

PRE-OPERATIVE ASSESSMENT GUIDELINES FOR ADULTS UNDERGOING SURGERY UNDER GENERAL OR REGIONAL ANAESTHESIA

Preoperative Assessment Clinics* and In-patients

*St Luke's Pre-assessment Centre

*Gynaecology Pre-assessment

*ENT/Ophthalmology Pre-assessment

Author (name and designation):	Samantha Kritzinger (Consultant Anaesthetist) Ray Smith (Consultant Anaesthetist)
Version Number:	
Approval Committees:	
Ratified by:	
Date ratified:	
Date issued:	2018
Review date:	2023

CONTENTS	Page
Introduction	3
Referral Criteria for Consultant Anaesthetist Pre-Assessment Clinic Appointment	4
Confirmation of Patient's Allergy Status	6
Pre-Operative Fasting Guidelines	7
Day Case Surgery	8
Hypertension	10
Anaemia	11
Pre-Operative Tests for Elective Surgery (including Nice Guidelines)	12
Abnormal Pre-Operative Blood Results	16
Pre-Operative Blood Transfusion Samples	17
Pre-Operative Cardio-Respiratory Investigations	19
Peri-Operative Protocol for Pacemakers and ICDs	20
Perioperative Care of the Elderly and Assessment of Frailty	21
Pre-Operative Cardiac Risk Assessment	24
Management of Obese Patients and Weight Reduction Surgery	30
Obstructive Sleep Apnoea	32
Guidelines for the Peri-Operative Management of Diabetes Mellitus in Adults	35
Peri-operative Management of Chronic Medication <ul style="list-style-type: none"> ➤ Handbook of Peri-operative Medicines ➤ Anti-platelet Agents ➤ Peri-Operative Steroid Supplementation 	42
Peri-Operative Recommendations for Complimentary Medicines	48
Anti-Coagulation Therapy in the Peri-Operative Period	50
Venous Thrombo-Embolic (VTE) Prophylaxis	56
Patients with Haematological Disorders	57
Anaesthesia and Breast Feeding	58
Guidelines for Pre-Operative Assessment of Patients for Cataract Surgery under Local Anaesthesia	59
Guidelines for Air Travel and Surgery	60

INTRODUCTION

All **elective patients** having surgery or a procedure under general anaesthetic or regional anaesthetic should undergo a pre-operative assessment prior to allocation of a date for surgery.

The pre-operative assessment may be:

- Nurse led assessment
- Anaesthetic clinic with a consultant assessment (see referral criteria pg4)

Benefits of a good pre-operative assessment prior to elective surgery, include

- Assessment of patients and co-morbidities
- Optimisation of co-morbidities
- Pre-operative investigations (NICE guidance CG45, April 2016)
- MRSA screening
- Documentation and patient information
- Reduce on the day cancellations
- Reduced length of stay
- Risk assessment
- Anaesthetic consent

The following information is mandatory and should be recorded on EPR:

- Weight (kg) and BMI
- Blood pressure and Pulse rate
- Current drug history
 - For in-patients, the chronic medicines should be prescribed on the patient's drug chart
 - Information regarding drug history can be acquired, with patients' consent, from SystemOne.
- Allergies
- Details of previous anaesthetic problems

Investigations are requested on an individual patient basis according to current NICE guidelines (NG45 – April 2016) and local policies.

The following guidelines are designed to help Pre-assessment Clinic staff and medical staff with the pre-operative preparation of patients for theatre, and the peri-operative management of common problems in both elective and non-elective surgical settings.

Queries should be directed via the Pre-operative assessment clinic (for out-patients) on ext5758 or for in-patients via the Anaesthetics department on ext4065.

Problems with individual patients should be discussed where possible with the Anaesthetist who will be responsible for that patient or with one of the Pre-assessment consultant anaesthetists.

Ray Smith, Consultant Anaesthetist
Samantha Kritzinger, Consultant Anaesthetist

REFERRAL CRITERIA FOR CONSULTANT ANAESTHETIST PRE-ASSESSMENT CLINIC APPOINTMENT

Send referral by formal letter or email to Ward.A2@bthft.nhs.uk or EPR/email to one of the pre-assessment consultant Anaesthetists

	Consultant Anaesthetic assessment	Anaesthetic review of notes or discussion with anaesthetist +/- decision to recall patient for face to face assessment
<p>All patients for major complex surgical cases are to be reviewed routinely by a Consultant Anaesthetist</p> <p>*routine CPX test</p> <p>**CPX test may be considered, but not routine</p>	<ul style="list-style-type: none"> • Aortic surgery* • Major colorectal surgery – laparoscopy and laparotomy • Major urology <ul style="list-style-type: none"> ○ Cystectomy* ○ Cysto-prostatectomy* ○ <i>any</i> ileal conduit formation** ○ nephrectomy • Major upper GI surgery <ul style="list-style-type: none"> ○ Oesophagectomy* ○ Gastrectomy* ○ Whipple’s procedure* ○ Weight reduction surgery • Major complex orthopaedic surgery <ul style="list-style-type: none"> ○ revision hip or knee replacement in ASA III or more patients • Major head and neck surgery <ul style="list-style-type: none"> ○ complex resections and reconstructive surgery 	
<p>Patients with previous anaesthetic related complications</p>		<ul style="list-style-type: none"> • Difficult intubation or previous awake fibre-optic intubation (anticipated or documented) • Family history of serious anaesthetic problems <ul style="list-style-type: none"> ○ malignant hyperthermia ○ Suxamethonium apnoea ○ porphyria • True anaphylaxis • History of major anaesthetic complication
<p>Patients with cardiac conditions</p>	<ul style="list-style-type: none"> • Cardiac failure <ul style="list-style-type: none"> ○ Not optimally controlled ○ Documented moderate to severe left ventricular impairment ○ Pacemaker for cardiac resynchronisation therapy ○ Dyspnoea at rest or on minimal exertion • Valve lesions <ul style="list-style-type: none"> ○ Known, suspected or symptomatic moderate/severe aortic stenosis or mitral stenosis • Pulmonary Hypertension • Acute myocardial infarction within last 6 months 	<ul style="list-style-type: none"> • Mitral or aortic valve replacement • Patients who have had coronary angioplasty with/without stents within the last 12 months • Patients on Clopidogrel with cardiac stents • New/undiagnosed murmur – for discussion with possible need for Echocardiogram • Patients with functional impairment due to other valve or congenital heart disease

		<ul style="list-style-type: none"> • Pre-assessment ECG with Mobitz II block, complete heart block, trifascicular block • Uncontrolled or symptomatic arrhythmias (e.g. SVT/AF/Atrial Flutter) • Patients with valve replacements who are anticoagulated • Follow guidelines for poorly controlled or uncontrolled hypertension
Patients with respiratory conditions	<ul style="list-style-type: none"> • Pulmonary Hypertension • Brittle asthmatic patients – hospital admissions in the last 12 months or ICU admissions in the past • Severe emphysema or COPD – limited functional capacity (dyspnoea at rest or minimal exertion), frequent respiratory tract infections requiring antibiotics and steroids, frequent hospital admissions or ICU admission in the past • Patients on home oxygen • Any other incapacitating respiratory symptoms 	<ul style="list-style-type: none"> • Obstructive Sleep Apnoea (OSA) <ul style="list-style-type: none"> ○ Any patient screened for OSA in pre-assessment centre or elsewhere scoring $\geq 6/8$ on STOPBANG criteria ○ Any patient with OSA on CPAP
Other conditions	<ul style="list-style-type: none"> ➤ Renal <ul style="list-style-type: none"> ○ Patients on renal dialysis for renal failure ○ Patients with chronic kidney disease stage 4/5 with Cr > 170 micromol/L ➤ Neuromuscular <ul style="list-style-type: none"> ○ Muscular dystrophies ○ Myasthenia gravis ➤ Severe rheumatoid arthritis or ankylosing spondylitis affecting mouth opening or neck extension ➤ Haematological <ul style="list-style-type: none"> ○ Jehovah's witness for major surgery ○ Haemoglobinopathies ○ Acquired or hereditary thrombophilia or haemophilia 	<ul style="list-style-type: none"> • Patients with poorly controlled diabetes (HbA_{1c} ≥ 75mmol/mol) • Abnormal thyroid function tests • Abnormal urea & electrolytes <ul style="list-style-type: none"> ○ Na⁺ < 125mmol/L ○ K⁺ > 6mmol/L ○ Ca²⁺ > 3mmol/L ○ Creatinine 110 – 170 micromol/L • Central Nervous System <ul style="list-style-type: none"> ○ CVA/TIA within the last 3 months • Anaemia should be discussed and treated preoperatively with iron (PO or IV – <i>pathway tbc 2018</i>) <ul style="list-style-type: none"> ○ Hb < 130g/L male and female • Patients on anticoagulation or antiplatelet agents

CONFIRMATION OF PATIENT'S ALLERGY STATUS

When patients are first being assessed whether at out-patients, pre-assessment clinics, on admission to hospital or prior to any surgical intervention it is essential that their allergy status is determined.

On initial assessment – ask the patient/patients carer if there is anything to which they believe they are allergic. If the patient states that they have no allergies, complete the EPR record with '**NO KNOWN DRUG ALLERGIES**'.

If the patient states that they have an allergy, document

- details of the **substance** that they are allergic to
- the type of **reaction** that they get e.g. wheezing, sneezing, skin rash, vomiting, and diarrhoea

This should include the following categories

- **medication**
- **food** especially allergy to shell fish, eggs, peanuts or fruits such as kiwi, bananas and avocados
- **substances** especially allergies to balloons, rubber gloves, contraceptives, dressings, elastic and Latex

Documentation of allergy status

- Peri Operative Care Plan
- EPR
- 2 **Red** Identification Bands
- Anaesthetic Record
- Theatre list

If there is any doubt pertaining to the allergy status of an individual, the person carrying out the assessment should contact the GP or access SystemOne to clarify.

If a patient suffers from an allergy to **latex it is essential that the patient is the first** on the operating theatre list to limit their exposure to airborne latex allergens. The person who has completed the assessment must inform the Medical Secretary/waiting list office.

PRE-OPERATIVE FASTING GUIDELINES

ELECTIVE SURGERY

Oral medication	With water until 1 hour before surgery
Morning List	No solids after 12 midnight Free access to fluids until 06h30
Afternoon List	No solids after 07h30 – light breakfast before this time Free access to fluids until 11h30
Fluids Allowed	Water, squash, tea or coffee (with a little milk)
Exclusions	Pregnancy (>16 weeks), upper GI disease, Oesophageal lesions, peptic ulcer disease, patients on regular opiates
Infants	Clear fluids until 1 hour prior to start of surgery. Breast milk until 4 hours prior to start of surgery. Formula/cow's milk/solids until 6 hours prior to start of surgery.

NON-ELECTIVE SURGERY

Oral medication should be taken with some water until 1 hour before surgery.

Where oral fluids are to be withheld for longer than 6 hours IV fluids may be administered. Individual clinical circumstances should be considered in all cases.

Nil by mouth for solids for at least 6 hours.

CHEWING GUM

There is no evidence that the chewing of gum at any stage pre-operatively significantly increases gastric volume or acidity. Research suggests that surgery can proceed safely but ensure that nothing more hazardous has also been consumed.

DAY CASE SURGERY

Selection of patients for day surgery should take the following into account:

Surgical and anaesthetic criteria

1. Minimally invasive techniques for abdominal (and thoracic) cavity surgery
2. Degree of surgical trauma is more important than the duration of surgery
3. Post-operative pain should be manageable with oral analgesia or regional anaesthetic techniques
4. No ongoing blood loss or requirement for fluid replacement
5. No specialist care or observations required post-operatively
6. Low risk of post-operative complications

Social criteria

1. Telephone access to a medical practitioner or hospital
2. Availability of responsible carer overnight and until 24 hours following surgery/general anaesthetic
3. A reasonable journey time to home and/or to emergency medical care (+/- 1 hour). Public transport is not a suitable option.
4. Patients should not have to care for elderly, infirm or young relatives.

Medical criteria

1. General considerations
 - Pre-optimisation of co-existing disease before elective surgery
 - If functional state is unlikely to be compromised by the planned procedure, same day discharge should be possible
 - Patient factors such as age, obesity and comorbidities *may* be associated with increased risk of adverse perioperative events but are usually minor and resolve soon after surgery. These are *poor predictors* of unanticipated hospital admission.
 - Preoperative clinical evaluation contributes essentially to suitability for day case surgery.
2. Specific points
 - **Age** – there is no arbitrary upper age limit for day surgery
 - **ASA 3** patients – although they have more complex perioperative management, their complication rates are no more, in the medium to late recovery period, than ASA 1 and 2 patients. The patient's fitness for day surgery is at the discretion of the surgeon and anaesthetist.
 - **ASA 4** patients – may be suitable for day surgery under local anaesthesia
 - **Obesity** – obesity and morbid obesity are not contraindications to day surgery. Patients with a BMI > 40 should be discussed with the anaesthetist regarding suitability for day surgery
 - **Obstructive Sleep Apnoea (OSA)** – patients with OSA may be suitable for day surgery if established and compliant with CPAP therapy, and symptoms are controlled. Opiates should generally be avoided. It is prudent to discuss the case with the pre-assessment anaesthetist before listing for day surgery.
 - **Cardiovascular disease** – patients with severe angina (at rest or on minimal exertion), heart failure, or an acute coronary event or revascularisation should be discussed with the pre-assessment anaesthetist before listing for day surgery.

If patients are booked who do not meet these criteria, the final decision regarding admission rests with the anaesthetist responsible for that list. Availability of a physical bed must be confirmed prior to commencing surgery.

REFERENCES

1. Jackson, Ian, Ian Smith, Douglas McWhinnie. *Day Case Surgery*. New York: Oxford University Press, 2012
2. Day Case and Short Stay Surgery – Association of Anaesthetists of Great Britain and Ireland; British Association of Day Surgery. May 2011
3. Report of the Working Party on Guidelines for Day case Surgery – Rev Ed Mar 1992. *RCS of England Commission on the Provision of Surgical Services*

HYPERTENSION

Primary care should ideally have achieved systolic blood pressure < 160 mmHg and diastolic blood pressure < 100 mmHg in patients before they are referred to secondary care for elective surgery. This is the objective for the recent Guidelines for the management of hypertension before elective surgery.

The objective for secondary care is to **avoid spurious hypertensive measurements**. Secondary care should not attempt to diagnose hypertension in patients who are normotensive in primary care.

Patients who present to pre-operative assessment clinics without documented primary care blood pressures, within the past 12 months, should proceed to elective surgery if clinic SBP < 180 mmHg and DBP < 110 mmHg.

Blood pressure measurements are more accurate in primary care than secondary care, due to a less stressful environment

- BP should only be measured in Pre-operative assessment clinics for patients who present without documentation of primary care blood pressures in past 12 months
- SBP > 180mmHg and/or DBP > 110mmHg – patient should return to GP for primary care assessment and management of their blood pressure
- SBP 140–180mmHg or DBP 90–110 mmHg, GP should be informed, but elective surgery should proceed.
- GPs should refer hypertensive patients for **elective** surgery after SBP < 160 mmHg and DBP < 100 mmHg.
- Patients may be referred for elective surgery if they remain hypertensive despite optimal antihypertensive treatment or if they decline antihypertensive treatment.

