>Day</th>
<th>Investigations required:</th>
<th>Treatment required:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate Postoperative</td>
<td>Ca, Mg, PTH, EUC</td>
<td></td>
</tr>
<tr>
<td>Postoperative – 48hrs</td>
<td>Ca, PO₄, Mg EUC</td>
<td>Recommend check every 6hrs for 48hrs postoperatively</td>
</tr>
<tr>
<td>48 hrs (day 3) onwards or 12hrs post cessation of IV Calcium replacement</td>
<td>Ca, Mg, PO₄, EUC</td>
<td>Twice daily until stable</td>
</tr>
<tr>
<td>&gt;48hrs – 1 week</td>
<td>Ca, PO₄, EUC</td>
<td>Predialysis for HD patients and twice weekly for other patients. Avoid hypercalcaemia</td>
</tr>
<tr>
<td>1 week – 1 month</td>
<td>Ca, PO₄</td>
<td>Weekly Avoid hypercalcaemia</td>
</tr>
<tr>
<td>1 month – 2 months</td>
<td>Ca, PO₄</td>
<td>Fortnightly or more frequently if abnormal levels Avoid hypercalcaemia</td>
</tr>
<tr>
<td>&gt; 2 months</td>
<td>Ca</td>
<td>As per usual protocol Avoid hypercalcaemia</td>
</tr>
</tbody>
</table>

Postoperative IV Calcium infusion:

Indications:
- IV Calcium infusion should be considered postoperatively if:
  - Patient is symptomatic with hypocalcaemia
  - Corrected Serum Ca on monitoring is:
    - <1.8mmol/L AND/OR
    - 1.8 – 2.1 mmol/L and symptomatic of hypocalcaemia AND/OR
    - >2.1mmol/L and falling rapidly (>10% in 4-6 hours)

Calcium levels should be maintained within the normal range according to site Pathology values (2.15 – 2.6 mmol/L)

Prescription and Preparation of IV Calcium infusion:
- Continuous replacement is suggested using either IV calcium gluconate or IV calcium chloride infusion.
- Calcium gluconate is preferred agent over calcium chloride due to reduced toxic effects on peripheral veins, thus reducing need for Central Venous Catheter (CVC)
- Administer using infusion pump via either a central venous line (CVC) is preferred only in high risk patients with increased risk of hypocalcemia or with poor veins for phlebotomy.
- It may be necessary to commence infusion postoperatively in recovery, if required.
**INTRAVENOUS CALCIUM GLUCONATE 10% INFUSION PROTOCOL**

**Preparation available**
- Calcium gluconate 10% Injection Ca gluconate monohydrate (10 ml) (equiv. elemental Ca 94 mg/ 10 ml; 2.2 mmol/ 10 mL)

**BOLUS IV CALCIUM INJECTION**
(Must be followed by maintenance infusion as below)

(Only if S Ca < 1.9 mmol/l and/or patient is symptomatic with hypocalcemia)
- Administer 10 ml (2.2 mmol) of 10% Calcium gluconate in 10 ml normal saline over 4 - 5 minutes as a slow bolus.
- (In emergency situations, this could be given undiluted in peripheral secure venous access)
- May repeat another ONE dose if patient remains symptomatic with hypocalcemia.

<table>
<thead>
<tr>
<th>Solution</th>
<th>50 ml (5 ampules of 10 ml each) of 10% Calcium gluconate in 450 ml of 5% Dextrose or Normal Saline [0.22 mmol/ 10 ml solution]</th>
<th>60 ml of 10% calcium gluconate in 250mL of Normal Saline [0.426 mmol/ 10 ml solution]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial infusion rate</td>
<td>50 ml/ hr (1.1 mmol/hr)</td>
<td>20 ml/ hr (0.85 mmol/hr)</td>
</tr>
</tbody>
</table>

