



“From the Trough”

Perioperative Interest Group Notes

Based on Cases discussed at the Weekly PIG Clinical Meeting on 1st December 2016.

Publication date 20th December 2016.

Website: www.perioptalk.org

Attendance: Tod Eggleton, Louise Hales, Ross Kerridge, Steve Pickering, Liz Hill, Luke McConnell

TOPIC 1: *Hereditary angioedema*

A 92 year old lady with a history of hereditary angioedema (including in her son and grandson) presents for elective spine surgery. Her hereditary angioedema was diagnosed in the 1980's with no consistent triggers other than stress. Her most recent presentation was with facial swelling in 2014. She reports that steroids and adrenaline are generally ineffective. She has been managed with regular Danazol. Immunology was consulted and reviewed the patient in person. Based on this, and noting that she is "a good 92", they recommended going ahead with surgery and giving Berinert 1000 units about 1 hour prior to theatre. If further problems occur, treatment with S/C Icatibant 30 units. The earlier this is given the more effective it is. Attacks can occur late in response to a stimulus (i.e. up to 48 hours or so after a stress stimulus).

Hereditary angioedema (HAE) is an autosomal dominant condition that results from a C1 esterase inhibitor deficiency. A major function of C1 esterase inhibitor is to prevent spontaneous activation of the complement system, including increased release of bradykinin.

Human plasma-derived C1 esterase inhibitor concentrate can be used to prevent attacks. It acts by replacing the C1 esterase inhibitor that the patient is deficient in. Duration of action is about 12 hours. It can only be given intravenously, and thus not generally considered useful for continuous treatment. *Berinert* is the trade name of the CSL formulation; *Cinryze* is the alternative by Shire.

Icatibant is a bradykinin type 2 receptor antagonist, thus blocking the effect of the raised bradykinin at the receptor level. It is used for treatment of attacks, given by subcutaneous injection. It is suitable for patients to carry for self-administration.

TOPIC 2: *Indications for combined spinal epidural*

A patient having twins for elective caesarean. Should a CSE be used? This was debated. Opinions varied. Opinion 1. "A Caesar for twins is only slightly longer than for a singleton, so a simple spinal should be adequate - although I may increase the dose slightly, and would have a lower threshold for using a CSE". Opinion 2:- "I do the same as I do for singletons - I do CSE for everyone" Why? It gives the ability to top-up and ensure adequate block including with a prolonged Caesar. This also enables a lower initial dose (e.g. 2.2 mls of plain bupivacaine and 20 micrograms of fentanyl). Other advantages of CSE:- you identify the depth of the dural space with the epidural needle, so you very unlikely to pass the spinal needle to far; because you have gone the interspinous ligament with the epidural needle you can clearly feel the dural puncture, even with a 27 gauge needle; the smaller hole with a 27 versus a 25 needle makes spinal tap headaches very unlikely. Technique tips for CSE:- Use plain rather than heavy bupivacaine because the patient is setting up for longer while the CSE is performed.

TOPIC 3: *Anti-phospholipid syndrome and IVC filters*

A woman for a caesarean section at term with a history of anti-phospholipid syndrome, multiple PE's and an IVC filter in situ for some years is on long term anticoagulation. With a previous Caesar she had a general anaesthetic, but this time she would prefer to be awake. Is this feasible? The Obstetricians have indicated they would want treatment with clexane until 12 hours beforehand. If the time off clexane could be prolonged, would this make a spinal a reasonable option? **Discussion:-** It was generally agreed that this is a strong indication for anticoagulation, and continuing up close to the time of surgery is appropriate. This could include a heparin infusion. Timing on the list should be fixed (i.e. she should be first on the list) to ensure that the caesarian is performed at 12 hours, and without unplanned delay. It was agreed by everyone that regional anaesthesia should not be seen as an option, although some anaesthetists have done so. *What are the statistics on risks?* Conducting a conventional trial to define the safety of spinal in the presence of residual anticoagulant is not feasible due to the huge number of cases that would need to be studied. It is impossible to give 'evidence-based' answer to the question of the risk posed – it can only ever be an estimate.

TOPIC 4: *Ovarian Cyst in pregnancy*

A women diagnosed with bilateral ovarian cysts in second trimester is booked for a laparotomy and removal of cyst due to high risk of torsion of the ovarian cyst during the pregnancy.

(Update from Obstetrician) Asymptomatic ovarian cysts are being diagnosed much more frequently than previously because of routine ultrasound scans at 12 weeks. Cysts between 4 and 8 cms are at risk of torsion during pregnancy (above 8cms are too large to tort.) If there is no pain, the patient can be counselled and 'wait and watch' is reasonable. If there are symptoms suggestive of torsion-like pain, then surgery (generally by laparotomy) is advised, being safer than surgery for an ischaemic torsion. Surgery in mid-trimester is preferred.

There was then discussion about the validity of evidence for increase rate of miscarriage in mid-trimester surgery. There is 'no' doubt that mid-trimester surgery is associated with pregnancy loss, but most pregnancy loss occurs in the context of acute illness, and the 'link' with surgery/anaesthesia is not clear. How much of this clinical knowledge is based on persisting anecdotage versus evidence? This would be important when considering an interval cholecystectomy, or the ovarian cysts tony as above. As with the previous dilemma, it is difficult (if not impossible) to give a clear, evidence based, statement about the true risk of surgery in this situation.

TOPIC 5: *Septoplasty*

A previously healthy 47 year old booked for a septoplasty had a blood count done (as a "routine" preoperative test). The platelet count is 108. There is no history of bleeding. Arguably, the test should not have been done, but having been done it we are now 'post-test':- The result needs to be responded to. **Discussion (advice from haematology):-** review the history generally, and the bleeding history in particular. Review past full blood counts (i.e. is it an chronic finding?). Any exposure thrombocytopenia drugs? Review Alcohol intake. Consider Folate deficiency. Ask Haematology to review the film manually, as the automated platelet count may be factitiously low. Splenomegaly may cause thrombocytopenia by sequestration but total numbers are maintained and surgically significant bleeding would be unlikely.



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Perioperative Interest Group Notes

Based on Cases discussed at the Weekly PIG Clinical Meeting on 3rd November 2016. Publication date 24th November 2016.

Website: www.perioptalk.org

Attendance: Ross Kerridge, Tehshin Ilyas, Berni Frost, Rob Bishop, Pragya Ajitsaria, Peter Harrigan, Todd Eggleton, Rebecca Scott, Libby Freihaut, Michael Hicks, Matthew Spencer, Len Conrad, Paul Healey

TOPIC 1: *MAOI Monoamine oxidase inhibitors*

A 56 year women was booked for surgery. She has a history of major depression and is currently treated with tranylcypromine (Parnate), and irreversible monoamine oxidase inhibitor. How should this be managed perioperatively?