REFERENCE

The measurement of adult blood pressure and management of hypertension before elective surgery – Joint Guidelines from the Association of Anaesthetists of Great Britain and Ireland and the British Hypertension Society; March 2016. A. Hartle, T. McCormack, J. Carlisle, S. Anderson, A. Pichel, N. Beckett, T. Woodcock and A. Heagerty. *Anaesthesia* 2016, 71, 326–337 doi:10.1111/anae.13348

ANAEMIA – we are in the process of setting up pre-operative anaemia pathways. This will be updated in due course.

The WHO defines anaemia as haemoglobin level of

- <130 g/L in males >15 years
- <120g/L in non-pregnant females

PRE-OPERATIVE ANAEMIA

The risks of transfusion (transmission of infection, transfusion reactions, immuno-suppression) have to be weighed against the risks of anaemia (reduced oxygen carrying capacity of blood leading to increased cardiac work and myocardial ischaemia).

Iron deficiency anaemia (including functional iron deficiency) should be investigated and corrected in the pre-operative period (for elective patients).

We are currently working on an anaemia pathway for patients who are anaemic preoperatively, to consider treatment options such as oral iron, IV iron, transfusion, or further investigation. This section is subject to change in the following months.

Any patient with Hb < 10g/dL undergoing major surgery with possible significant blood loss should be discussed with an anaesthetist.

Guidelines for transfusion of red cells as per the Association of Anaesthetists of Great Britain and Ireland:

1. Patients should not normally be transfused if the haemoglobin concentration is > 10g/dL
2. A strong indication for transfusion is a haemoglobin concentration < 7g/dL
3. Transfusion will become essential when the haemoglobin concentration decreases to 5g/dL
4. A haemoglobin concentration of 8-10g/dL is a safe level even for those patients with significant cardiorespiratory disease.
5. *Exception to the rule* are patients presenting with hip fractures for surgery – in the presence of ischaemic heart disease, transfuse if Hb < 10g/dL, otherwise consider transfusion if Hb < 9g/dL.
6. Symptomatic patients should be transfused

REFERENCES

1. Association of Anaesthetists of Great Britain and Ireland. Blood transfusion and the anaesthetist – red cell transfusion 2; June 2008
2. Association of Anaesthetists of Great Britain and Ireland Safety Guideline. Management of Proximal Femoral Fractures 2011; June 2012

PREOPERATIVE TESTS FOR ELECTIVE SURGERY:

- NICE GUIDELINES NG45, 2016

BTHFT LOCAL POLICY where different to NICE guidance

NICE National Institute for
Health and Care Excellence

Bradford Teaching Hospitals **NHS**
NHS Foundation Trust

1. RECOMMENDATIONS RELEVANT FOR ALL TYPES OF SURGERY

The recommendations in this NICE guideline were developed in relation to the following comorbidities: cardiovascular, diabetes, obesity, renal, and respiratory.

Take into account any medicines people are taking when considering whether to offer any preoperative test.

Pregnancy tests

On the day of surgery, sensitively ask all women of childbearing potential whether there is any possibility they could be pregnant.

- Make sure women who could possibly be pregnant are aware of the risks of the anaesthetic and the procedure to the foetus
- Document all discussions with women about whether or not to carry out a pregnancy test.
- Carry out a pregnancy test with the woman's consent if there is any doubt about whether she could be pregnant

Sickle cell disease or sickle cell trait tests

- Do not routinely offer testing for sickle cell disease or sickle cell trait before surgery
- Ask the person having surgery if they or any member of their family have sickle cell disease
- If the person is known to have sickle cell disease and has their disease managed by a specialist sickle cell service, liaise with this team before surgery

HbA1c testing

- **HbA1c result < 3 months old remains valid** (can be evidence of hospital or primary care result – please check SystemOne before requesting a sample)

Urine tests – NICE guidelines do not support routine urine dipsticks on all patients, unless a positive result affects the decision to operate, or patient is symptomatic.

BTHFT Local Guidance for urinalysis

- **ALL Urology surgery** patients require an **MSU** irrespective of dipsticks results
- **Urine dipsticks for the following**
 - ALL Uro-gynaecology surgery
 - ALL MAJOR surgery – general, orthopaedics (arthroplasty, arthroscopic surgery with implants), vascular, plastics, ENT, Maxillofacial
 - Any minor or intermediate surgery where patients are symptomatic for UTI
- If positive urine dipsticks, send MSU for culture and sensitivity
 - Positive MSU results require antibiotic treatment (GP and patient to be informed)
 - Surgical team to be informed of a positive MSU test if within 1 week of TCI date
 - Orthopaedic patients

1. Male patient's surgery to be suspended – inform secretary (surgeon to refer to Urologist for investigations)
 2. Female patients proceed to surgery – GP to be informed with request for 3/7 antibiotics (Trimethoprim 200mg BD or Ciprofloxacin 250mg BD if allergic to Trimethoprim)
- Document all discussions/correspondence on EPR

Chest X-ray – **not** to be offered routinely before surgery

Echocardiography - **discuss with anaesthetist**

Consider if:

1. undiagnosed heart murmur **and** cardiac symptoms (including breathlessness, pre-syncope, syncope or chest pain) or
2. signs or symptoms of heart failure

BTHFT Local Guidance – MRSA Screening Criteria in Pre-assessment clinic (Oct 2016)

- **Day case surgery** – the following elective day case patients should be screened (all others are exempt from screening):
- orthopaedic patients
 - plastic surgery patients (exception of OPLA)
 - any patient requiring implants into sterile body sites
 - patients undergoing renal procedures
 - patients from other specialties with a permanent or temporary bed allocation on orthopaedic wards (ward 27 & 28)
- **Screen all elective overnight stay patients under high-risk specialties prior to admission:**
- renal/dialysis
 - oncology
 - haematology
 - vascular
 - orthopaedics (trauma and elective)
 - plastic surgery
- Overnight stay elective patients under other specialties, such as urology and general surgery, should be screened only if they meet the **moderate or high-risk criteria** (see below)
- **Risk assess** using the following criteria, and perform MRSA screen if any one or more of the criteria exist (check alerts on EPR, ICE, medical records and by asking the patient/carer)
- **High risk criteria**
 - Previous history of MRSA colonisation or infection, *unless they have had 3 consecutive negative MRSA screens*
 - **Moderate risk criteria**
 - Family history of MRSA
 - Resides in a nursing or residential home
 - Receives respite care
 - Previous hospital in-patient admission/hospital transfer in the last 12 months with exception of maternity patients
 - Presence of skin ulcers or wounds or severe skin disease
 - Presence of urinary or venous catheter or gastrostomy feeding tubes on admission
 - Health care worker

2. RECOMMENDATIONS FOR SPECIFIC SURGERY AND ASA GRADES

ASA Grades (American Society of Anaesthesiologists Physical Status Classification System)				
ASA 1	A normal healthy patient			
ASA 2	A patient with mild systemic disease			
ASA 3	A patient with severe systemic disease			
ASA 4	A patient with severe systemic disease that is a constant threat to life			
Test	Notes	ASA 1	ASA 2	ASA 3 or ASA 4
Minor surgery (e.g. excising skin lesion; draining breast abscess)				
Full blood count		Not routinely	Not routinely	Not routinely
Clotting/Haemostasis		Not routinely	Not routinely	Not routinely
Renal function (U&Es)		Not routinely	Not routinely	Consider in patients at risk of AKI ¹
ECG	BTHFT – <u>all</u> patients > 50 years old	Not routinely	Not routinely	Consider if no ECG in past 12 months
Lung functions/ABG		Not routinely	Not routinely	Not routinely
Intermediate surgery (e.g. primary repair of inguinal hernia; surgery for varicose veins; tonsillectomy or adeno-tonsillectomy; knee arthroscopy)				
Full blood count	BTHFT	Not routinely	Not routinely	Yes
Clotting/Haemostasis		Not routinely	Not routinely	Consider in patients with chronic liver disease. Anticoagulated patients – discuss need for bridging plan with anaesthetist
Renal function (U&Es)		Not routinely	Consider in patients at risk of AKI ¹	Yes
ECG	BTHFT – <u>all</u> patients > 50 years old	Not routinely	Patients with CVS, renal or diabetes comorbidities	Yes
Lung functions/ABG		Not routinely	Not routinely	Seek advice from anaesthetist for ASA 3 or 4 patients due to respiratory disease (whether known or suspected)
Major or complex surgery (e.g. TAH, TURP, thyroidectomy, joint replacements, colorectal surgery, radical neck dissection, ureter re-implantation, any laparotomy, bariatric surgery)				
Full blood count		Yes	Yes	Yes
Clotting/Haemostasis	BTHFT – <u>all</u> major vascular surgery patients	Not routinely	Not routinely	Consider in patients with chronic liver disease. Anticoagulated patients – discuss need for bridging plan with anaesthetist
Renal function (U&Es)		Consider in patients at risk of AKI ¹	Yes	Yes
ECG	BTHFT – <u>all</u> patients > 50 years old	Consider if no ECG in past 12 months	Yes	Yes
Lung functions/ABG		Not routinely	Not routinely	Seek advice from anaesthetist for ASA 3 or 4 patients due to respiratory disease (whether known or suspected)

AKI, acute kidney injury; CVS, cardiovascular; ABG, arterial blood gas

¹See recommendation 1.1.8 of the NICE guideline on acute kidney injury <https://www.nice.org.uk/guidance/cg169/chapter/1-Recommendations#assessing-risk-factors-in-adults-having-surgery>

AKI risk – see below

²Note that the effects of direct oral anticoagulants (DOACs) cannot be measured by routine testing

Routine preoperative tests for elective surgery, NICE guideline NG45 (April 2016) & BTHFT local guidelines

Patients at risk of perioperative Acute Kidney Injury

- chronic kidney disease
- diabetes
- heart failure
- age 65 years or over
- liver disease
- drugs with nephrotoxic potential – NSAIDs, ACE-I (Ramipril, Lisinopril, Enalapril), ARBs (Candesartan, Losartan, Valsartan), diuretics
- urological obstruction – previous stones, urological obstructive pathology
- high output stomas
- intraperitoneal surgery (any intra-abdominal surgery, both laparotomy and laparoscopy)
- emergency surgery, especially when the patient has sepsis or hypovolaemia

ABNORMAL PRE-OPERATIVE BLOOD RESULTS

	Normal range (mmol/L)	Perioperative problems/implications	Inform anaesthetist pre-operatively if
Na ⁺	135 – 145 mmol/L	Instability in circulation and CNS	Na ⁺ < 130 Na ⁺ > 149
K ⁺	3.5 – 5.5 mmol/L	Cardiac arrhythmias; cardiac arrest; muscle weakness; GI dysfunction; problems with muscle relaxants	K ⁺ < 3.1 K ⁺ > 5.8
Ca ²⁺	2.15 – 2.31 mmol/L	Muscle weakness; arrhythmias; impaired cardiac contractility and cardiac output; impaired coagulation	Ca ²⁺ < 2.1 Ca ²⁺ > 2.7
Urea	2.5 – 6.7 mmol/L	Elevated urea indicates dehydration or impaired renal function – can interfere with elimination of drugs	Urea > 10
Creatinine & GFR	70–110 μmol/L >90 ml/min	Indicator of renal function. eGFR gives a gradation of severity of renal impairment (CKD, chronic kidney disease)	Creatinine > 110 μmol/L and patient not known to have renal disease, inform GP. Creatinine > 170μmol/L, inform anaesthetist
Thyroid function tests (TFTs)	TSH <0.5mU/L T4 9-25pmol/L T3 3.5-7.8pmol/L	Hyperthyroidism: tachycardia, arrhythmias/AF, cardiac failure, hyperthermia, accelerated drug metabolism, labile BP. Hyperthyroidism always needs correcting pre-operatively (low TSH & high T4/T3). Hypothyroidism: delayed drug metabolism, slow recovery from anaesthesia, bradycardia, hypothermia, hypotension, prolong action of muscle relaxants, abnormal response to hypoxia/hypercarbia. Accept TSH <10 for treated hypothyroidism.	TFTs do not need to be repeated if they are checked annually by the GP for patients with hypothyroidism. Patients with previously undiagnosed thyroid disease and abnormal function tests should be investigated and treated before all but very urgent surgery – discuss with anaesthetist.

PRE-OPERATIVE BLOOD TRANSFUSION SAMPLES

TRANSFUSION LABORATORY Ext 4204

ELECTIVE SURGERY

Electronically issued blood

- Available within 5 minutes of requesting as long as a valid G&S sample available in the laboratory and no problems with testing or special requirements
- Patients must have had TWO blood samples (G&S) sent at two SEPARATE times (one at pre-assessment clinic and one on admission)
- Samples are valid for seven days unless the patient has had a blood transfusion in the last 28 days in which case the sample is only valid for 72 hours
- Information about the validity of samples is available on ICE

Patients with antibodies

- Patients known to have antibodies, or found to have antibodies on G&S samples require blood ordering prior to surgery as per the maximum surgical blood order schedule (MSBOS*)
- This must be arranged *before* the patient is admitted for surgery
- These patients require their **second G&S sample sending >48 hours pre-operatively**

Patients who require irradiated blood

- Needs to be arranged in advance with Transfusion for pre-ordering of stock
- Can be electronically issued if no antibodies, provided there is sufficient stock

URGENT SURGERY

One sample is usually sufficient as it will be grouped twice by Transfusion before blood is electronically issued

IF ANY DOUBT EXISTS AS TO THE AVAILABILITY OF ELECTRONICALLY ISSUED BLOOD, OR IF PATIENTS REQUIRE PRE-ORDERED BLOOD OR SPECIAL PRODUCTS (IRRADIATED BLOOD), PLEASE CHECK WITH THE TRANSFUSION LABORATORY THE DAY BEFORE SURGERY.