**FOLLOW UP INFUSION RATES BASED ON SERUM CALCIUM MONITORING**

<table>
<thead>
<tr>
<th>SYMPTOMATIC</th>
<th>BOLUS IV CALCIUM INJECTION AS ABOVE</th>
<th>BOLUS infusion as above and increase Ca infusion rate by 50% of the previous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum Ca: &lt;1.9 mmol/L</td>
<td>75 ml/ hr (1.65 mmol/hr)</td>
<td>Repeat Ca in 2 hours</td>
</tr>
<tr>
<td>1.9 - 2.1 mmol/l</td>
<td>50 ml/ hr (1.1 mmol/hr)</td>
<td>Increase infusion rate by 50% of current rate</td>
</tr>
<tr>
<td>2.1 - 2.2 mmol/l</td>
<td>25 ml/ hr (0.55 mmol/hr)</td>
<td>Continue current rate</td>
</tr>
<tr>
<td>&gt; 2.2 mmol/l</td>
<td>Cease infusion, Continue oral calcium and Calcitriol</td>
<td>As routine</td>
</tr>
</tbody>
</table>
Potential Problems During or Post Procedure

- Hypocalcaemia post procedure may result in seizures or cardiac arrest
- Hyperkalaemia can occur in patients with advanced CKD following parathyroidectomy. Close monitoring of serum potassium levels following surgery is advised.

Refer to Medical Emergencies CPS and Observations - Physiological CPS via: healthpoint.hdwa.health.wa.gov.au

Discharge Management

Refer to site guidelines regarding discharge processes, patient education and follow up for postoperative patients.

- Calcium level may rise rapidly 3-5 weeks after Parathyroidectomy. Contact Renal Physician for advice and management.
- Requirements for calcium supplements and calcitriol upon discharge are likely to vary considerably between individual patients
- Advise should be sought from the Renal Physician or Senior Registrar regarding exact doses and follow-up arrangements
- Medication adjustment to be supervised by Renal Physician or Senior Renal Registrar with responsibility for the relevant clinical area

Haemodialysis patients:
- Check serum Calcium 2-3 times per week (at the beginning of their normal Haemodialysis session) until in the normal range and stable

Peritoneal dialysis and renal transplant patients:
- Check serum Calcium checked 2-3 times per week until stable
- this will be arranged through Home Dialysis Therapies or Renal Clinics

Calcium level may rise rapidly 3-5 weeks after parathyroidectomy. Contact Renal Physician for advice and management.
Clinical Handover

Clinical Handover is the transfer of professional responsibility and accountability for some or all aspects of care for a patient, or group of patients, to any person or professional group on a temporary or permanent basis. Information exchange should adhere to the WA Health Clinical Handover Policy (iSoBAR)³.

Compliance Monitoring

Evaluation, audit and feedback processes should be in place to monitor compliance.

Acknowledgement of previous site endorsed work used to compile this standard

We would like to thank the following people for their contribution to the project:

   Kulkarni, H, Dr. – Renal Physician, Fremantle Hospital and Health Service

Fremantle Hospital and Health Service, Parathyroidectomy, Care of renal patients protocol. January 2011.
   Micalllef,J – SDN Renal, Fremantle Hospital and Health Service
   Porter, S – CNS Renal, Fremantle Hospital and Health Service

Royal Perth Hospital, Guidelines for peri-parathyroidectomy calcium replacement and monitoring, Department of Nephrology and Medical Renal Transplant Unit, August 2013.
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SMHS Code: CPSR004

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Legislation
Acts Amendment (Consent to Medical Treatment) Act 2008
Carers Recognition Act 2004
Civil Liability Act 2002
Disability Services Act 1993
Guardianship and Administration Act 1990
Health Practitioner Regulation National Law (WA) Act 2010
Mental Health Act 1996
Occupational Safety and Health (OSH) Act, 1984 (Amended 2011)
OSH Regulations, 1996
Poisons Act 1964
Poisons Regulations 1965
Poisons Amendment Regulations 2010
Public Sector Management Act, 1994
State Records Act 2000 - The children and community Services Amendment (Reporting Sexual Abuse of Children) Act 2008
The Children and Community Services Amendment Bill 2010

Standards
EQuIPNational www.achs.org.au/
National Standards for Mental Health Services (NSHMS)