Discussion: - Conventional teaching has been that MAOI's should be ceased before surgery. Two weeks cessation is needed to remove the danger of tyrosine-induced side effects. Since the advent of new generation modern anti-depressants (SSRIs etc), it is reasonable to assume that any patient being treated with these drugs has very resistant depression and the dangers of cessation of therapy are significant. It is generally seen as preferable to maintain the MAOI's and avoid drugs that may interact (including pethidine/meperidine, indirect vasoconstrictors (metaraminol) and sympathomimetics (ephedrine), ketamine, tramadol, ondansetron. Some sources also list fentanyl, although this is not accepted by others. Blood pressure stability may be maintained with fluids and with phenylephrine. In this case, the women had previously had her drugs ceased prior to a previous operation, and this had, indeed, precipitated a recurrence of her major depression which took 6 months to re-stabilise.

See:- Menkes D, Bosanac P, Castle D. MAOIs - does the evidence warrant their resurrection? Australas Psychiatry. 2016 Aug;24(4):371-3.

TOPIC 2: *The Vortex of Investigation & Preparation*

A 68 year old man was booked for a total knee replacement, and was initially seen in 2011. At that time he was noted to have a number of medical issues, including atypical chest pain, TIA's and has severe eczema. He has some anxiety issues. His operation was postponed for cardiological investigation at that time, and the operation was subsequently again postponed due to an exacerbation of his skin condition. He was further assessed in 2013 and 2014, and has had angiograms and a CT angiogram in the last 3 years, both showing “minor disease”. Echocardiogram is reasonably reassuring. He now presenting for surgery again. Some atypical symptoms persist but there must come a point where it is better to get out of the vortex of preoperative assessment, accept the risk as having been assessed, and go ahead with surgery.

TOPIC 3: *A 67 year old “old” man presents with a rapidly growing SCC for neck dissection*

The speed of growth of the cancer has made the surgeons keen to operate promptly, and has bought his scheduled date of surgery forward. Operation will take about 4 hours. The patient has a productive cough, is a continuing smoker and alcohol user, FEV1 30% FVC 48% of normal. He desaturates dramatically with exercise. He is generally a doctor avoider “and non-compliant with usual medication”. In normal circumstances he would require further outpatient investigation and optimisation, but the surgical pathology implies some time pressure. He is socially challenged and ‘non-compliant’.

Discussion: - There was a long discussion about the above and other problems. What investigations are important, and what is logistically possible, or can be made possible? A PET scan is needed to clarify if there are secondaries, and an echocardiogram to clarify if any pulmonary hypertension. The surgery is potentially curative but is also palliative, so there is high incentive to go ahead soon. His domestic situation makes his outpatient setting problematic. Hence it was agreed that in this case he should be admitted to hospital five days early for inpatient “rehabilitation” involving respiratory optimisation, physiotherapy, avoidance of smoking and alcohol, and for advance care planning with intensive care. In summary, using pre hospital time to avoid prolonged time in hospital post operatively. (The record of discussion at the PIG meeting facilitated later agreement from surgeons and hospital executive to this plan).



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Perioperative Interest Group Notes

Based on Cases discussed at the Weekly PIG Clinical Meeting on 6th October 2016. Publication date 13th October 2016.

Attendance: Ross Kerridge, Sarah Crosby, Michael Hicks, Mark Davies, Fiona Merritt, Pragma Ajitsaria, Paul Healey

TOPIC 1: Aspirin – Again

A 74 year old for total knee replacement with known IHD, assessed by sestamibi and angiogram in 2005, with subsequent medical management. Has been stable with no symptoms for the last 10 years. Now returning for the TKR that was postponed pending cardiac assessment in 2005. Patient was seen in the preop clinic and accepted for surgery. Aspirin was stopped by the anaesthetist in the clinic. (Note that most Orthopaedic surgeons are prepared to operate on aspirin if there is good reason for it). Subsequent to the pre-op visit, the GP decided to refer the patient for a stress test both as pre-operative assessment and for other lifestyle reasons. Stress test result is positive, and the patient has subsequently been referred to a cardiologist.

Discussion:- Does the positive stress test change decision making? General discussion agreed with the initial assessment, although most thought the aspirin should have been continued. At the time of surgery, the procedural anaesthetist made a phone call consultation with a senior cardiologist. Both agreed that it was appropriate to go ahead. Case proceeded – uneventfully.

ASPIRIN:- In this case the Orthopaedic surgeons would have been happy to operate on aspirin. But what ‘should’ be normal practice? Following POISE 2, it would seem that previous general advice to strongly support aspirin being continued may be “softened”. Cessation of aspirin preoperatively may be of less concern than has been commonly been thought in the past. In general, however, it would seem appropriate to continue to advise continuing perioperative aspirin, particularly when there is a strong indication.

TOPIC 2: Total Knee Replacement

A 56 year old patient awaiting a total knee replacement. She has had a prolonged preoperative assessment and preparation process while her multiple medical conditions have been improved. She was previously 220kg, very noncompliant with medical therapy, smoker etc. She is now 86 kg, has stopped smoking, and is generally much healthier. She is remarkably free of clinically apparent complications of diabetes. She is on >100 units of insulin/day. Nevertheless her HBA1C runs at 10-11, and she complains of symptomatic “hypos” when BSL is less than 10. BSL today greater than 24, but she claims this is unusual. She is (understandably) keen to have surgery.

Discussion:- Discussed with a diabetologist. The phenomenon is described as “pseudo hypos”. Ideally the patient should be seen again:- recommended treatment is to gradually adjust her insulin and diet therapy to bring her mean blood sugar down to a better range. This needs to be done over 6 to 8 weeks to maximise patient compliance, as their sense of normoglycaemia is disturbed. Although the patient feels well at 10, they still have a raised risk of infection complications. It was suggested to discuss with the patient further, and patient to meet with diabetologist to at least consider whether optimisation of glycaemic targets can be improved.

TOPIC 3: Cervical Spine - Multiple Cardiac Risk Factors

A 60 year old patient for ACDF of cervical spine. Multiple cardiac risk factors (IHD, DES 2012 to RCA. AICD for VT (2015); LVEF 41%; Multiple episodes of overdrive pacing in last few months, and a shock for VT. Smoker, GFR 90, ex IVDU, HCV. Cardiologists have agreed that it is appropriate to go ahead, and recommend rivaroxaban cessation for 48 hours.

Discussion:- Despite all the comorbidities, the patient is essentially equivalent to a patient with atrial fibrillation (i.e. fits the criteria for the BRIDGE trial). For Neurosurgery, management of anticoagulants should

be more 'conservative' than other surgery:- Management in accordance with ESRA guidelines is arguably an appropriate approach. It was therefore suggested that rivaroxaban should be ceased for 72 hours.