MAXIMUM SURGICAL BLOOD ORDER SCHEDULE

Blood Transfusion Laboratory Ext. 4204

GENERAL SURGERY		Thyroidectomy	G & S
Abdo-perineal Resection	2 units	Whipples	6 units
Amputation	G & S	Y Graft	6 units
Aortic aneurysm	6 units	ORTHOPAEDICS	
Biopsy unspec	G & S	Fractured NOF	G & S
Cholecystectomy	G & S	Fractured Shaft of Femur	G & S
Colonic surgery	G & S/2	Osteotomy	G & S
Embolectomy	G & S	THR	G & S
ERCP	G & S	THR Revision	4 units
Fem. Pop. Bypass	G & S	TKR	G & S
Gastrectomy - partial	G & S	TKR Revision	2 units
Gastrectomy - total	2 units	UROLOGY	
Gastrojejunostomy	G & S	Cystectomy	3 units
Laparotomy	G & S	Cystoscopy	G & S
Liver biopsy	G & S	Nephrectomy	2 units
Mastectomy	G & S	TURP	G & S
Oesophagectomy	4 units	TURBN/TURBT	G & S
Renal biopsy	G & S		
Splenectomy	G & S		
Thoracotomy	2 units		
OBSTRETRICS AND GYNAECOLOGY		Specific patients at high risk of requiring blood/bleeding e.g. previous PPH, anaemia (< 90) in labour	2 units
Abortion Threatened	G & S	Sterilisation or Reversal	G & S
Abortion Inevitable	G & S	Termination of Pregnancy	G & S
Antepartum Haemorrhage	2 units	Trial of Labour	G & S
Colporrhaphy & Repair	G & S	Vulvectomy	2 units
Colposuspension	G & S	ENT & MAXILLOFACIAL	
Cone Biopsy	G & S	Laryngectomy	G & S
?Ectopic	G & S	Parotidectomy	G & S
Ectopic	G & S	Bimaxillary Osteotomy	G & S
Ruptured Ectopic	2 units	Neck Dissection	G & S
Elective LSCS	G & S	PLASTICS	
Emergency LSCS	G & S	Abdominoplasty	G & S
Placenta Praevia for LSCS	4 units	Breast Surgery	G & S
Hysterectomy	G & S	Free Flap	G & S
Induction of labour	G & S	Skin Graft	G & S
Manual Removal of Placenta	G & S		
Myomectomy	G & S		
Oophorectomy	G & S		
Placenta Praevia	G & S		
Post partum haemorrhage	G & S		
In routine surgery, sample required by 1500hrs on previous working day		ANAEMIA – Consider not only Hb but – bleeding? – symptomatic – signs? and document in notes	

If there is any likelihood of blood being needed, collect a G&S sample at pre-assessment and prior to the procedure.

This MSBOS only applies if Electronic Issue is not available.

Electronic Issue will not be available for patients with antibodies or if the transfusion laboratory computers are not working.

PRE-OPERATIVE CARDIO-RESPIRATORY INVESTIGATIONS

Cardiopulmonary Exercise Testing (CPEX)

Indications for routine testing at BTHFT:

- aortic surgery
 - all AAAs
 - Y-graft with discretion, depending on severity of claudication
- oesophagectomy
- gastrectomy
- major colorectal surgery (not laparoscopic)
- cystectomy
- major upper/lower GI surgery or major urological surgery plus significant cardiac or respiratory disease and at the discretion of the anaesthetist assessing the patient in pre-assessment clinic or surgeon's discretion at time of referring patient for anaesthetic assessment.

This is not an exhaustive list and testing may be appropriate for other procedures after discussion with the pre-assessment consultant anaesthetist.

Pulmonary Function Tests

Peak Expiratory Flow Rate (PEFR)

All patients with history of asthma or COPD should have a PEFR in pre-assessment clinic. If the PEFR is significantly lower than the level expected for age and height, according to PEFR tables, they may be referred for formal spirometry unless they are currently suffering a respiratory tract infection. Delay Spirometry for 4 weeks post lower respiratory tract infection.

Discuss with pre-assessment anaesthetist.

Spirometry (Pulmonary function tests – PFTs)

- Per se does not predict risk more accurately than clinical evaluation and history.
- Results are dependent on patient's technique and effort. They should be interpreted in conjunction with patient history and examination.
- PFT's are contra-indicated in the following situations and are discussed with the pre-assessment Anaesthetist before proceeding to test:
 - ACS within preceding 3 months
 - Ophthalmic surgery within preceding 3 months
 - Thoracic or abdominal surgery within preceding 3 months (including laparoscopic/thoroscopic surgery)
 - History of pneumothorax
 - History of haemoptysis
 - During an acute exacerbation of a patient's lung disease
 - Patients suffering with nausea, vomiting or diarrhoea
 - PFTs can be helpful in cases when the history and physical examination leave the degree of risk uncertain such as unexplained poor exercise tolerance or dyspnoea

PERI-OPERATIVE PROTOCOL FOR PACEMAKERS AND ICDs

For full guidance on the management of patients with pacemakers and/or implantable cardiac defibrillators (ICDs) presenting for surgery, please refer to the protocol on the Trust's intranet website:

Peri-operative management of patients with cardiac pacemakers and implantable defibrillators undergoing surgery

ELECTIVE SURGERY

- All patients with permanent pacemaker (PPM) and /or ICD to be identified at pre-assessment clinic
- Referral to pacemaker clinic (for 08h30 on morning of surgery)
- Device manufacturer and model required
- Patients with ICD and/or PPM should be *first* on morning list
- ICDs
 - Will be programmed to “monitor only” mode
 - Require reprogramming in PACU at 13h00 (patients remain in PACU area with ECG monitoring until reprogrammed)
 - If after 13h00 but within working hours, the case should be discussed with the cardiac physiologist on ext 4073 (out of hours via Ward 22)
- PPMs
 - There is no true “safe” pacemaker mode
 - Devices may be programmed to asynchronous mode for surgery
 - Decision is based on balance of risk to patient and is made at the Pacemaker clinic
 - PPM should be reprogrammed post-operatively preferably before 17h00 on same day
 - There is no on-call facility for PPM/ICD patients

EMERGENCY SURGERY

- Please refer to the protocol for procedures to follow
- The responsible anaesthetists must be contacted for further discussion regarding the peri-operative management of these patients

Link to BTHFT Protocol for Perioperative management of patients with cardiac pacemakers and implantable defibrillators undergoing surgery (2017 guidance)

<http://nww.bradfordhospitals.int/policies-and-clinical-guidance/Clinical%20Guidelines/Forms/AllItems.aspx?RootFolder=%2Fpolicies%2Dand%2Dclinical%2Dguidance%2FClinical%20Guidelines%2FDivisional%20Policies%20And%20Guidance%2FMedicine%20and%20Integrated%20Care%2FCardiology&InitialTabId=Ribbon%2EDocument&VisibilityContext=WSSTabPersistence>

PERIOPERATIVE CARE OF THE ELDERLY and ASSESSMENT OF FRAILITY

8% of the population in the UK are over the age of 75. 23% of surgical procedures in the UK are performed on patients in this age group. There is an age-related decline in physiological reserve, which is compounded by chronic and current illness, cognitive decline, frailty and polypharmacy. They are at relatively higher risk of mortality and morbidity after surgery. Multidisciplinary care improves outcomes for elderly surgical patients and should be individualised to suit each patient. The AAGBI strongly supports an expanded role for senior geriatricians in coordinating peri-operative care for the elderly. Discussion with a geriatrician should be considered in each case. Elderly patients should be assumed to have the mental capacity to make decisions about their treatment. Good communication is essential. If they lack that capacity, proxy information should be sought to determine what treatment, if any, is in the patient's best interests.

It is insufficient to undertake comprehensive assessment of the older surgical patient without also attempting to optimise and improve their preoperative health status. The benefits must be balanced against the risks of delaying surgery to achieve these. Pre-optimisation should focus on reducing the risk of postoperative complications, namely, organ/system specific disease, malnutrition, post-operative cognitive decline or delirium (POCD/POC)

Frailty is a medical syndrome with multiple causes and contributors, characterised by reduced strength, endurance and physiologic function. This increases the individual's vulnerability for developing increased dependency and/or death.

Geriatric patients often have comorbid conditions that may lead to increased risk of post-operative mortality and morbidity. They have decreased physiological reserves across multiple organ systems, arising from the cumulative comorbid conditions, including biomedical, psychological, and social factors. Frail elderly surgical patients are more likely to suffer post-operative complications (pneumonia, delirium, UTIs), prolonged length of stay, discharge to nursing homes or long-term care facilities and higher mortality rates than fit patients. There is a high risk of not returning to their pre-operative level of functioning, hence requiring further increased levels of social support and medical care.

Standard conventional pre-operative risk stratification models have substantial limitations when used in the elderly. There is evidence to show that the multidimensional frailty score based on *comprehensive geriatric assessment* is more useful and accurate in predicting outcomes in this group of patients undergoing surgery than conventional methods. Consideration of a consultation or discussion with a Geriatrician should be considered for frail patients undergoing major surgery, in the pre-operative period.

Different frailty instruments are available to diagnose and assess severity of frailty such as

1. Frailty Phenotype – presence of frailty if ≥ 3 of the following exist:
 - a) Unintentional weight loss (>4kg in prior year)
 - b) Self-reported exhaustion
 - c) Weakness (grip strength)
 - d) Slow walking speed
 - e) Low physical activity
2. Frailty Index (deficit accumulation model)
3. **Edmonton Frail Scale (see table below)** – assessment of severity of frailty for use by non-geriatricians (app available). This 17-point assessment tool is beneficial in the pre-assessment setting.
4. Frailty evaluation tools - Rockwood Clinical Frailty Scale, Gait Speed Test, PRISMA-7 scale.

EDMONTON FRAIL SCALE

Frailty Domain	Item	Score 0	Score 1	Score 2
Cognition	Imagine this pre-drawn circle is a clock. I would like you to place the numbers in the correct positions then place the hands to indicate the time of “ten past eleven”.	No errors	Minor spacing errors	Other errors
General health status	In the past year, how many times have you been admitted to a hospital?	0	1-2	≥ 2
	In general, how would you describe your health?	Excellent Very good Good	Fair	Poor
Functional independence	With how many of the following activities do you require help? Meal preparation Shopping Transportation Telephone Housekeeping Laundry Managing money Taking medications	0-1	2-4	5-8
Social support	When you need help, can you count on someone who is willing and able to meet your needs?	Always	Sometimes	Never
Medication use	Do you use five or more different prescription medications on a regular basis?	No	Yes	
	At times, do you forget to take your prescription medications?	No	Yes	
Nutrition	Have you recently lost weight such that your clothes have become looser?	No	Yes	
Mood	Do you often feel sad or depressed?	No	Yes	
Continence	Do you have a problem with losing control of urine when you don't want to?	No	Yes	
Functional performance	Please sit in this chair with your back and arms resting. Then, when I say “Go”, please stand up and walk at a safe and comfortable pace to the mark on the floor (approx. 3m away), return to the chair, and sit down.	0-10 s	11-20 s	One of: > 20 s Patient unwilling Requires assistance
Totals	Final score is the sum of column totals			

Total =/17

Scoring

0-5 Not frail

6-7 Vulnerable

8-9 Mild frailty

10-11 Moderate frailty

12-17 Severe frailty

REFERENCES:

1. Griffiths R, Mehta M. Frailty and anaesthesia: what we need to know. *Continuing Education in Anaesthesia Critical Care and Pain*. 2014 Dec; 14(6):273-277. doi: 10.1093/bjaceaccp/mkt069
2. Kim SW, Han HS, Jung HW, Kim KI, Hwang DW, Kang SB, Kim CH. Multidimensional frailty score for the prediction of postoperative mortality risk. *JAMA Surg*. 2014 Jul;149(7):633-40. doi: 10.1001/jamasurg.2014.241
3. Griffiths R, Beech F, Brown A, Dhesi J, Foo I, Goodall J, Harrop-Griffiths W, Jameson J, Love N, Pappenheim K and White S. Peri-operative care of the elderly 2014. *Anaesthesia* 2014, 69 (Suppl. 1), 81–98 doi:10.1111/anae.12524

PRE-OPERATIVE CARDIAC RISK ASSESSMENT

INTRODUCTION

Cardiac events are the most common cause of post-operative mortality – ACS, cardiac failure, arrhythmias – and the incidence of cardiovascular disease is increasing in the surgical population. Effective pre-operative cardiac assessment requires liaison between Surgical, Anaesthetic, and Cardiology departments.

Most patients who are at high risk of a peri-operative cardiac event can be predicted from a careful history and examination, and the majority of these patients do not need expensive investigations to prove this, unless consideration is being given to angiography and subsequent revascularisation. Investigations should be limited to circumstances which would change patient management and outcome.

Patients identified as high risk by history and examination or positive results from non-invasive testing, have a greater than 30% chance of suffering a serious peri-operative cardiac event if they undergo major surgery. Careful discussion is required about the need for surgery. If it is essential, this group should be managed aggressively, with pre-operative optimisation, consideration for beta-blockade and statin therapy, HDU or ICU care, and invasive monitoring.

There is a need to select which patients would benefit from pre-operative cardiac investigations, and to consider which investigation would be the most appropriate.

Any patient identified as high risk and requiring further assessment and investigations requires referral to or discussion with a Consultant Cardiologist. Non-urgent surgery should be suspended pending a Cardiology opinion. Patients requiring more urgent surgery (vascular, cancer) should be referred to the Cardiology department as an urgent request, by the anaesthetist at pre-assessment clinic.

PATIENT IDENTIFICATION

Several scoring systems (see *Clinical risk and stratification tools below) have been widely used to identify patients at high risk of a peri-operative cardiac event. These systems give weighted points to various pre-operative risk factors to produce an overall risk score but give no guidance to further investigation.

1. Coronary artery disease (CAD) – see flowchart below for stepwise assessment of CAD prior to non-cardiac surgery

Recent data suggests that ≥ 60 days should elapse after an MI before non-cardiac surgery in the absence of a coronary intervention. An MI within 6 months of non-cardiac surgery was found to be an independent risk factor for perioperative stroke.

2. Heart failure (HF)

Patients with active heart failure have a significantly higher risk of postoperative death than do patients with CAD. Signs and/or symptoms of decompensated HF confer the highest risk. Left ventricular ejection fraction (LVEF) is an independent contributor to perioperative outcome and long-term risk factor for death in patients with HF undergoing high or intermediate risk surgery. Survival after surgery for those with a LVEF $\leq 29\%$ is significantly worse than for those with a LVEF $>29\%$. Diastolic dysfunction with and without systolic dysfunction has been associated with a significantly higher rate of major adverse cardiac event, prolonged length of stay, and higher rates of postoperative HF.

Discuss requirement for an Echocardiogram with consultant anaesthetist in pre-assessment clinic.

3. Valvular disease

Significant valvular heart disease increases the cardiac risk for patients presenting for surgery. Patients with clinically suspected moderate or severe valvular lesion should undergo Echocardiography pre-

operatively if there has not been an Echo in the last 12 months or if clinical symptoms have become worse since last evaluation.

Patients who meet the criteria for valvular intervention, should proceed prior to non-cardiac surgery, as it is proven to reduce the perioperative cardiac risk during non-cardiac surgery.

Patients with suspected valvular heart disease should undergo echocardiography to quantify the severity of stenosis or regurgitation, calculate systolic function, and estimate right heart pressures. Evaluation for concurrent coronary artery disease is also warranted.

For patients presenting for urgent/emergency surgery, the perioperative risk can be minimised by accurate diagnosis of the type and severity of valvular heart disease, careful perioperative anaesthetic planning, including invasive monitoring, and postoperative critical care.

4. Pulmonary Hypertension

Chronic pulmonary vascular targeted therapy should be continued perioperatively unless contraindicated or not tolerated in patients with pulmonary hypertension.

Unless the risks of delay outweigh the potential benefits, preoperative evaluation by a pulmonary hypertension specialist before noncardiac surgery can be beneficial for patients with pulmonary hypertension, particularly for those with features of increased perioperative risk:

- pulmonary arterial hypertension
- pulmonary hypertension associated with pulmonary artery systolic pressures >70 mm Hg, and/or moderate or greater RV dilatation and/or dysfunction and/or pulmonary vascular resistance >3 Wood units
- WHO/NYHA class III or IV symptoms due to pulmonary hypertension

5. Cardiomyopathy

There is minimal information on the preoperative evaluation of patients with specific non-ischaemic cardiomyopathies before surgery. Preoperative recommendations must be based on the pathophysiology of the cardiomyopathy, assessment and management of the underlying process, and the overall management of the heart failure. Patients should be discussed with a consultant anaesthetist preoperatively.