WA Department of Health Policies (Operational Directives)
healthpoint.hdwa.health.wa.gov.au
www.health.wa.gov.au
Clinical and Related Waste Management – Clinical Wastes (OD 0259/09)
Clinical Handover Policy, 2012 (OD 0403/12)
Clinical Incident Management Policy, 2012 (OD 0421/13)
Consent to Treatment Policy for the Western Australian health system, 2011 (OD 0324/11)
Correct Patient, Correct Site and Correct Procedure Policy and Guideline for WA Health Services 2nd Edition (OD 0004/06)
Implementation of the Australian Health Service Safety and Quality Accreditation Scheme and the National Safety and Quality Health Service Standards in Western Australia (OD 0410/12)
Medical Emergency Response (OD 0040/07)
National Hand Hygiene Initiative in Western Australian Healthcare Facilities (OD 0429/13)
The Policy for Credentialing and Scope of Clinical Practice for Medical Practitioners 2nd Edition 2009 (OD 0177/09)
Western Australian Patient Identification Policy 2010 (OD 0312/10)
Post-Fall Management Guidelines in Western Australia (OD 0442/13)

SMHS Policies
healthpoint.hdwa.health.wa.gov.au
Aboriginal and Multicultural Groups (SMAHS CF: 02)
Bariatric Management: (SMAHS COC: 06)
Consumer and Carer Participation: (SMAHS CF: 03)
Consumer and Carer Participation in Mental Health: (SMHS CF: 07)
Health Record Documentation Policy and Standards (SMAHS COC: 03)
Infection Prevention and Management Policy (SMHS PS:06)
Mandatory Training Governance Policy (SMHS HR: 04)
OSH: Manual Handling (SMAHS SPE: 04)
Single Use/Single Patient Use Medical Devices: (SMAHS SPE: 40)
Standardised Logos

EQuIPNational www.achs.org.au

Governance for Safety and Quality in Health Service Organisations
Partnering with Consumers
Preventing and Controlling Healthcare Associated Infections
Medication Safety
Patient Identification and Procedure Matching
Clinical Handover

WA Department of Health iSoBAR - Guide to Handover Content and Structure

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<tr>
<th>i</th>
<th>IDENTIFY</th>
<th>Introduce yourself and your patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>SITUATION</td>
<td>Describe the reason for handing over</td>
</tr>
<tr>
<td>o</td>
<td>OBSERVATIONS</td>
<td>Include vital signs and assessments</td>
</tr>
<tr>
<td>B</td>
<td>BACKGROUND</td>
<td>Pertinent patient information</td>
</tr>
<tr>
<td>A</td>
<td>AGREE A PLAN</td>
<td>Given the situation, what needs to happen</td>
</tr>
<tr>
<td>R</td>
<td>READ BACK</td>
<td>Clarify shared understanding</td>
</tr>
</tbody>
</table>

Blood and Blood Products
Preventing and Managing Pressure Injuries
Recognising and Responding to Clinical Deterioration in Health Care
Preventing Falls and Harm from Falls
Service Delivery
Provision of Care
Workforce Planning and Management
Information Management
Corporate Systems and Safety

Compiled: 25/6/2013  Version: 1.0  Review Date: 29/11/2016
Document Owner: Group General Manager Safety Quality & Risk
Appendix 1: Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetany</td>
<td>Involuntary contraction of muscles, which may be caused by disease or other conditions that increase the action potential frequency. Usual cause is lack of Calcium. Excess Phosphate can also trigger spasms.</td>
</tr>
<tr>
<td>Chvostek's sign</td>
<td>The Chvostek sign is one of the signs of tetany seen in hypocalcaemia. It refers to an abnormal reaction to the stimulation of the facial nerve. When the facial nerve is tapped at the angle of the jaw (i.e. masseter muscle), the facial muscles on the same side of the face will contract momentarily (typically a twitch of the nose or lips), because of hypocalcaemia with resultant hyperexcitability of nerves.</td>
</tr>
<tr>
<td>Trousseau's sign</td>
<td>Trousseau sign of latent tetany is a medical sign observed in patients with low calcium. This sign may become positive before other gross manifestations of hypocalcaemia such as hyperreflexia and tetany, as such it is generally believed to be more sensitive (94%) than the Chvostek sign (29%) for hypocalcaemia. To elicit the sign, a blood pressure cuff is placed around the arm and inflated to a pressure greater than the SBP and held in place for 3 minutes. This obviates the brachial artery. In the absence of blood flow, the patient's hypocalcaemia and subsequent neuromuscular irritability will induce spasm of the muscles of the hand and forearm. The wrist and metacarpophalangeal joints flex, the Distal Interphalangeal (DIP) joints and Proximal Interphalangeal (PIP) joints extend, and the fingers adduct.</td>
</tr>
</tbody>
</table>
References