TOPIC 4: *Poorly Compliant Patient*

A patient on chronic methadone had arrived in hospital on Day of Surgery, booked for extraction of wisdom teeth. (A process deficiency meant he was accepted for surgery without full work-up). He had refused to give details of his general practitioner. It is difficult to clarify the dose, and the patient's report of the opiate dose was very high, with expectation he would be given more by the hospital. Should we go ahead?

Discussion:- Patients have both rights and responsibilities. (In the recent past a statement to this effect was obtainable on the Australian Commission on Safety and Quality in Health Care, but it is no longer on this website. Available material focusses on rights...) Some argued that for surgery such as this, it is entirely appropriate to cancel surgery and demand that the patient be fully compliant with "normal" clinical practice. (i.e. "Education by cancellation"). In this case however, it could also be suggested that postponing the case may lead onto a dental abscess, and thus more complex surgery. There is no gain to other patients by cancelling on the day (i.e. "the milk has been spilt"). The surgery can be done without knowing what the patient's opiate dose is. The patient's analgesia is limited to nerve blocks and non-opiates:- no methadone should be given. The only 'harm' to the patient may be suboptimal analgesia. Proceeding to surgery also has the result that the wisdom teeth are dealt with. The anaesthetist on the day decided to go ahead and accept that the patient's pain maybe sub optimally controlled.

TOPIC 5: *A 'covert' smoker having vascular surgery*

A patient having vascular surgery had been instructed by the surgeon that he must stop smoking prior to surgery. On the day of initial presentation for surgery, cigarette smoke was noticeable, and the patient admitted that they were still smoking. They had been cancelled. During phone call follow up, the anaesthetist reinforced the need to stop smoking and the patient asserted that they had stopped, and surgery could be scheduled. A Nurse subsequently spoke to the patient and informed him that "do you know we now have a blood test for smoking". There was silence on the phone and the patient said "Then I suppose I'd better stop".
Testing for smoking:- Nicotine consumption (i.e. smoking) can be assessed using a qualitative urinary cotinin. (i.e. based on a Urine dipstick). A quantitative assay of serum cotinine can also be done, which gives an approximate estimate of the patient's smoking consumption. Testing is not currently being used...perhaps it should. Further details of feasibility etc to be obtained and considered.



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Perioperative Interest Group Notes

Based on Cases discussed at the Weekly PIG Clinical Meeting on 8th December 2016. Publication December 2016.

Website: www.perioptalk.org

Attendance: Bryony Ross, Peter Freeman, Allysan Armstrong-Brown, Pragya Ajitsaria, Ross Kerridge, Sacha Muller, Elizabeth Freihaut, and others

Discussion on current Pre-Operative Group and Screen clinical practise.

Recently an obstetrician asked as to why ‘cross match’, group and hold’, or ‘group and screen’ was performed on elective caesarean sections. A clinical audit had shown that very few elective cases are transfused. Is it time to reconsider this practice?

Discussion: - There is clearly considerable misunderstanding of the principles underlying and current clinical practice with regard to cross match and group and screen. The terminology itself is confusing, and reflects changes in practice over recent years. The recent development of ‘electronic cross matching’, and its ongoing dissemination across Australia and internationally has contributed to these changes in practice and further contributed to widespread misunderstanding. Note that ‘electronic cross matching’ is still not universal practice in other parts of Australia. It only became common in Britain about five years ago, and is not utilised in the United States, where transfusion practice is considerably different to that in Australia. The discussion shows that there is a need for better understanding by anaesthetists of current transfusion practice.

Questions: -

What is compatibility testing?

This is the laboratories ability to detect and identify blood group antigens and antibodies, ensuring that the red cells of a unit of blood to be transfused are compatible with the plasma of the recipient.

It consists of

- determining the patients blood group ABO and Rh
- screening the patients serum for red cell antibodies stimulated by previous transfusion or pregnancy
- choosing a unit of blood for transfusion which is compatible with the patients blood group
- “crossmatching” the patient with the donor – either using an electronic system or a bench crossmatch

The common compatibility testing methods used in our laboratory include:

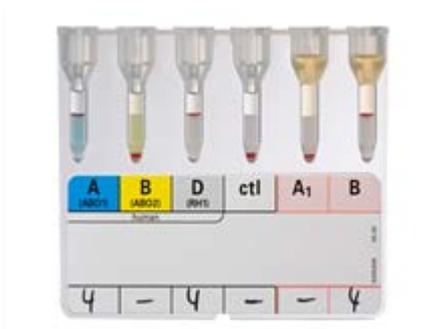
- Group and Screen
- Crossmatch
 - Serological Crossmatch
 - Electronic (computer) Crossmatch

What is a “Group and Screen”?

A group and screen identifies the ABO group, Rhesus (CDE), and minor antigens and antibodies such as Kell Lewis Duffy etc. If antibodies are identified, these can be characterised in more detail, and appropriate blood for the patient can be found. If a group and screen is ordered in our laboratory, the following will be performed:

- Confirmation that patient details on blood sample and request form are identical.
- Checking historical information on patient such as previous blood group, previous transfusion and obstetric history
- ABO and RhD typing of recipient's red cells
- Antibody screen to detect antibodies in recipient's plasma
- Identification of red cell antibodies (performed if positive antibody) screen detected
- Checking to see if appropriate stock is available in our fridges

If group and screen has not been performed, then in an emergency group O blood would need to be used, and there is a chance that this may not be compatible with the patient if they have antibodies. In an urgent but non-emergency situation group and screen will be able to be performed, but there may be a risk of finding inadequate time to identify, characterise, and respond to unusual antigens or minor antibodies.



In this picture, the patient expresses the A antigen, does not express the B antigen, They also express the RhD antigen, and the last 2 wells show that the patients plasma does not have the A antibody and does have the B antibody.

Therefore the blood group is A Positive.

What does 'Cross-Matching' mean?

Crossmatching is used to confirm compatibility between the patient's blood (plasma) and the donor red cells. The term "cross matching" is somewhat confusing because of changes in practice from the serological to electronic system. .

Serological crossmatching involved incubating the patient's plasma with the donor red cells - looking for cell agglutination. Traditional 'Cross-Matching' is/was used as a check on the integrity of the information recording system. In electronic transfusion systems, physical cross-matching does not always occur, but is still performed if a patient is shown to have antibodies on the group and screen)

Electronic (computer) crossmatch is much more commonly performed in modern laboratory practice (and in our laboratory). This includes:

- The Laboratory information system matches the patient to a donor unit of red cells using the information gathered by the group and screen
- ABO compatibility of patient plasma and donor red cells is checked by the laboratory information system (LIS) with **no serological crossmatch tests** needing to be performed.
- Only used if patient currently has no clinically significant antibodies, and there is no history of clinically significant antibodies.
- Allow red cells to be issued with minimal delay once blood group and antibody screen completed.