CLINICAL PREDICTORS AND PROPOSED MANAGEMENT PLAN

	CLINICAL PREDICTORS OF CARDIOVASCULAR RISK		
	Minor	Intermediate	Major
SIGNS & SYMPTOMS	<ul style="list-style-type: none"> ➤ old age ➤ abnormal resting ECG (LBBB, LVH, minor ST/T changes) ➤ rhythm other than SR (AF) ➤ CVA/TIA ➤ hypertension 	<ul style="list-style-type: none"> ➤ mild stable angina ➤ compensated CCF ➤ diabetes mellitus ➤ previous ACS 	<ul style="list-style-type: none"> ➤ unstable coronary syndromes (unstable angina, ACS < 30 days, on-going ischaemia) ➤ haemodynamically significant arrhythmias ➤ severe AS or MS ➤ decompensated CCF
MANAGEMENT PLAN	<ul style="list-style-type: none"> ➤ Further cardiac testing unnecessary unless poor functional capacity and high risk surgery ➤ CPEX test may be of use 	<ul style="list-style-type: none"> ➤ Likely to benefit from non-invasive cardiac testing ➤ Stratify according to functional capacity and surgery specific risk ➤ CPEX test may be of use 	<ul style="list-style-type: none"> ➤ Postpone if possible and treat aggressively

FUNCTIONAL CAPACITY is widely recognised to be a major predictor of peri-operative risk. An accepted measure is the metabolic equivalent (MET):

Number of METs	Equivalent energy expenditure	Functional capacity	Peri-operative Risk
1 MET	Person at rest		
< 4 METs	Walk around house, dress self, light housework	Poor	High
4 - 7 METs	walk 1-2 blocks on level, moderate housework, climb a flight of stairs,	Moderate	Moderate
> 7 METs	Run short distance, sport activities, heavy housework	Good	Low
> 10 METs	Strenuous exercise	Excellent	Low

SURGERY-SPECIFIC RISK**

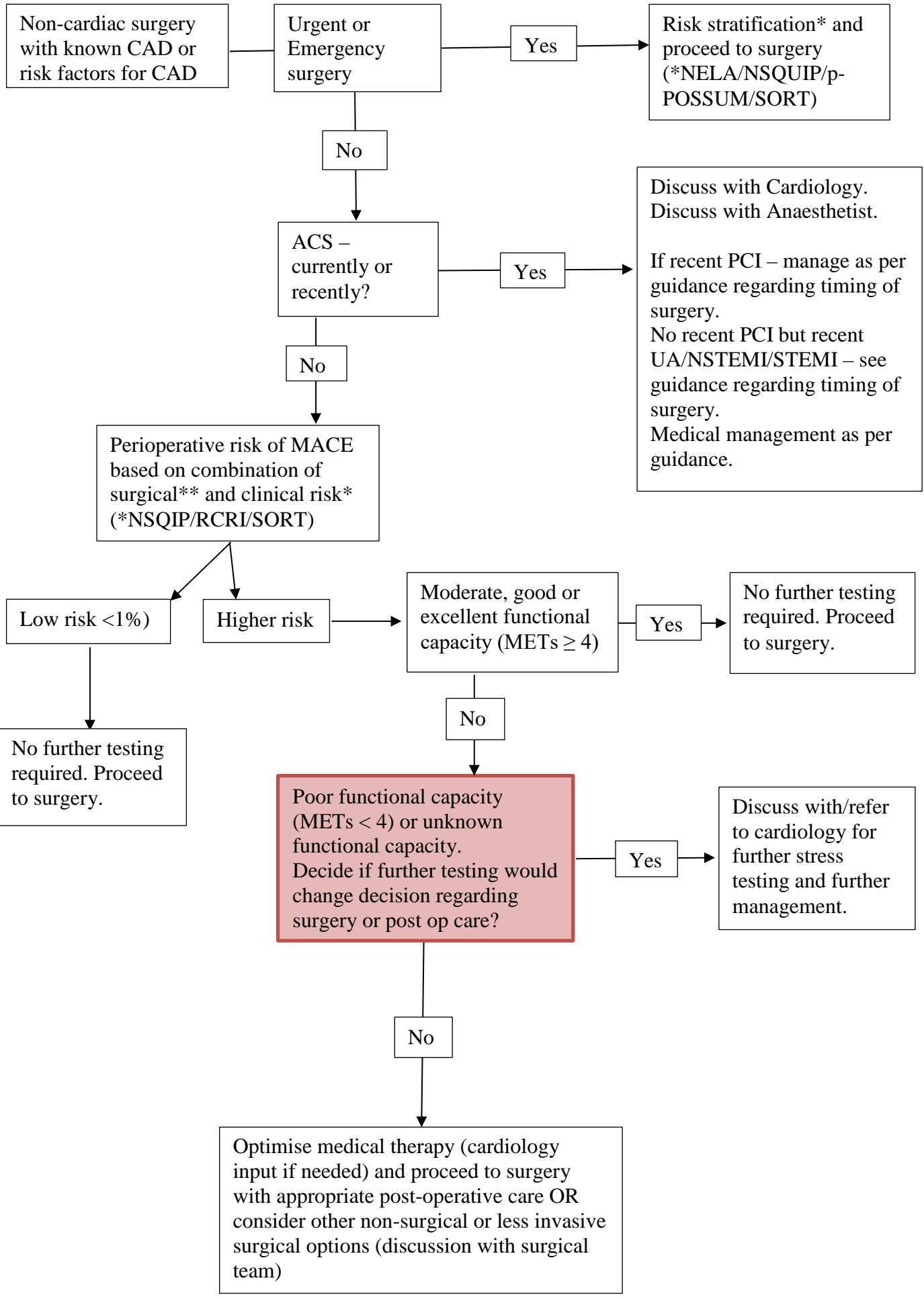
SURGERY SPECIFIC RISK** (30-day cardiac death and myocardial infarction)		
HIGH RISK (>5%)	INTERMEDIATE RISK (1-5%)	LOW RISK (<1%)
<ul style="list-style-type: none"> ➤ Emergency major surgery ➤ Aortic and major vascular surgery ➤ Peripheral vascular surgery ➤ Upper GI surgery – oesophagectomy, gastrectomy ➤ Surgery with significant fluid shifts and blood loss 	<ul style="list-style-type: none"> ➤ Carotid endarterectomy ➤ Head and neck surgery ➤ Uncomplicated abdominal and thoracic surgery ➤ Peripheral artery angioplasty ➤ EVAR ➤ Major orthopaedic (arthroplasty) ➤ Major urology 	<ul style="list-style-type: none"> ➤ Endoscopic and arthroscopic surgery ➤ Breast surgery ➤ Body surface surgery ➤ Eye surgery ➤ Dental surgery ➤ Minor urology ➤ Gynaecology

Patients at high cardiac risk based on clinical features, poor functional status and for high risk surgery may benefit from further evaluation following referral to/discussion with a consultant cardiologist.

CARDIAC DIAGNOSTIC TESTS – at the discretion of Consultant Cardiologist

Test	Indication	Notes
ECHO/Nuclear testing – non-invasive evaluation of LV function	<ul style="list-style-type: none"> • Dyspnoea of unknown origin • Known CCF with worsening dyspnoea or functional status if most recent assessment >12 months ago 	Routine peri-operative evaluation of LV function not recommended
Stress testing	Patients with active cardiac conditions <ul style="list-style-type: none"> • Unstable angina • Decompensated CCF • Severe valvular disease 	<ul style="list-style-type: none"> • Useful to detect myocardial ischaemia • Not useful for low risk surgery
Coronary angiography	<ul style="list-style-type: none"> • Evidence of high cardiac risk based on non-invasive testing • Angina unresponsive to maximal medical therapy • Unstable angina • High/intermediate risk surgery with equivocal non-invasive test results 	<ul style="list-style-type: none"> • Not indicated for patients with stable angina

Stepwise Approach to Perioperative Cardiac Assessment for Coronary Artery Disease (CAD)



*Clinical risk and risk stratification tools:

1. NELA – National Emergency Laparotomy Audit <http://data.nela.org.uk/riskcalculator/>
2. NSQIP ACS Surgical Risk Calculator <https://riskcalculator.facs.org/RiskCalculator/>
3. P-POSSUM <http://www.riskprediction.org.uk/index-pp.php>
4. SORT Surgical Outcome Risk Tool <http://www.sortsurgery.com/>
5. RCRI Revised Cardiac Risk Index [https://www.thecalculator.co/health/Revised-Cardiac-Risk-Index-\(RCRI\)-Calculator-872.html](https://www.thecalculator.co/health/Revised-Cardiac-Risk-Index-(RCRI)-Calculator-872.html)

**See table above for Surgical-specific risk

PERIOPERATIVE MANAGEMENT OF PATIENTS WITH CORONARY ARTERY STENTS IN SITU

Patients who have undergone coronary artery stenting are increasingly presenting for non-cardiac surgery. For these patients, the peri-operative risk is significantly raised in the first 3 months following stenting. In addition, patients may be taking various combinations of anti-platelet drugs or anticoagulants, which may increase the risk of bleeding in the peri-operative period (40% increased risk of bleeding). This risk must be weighed against the increased risk of a coronary event if the anti-platelet therapy is discontinued (2-4 fold increase in risk).

Aspirin is normally continued for life. Clopidogrel/Prasugrel/Ticagrelor treatment is normally recommended for 12 months for drug eluting stents (DES), though more recent evidence suggests if the delay in surgery is not possible, surgery could go ahead after the first 6 months. For patients with bare metal stents (BMS), a delay for 6 weeks is advised.

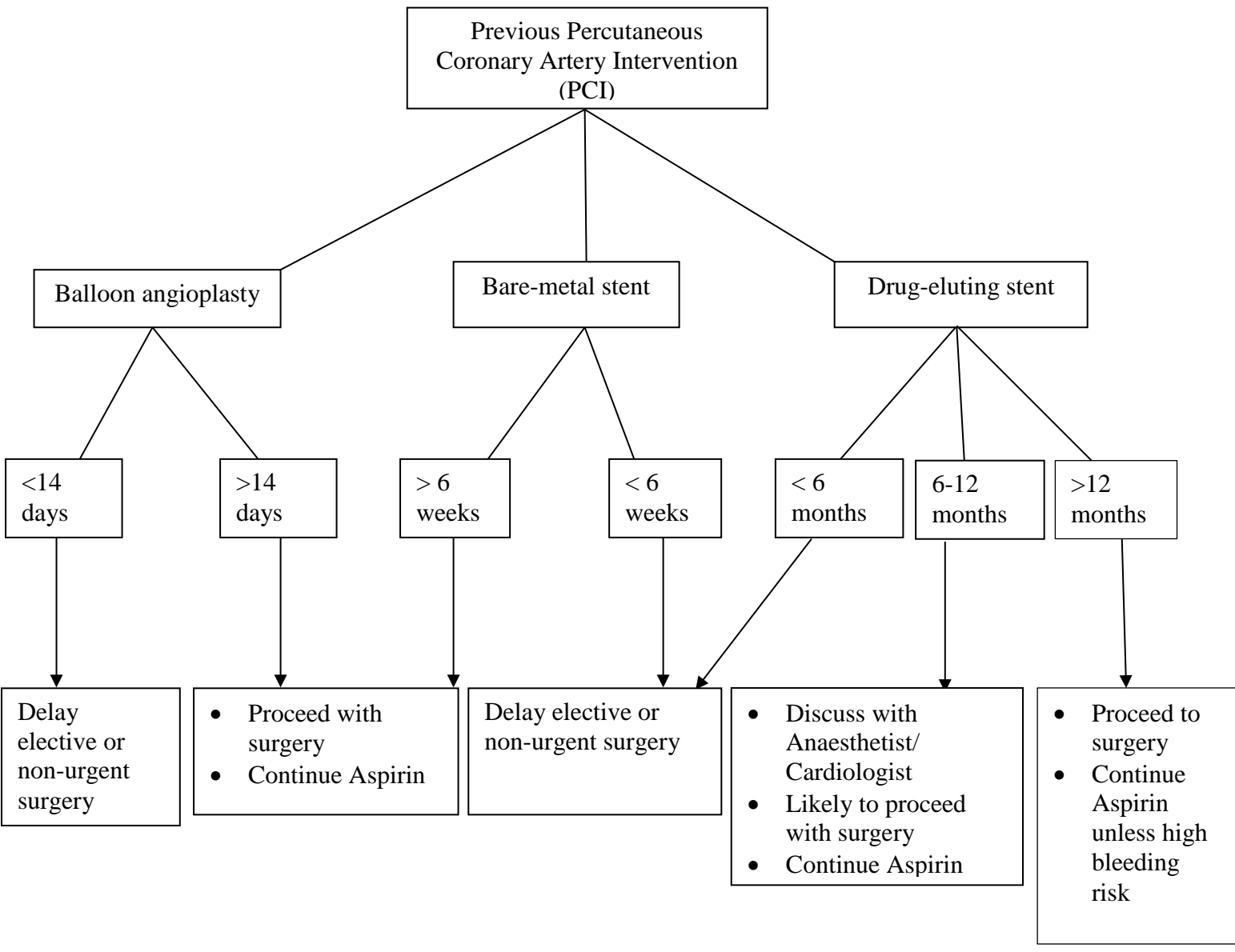
If there is any doubt, the patient should be discussed with the Cardiologist pre-operatively.

For surgery where an excess risk of bleeding is considered particularly significant (including central neuraxial blockade), Clopidogrel/Prasugrel/Ticagrelor should be stopped for 1 week prior to surgery. Aspirin must be continued, and Clopidogrel/Prasugrel/Ticagrelor restarted as soon as it is considered safe post-operatively.

Please refer to further guidance under section “Peri-operative guidance on anti-platelet therapy” for further information.

REFERENCE

1. Fleisher LA, Fleischmann KE, Auerbach AD, Barnason SA, Beckman JA, Bozkurt B, Davila-Roman VG, Gerhard-Herman MD, Holly TA, Kane GC, Marine JE, Nelson MT, Spencer CC, Thompson A, Ting HH, Uretsky BF, Wijeyesundera DN, 2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery, *Journal of the American College of Cardiology* (2014), doi: 10.1016/j.jacc.2014.07.944.
2. Spahn DR et al. Coronary stents and peri-operative anti-platelet regimen: dilemma of bleeding and stent thrombosis. *BJA* 96(6): 675-7 (2006)
3. Newsome LT et al. Coronary Artery Stents: II. Perioperative Considerations and Management. *A & A* August 2008 vol. 107 no. 2 570-590



MANAGEMENT OF OBESE PATIENTS AND WEIGHT REDUCTION SURGERY

Obesity is a major risk factor for anaesthesia and surgery.

Obese patients are at risk of multiple peri-operative complications and have a high incidence of co-existing diseases, including

- diabetes
- hypertension, cardiac disease, metabolic syndrome
- respiratory disease
- OSA (obstructive sleep apnoea) and obesity hypoventilation syndrome (see “Screening for OSA”)
- venous thromboembolic disease
- regurgitation, reflux and aspiration
- difficult airway management

Body mass index as a measure of obesity:

$$\text{BMI} = \text{weight/height}^2 \text{ (kg/m}^2\text{)}$$

Classification	BMI
Acceptable	20 - 24.9
Overweight	25 - 29.9
Obese	30 – 40
Morbidly obese	> 40
Super morbid obesity	>45

BMI 30 - 40	BMI >40	BMI >50
<ul style="list-style-type: none"> • Suitable for day case surgery 	<ul style="list-style-type: none"> • May be suitable for day case procedures at individual discretion of anaesthetist and surgeon 	<ul style="list-style-type: none"> • High risk patients • Not for remote site surgery as may need HDU facility • Discuss with Anaesthetist at Pre-assessment clinic
<ul style="list-style-type: none"> • Offer weight loss advice pre-operatively • If patient requests support <ul style="list-style-type: none"> ○ Weight reducing diet advice sheet ○ Send to practice nurse for monitoring weight loss 	<ul style="list-style-type: none"> • Patient should be referred to dietician from pre-assessment clinic 	<ul style="list-style-type: none"> • Patient should be referred to dietician from pre-assessment clinic

If routine **surgery is suspended**, dietetic outpatient appointment should be offered stating suspended period on the referral form.

The patient, surgeon, and GP should be immediately informed.

Pre-operative assessment of patients having weight reduction surgery

A robust system is in place whereby patients who have received funding for, or meet NICE guidance criteria, for weight reduction surgery have been fully assessed by the surgical team, psychology team, and nutritional teams, as well as having been screened for Obstructive Sleep Apnoea (and treated where needed), and discussed at MDT, *prior* to pre-operative assessment.

At pre-operative assessment clinic, the patient has a nurse-led and Consultant anaesthetic assessment. Information is given to the patient at pre-assessment regarding weight loss diet to be commenced 1 week prior to surgery for patients with a BMI<50, or 2 weeks prior to surgery for those with a BMI>50.

Patients with diabetes are referred to the Diabetes Specialist Nurse.

All patients are pre-assessed by the consultant anaesthetist where a discussion about risk, anaesthetic and perioperative care is undertaken.

A risk assessment is made to decide on the appropriate level of care in the post-operative period.

Post-operative management of patients undergoing weight reduction surgery to be decided following assessment at anaesthetic pre-assessment clinic

a) Planned HDU post-operatively (Level 2)

- Chronic respiratory disease with functional limitation
- Chronic cardiac disease with functional limitation
- Untreated or non-compliance with CPAP for moderate to severe OSA
- Revision surgery or planned open surgery

b) Monitored Ward 21 bed (Level 1)

- Treated OSA with CPAP with additional comorbidities

c) Ward based care (Level 0; Ward 8, 11, 21 non-monitored)

- Treated OSA with CPAP with **no** other comorbidities (patient would need to set own CPAP machine up)
- Patients with no comorbidities

REFERENCES

1. Morgan DJR, Ho KM, Armstrong J, Baker S. Incidence and risk factors for intensive care unit admission after bariatric surgery: a multicentre population-based cohort study. *Br. J. Anaesth* 2015; **115**: 873-882
2. Nightingale CE, Margaron MP, Shearer E, *et al.* Peri-operative management of the obese surgical patient 2015. *Anaesthesia* 2015; **70**: 859-876
3. DeMaria EJ, Portenier D, Wolfe L. Obesity surgery mortality risk score: proposal for a clinically useful score to predict mortality risk in patients undergoing gastric bypass. *Surg Obes Relat Dis* 2007; **3**(2): 134-40

OBSTRUCTIVE SLEEP APNOEA

Obstructive sleep apnoea (OSA) is a potentially serious sleep disorder in which breathing repeatedly stops and starts during sleep. Several types of sleep apnoea exist, but the most common type is obstructive sleep apnoea.

Many OSA patients are undiagnosed when they present for surgery (17% - severe OSA; 25% - mild OSA). The prevalence is on the increase and associated with gross obesity.

Common comorbidities associated with OSA (> 50% prevalence)

Cardiac	Resistant hypertension
	Congestive cardiac failure
	Atrial fibrillation
	Dysrhythmias
Respiratory	Obstructive airways disease
	Pulmonary hypertension
Neurology	First CVA
Metabolic/Endocrine	Type 2 Diabetes
	Morbid obesity
	Metabolic syndrome
	Hypothyroidism
Surgical	Bariatric surgery
	Head and neck cancer
	Intracranial tumour surgery
Other	Gastro-oesophageal reflux disease

Patients with OSA

1. particularly vulnerable during anaesthesia and sedation
2. sensitive to opioids
3. may present with difficult airways pre-and post-operatively
4. are at increased risk of re-intubation post-operatively
5. prone to postoperative cardiopulmonary complications
6. increased risk for anaesthetic morbidity and mortality
7. have a longer length of stay in hospital than non-OSA patients
8. first 24 hours postoperatively is most critical time, however, complications may arise later
9. patients non-compliant with CPAP prior to surgery who require CPAP post operatively pose highest risk of complications

Preoperative screening for OSA – any patient with BMI>40

- is a critical step in identifying patients at risk with high incidence of moderate or severe OSA
- **STOP-BANG** is a screening tool which may be used to decide which patients should be referred for further investigation – bicarbonate levels and ARES sleep study.

S	Snoring: Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?
T	Tired: Do you often feel tired, fatigued or sleepy during the daytime?
O	Observed: Has anyone observed you stop breathing during your sleep?
P	Blood pressure: Do you have or are you being treated for high blood pressure?
B	BMI: BMI more than 40 kg/m ²
A	Age: Age over 50 years
N	Neck circumference: Neck circumference greater than 40 cm
G	Gender: Male

STOP-BANG Questionnaire

- **High probability of moderate/severe OSA $\geq 6/8$**
- **$< 3/8$ = low probability of OSA**

Diagnosis

If patient's STOPBANG is $\geq 6/8$ refer for

- Pulse oximetry and/or
- Respiratory polysomnography (ARES)

Treatment modalities include

- Weight loss
- Mandibular advancement splints
- CPAP

Patients presenting with a high probability of moderate or severe OSA (STOPBANG $\geq 6/8$), but not yet diagnosed, require sleep studies (overnight oximetry or ARES study). Patients presenting for elective surgery require referral for investigations via their GP – they will be informed and surgery will be postponed. Patients presenting for urgent or scheduled surgery will be referred directly from Pre-assessment clinic, if time allows.

Sleep study results will be assessed by the Sleep physicians. If moderate or severe OSA is diagnosed, the patient will receive an appointment to be seen at the Sleep Clinic for further review and management *prior to surgery*.

If surgery cannot be postponed (clinical urgency) the patient must be assessed by the consultant anaesthetist in the Anaesthetic Pre-assessment clinic.

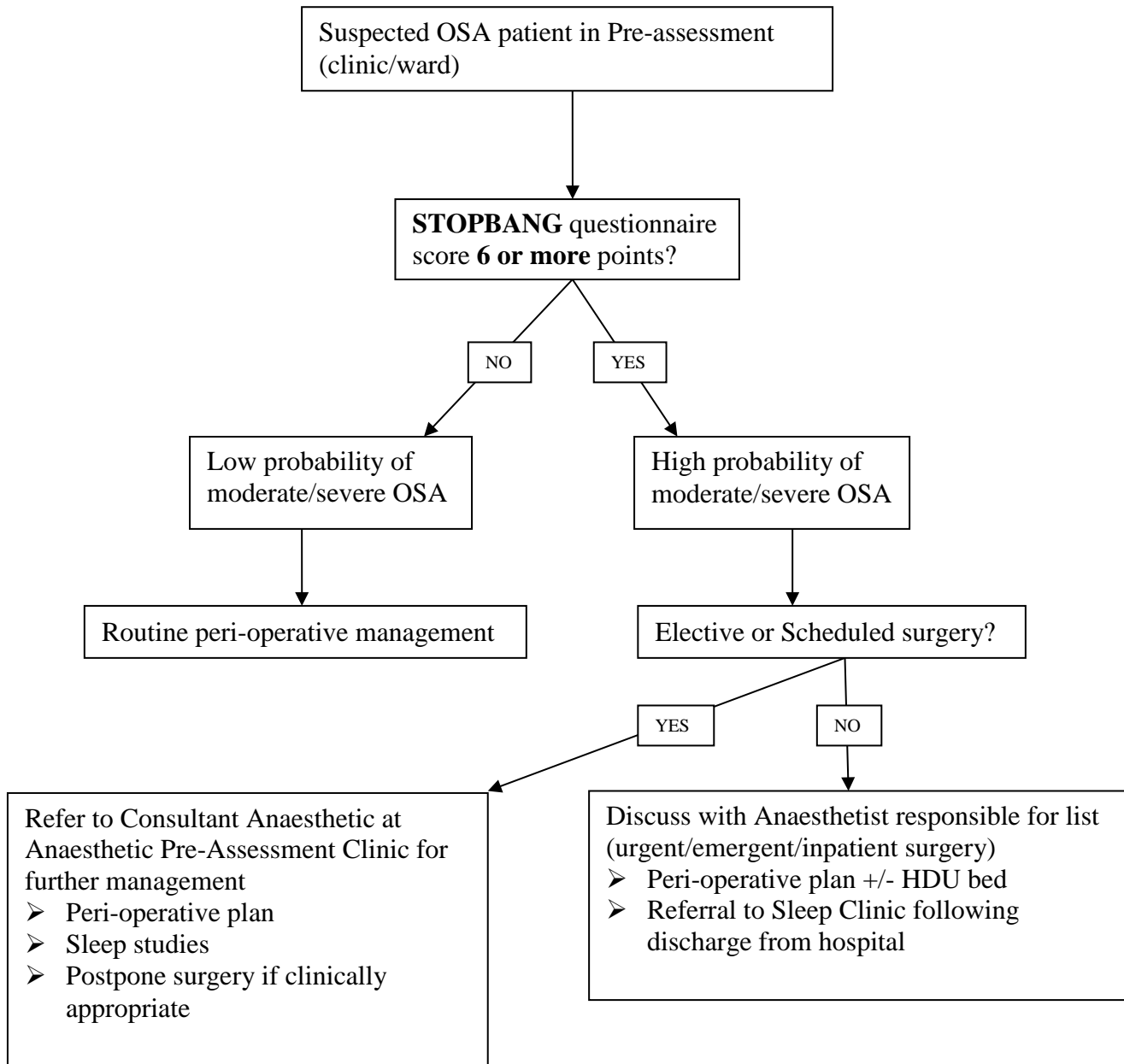
Untreated or CPAP non-compliant patients with moderate or severe OSA are likely to require HDU in the postoperative period.

Depending on the type of surgery, duration, type of anaesthetic, analgesic requirement, and the presence of comorbidities, even treated OSA patients may require postoperative critical care.

Patients known to have OSA, who are on treatment, must bring their CPAP machines, mandibular advancement splints, or other treatment modalities with them when admitted for surgery, to be used in hospital in the perioperative period.

Day Case Surgery and OSA – Patients with OSA may be suitable for day case procedures – this decision is made on a case by case basis following discussion with a consultant anaesthetist.

Algorithm for the assessment and management plan of the suspected OSA patient in Pre-assessment clinic or ward



GUIDELINES FOR THE PERI-OPERATIVE MANAGEMENT OF DIABETES MELLITUS IN ADULTS

1. DIAGNOSIS OF DIABETES MELLITUS

Previously undiagnosed diabetes – inform patient’s GP

Diagnosis based on laboratory tests:

- A fasting plasma glucose ≥ 7.0 mmol/L
- A random plasma glucose ≥ 11.1 mmol/L
- HbA_{1c} >48 mmol/mol

Urinalysis positive for ketones – refer the patient immediately to the Diabetic Unit.

All other cases, routine referral to the Diabetic Unit should be made according to Trust guidelines.

If in doubt about diagnosis or management please liaise with the Diabetes Unit on **ext 4453**

2. PRE-OPERATIVE ASSESSMENT CLINIC

- a. Current medication
- b. Previous blood glucose control
- c. Known complications of diabetes (ischaemic heart disease, hypertension, nephropathy, neuropathy)
- d. Previous problems with surgery and/or anaesthesia
- e. Investigations should include:
 - FBC/U&Es
 - HbA_{1c} within last 3 months (primary care included)
 - Urinalysis & Dipstix for ketones/protein
 - ECG (valid for 12 months in absence of any event)

HbA_{1c} >69 mmol/mol within the last 3 months should be discussed with the pre-assessment anaesthetist. Either the GP will be contacted to optimise management, or a diabetes specialist nurse referral made, depending on the urgency of surgery and previous optimisation. Frequently the patient can be admitted for procedure as planned (following discussion with the consultant anaesthetist at pre-assessment clinic). Consider a variable rate intravenous insulin infusion (VRIII) peri-operatively in patients with poor glycaemic control.

Provide patient information/advice about their **diabetic medication** pre-operatively.

3. PERI-OPERATIVE MANAGEMENT OF DIABETIC PATIENTS

Ideally, diabetic patients should be **first** on the morning/afternoon operating list.

Maintain blood glucose between 4 and 12 mmol/L peri-operatively:

If capillary glucose measures < 4 mmol/L or > 12 mmol/L, review the regimen and consider an alternative regimen.

<p><i>Regimen 1</i> Observation only Diet-controlled diabetes requires 4-hourly glucose measurements peri-operatively. If consistently >12 mmol/l, consider changing to regimen 4.</p>	<p><i>Regimen 2</i> Omission of oral hypoglycaemic drugs (*see guidelines below) Stop drugs 6-12 hours pre-op and monitor glucose 4-hourly peri-operatively</p>
<p><i>Regimen 3</i> Proportion of usual insulin (see guidelines below) <i>At the discretion of the anaesthetist</i> AM cases: Omit breakfast and insulin PM cases: Light breakfast and half usual insulin All cases: Monitor blood glucose 2-hourly</p>	<p><i>Regimen 4</i> Variable rate intravenous insulin infusion (VRIII) – standard regimen If 4 readings out of target range, change to gentle or aggressive regimen</p>

Restarting usual treatment

- Insulin treated patients: Restart s/c insulin before the second full meal. Discontinue infusions one hour after the first s/c dose.
- Tablet treated patients: Restart usual treatment before the second full meal. If once daily treatment, then restart treatment with evening meal and half usual morning dose.

Wherever possible, diabetic patients should be put first on a morning list. If the patient is on an all-day list and is not first, then take advice from the Anaesthetist as to whether Regimen 4 should be used.

Caution using Potassium in patients with renal failure – discuss with renal team if unsure.