Whichever method is used, when a crossmatch is requested, specific units of blood are then labelled and set aside for a particular patient. It is thus taken out of the common pooled blood supply, and set aside for 3 days (or longer) in case it is required for the patient that it has been cross matched for. The term continues to be used to indicate that a unit of blood has been labelled and set aside for a particular patient.

Why is "cross matching" discouraged for pre-operative patients? If a unit of blood is repetitively taken out of the pooled blood supply on multiple occasions, the blood may get to the point of expiry without actually being used. For this reason, blood inventory management principles suggest that cross matching should be avoided unless there is a high likelihood that blood will be required. Ideally, the 'Cross-match to Transfusion Ratio' (CTR) should be as close to 1 as possible.

MBOS:- The concept of maximum blood order schedule (MBOS) was promulgated to shift clinical practice from cross matching blood unnecessarily before surgery. Over time, the recommended number of units to be cross matched before surgery has gradually reduced to reflect current practice.

What is Electronic Blood Issue and how does it reduce the need for 'cross-matching' ? In an electronic transfusion-service, in a large centre, if a patient has a valid Group & Screen, a unit of blood can be released very quickly. The patient records and antigen profile is matched against the records of all units in the pooled blood stock:- The most appropriate unit is identified and allocated to the patient. No physical processing of cells and serum is performed. As a result, a unit of blood can be supplied within minutes. In a well-functioning electronic transfusion service environment, in a major centre, it can be argued that there is rarely any need for formal "cross matching" other than for patients with unusual blood groups or antibodies.

Is our current practice of group and screen pre-operatively appropriate? The current recommended group and screen protocol is based on the assumption that where there is a presumed risk of transfusion of greater than 1% for a patient group, group and screen should be performed. On this basis, a schedule of operations where pre-operative group and screen was recommended was developed. But is this still appropriate?

If there is to be a change in clinical practice, then there is a need for some evidence about current practice, and the actual risk of finding unusual antigens and antibodies, as well as the actual requirement, and urgency of requirement, for blood. It is suggested that for patients who have been identified pre-operatively as not having a particularly high risk of bleeding (ideally by the use of a formalised bleeding assessment tool), then it will be very unusual that they would require blood urgently, and it would be reasonable to proceed to most surgery without a group and screen.

In order to answer the question an audit needs to be performed asking the following questions.

- How many group and screens are currently preformed?
- What is the rate of discovery of antibodies in the current surgical population? This should be broken down by gender and transfusion history.
- How often is blood required preoperatively, and with what degree of urgency?
- What is the decrement of safety between a group and screen preformed one week beforehand and a group and screen preformed semi-urgently?
- What are the current costs of a group and screen including the pathology costs, workload of blood sampling?
- What is the estimated decrement of safety between group O blood, and blood supplied after a short group and screen?

These issues will be considered further.

Further information from the NBA website at:

http://www.transfusion.com.au/transfusion_practice/pretransfusion_compatibility_testing



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Perioperative Interest Group Notes

Based on Cases discussed at the Weekly PIG Clinical Meeting on 13th October 2016. Publication date 27th October 2016.

Attendance: Gavin Sullivan, Candice Peters, Ross Kerridge, Daniel Orr, Viv Ho, Swaetha Koneru

TOPIC 1: *First Diagnosis of Diabetes*

53 year old man with a moderately symptomatic inguinal hernia awaiting surgery. Little previous attendance for medical care. Heavy smoker. History-taking elicited a report of recurrent carbuncles and skin abscesses etc. Noted to have a random blood sugar greater than 20mMol. Surprisingly normal spirometry. Blood pressure 150/103. Pathology results showed HBA1C of 14% and polycythaemia (190 G/L). The surgery was postponed for some 3 months for management of the condition.

- Patient was referred to endocrinology, who agreed to see the patient quickly wrt diabetes.
- The general practitioner will manage the blood pressure.
- Patient advised strongly to stop smoking. There is growing evidence that patient receptiveness to anti-smoking messages from doctors is increased when the messages are coming from surgeons or anaesthetists in the context of planned surgery. The short term focus and “bargaining transaction” makes the patients more likely to change. Ashley Webb, anaesthetist at Frankston in Melbourne has spoken and written on this topic extensively. (see his paper in the ANZCA ‘Blue Book’ paper, copy on the PeriopTalk website)

Attached:- Summary of Current Primary Management of ‘new’ Diabetes

TOPIC 2: *Incidental findings of trifascicular block on ECG*

A 62 year old man awaiting knee replacement with some cardiac risk factors (hypertension, previous smoker, distant history of ischemic heart disease) was found on ECG to have trifascicular block (1st degree, RBBB + LAHB) and heart rate 61. Discussed with Cardiologist. The cardiologist suggested that the patient’s beta blocker should be stopped and a 24-hour Holter monitor recording obtained. (A Holter monitor recording can be organised through most private pathology services at reasonably short notice, usually as a bulk-billed service. In this case, the patient was able to organise and commence Holter monitoring within 1 hour of being called!)

If the Holter monitor shows appropriate heart rate variability, and (in particular) appropriate tachycardia with exercise, then it would be reasonable to go ahead without any further interventions. Traditional concern about patients with incomplete heart block presenting for anaesthesia and surgery is perhaps based on concerns when halothane (a cardiac conduction inhibitor) was commonly used. Temporary transvenous pacing is no longer appropriate. Perioperative monitoring may guide post-anaesthetic care. If more extensive block or bradycardia develops, management can reasonably be by temporary pacing by external pads. Isoprenaline can be used, however low dose adrenalin maybe more available and is a reasonable option. (Note isoprenaline is no longer included in ALS guidelines.)

TOPIC 3: *Incidental finding of renal impairment*

A 72 year old woman presenting for shoulder surgery seemed acceptable for surgery, and was generally asymptomatic for other medical conditions, but surprisingly, blood tests from the clinic showed a creatinine of 280 and haemoglobin of 7.1! Surgery was postponed and referred to nephrologist.

Attached:- Initial Investigation & Management of ‘new’ Renal impairment.



“From the Trough”

Perioperative Interest Group Notes

Based on Cases discussed at the Weekly PIG Clinical Meeting on 17th November 2016.

Publication date 1st December 2016.

Website: www.perioptalk.org

Due to a number of factors there was no PIG Meeting on the 17th November.

Agency for Clinical Innovation Seminar

On the 8th of November the NSW Agency for Clinic Innovation held a state-wide workshop in Sydney focusing on Perioperative Services. Representatives of Perioperative Services from across the state were invited to take part, and share ideas.