4. GUIDELINES FOR THE USE OF A VARIABLE RATE INTRAVENOUS INSULIN INFUSION (VRIII)

Aim

To achieve/maintain perioperative normoglycemia, at 4-12mmol/L

Indications

- Patients anticipated to have starvation period of >12hrs **or missing 2 or more meals** (includes the meal missed prior to surgery)
- Poorly controlled or decompensated diabetes
- **Any** diabetic patient presenting for an **emergency/urgent/acute** surgical procedure

Principles

- Patients should continue their long acting insulin analogues (usually Levemir® or Lantus®) according to guidance
- The VRIII should be commenced early in the morning (07h00 – 07h30) on the morning of major surgery, even if surgery is scheduled for the afternoon
- Obese patients, patients on steroid therapy and patients with severe infections often require more insulin per hour, and therefore higher infusion rates
- Initial rate of infusion determined by the capillary blood glucose reading
- Frequency of capillary blood glucose measurements
 - hourly for the first 4-6 hours after the infusion is commenced, and every 2 hours thereafter
 - Intra-operatively the capillary blood glucose level should be measured **hourly**
 - Measurements should not be taken from the same arm as to which the infusion is connected
- If 3 consecutive readings are >12mmol/L and not decreasing by 3mmol/L/hour, the rate of the insulin infusion should be increased
- If the blood glucose reading is <4mmol/L
 - Reduce rate to 0.5units/hour
 - Or if patient has had long acting analogue, discontinue the infusion
 - Treat blood glucose \leq 4mmol/L as a hypoglycaemic event as per guidelines irrespective of whether the patient is symptomatic or not
 - Continue regular capillary blood glucose readings
- The amount of glucose required to prevent hypoglycaemia and provide the basal energy requirements is between 5-10 g glucose per hour, administered as 10% Dextrose running at 50ml/hour.
- Normokalaemia diabetic patients with normal renal function should receive 10% Dextrose with 10mmol of Potassium Chloride per 500ml bag of fluid. Additional Potassium may be required, especially in insulin-resistant patients. In a poorly controlled diabetic the Potassium level should be checked 6-8 hours after the insulin infusion is started.

Insulin doses may need to be altered to achieve these stable blood glucose levels.

If patients are either having episodes of hypoglycaemia or the insulin infusion is being altered frequently, please contact the Diabetic Team for advice.

5. POST-OPERATIVE INSULIN INFUSION REGIME

With the VRIII, the post-operative management of diabetes is made simple.

It is recommended that the first light breakfast following surgery should be eaten while the VRIII continues, to check that the meal is tolerated. Patients who normally take a subcutaneous basal-bolus regimen can be given their usual dose of subcutaneous insulin about 30 minutes before lunch. The VRIII must be continued for an hour, or at least until the meal is completed, to allow for absorption of the subcutaneous insulin.

For patients normally on twice daily insulin (who do not take a lunchtime dose), the usual subcutaneous dose can be given before the evening meal.

If glycaemic control is not maintained after reinstating the normal insulin, Specialist advice should be sought and consideration given to transferring the patient back to the IV insulin infusion regimen.

For patients with Type 2 Diabetes, the VRIII can be stopped and the oral hypoglycaemic therapy can be resumed once the patient is tolerating a normal diet.

6. POST-OPERATIVE FLUIDS

Many patients require fluid and electrolyte replacement during the peri-operative period.

When diabetic patients are put on the VRIII, it is strongly recommended that other post-operative fluids should be:

- given through a separate intravenous route
- restricted to fluids that do not contain dextrose

The insulin regimen running 10% Dextrose at 50ml/hour equates to a total volume of 1200ml per day.

If in doubt about the prescribing of post-operative fluids please seek senior advice.

7. PERI-OPERATIVE USE OF CONTINUOUS SUBCUTANEOUS INSULIN INFUSION PUMPS

Patients using pump therapy have a continuous supply of background insulin. Each pump user has an individualised carbohydrate ration. Patients using insulin pump therapy have been trained to manage their diabetes individually and independently. Fasting is not a problem for pump users.

Situations when the pump must be discontinued - If you discontinue the pump then an alternative strategy of giving insulin **must** be established as a matter of urgency to avoid deterioration in condition:

- major /acute surgery
- condition preventing self-management
- DKA
- conditions associated with shock and poor insulin absorption (Sepsis)
- severe skin disorders (e.g. burns, blistering)
- overdose of insulin

Situations when the pump can be continued:

- hypoglycaemia if corrected and responded to treatment
- elective surgical procedures (even if on variable rate intravenous infusion)
- if a surgical procedure is planned, please liaise with the Diabetes Specialist Nurse at Pre-assessment
- day case procedures

If in doubt use established routine - always contact the Diabetes Team for advice ext 4453

8. MANAGEMENT OF TYPE 2 DIABETES ON ORAL HYPOGLYCAEMIC AGENTS ONLY

- i. **Diet controlled Type 2 Diabetes** – no specific treatment required perioperatively. Blood glucose should be monitored peri-operatively.
- ii. **Day case surgery/minor surgery under local or general anaesthesia:**
 - Oral hypoglycaemic agents should be managed according to the guideline for peri-operative adjustment of non-insulin medication (no more than ONE missed meal) – *see below*
 - Monitor blood glucose and correct hyperglycaemia with the insulin infusion regimen
 - Administer the oral hypoglycaemic agent at the next meal after surgery if a normal diet can be resumed
 - If a normal diet cannot be resumed or the patient suffers protracted nausea and vomiting, consider starting the insulin infusion regimen
- iii. **Commencing an insulin infusion (VRIII) for Type 2 Diabetic patients having day case surgery/minor surgery depends on:**
 - The patient’s current metabolic state
 - The diet the patient will be allowed to eat after surgery
 - The type of surgery proposed
 - Whether or not the patient’s regimen normally includes insulin
 - The likelihood of protracted postoperative nausea and vomiting
- iv. **Type 2 Diabetic patients having major surgery:**
 - Omit oral hypoglycaemic agents on the morning of surgery
 - Metformin can be continued until the morning of surgery unless renal/hepatic dysfunction
 - If diabetes is well-controlled ($HbA_{1C} < 69$ mmol/mol), commence the VRIII regimen (as per Type 1 Diabetic patients) on the morning of surgery
 - If diabetes is poorly controlled ($HbA_{1C} > 69$ mmol/mol), *consider* commencing the insulin infusion regimen at midnight before surgery
 - The infusion should be continued until the patient can resume a normal diet and their oral hypoglycaemic agent post-operatively

Fasting guidelines for diabetes medications (short starvation period – no more than one missed meal)

MEDICATION TYPE	COMMONLY USED MEDICATIONS	DAY OF FASTING
Biguanide	Metformin, Metformin MR, Glucophage SR	Can be taken as normal, but may cause GI upset
Sulphonylurea	Gliclazide, Gliclazide SR, Glimpeiride	<ul style="list-style-type: none"> • Omit morning dose • If taken twice daily give pm dose if patient eating by evening meal, otherwise omit.
Thiazolidinedione	Pioglitazone	Take as normal
DPP-4 Inhibitors	Sitagliptin, Vildagliptin, Saxagliptin, Linagliptin, Alogliptin	Take as normal
GLP-1 Analogues (Non-insulin injectables)	Exenatide, Liraglutide, Lixisenatide	Take as normal
GLP-1 Analogue & Insulin combinations	Xultophy	Take as normal
SGLT-2 Inhibitors	Dapagliflozin, Canagliflozin, Empagliflozin	Omit when fasting

- Use in conjunction with BTHFT guidelines on “IV insulin for patients with Diabetes when fasting” to assess whether VRII is required
- Aim to get patient back onto their usual medications as soon as possible.
- For combination tablets, omit if one part is not suitable for fasting.
- Blood glucose levels must be monitored 2-4 hourly during fasting, unless on VRII, then hourly.

9. MANAGEMENT OF TYPE 1 DIABETES AND TYPE 2 DIABETES ON INSULIN

i. Day case surgery or minor surgery

a) Local anaesthesia

- The usual morning s/c insulin dose can be delayed until after surgery if surgery is short and a normal diet can be resumed immediately
- Blood glucose should be monitored peri-operatively and corrective action taken for the occurrence of either hypoglycaemia or hyperglycaemia

b) General anaesthesia

Fasting guidelines for diabetes medications (short starvation period – no more than ONE missed meal)

INSULIN REGIME	COMMONLY USED INSULINS	DAY OF FASTING	
ONCE DAILY BASAL OR INTERMEDIATE ACTING	Lantus, Levemir, Humulin I, Insuman Basal, Toujeo, Tresiba, Basaglar	<ul style="list-style-type: none"> • Continue at usual timing and dose • Make sure these continue alongside variable rate IV insulin (VRII) 	
TWICE DAILY (Biphasic insulins)	Humalog Mix25, Humalog Mix50, Humulin M3, Insuman Comb25, NovoMix30	<ul style="list-style-type: none"> • Give half of usual morning dose • If patient eating by evening meal time – no change to evening dose • If not eating by evening meal time, commence variable rate IV insulin (VRII) 	
THRE TIMES DAILY (Biphasic insulins)	Humalog Mix50, Insuman Comb50	AM or ACUTE LIST	PM LIST
		<ul style="list-style-type: none"> • Halve usual morning dose • Omit lunchtime dose if still fasting 	<ul style="list-style-type: none"> • Take usual morning dose • Omit lunchtime dose
		<ul style="list-style-type: none"> • If patient eating by evening meal time – no change to evening dose • If not eating by evening meal time, commence variable rate IV insulin (VRII) 	
FOUR OR MORE DAILY (Basal bolus regime)	<u>Basals:</u> Lantus, Toujeo, Tresiba & Levemir USED TOGETHER WITH <u>Short acting:</u> Humalog, Fiasp & NovoRapid	AM or ACUTE LIST	PM LIST
		<ul style="list-style-type: none"> • Omit the morning short acting insulin 	<ul style="list-style-type: none"> • Take usual morning dose of short acting insulin
		<ul style="list-style-type: none"> • No change to basal/background insulin (can have with VRII) • Omit lunchtime short acting dose if still fasting • If patient eating by evening meal time – no change to evening dose. If not eating by evening meal time commence variable rate IV insulin (VRII). Continue basal insulins alongside IV insulin. 	

- Use in conjunction with BTHFT guidelines on “IV insulin for patients with Diabetes when fasting” to assess whether VRII is required
- Aim to get patient back onto their usual medications as soon as possible.

The plasma glucose should be checked hourly peri-operatively.

The option of commencing an insulin infusion depends upon several factors:

- The patient's current metabolic state
- The diet the patient will be allowed to eat after surgery
- The type of surgery proposed
- The patient's insulin therapy
- The likelihood of protracted postoperative nausea and vomiting

ii. Major surgery: Type 1 Diabetic patients and Type 2 Diabetic patients on insulin should be commenced on the VRIII regimen

- If diabetes is well-controlled ($HbA_{1C} < 69\text{mmol/mol}$), commence VRIII on the morning of surgery
- If diabetes is poorly controlled ($HbA_{1C} > 69\text{mmol/mol}$), consider commencing the VRIII at midnight before surgery

10. AFTERNOON OPERATING SESSIONS

If it is not possible to place diabetic patients at the beginning of morning operating lists, Day Case diabetic patients placed on afternoon lists should be instructed to manage their individual anti-diabetic regimes according to the guidelines set out above.

On admission to hospital, each patient will be adequately starved (a light breakfast before 07h30, and clear fluids up to 11h00) and should have their blood sugar monitored. If the patient becomes either hypo- or hyper-glycaemic, corrective action as outlined in the guidelines should be taken.

Any diabetic patient that has unstable diabetic control should NOT be admitted as a Day Case.

In-patient diabetic patients placed on afternoon operating lists may need to be put on VRIII if time of surgery is unknown.

11. PATIENTS SCHEDULED FOR URGENT/EMERGENCY SURGERY

See above tables for "Acute List"

12. MANAGEMENT OF HYPOGLYCAEMIA AND HYPOGLYCAEMIA RISK

Patients admitted pre-operatively should have a capillary blood glucose (CBG) measured

- If admission CBG is $< 6\text{mmol/L}$
 - consider a potential of hypoglycaemia in the perioperative period
 - Patients on diet alone are not at risk hypoglycaemia and are excluded from the guidance below
- If CBG is $4\text{-}6\text{mmol/L}$ and no symptoms of hypoglycaemia
 - Consider giving 50-100mls of 10% dextrose as a stat iv bolus
 - Repeat CBG after 15 minutes
- If CBG $< 4\text{mmol/L}$
 - Give 80-100mls of 20% glucose
 - Repeat CBG after 15 minutes
- Try to avoid stopping the VRIII in patients with Type 1 Diabetes. If stopped, recommence as soon as the CBG rises above 5mmol/L

13. REFERENCES

1. K. Brown Fasting Guidelines for Diabetes medications – for staff. Version 3. November 2017.
2. Management of adults with diabetes undergoing surgery and elective procedures: Improving standards. Revised edition March 2016
3. P.Barker, P.E.Creasey, K.Dhatariya, N.Levy, A.Lipp, M.H.Nathanson, N.Penfold, B.Watson, T.Woodcock. Peri-operative management of the surgical patient with diabetes 2015. Association of Anaesthetists of Great Britain and Ireland
4. NHS Diabetes: Management of adults with diabetes undergoing surgery and elective procedures: improving standards
5. www.diabetes.nhs.uk/our_work_areas/inpatient_care/

PERIOPERATIVE MANAGEMENT OF CHRONIC MEDICATION

- Adverse events are more likely to occur in the peri-operative when patients' chronic medication has been omitted on the day of surgery.
- National guidance on chronic medication in the perioperative period is available to view on the [Pharmacy Intranet Page](#) in "The Handbook of Peri-operative Medicines – UKCPA, 2nd edition, 2017"

<http://nww.bradfordhospitals.int/policies-and-clinical-guidance/Clinical%20Guidelines/Divisional%20Policies%20And%20Guidance/Pharmacy/Clinical/Surgical%20prescribing%20practice/Handbook%20of%20perioperative%20medicines%202nd%20Edition.pdf>

- Essential drugs should not be omitted prior to surgery, unless it has been discussed with the ward doctor or anaesthetist. If there is any clinical concern in administering the drugs, please clarify with the ward doctor or anaesthetist, or seek specialist medical input wherever appropriate.
- If a patient is NIL BY MOUTH for surgery, their usual medication should be administered with water **no less than one hour prior** to surgery.
- Medication should be reviewed **daily** post-operatively with specialist medical input as appropriate.
- Patients presenting for urgent or emergency surgery should have their chronic medication reviewed by the specialty doctor prior to administration of drugs.
- Patients with complex medical and drug histories should be referred to the Pharmacist for a perioperative plan.
- Below is *local* guidance on the use of anti-coagulants, anti-platelet agents and other drugs not included in the UKCPA handbook.