The day was also the launch of the draft **Perioperative Toolkit**, which incorporates a great deal of resources around principles underlying organisation of perioperative services. The Toolkit is a re draft of the previous Pre-Procedure Preparation Toolkit, published in 2007. Apart from being updated, the Toolkit incorporates an increasing focus on the entire perioperative journey, including the postoperative phase. As well as the Toolkit there is a draft **self-assessment checklist** to allow hospitals to assess the features of their pre-admission process. Although these resources are specifically designed for the public NSW Health System, they are a useful resource for anywhere, and provide an interesting contrast to similar resources being produced by the College of Anaesthetists and the NHS in Britain, and by the Perioperative Surgical Home initiative of the American Society of Anaesthesiologists.

Green Theatres

Another highlight of the seminar was a presentation about the “Green Theatres” initiative. Many anaesthetists are concerned at unnecessary waste in the health system, including from a preventable cost and an environmental point of view. Some hospitals have taken initiatives to reduce waste, particularly by introducing point of use sorting of material to reduce the cost of waste disposal. (Material that is regarded as high level biological waste costs considerably more than to dispose of than standard hospital grade or household waste.) A group is being formed through the Agency of Clinical Innovation to consider these issues further.

Central Line Associated Air Embolism

A presentation at the workshop included raising concerns about the incidence of Venous Air Embolism associated with central lines. This has previously been regarded as an exceedingly rare complication, however some work has suggested that this in fact much more common than is commonly realised. Some estimates suggest that there is one preventable death per day around the world from central line associated air embolism. The unusual physiology and pathogenesis of the condition means that many staff managing central lines, particularly after insertion, are unaware of the potential for this condition. The group have put together a website focusing on other potentially preventable patient safety issues. The website can be found at www.patientsafe.wordpress.com it also includes an interesting collection of resources around human factors approaches to safety.

(Below:- Extract from the site www.patientsafe.wordpress.com)

Central Line Air Embolus: one death every day?

Central lines are essential for the care of many patients. However worldwide data may indicate that at least one patient is dying every day from an avoidable central line related air embolus. (Venous Air Embolus associated with Central Venous Access Device) The amount of air required to cause an intractable cardiac arrest can enter a central line easily and rapidly over 1 or 2 seconds.

If CVC related air embolus is so prevalent where are all the reports?

Clinicians have collated numerous case series and an overwhelming amount of case reports which highlight the prevalence of this problem. As is the nature of adverse events in healthcare they tend to be dispersed in time and place. This often starves us of the impetus required to put effective system measures in place. They have only just started to collate this data; however one may already start to appreciate the magnitude of this issue.

They suggest that the usual healthcare safety approach of education, alerts and policy writing don't appear to have impacted on preventing this issue. In fact reports demonstrate the frequency of this adverse event is only increasing. They discuss how a human factors approach including technology redesign may significantly help in reducing adverse event frequency.

Report to NSW Agency for Clinical Innovation **NSW reports 2012 to 2015:**

- Fourteen actual or suspected VAE incidents related to CVADs were identified. There were six deaths.
- Two-thirds of the incidents and four of the deaths related to removal practices.

CVAD precipitating activity	Patient survived with/without confirmed deficit (n=8)	Death (n=6)
CVAD removal (n=9)	5	4
CVAD insertion (n=3)	2	1
CVAD disconnection (n=2)	1	1

- Seven patients were in a sitting or semi-recumbent position during removal. All incidents that specified a site indicated the CVADs were inserted in the jugular vein.



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Perioperative Interest Group Notes

Based on cases discussed at the weekly PIG clinical meeting on 20th October 2016. 3rd November 2016 Publication date

Attendance: Tracey Tay, Mich Poppinghaus, Rebecca Scott, Michael Hicks, Rhys Thomas

TOPIC 1: *Elective TKR post hypoxic cardiac arrest*

A 68 year old man presented to perioperative clinic for consultant review, 8 days after a hypoxic cardiac arrest that occurred when he was anaesthetised for planned (elective) total knee replacement. Following a spinal anaesthetic, GA was induced and an LMA was placed. It was not well-fitting and the patient desaturated profoundly, despite attempts to reposition. BMV was attempted but a seal was unable to be obtained. The patient became hypoxaemic and bradycardic to the point of PEA arrest. ECM was commenced. The rhythm degenerated to VF and a single DC shock of 200J was applied. ROSC was achieved, and he was emergently intubated and stabilised. The procedure was abandoned and he was admitted to ICU for post cardiac arrest care. He was extubated uneventfully the following morning. He had formal cognitive assessment by a delirium CNC following the event, who found evidence of some cognitive impairment (though presumably with no baseline measurement?). His wife concurred that there had been some deterioration following the event. Intriguingly, there was an attempt to re-book him for the TKR during that inpatient episode, but this was stymied by lack of available theatre time. Inpatient TTE was essentially normal and angiography showed evidence of mild CAD only.

Question: What is an appropriate time to wait following such an event, before proceeding with elective surgery?

Discussion:- Whilst there is fairly clear guidance from the AHA/ACC guidelines that elective surgery should be delayed a minimum of 6 months following AMI, there appears to be an evidence void when it comes to cardiac arrest. A cardiologist was consulted – the feeling was that there was no specific need to wait – the arrest was not from a primary cardiac cause. A Holter monitor was planned for thoroughness. A similar discussion could be held with regard to the possible neurological injury. In the absence of evidence. A plan was made to reassess his cognitive state and to re-book him for approximately 6 weeks from the date of the arrest.

TOPIC 2: *Follow up post allergy clinic*

A 50 year old man was referred to Immunologist's allergy clinic, following what was potentially an anaphylactic or 'anaphylactoid' reaction following a thrombectomy to his left subclavian vein. The suspect agents were urokinase and Ultravist. Testing to both was problematic – Urokinase was negative on skin testing, but the test was described as “limited”, while the clinic is unable to test Ultravist at all. This is because the mechanism of reaction is considered to be caused by contrast mediated direct histamine release (as occurs with morphine), rather than IgE mediated or true anaphylaxis. The patient underwent a subsequent procedure for 1st rib resection, both these agents were avoided and there were no intraoperative complications. The Immunologist's recommendation was that he never again be given Urokinase (thought to be the most likely culprit), and that if he required IV iodinated contrast, he should be given an appropriate steroid cover as per RANZCR protocol. (see attachment)

Discussion: What is the best way to ensure that this patient can inform future health professionals about his potential allergy? Various options were discussed, including HARD card, MedicAlert bracelet as well as ensuring CAP alerts were put in place. MedicAlert is not a free service; their website lists the price as an initial \$32 “membership” fee with prices for warning bracelets starting from \$42.

The decision was made to follow up with the GP and patient directly and to ensure he had both a copy of the letter from the allergy clinic and that the important information in it was repeated for clarity. CAP alerts were also updated to reflect the new information.



“From the Trough”

Perioperative Interest Group Notes

Based on Cases discussed at the Weekly PIG Clinical Meeting on 24th November 2016.

Publication date 15th December 2016.

Website: www.perioptalk.org

Attendance: Todd Eggleton, Ross Kerridge, Monica Diczbalis, Tracey Tay, Mich Poppinghaus

TOPIC 1: *More about Diets.*

The recent review of the obesity epidemic by (covered in PIG Notes 10th November) included some discussion of dietary changes, but did not go into great detail on this. As many will be aware, there is increasing focus on avoiding carbohydrates rather than fats, a debate that has been ongoing for at least 40 years. An interesting review on the topic that is written for a general audience rather than specifically medical is attached. Although it is written for a general audience, it reviews the scientific literature at the level of “catalyst” (but staying within mainstream medicine) appears to be useful resource.

Also on this topic is an ongoing story about low-carb enthusiast Dr Gary Fettke. The ABC story suggests he has been disciplined by AHPRA for giving low-carb nutritional advice:- This is an ongoing story, but the headline simplifies the issue for the media. There is a difference between advice to reduce carbohydrates and giving specific nutritional advice (and crossing into another discipline), and with claims of benefit beyond the conventionally accepted. Fettke has refused to allow AHPRA permission to comment on the case (which is his right), but he is not constrained from commenting himself. This is an ongoing story.....

<http://mobile.abc.net.au/news/2016-11-30/low-carb-advice-lands-doctor-in-hot-water/8078748?pfmredir=sm>

TOPIC 2: *Should HbA1C alone be used as a ‘cut-off’ triage tool for joint replacements?*

It is well recognised that HbA1C is associated with postoperative joint infection. It has therefore been suggested by some that a raised HbA1C should be used as a cut-off for booking surgery. Current literature suggests that although there is an increasing risk, the data isn’t convincing enough for use as a triage tool:- there is no clear “inflection point” for HbA1C where it would be justifiable to postpone surgery on HbA1C alone. i.e. HbA1C alone is an unreliable predictor of poor postoperative outcome. Pragmatically, it needs to be used in association with other markers of diabetes severity, potential for improvement, and other clinical factors about the patient.

(See Refs below)

TOPIC 3: *Health pathways*

Health Pathways are an online health information portal developed by HNE Health in association with HNE-CC Primary Health Network. It is based on earlier work done in Christchurch, New Zealand after the massive earthquake there. Although aimed at general practitioners, it now contains a myriad of useful resources for a wide range of health conditions, useful for hospital practice as well. There needs to be more awareness of this by hospital specialists and staff. Health pathways can be accessed from the internet, with a login code and password available by application. (It can be accessed within the HNE Health System directly.) .

Surgical outcomes of total knee replacement according to diabetes status and glycemic control, 2001 to 2009.

Adams AL, et al. *J Bone Joint Surg Am.* 2013 Mar 20;95(6):481-7.

BACKGROUND: Poor glycemic control in patients with diabetes may be associated with adverse surgical outcomes. We sought to determine the association of diabetes status and preoperative glycemic control with several surgical outcomes, including revision arthroplasty and deep infection.

METHODS: We conducted a retrospective cohort study in five regions of a large integrated health-care organization. Eligible subjects, identified from the Kaiser Permanente Total Joint Replacement Registry, underwent an elective first primary total knee arthroplasty during 2001 through 2009. Data on demographics, diabetes status, preoperative hemoglobin A1c (HbA1c) level, and comorbid conditions were obtained from electronic medical records. Subjects were classified as nondiabetic, diabetic with HbA1c < 7% (controlled diabetes), or diabetic with HbA1c ≥ 7% (uncontrolled diabetes). Outcomes were deep venous thrombosis or pulmonary embolism within ninety days after surgery and revision surgery, deep infection, incident myocardial infarction, and all-cause rehospitalization within one year after surgery. Patients without diabetes were the reference group in all analyses. All models were adjusted for age, sex, body mass index, and Charlson Comorbidity Index.

RESULTS: Of 40,491 patients who underwent total knee arthroplasty, 7567 (18.7%) had diabetes, 464 (1.1%) underwent revision arthroplasty, and 287 (0.7%) developed a deep infection. Compared with the patients without diabetes, no association between controlled diabetes (HbA1c < 7%) and the risk of revision (odds ratio [OR], 1.32; 95% confidence interval [CI], 0.99 to 1.76), risk of deep infection (OR, 1.31; 95% CI, 0.92 to 1.86), or risk of deep venous thrombosis or pulmonary embolism (OR, 0.84; 95% CI, 0.60 to 1.17) was observed. Similarly, compared with patients without diabetes, no association between uncontrolled diabetes (HbA1c ≥ 7%) and the risk of revision (OR, 1.03; 95% CI, 0.68 to 1.54), risk of deep infection (OR, 0.55; 95% CI 0.29 to 1.06), or risk of deep venous thrombosis or pulmonary embolism (OR, 0.70; 95% CI, 0.43 to 1.13) was observed.

CONCLUSIONS: No significantly increased risk of revision arthroplasty, deep infection, or deep venous thrombosis was found in patients with diabetes (as defined on the basis of preoperative HbA1c levels and other criteria) compared with patients without diabetes in the study population of patients who underwent elective total knee arthroplasty.

Diabetes mellitus, hemoglobin A1C, and the incidence of total joint arthroplasty infection.

lorio R, et al. *J Arthroplasty.* 2012 May;27(5):726-9.e1.

Patients with diabetes have a higher incidence of infection after total joint arthroplasty (TJA) than patients without diabetes. Hemoglobin A1c (HbA1c) levels are a marker for blood glucose control in diabetic patients. A total of 3468 patients underwent 4241 primary or revision total hip arthroplasty or total knee arthroplasty at one institution. Hemoglobin A1c levels were examined to evaluate if there was a correlation between the control of HbA1c and infection after TJA. There were a total of 46 infections (28 deep and 18 superficial [9 cellulitis and 9 operative abscesses]). Twelve (3.43%) occurred in diabetic patients (n = 350; 8.3%) and 34 (0.87%) in nondiabetic patients (n = 3891; 91.7%) (P < .001). There were 9 deep (2.6%) infections in diabetic patients and 19 (0.49%) in nondiabetic patients. In noninfected, diabetic patients, HbA1c level ranged from 4.7% to 15.1% (mean, 6.92%). In infected diabetic patients, HbA1c level ranged from 5.1% to 11.7% (mean, 7.2%) (P < .445). The average HbA1c level in patients with diabetes was 6.93%. Diabetic patients have a significantly higher risk for infection after TJA. Hemoglobin A1c levels are not reliable for predicting the risk of infection after TJA.