The Handbook of Peri-Operative Medicines



This Handbook has been supported and funded by:

UKCPA

CLINICAL PHARMACY ASSOCIATION

Endorsed by



ROYAL COLLEGE OF
PHYSICIANS AND
SURGEONS OF GLASGOW

Endorsed by



Endorsed by

ROYAL
PHARMACEUTICAL
SOCIETY

<http://nww.bradfordhospitals.int/policies-and-clinical-guidance/Clinical%20Guidelines/Divisional%20Policies%20And%20Guidance/Pharmacy/Clinical/Surgical%20prescribing%20practice/Handbook%20of%20perioperative%20medicines%202nd%20Edition.pdf>

1. ANTI-PLATELET THERAPY

DRUG(S)	INDICATION	RECOM-MENDED DURATION	PERIOPERATIVE GUIDANCE	PRE-OPERATIVE MANAGEMENT PLAN
DUAL ANTI-PLATELET THERAPY				
Aspirin and Clopidogrel OR Aspirin and Ticagrelor OR Aspirin and Prasugrel	Acute coronary syndrome (ACS)	1-12 months	<u>Elective non-cardiac surgery:</u> Delay surgery for a minimum of 2 months post ACS/MI in absence of coronary intervention	Continue Aspirin 75mg in perioperative period for all surgery (except eye surgery: trabeculectomy, dacryocystorhinostomy, eyelid surgery or at the specific request of the operating surgeon) Discontinue Clopidogrel and Prasugrel for 7 days pre-operatively Ticagrelor for 5 days pre-operatively
	PCI: Coronary artery stent with Bare metal stent (BMS)	1-12 months	<u>Elective non-cardiac surgery:</u> Delay for minimum 30 days (optimally 6 weeks) post PCI <u>Non-elective non-cardiac surgery:</u> Discuss with anaesthetist/cardiologist/surgeon before discontinuing treatment	
	PCI: Coronary artery stent with Drug-eluting stent (DES)	Minimum of 12 months	<u>Elective non-cardiac surgery:</u> Delay for 12 months post PCI. If the risk of delaying surgery for 12 months outweighs the risk of stent thrombosis or ischaemia, surgery may be considered after 6 months post PCI. <u>Non-elective non-cardiac surgery:</u> Discuss with anaesthetist/cardiologist/surgeon before discontinuing treatment	
Aspirin and Dipyridamole	Secondary prevention of ischaemic TIA/CVA	3 months	<u>Elective non-cardiac surgery:</u> Delay surgery for at least 3 months following TIA/CVA <u>Non-elective non-cardiac surgery:</u> Discuss with anaesthetist/surgeon before discontinuing treatment	Continue Aspirin 75mg in perioperative period for all surgery (except eye surgery: trabeculectomy, dacryocystorhinostomy, eyelid surgery or at the specific request of the operating surgeon)

	Carotid artery stenting	1 month	<u>Elective non-cardiac surgery:</u> Delay surgery for at least 1 month following procedure <u>Non-elective non-cardiac surgery:</u> Discuss with anaesthetist/surgeon before discontinuing treatment	Discontinue Dipyridamole 2 days pre-operatively
MONOTHERAPY				
Clopidogrel	Secondary prevention of ischaemic TIA/CVA	3 – 6 months	<u>Elective non-cardiac surgery:</u> Delay surgery for at least 3 months following event <u>Non-elective non-cardiac surgery:</u> Discuss with anaesthetist/surgeon before discontinuing treatment	Discuss with anaesthetist/surgeon before discontinuing treatment
Aspirin OR Clopidogrel	Post- Carotid Endarterectomy (CEA)	Long term	<u>Elective non-cardiac surgery:</u> Delay surgery for at least 1 month following CEA surgery <u>Non-elective non-cardiac surgery:</u> Discuss with anaesthetist/surgeon before discontinuing treatment	Continue Aspirin 75mg in perioperative period. Discontinue Clopidogrel 7 days pre-operatively (consider replacing with Aspirin)
Aspirin	AF, primary prevention of stroke or primary prevention of MI	Long term (primary prevention)		May be discontinued 7-10 days pre-operatively (consider continuing in perioperative period for surgery with low risk of bleeding)
DUAL OR MONO ANTIPLATELET THERAPY				
Aspirin and/or Clopidogrel	Secondary prevention of ischaemic TIA/CVA	Pre-operatively for Carotid Endarterectomy surgery or Carotid Stenting		Continue antiplatelet therapy during the perioperative period – do not withhold treatment unless advised by the vascular surgeon

2. ANTI-COAGULATION THERAPY – pg49

See specific guidance on Peri-operative Management of Anti-coagulation therapy

3. ANGIOTENSIN CONVERTING ENZYME INHIBITORS (ACE-I) and ANGIOTENSIN II RECEPTOR BLOCKERS (ARBs)

For patients undergoing noncardiac surgery, rates of death, stroke, acute kidney injury and myocardial injury are reduced when ACE-Is and ARBs are discontinued 24 hours before surgery.

- Ramipril, Lisinopril, Enalapril, Captopril, Perindopril, Fosinopril, Quinapril
- Losartan, Valsartan, Candesartan, Irbesartan, Eprosartan, Olmesartan, Telmisartan

4. BETA-BLOCKERS

Do not omit Beta-blockers unless HR < 40/min or systolic blood pressure <120mmHg.

- Bisoprolol, Metoprolol, Labetalol, Atenolol, Propranolol, Sotalol

5. DIURETICS

Omit on the day of surgery, with careful monitoring of fluid balance peri-operatively.

- Potassium sparing (Spironolactone, Amiloride)
- Furosemide, Bumetanide, Bendroflumethiazide

6. TAMOXIFEN

Discontinue for 1 month prior to any MAJOR SURGERY. Recommence one month following major surgery (increased VTE risk).

Continue as usual prior to minor/ambulatory surgery.

Follow trust guidance as for patients with increased risk for VTE in perioperative period.

7. LITHIUM

Discontinue Lithium 24 hours pre-operatively.

8. NON-STEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDs)

Omit NSAIDs on the day of intermediate or major surgery.

- Diclofenac, Ibuprofen, Naproxen, Indomethacin

9. DIABETES MEDICATION – pg35-41

Follow Trust specific guidance on Insulin and hypoglycaemic agents in the perioperative period.

10. PERI-OPERATIVE STEROID SUPPLEMENTATION

Patients on chronic steroid therapy should receive their usual pre-operative dose of steroids on the day of surgery. Class A and B evidence is lacking to fully support or refute the need for peri-operative stress-dose of steroids for patients with suspected secondary adrenal insufficiency. If hypothalamic-pituitary-adrenal axis suppression (HPAA) is of clinical concern, proceed to administration of peri-operative steroids as the standard of care.

Guide to consideration of a stress-dose of steroids in peri-operative period:

- High risk of HPAA suppression – administer stress-dose of steroids peri-operatively
 - primary adrenal insufficiency (Addison’s disease)
 - high dose of Prednisolone $\geq 20\text{mg/d}$ for ≥ 3 weeks, or with features of Cushing’s syndrome
 - known diagnosis of secondary adrenal insufficiency
- Low risk of HPAA suppression – peri-operative steroids not required unless signs of HPAA suppression perioperatively
 - any dose of steroids for < 3 weeks
 - Prednisolone 5mg daily
 - Prednisolone 10mg alternate days
- Intermediate risk of HPAA suppression
 - history of chronic steroid therapy not in one of the above categories – exercise clinical judgement based on patient’s pre-operative status and the stress/type of surgery
- High dose for immunosuppression – continue peri-operatively

PERI-OPERATIVE MANAGEMENT OF STEROIDS

Surgery	Hydrocortisone regime
Minor or Intermediate surgery	Usual daily steroid dose <i>plus</i> 50mg on induction <i>then</i> 25mg 8 hourly for 24hours <i>then</i> Usual daily dose
Major surgery	Usual daily steroid dose <i>plus</i> 100mgs on induction <i>then</i> 50mg 8 hourly for 24 hours Taper dose by half each day until usual dose is reached
High dose immunosuppression	Give usual immuno-suppressive steroids only

Please seek advice from pharmacy if patients are unable to continue their oral dose of steroids postoperatively.

11. PERI-OPERATIVE RECOMMENDATIONS FOR COMPLIMENTARY MEDICINES

For further information (scientific names, common uses & possible side effects/drug interactions and health promotion advice) please see BHNHST Complementary Medicines Pre-Operative Recommendations

Brand name (common name)	Common uses	Side effects and drug interactions	Perioperative recommendations
Cayenne (Capsicum, chilli pepper, cayenne, paprika)	Treatment of dyspepsia, BP lowering, energy level enhancer		Discontinue 7 days pre-operatively
Echinacea (Purple cone flower)	URTI/LRTI, UTI, wound and burns	Hepatotoxicity, reduced efficacy of corticosteroids, increased risk of allergic reactions	Discontinue usage following pre-assessment until after discharge
Ephedra (Ma-huang, Chinese joint fir, ephedrine)	Diet aids, antitussive, bacteriostatic	Arrhythmias, MAOI, enhanced sympathomimetic activity, increased risk of major cardiac event	Discontinue 7 days pre-operatively
Feverfew (Midsummer daisy)	Migraine prophylaxis, antipyretic	Platelet inhibitor, increased bleeding	Discontinue 7 days pre-operatively
Garlic (Ajo)	Anti-platelet, anti-oxidant, anti-thrombolytic, BP and lipid lowering	Potent inhibitor of TXA synthetase, increased bleeding time, epidural haematoma	Discontinue 7 days pre-operatively
Ginger (Black/African ginger)	Anti-emetic, anti-spasmodic	Inhibitor of TXA synthetase, increased bleeding time	Discontinue 7 days pre-operatively
Ginko (Maidenhair, fossil tree)	Inhibits platelet activating factor	Increased bleeding time, interacts with NSAIDs and Warfarin	Discontinue 7 days pre-operatively
Ginseng (American/Chinese/Korean ginseng)	Energy level enhancer, anti-oxidant	Ginseng abuse syndrome (somnolence, hypertonia, oedema) interacts with antipsychotics, antiplatelet agent, increased bleeding, hypoglycaemia, CVS instability	Discontinue 7 days pre-operatively
Goldenseal (orange/yellow root, turmeric/eye root, ground raspberry)	Diuretic, anti-inflammatory, laxative, haemostatic	Aquaretic with sodium retention – may worsen oedema, hypertension, oxytocic	Discontinue 7 days pre-operatively
Kava-kava (Ava pepper, kawa)	Anxiolytic	Hepatotoxicity – withdrawn from UK	Discontinue 7 days pre-operatively
Liquorice (sweet root)	Treat peptic ulcers, gastritis, bronchitis/cough	Hypokalaemia, hypertension, oedema	Discontinue 7 days pre-operatively
Saw palmetto (Sabal, cabbage palm)	BPH, anti-androgenic, anti-exudative	Additive effects with other hormone preparations	Discontinue 7 days pre-operatively
St John's Wort (Hardhay, amber, goat weed)	Treat depression and anxiety	Induces cytoP450 enzymes, prolongs effects of anaesthetic agents, serotonin syndrome, reduces immunosuppressant drugs' therapy	Discontinue 7 days pre-operatively
Valerian (All-heal, vandal root, setwall)	Mild anxiolytic and sedative	May potentiate barbiturates	Discontinue 7 days pre-operatively
Vitamin E	Slow ageing, wound healing, prevention DVT/PE	May increase bleeding, and affect thyroid functions	Discontinue 7 days pre-operatively

REFERENCES

1. Fleisher LA, Fleischmann KE, Auerbach AD, Barnason SA, Beckman JA, Bozkurt B, Davila-Roman VG, Gerhard-Herman MD, Holly TA, Kane GC, Marine JE, Nelson MT, Spencer CC, Thompson A, Ting HH, Uretsky BF, Wijeyesundera DN. 2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. *Journal of the American College of Cardiology* (2014), doi: 10.1016/j.jacc.2014.07.944.
2. A. D. Oprea, W. M. Popescu. Perioperative management of antiplatelet therapy, *British Journal of Anaesthesia* 111 (S1): i3–i17 (2013), doi:10.1093/bja/aet402
3. A.Huibersac, A.Hallidaya, R.Bulbuliab, G.Coppid, G.J.de Borstc, ACST-2 Collaborative Group. Antiplatelet Therapy in Carotid Artery Stenting and Carotid Endarterectomy in the Asymptomatic Carotid Surgery Trial-2. *Eur J Vasc Endovasc Surg* (2016) 51, 336e342
4. Melanie M. Liu, Andrea B. Reidy, Siavosh Saatee, Charles D. Collard. Perioperative Steroid Management: Approaches Based on Current Evidence. *Anesthesiology* 2017; 127:166-72
5. Tom Peck, Adrian Wong, Emma Norman. Anaesthetic implications of psychoactive drugs. *Continuing Education in Anaesthesia Critical Care & Pain*, Volume 10, Issue 6, 1 December 2010, Pages 177–181, <https://doi.org/10.1093/bjaceaccp/mkq037>
6. What you should know about your patient's use of herbal medicines and other dietary supplements 2010, American Society of Anaesthesiologists.
7. Murphy Jane (1999) Preoperative Considerations with Herbal Medicines, *AORN Journal*, 69(1)
8. Ang Lee M et al (2001) Herbal Medicines and Perioperative Care, *Journal of the American Medical Association*, 286(2), 208-216

ANTI-COAGULATION THERAPY IN THE PERI-OPERATIVE PERIOD

1. Oral anticoagulants are frequently prescribed for long-term prevention of venous or arterial thromboembolism for at risk patients
2. In the peri-operative period risks and consequences of thrombosis need to be weighed against risk and consequences of excess perioperative and postoperative bleeding
3. There are **3 options** for the peri-operative management of anti-coagulants
 - a. **Continue** warfarin (with INR monitoring pre-procedure) or other novel oral anticoagulants – this is for minor superficial procedures
 - i. Cataract surgery, minor superficial dermatological procedures, minor dental procedures, low-risk endoscopic (diagnostic +/- biopsies, biliary or pancreatic stenting, diagnostic EUS)
 - b. Temporary cessation of anticoagulation for a period pre- and post-operatively with post-operative **prophylactic** anticoagulation only
 - c. Temporarily withhold warfarin or other novel oral anticoagulants pre-operatively, **bridging anticoagulation therapy** with LMWH or IV Heparin
4. The option chosen is determined by
 - a. The primary indication for anticoagulation and risk assessment of thromboembolism
 - b. The type of procedure or surgery
 - c. The risk of perioperative bleeding
5. Pre-operative bridging carries a low risk of bleeding, but use of post-operative bridging carries high risk of bleeding and requires careful consideration
 - a. In high bleeding risk surgery it is recommended that post-operative **therapeutic** anticoagulation bridging is not commenced **until at least 48hrs** postoperatively (note that **prophylactic** anticoagulation should be given)
6. A risk assessment must be made and the appropriate plan discussed with the patient prior to their surgery.

Patients with complex anticoagulation problems

Some complex patients may require discussion with the haematologists as they may require an individual management plan, for example patients with anti-thrombin III deficiency. If you think this is the case, please contact the “Haematology advice phone” via switchboard. If an individual plan is required, then details will be passed to the thrombosis specialist nurse for completion and uploaded to EPR with a copy sent to the patient.

The following information should be included:

- Date and type of procedure
- Admitting ward
- Consultant
- Patient’s weight
- Current anticoagulation and dose

CONTINUE ANTICOAGULATION

- Dental surgery
 - single or multiple simple extractions
- Minor dermatological surgery e.g. skin biopsy
- Cataract surgery
- Joint and soft tissue injections/aspirations
- Coronary angiography and pacemaker insertion
- Some diagnostic endoscopy +/- biopsy (see local gastroenterology guidelines)

Check INR within 5 days of procedure or on the day of the procedure to ensure not elevated.