Hemoglobin A1C as a marker for surgical risk in diabetic patients undergoing total joint arthroplasty.

Harris AH, et al. *J Arthroplasty.* 2013 Sep;28(8 Suppl):25-9. doi: 10.1016/j.arth.2013.03.033. Epub 2013 Jul 30

Diabetes is a risk factor for complications following total joint arthroplasty (TJA). This retrospective cohort study of 6088 diabetic patients from the Veterans Health Administration (VHA) undergoing TJA sought to determine if hemoglobin A1c, an accessible and objective lab value, has utility as a predictor of risk of complications in TJA after controlling for demographic, surgical, and medical center effects, and to evaluate the benefits and risks of alternative thresholds. Analysis of the functional relationship between hemoglobin A1c and complications revealed that the risk linearly increases through, rather than surging at, the threshold of 7%. Before delaying surgery to achieve better diabetic control, surgeons and patients should weigh the estimated risks of TJA against the potential benefits.



“From the Trough”

Perioperative Interest Group Notes

Based on Cases discussed at the Weekly PIG Clinical Meeting on 27th October 2016. Publication date 3rd November 2016.

Attendance: Rhys Thomas, Ross Kerridge, Peter Harrigan, Rob Bishop, Sam Phillips, Keith Streatfield, Todd Eggleton, Michael Hicks, Sarah Crosby, Amanda Taylor, Ross Kerridge,

TOPIC 1: *Highlights of the 5th an Australasian Perioperative Symposium*

Richard Griffiths, Anaesthetist from the UK, spoke about the national performance improvement program for management of fractured neck of femur, in particular the SPRINT audit that aims to standardise and improve performance. This has been regarded as a major improvement, although there was major variability in anaesthetic management documented across the country. A similar program is being developed in Australia. There remains no evidence to decide whether a spinal is better than general anaesthetic, and in his words “that will never be possible”.

Ruth Hubbard Geriatrician from Sydney talked about frailty and the science of assessment of frailty. Walking speed is one of the most important physical indicators, reflecting the multiple cognitive and performance domains involved in walking. At a more subtle level, the ability to “hold 2 thoughts simultaneously” was a more subtle indicator of (lack of) cognitive loss.

Jugdeep Dhesi, Geriatrician from London, spoke about the development of their POPS model of care (Perioperative Care for Older Persons) at her hospital (St Thomas’, London). It is a leading centre nationally. It focuses on aged and high risk patients, but the “Perioperative” model is the basis for their model of care. Triage is used to select out patients for this model – the remainder go through ‘normal care’. Geriatrics in this model is more akin to acute general medicine for the hospitalised elderly, with less emphasis on the community than in some Australian centres.

David A Scott (President of ANZCA) gave a talk outlining the current understanding of POCD (Post-Operative Cognitive Dysfunction) The previous concern about anaesthetics as being the major driver for the phenomenon of confusion, delirium, and accelerated cognitive decline at the time of surgery and anaesthesia can no longer be supported, although adverse effects of anaesthetic agents cannot be totally excluded. The most effective regimes for avoiding cognitive dysfunction focus on the other aspects of hospitalisation such as drugs, sleep deprivation, avoidance of the inflammatory response to surgery. The role of hypertension perioperatively causing some cognitive loss cannot be excluded.

Steve Smith:- (Surgeon from Newcastle). Gave an excellent review of the implementation of ERAS – Enhanced Recovery After Surgery (which he prefers to describe as good surgical principles) in contemporary surgical practice in both teaching hospital and private practice settings.

Captured the audience’s attention with his description of a colorectal surgeon’s rapid clinical assessment of the elderly patient. Go to the waiting room, call their name (cognition/attention/hearing); watch them get up from chair (core strength, balance): assess walking speed (general frailty, CVS reserve); greet them & shake their hand (grip strength); tell them to turn left into the room and take the seat on the right (assesses if they can hold two ideas simultaneously!)

TOPIC 3: *A caution about using NSQIP Risk Prediction Tool*

Among the best available risk prediction tools are PPossum and NSQIP. It should be noted that NSQIP includes a prediction of discharge to a nursing facility; however this should not be taken to imply long term residential care. It applies to the American hospital situation, where patients may well be discharged to a “skilled nursing facility” (i.e. rehabilitation facility) post-operatively, but may then return home. This may explain the remarkably high level of prediction of “nursing home” placement post operatively. It should be interpreted with caution.

TOPIC 4: A 70 year old lady with a massive hiatus hernia – fitness for surgery

A patient with a massive hiatus hernia was noted to have a remarkably high degree of exertional dyspnoea. She is being assessed for laparoscopic repair of the hernia. What is the cause of the dyspnoea?

Discussion: - Conventional assessment looking at cardiac and respiratory causes is appropriate. Consideration of the possible contribution of the hiatus hernia is also appropriate.

For some years there has been a clinical observation that some of these patients have surprisingly severe exertional dyspnoea that is out of proportion to their conventional cardiorespiratory findings. The suggestion that the hernia was displacing lung volume and thus causing dyspnoea had been proposed, but was difficult to accept, as the actual lung volume reduction was less than seen in other settings. Nevertheless dyspnoea appeared to improve after surgery. A recently postulated mechanism for dyspnoea in these patients has been proposed by clinicians (Chris Naoum, Cardiologist, Greg Falk, Surgeon & others) at Concord Hospital in Sydney, and is gaining international interest and acceptance. The suggestion is that the hiatus hernia compresses the left atrium, pulmonary veins and coronary sinus, restricting blood flow into the left atrium and thus causing a dynamic impairment in exercise tolerance, particularly in a postprandial setting. (See Naoum C, Falk GL, Ng ACC, JAmCollCardiol 2011;58:1624-34 and Editorial by Marwick TH JAmCollCardiol 2011;58: 1635-36).

In this case:- A non-specific echocardiographic examination had already been performed. In view of the above, this was repeated with specific request to the cardiologist to evaluate for left atrial compression. This was found to be quite marked, and associated with a mass (the hiatus hernia) immediately posterior to the LA. (*"Diagnosis confirmed"*). The rest of the examination was unremarkable – Good LV function and no pulmonary hypertension. The patient can be scheduled for surgery in anticipation her dyspnoea will be improved (as well as her hiatus hernia). See clips from echo.



“From the Trough”

Perioperative Interest Group Notes

Based on Cases discussed at the Weekly PIG Clinical Meeting on 10th November 2016. Publication date 24th November 2016.

Website: www.perioptalk.org

Attendance: In view of interest in the topic being presented, the PIG meeting for 10th November was combined with Medical Grand Rounds.

TOPIC : A Strategy for Obesity ?

Summary of Presentation by Endocrinologist Katie Wynne at JHH Medical Grand Rounds.

Over the past four decades, we have transitioned from a world in which twice as many people were underweight than overweight, to one in which the global population is obese. Obesity and T2D are likely to be the two greatest public health problems of the coming decades.

Current ‘hot topics’ with regard to our response to the obesity epidemic include:-

- BMI is a useful screening tool for diagnosis but has limitations. ‘Weight bias’ in obesity care is an important obstacle that can interfere with effective obesity treatment. A more wholistic approach to assessment has been proposed using the *Kings Obesity Staging Criteria (or King’s Scale)* of obesity-related health conditions. (see figures) This provides a framework for assessment that emphasizes the wide spectrum of manifestations of obesity-related disease.
- The body attempts to maintain energy balance and protect existing body weight through a complex feedback system integrated in the hypothalamus. Dieting results in a gut hormone profile that mimics the fasted state; (i.e. *the body attempts to ‘defend’ the previous body weight*). These changes persist for 12 months after weight loss and may explain why the majority of obese dieters fail to maintain a reduced body weight.
- New understanding of the microbes that live in our digestive tract is offering interesting insights into energy homeostasis and potential avenues for intervention. Changes to gut microbiota and altered faecal short chain fatty acids, produced by bacterial fermentation, have been linked with insulin resistance, diabetes and obesity.
- Weight loss provides significant health outcome benefits in chronic disease attributable to obesity. Benefits are seen with only modest weight losses (particularly in T2DM, AF, HT and OSA) and are magnified with larger reductions.
- ANZOS recently launched a Primary Care Algorithm for the management of Obesity (October 2016) recommending specialist services for BMI $>40\text{kg/m}^2$ or BMI $30\text{-}40\text{kg/m}^2$ with complications. The algorithm provides a weight loss target of $>10\%$ in individuals with BMI $30\text{-}40\text{kg/m}^2$ and $>15\%$ in individuals with BMI $>40\text{kg/m}^2$. It emphasizes the role of VLED and bariatric surgery and identifies the pathway from primary care to specialist services.
- The foundation of any program is lifestyle change, diet and increased physical activity. VLEDs induce ketosis (and resultant appetite suppression) and result in a significant reduction in liver and pancreatic fat; in some patients this restores insulin secretion, which suggests T2DM is a disease of positive calorie balance and not inevitably progressive. Liraglutide has recently been TGA-approved for obesity and results in $>5\%$ weight loss in 50% patient over 3 years.

- Bariatric surgery is the only intervention that is associated with sustained weight-loss, reduced mortality, CVD and cancer risk. Recent guidelines have moved to include metabolic consequences of obesity, in addition to BMI, with the aim of improving metabolic health. The rapid improvement in glucose metabolism is a consequence of changes to gut hormones, bile acids and the microbiome. LAGB and LSG are safe operations with mortality of 0.1-0.5% and major complications 2-6%. Lifelong follow up of nutritional adequacy is essential.
- Evidence suggests that publically funded surgery is effective and results in the expected remission of T2D, HT and OSA. In Australia, the highest prevalence of obesity exists in the lowest socio-economic groups, but most bariatric surgery is performed in the private sector, making it inaccessible to those most likely to benefit. Legal precedent has demonstrated that there is a duty of care to offer bariatric surgery to those in whom it is indicated.
- Locally, HNE is developing a Model of Care that aims to target complex patients who present to acute services. A pilot project 'Sweetdreams' is investigating the efficacy and durability of a VLED with a year of care in patients with T2DM. Next steps may include service development to establish a referral pathway, multidisciplinary team and metabolic surgery pathway.

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The King's Scale (The Original Scale has been modified and developed since this publication)

- Aasheim, E. T., Aylwin, S. J. B., Radhakrishnan, S. T., Sood, A. S., Jovanovic, A., Olbers, T. and le Roux, C. W. (2011), Assessment of obesity beyond body mass index to determine benefit of treatment. *Clinical Obesity*, 1: 77–84. doi:10.1111/j.1758-8111.2011.00017.x
- **Tackling Obesity in South London** *Discussion paper released by The Health Innovation Network on 2 April, 2014 (In www.perioptalk.org)*

The King's Scale (King's Obesity Staging Criteria)

Criterion	Stage 0 Normal Health	Stage 1 At risk	Stage 2 Established disease	Stage 3 Advanced disease
A Airway / Apnoea	Normal No snoring, neck circumference <43 cm; ESS < 10	Mild sleep apnoea Mild snoring, ESS>10, Mild OSA (dip rate<15/hr), neck circ>43cm, mild asthma	Requires CPAP Witnessed apnoea Dip rate >15/hr Uses CPAP (controlled) Severe asthma	Cor pulmonale Obesity hypoventilation syndrome Uncontrolled OSA
B BMI (kg/m ²)	<35	35-50	50-60	>60
C CVD risk (% 10 years)	<10% http://www.bhsoc.org/resources/cvd-risk-charts-and-calculators/	10-20 T2D	>20 or stable CAD CFF NYHA I-II	Severe angina or CFF NYHA III-IV
D Diabetes	Normal Fasting /random glucose <5.7mmol/l Normal HbA1c	IGF IFG /IGT or GDM	T2D Hba1c <9%	Uncontrolled DM HbA1c>9% Advanced Microvascular disease
E Economic	Normal	Financial impact Travel / clothes	Workplace disadvantage Earnings limited by obesity; receiving benefits due to obesity	Unemployed due to obesity; carer
F Functional status	No limitation	1 flight of stairs Limits on recreation	<1 flight stairs Help with ADL's	Housebound Wheelchair Registered disabled
G Gonadal	Normal Normal sexual and reproductive function	PCOS / Erectile dysfunction / low Testosterone	Subfertility Relationship breakdown Cessation of sexual activity	

Criterion	Stage 0 Normal Health	Stage 1 At risk	Stage 2 Established disease	Stage 3 Advanced disease
H mental Health Status	Normal Good mental and physical well-being	Low mood / poor QoL	Mild-Moderate depression	Severe depression Suicidal ideation Substance abuse Self-harm
I body Image and eating	Normal eating pattern	Dislikes appearance Comfort eating Inappropriate eating Mild dysphoria	Avoids social interaction Severe dysphoria Controlled eating disorder	Eating disorder Social Phobia
J Oesophageal gastric J	Normal	GORD Controlled on PPI	Oesophagitis <12months Severe GORD high dose PPI	Barrett's oesophagus
K Kidney	Normal	Proteinuria	eGFR<60	eGFR<30
L Liver	Normal	Elevated LFT's, NAFLD on ultrasound	NASH	Liver failure

M: medications

N: nutritional history and assessment

O: on clinical examination

P: plan