For patients on DOAC treatment it is best to avoid the DOAC on the day of the procedure – although if patient has taken then could consider performing the procedure aware that the peak effect of anticoagulation is **2-3 hours** following ingestion.

PROPHYLACTIC ANTICOAGULATION (warfarin)

All patients who do not fit criteria for bridging anticoagulation (see below) **do not require** pre-operative bridging with LMWH.

Pre-operative management

Discontinue Warfarin 5 days prior to surgery (ie omit 5 doses).

Phenindione (Dindevan®) and acenocoumarol (Sinthrome®): These agents have shorter half-lives than warfarin, hence a shorter duration of action and more rapid onset of action. Patients should be advised to discontinue 4 days pre-operatively (i.e. omit 4 doses).

Check INR on day of Surgery to ensure < 1.5

Pre-operative management

D -6	D -5	D-4	D -3	D -2	D -1	D0 – Surgery
Last dose warfarin	No indication for pre-operative bridging					Commence LMWH Prophylaxis 6-12 hours post op

Post-operative management

- Commence LMWH prophylactic dose 6-12 hours post-operative assuming haemostasis
- Continue prophylactic LMWH post-operatively until INR >2 for 2 days
- It may take 7-10 days so ensure patient has a supply of LMWH if discharged for this period of monitoring

Re-commence warfarin the day following surgery (Day+1) giving twice the patients usual dose (max 15mg) then their usual dose daily from Day +2. Check INR D+4 or D+5 which can be done at the warfarin clinic during normal working days Monday – Friday. If it is a weekend or bank holiday alternative arrangements will need to be made.

Post-operative management

D+1	D+2	D+3	D+4
LMWH prophylaxis 5pm	LMWH prophylaxis 5pm	LMWH prophylaxis 5pm	LMWH prophylaxis 5pm
Re-start warfarin 2x usual dose (max 15mg)	Warfarin usual dose	Warfarin usual dose	<u>INR Check</u>

BRIDGING ANTICOAGULATION (warfarin)

When to consider bridging with treatment dose heparin in patients who stop warfarin if thrombotic risk is especially high:

VTE	Patients with a VTE within previous 3 months.
	Very high-risk patients such as patients with a previous VTE whilst on therapeutic anticoagulation who now have a target INR of 3.5
AF	Patients with a previous stroke/TIA in last 3 months.
	Patients with a previous stroke/TIA and 3 or more of the following risk factors: <ul style="list-style-type: none"> ➤ Congestive cardiac failure ➤ Hypertension (>140/90 mmHg or on medication) ➤ Age >75 years ➤ Diabetes mellitus
MHV	All MHV patients EXCEPT bi-leaflet aortic valves and none of the risk factors below: <ul style="list-style-type: none"> ➤ Chronic AF ➤ Left ventricular dysfunction ➤ Age > 75 years ➤ Hypertension ➤ Diabetes ➤ Prior stroke/TIA

VTE, venous thromboembolism; INR, International Normalized Ratio; AF, atrial fibrillation; TIA, transient ischaemic attack; MHV, mechanical heart valve.

Pre-operative guidelines for bridging warfarin patients:

Discontinue Warfarin 5 days prior to surgery (i.e. omit 5 doses).

Phenindione (Dindevan®) and acenocoumarol (Sinthrome®): These agents have shorter half-lives than warfarin, hence a shorter duration of action and more rapid onset of action. Patients should be advised to discontinue 4 days pre-operatively (i.e. omit 4 doses).

Patients will require LMWH prior to procedure. Please ensure the correct dose is given to the patient as per the regimen below:

INR must be checked at least once between D-5 and D-3 before surgery as well as on the day of surgery. Dose of LMWH will depend on this result.

D-6	D-5	D-4	D-3
LAST dose of warfarin	<2 reg B	<2 reg B	<2 reg B
	2-3 reg B	2-3 reg B	2-3 reg A
	3-4 reg B	3-4 reg A	3-4 reg C
	> 4 repeat D-3	>4 reg C	>4 reg C

T=therapeutic dose P=prophylactic dose X=no LMWH

REGIMEN	D -3	D -2	D -1
Regimen A	P	P	P
Regimen B	T	T	P
Regimen C	give oral Vitamin K 2mg and repeat INR next morning		

Example:

Patient with a mechanical heart valve having knee surgery. Last dose of warfarin Friday D-6. It is the weekend, so INR checked Monday Day -3. INR is 1.8 so follow regimen B - patient receives Therapeutic LMWH on Monday (D-3), Tuesday (D-2); then Prophylactic LMWH on Wednesday (D-1) before having surgery on the Thursday (D0).

Post-operative anti-coagulation management bridging:

- Provided haemostasis is secure:
 - Commence prophylaxis LMWH 6-12 hours post op
 - Re-start therapeutic LMWH at earliest at 48 hours post-operatively, but split the dose
 - Consider re-starting therapeutic LMWH at 24 hours after minor procedures
 - Patients with renal failure see guideline on LMWH in renal failure for dose
- ensure anticoagulation clinic appointment is booked on discharge
- check INR day +4 (or day +5 post-surgery if discharged and no concerns)
- it may take 7-10 days for INR to be therapeutic so discharge with 7-10 days LMWH

Re-commence warfarin the day following surgery (Day+1) giving twice the patients usual dose (max 15mg) then their usual dose daily from Day +2 . Check INR D+4 or D+5 which can be done at the warfarin clinic during normal working days Monday – Friday. If it is a weekend or bank holiday alternative arrangements will need to be made.

D 0	D+1	D+2	D+3	D+4	D+5	D+6
Surgery						
LMWH Prophylaxis 6-12 hours post-op	LMWH prophylaxis 5pm Commence Warfarin 2x usual dose (max 15mg)	LMWH Prophylaxis 5pm Warfarin Usual dose	LMWH therapeutic dose (give this as a split dose twice daily) Warfarin usual dose	LMWH therapeutic dose (give this as a split dose twice daily) Warfarin usual dose Check INR	LMWH therapeutic dose (give this as a split dose twice daily) Warfarin usual dose Check INR	LMWH therapeutic dose – consider change to daily dosing Warfarin usual dose Check INR

Example calculation for split dose LMWH:

Weight 80 kg and normal renal function. Tinzaparin 175 units/Kg = 14,000 units daily dose.

Prescribe Tinzaparin 7000 units BD (split dose)

NOVEL ORAL ANTI-COAGULANTS (NOACs)

Pre-operative recommendations for discontinuing NOACs

NOAC	Creatinine Clearance (ml/min)	High risk of bleeding/major surgery/ neuraxial block	Standard risk of bleeding/no neuraxial block	Investigation of day of surgery
DABIGATRAN	≥80 50 – 79 30 -49	2 days pre-operatively 3 days pre-operatively 4 days pre-operatively	1 day pre-operatively 2 days pre-operatively 3 days pre-operatively	Clotting screen and Thrombin time
RIVAROXABAN, EDOXABAN, APIXABAN	≥30 <30	2 days pre-operatively 3 days pre-operatively	1 day pre-operatively 2 days pre-operatively	Clotting screen

Post-operative recommendations for recommencing NOAC therapy

- Following minor or low risk surgery in patients with low bleeding risk, prophylactic anticoagulation can be commenced 6–12 h post-procedure if haemostasis has been fully secured
- Following high risk surgery and in patients with an increased bleeding risk or in any situation where any increased risk of bleeding is unacceptable, DOACs should not be re-introduced at full dose until at least 48-72 hours post-operatively.
- In patients with high thrombosis risk it is appropriate to consider prophylactic doses of LMWH before re-introducing full therapeutic dose DOACs
- Ensure oral route is acceptable and no concerns for absorption before restarting DOAC
- Repeat renal function may be required before restarting DOAC
-

DRUG	Surgery type	Day 0	D+1	D+2	D+3	D+4
DOAC	MINOR	Prophylactic LMWH 6-12 hours post op	Consider restarting DOAC at least 24 hours post-surgery			
	MAJOR (includes any intra-abdominal surgery)	Prophylactic LMWH for 48-72 hours post-surgery	Consider restarting DOAC 48-72 hours post-surgery			

HEPARIN INFUSION - UNFRACTIONATED HEPARIN INFUSION

- Stop infusion 6 hours pre-operatively on day of surgery
- Check APTT 2 hours pre-operatively

REFERENCES

1. David Keeling, R. Campbell Tait, Henry Watson on behalf of the British Committee for Standards in Haematology. Peri-operative management of anticoagulation and antiplatelet therapy. *BJH*, 2016, 175, 602–613
2. Douketis JD. Perioperative management of patients who are receiving warfarin therapy: an evidence-based approach and practical approach. *Blood* 2011, 117 (19): 5044-9

Guideline produced by Dr S Ackroyd (Consultant Haematologist) and Dr S Kritzingner (Consultant Anaesthetist). Updated Sept 2018

Prophylactic Tinzaparin dosing

Weight kg	Dose	Syringe Size
<50 kg	3500 units	3500 unit in 0.35 ml
51 to 109 kg	4500 units	4500 unit in 0.45 ml
110 to 149 kg	7000 units	2 x 3500 unit syringes
>150 kg	9000 units	2 x 4500 unit syringes

Therapeutic Tinzaparin dosing

Weight to nearest 5 kg	Dose units	Graduated Syringe Size
40	7000	8000 units in 0.4 ml
45	8000	“
50	9000	10000 units in 0.5 ml
55	10000	“
60	11000	12000 units in 0.6 ml
65	11000	“
70	12000	“
75	13000	14000 units in 0.7 ml
80	14000	“
85	15000	16000 units in 0.8 ml
90	16000	“
95	17000	18000 units in 0.9 ml
100	18000	“
105	18000	“
110	19000	Use 40000 units in 2 ml vial
115	20000	“
120	21000	“
125	22000	“
130	23000	“
135	24000	“
140	25000	“
145	25000	“
150	26000	“
155	27000	“
160	28000	“
165	29000	“

**For patients with a creatinine clearance <20ml/min adjust the dose of Tinzaparin to 125 units/kg*

VENOUS THROMBO-EMBOLIC (VTE) PROPHYLAXIS

FOLLOW TRUST GUIDANCE AND PROMPTS ON EPR

1. All surgical patients require a VTE assessment on admission and thereafter, as per Trust guidance and EPR alerts
2. Elective day surgery patients
 - i. chemical thromboprophylaxis is usually not required for minor procedures carried out under local anaesthesia
 - ii. Day cases under general anaesthetic, where the patient is assessed as being at high risk of thromboembolism, prescribe subcutaneous Tinzaparin (dose according to weight) subcutaneously perioperatively.
Please check with the Anaesthetist prior to administration as it may prevent the use of regional anaesthesia.
3. Do not administer Tinzaparin on the same day as procedures which involve epidural/spinal injections. However, such procedures can be carried out if the patient has received that Tinzaparin the previous evening. This also applies to patients on Aspirin.
4. Tinzaparin can be administered post-operatively but not within 6 hours of the insertion of an Epidural line.
Tinzaparin **can** be continued post-operatively whilst the epidural is in situ.
Epidural catheters should be removed a minimum of 12 hours after the last dose of Tinzaparin, and any subsequent doses delayed for at least 4 hours after removal.
5. Elective patients admitted the day before surgery:
Prescribe Tinzaparin prophylaxis in the evening before surgery if risk assessed as being at risk of thromboembolism – provided this conforms with the individual requirements of the Consultant/Speciality.
6. Acutely admitted patients: Prescribe Tinzaparin on the day of admission if the patient is assessed as being at risk of thromboembolism and if appropriate during the initial medical assessment of the patient's condition.

PATIENTS WITH HAEMATOLOGICAL DISORDERS

Patients with the following bleeding disorders need a haematology surgical management plan to cover surgical and/or invasive procedures, to prevent them from bleeding during or after the procedure.

Contact Susan Smith, Haematology CNS on 382511 or the Haematology Registrar via switchboard or ward 7.

The following disorders are included:

- Haemophilia
- Von Willebrand's disease
- Haemophilia carriers with low clotting factor levels of factors II, V, VII, VIII, IX, X, XI, XIII
- Platelet disorders
- Combinations of above
- Low/deranged fibrinogen levels

If any uncertainty exists, please contact the haematology team for advice.

The following information should be included:

- Date and type of procedure
- Admitting ward
- Consultant
- Patient's weight
- Advise who plan and notes should be returned to
- Occasionally a plan may have been written in advance of the patient attending pre-assessment clinic – please check if the plan contains blood test requests to be taken at pre-assessment clinic.

ANAESTHESIA and BREAST FEEDING

- Patients can continue to breast feed before and after their surgery
- Regional anaesthesia is preferred over general anaesthesia as feeding can be resumed immediately postoperatively in most cases.
- Consider longer period of interruption to breast feeding in premature infants or those prone to apnoea, hypotension, or weakness following general anaesthetic.
- Anaesthetic drugs, including opiates, appear in breast milk in such small quantities that they are unlikely to affect the baby.
- NSAIDs (Ibuprofen, Diclofenac and Ketorolac) and Paracetamol are safe to be used in breast feeding mothers.
- Codeine should be avoided in the lactating mother.
- Low-dose morphine can be used safely and is the preferred analgesic in the postoperative or postpartum period.
- General principle is that a mother can resume breastfeeding once awake, stable, and alert after anaesthesia has been given. A return to baseline mentation and strength suggests that sedating medications have redistributed from the plasma and milk compartment to the adipose and muscle and are being slowly released back into the plasma.
- For additional safety, mothers should closely monitor their infant for signs and symptoms of behavioural changes while consuming medications.
- If the intended surgery makes it likely that the mother will be unable to breast feed, then expert advice should be sought regarding alternative options such as expressing milk or bottle feeding
- The usual contra-indications to drugs and breast feeding still apply – detailed discussion of which are beyond the scope of this document
- Consult the BNF for further guidance on drugs which are safe for breastfeeding patients

REFERENCES

1. Benjamin Cobb, Renyu Liu, Elizabeth Valentine, Onyi Onuoha. Breastfeeding after Anesthesia: A Review for Anesthesia Providers Regarding the Transfer of Medications into Breast Milk. *Transl Perioper Pain Med.* 2015; 1(2): 1–7
2. Kundra S, Kundra S. Breastfeeding in the perioperative period. *J Obstet Anaesth Crit Care* 2011;1:46-7
3. Anne Montgomery, Thomas W. Hale, The Academy of Breastfeeding Medicine. ABM Clinical Protocol #15: Analgesia and Anesthesia for the Breastfeeding Mother, Revised 2012. *Breastfeeding Medicine.* 2012; Vol 7 (6): 547 - 553

GUIDELINES FOR PRE-OPERATIVE ASSESSMENT OF PATIENTS FOR CATARACT SURGERY UNDER LOCAL ANAESTHESIA

It has been agreed within the Anaesthetic Department in conjunction with the ENT/Eye Assessment Unit that patients undergoing cataract surgery under local anaesthesia should have the following investigations performed:

1. Routine pre-operative history and examination as is current practice
2. Measurement of blood pressure and adherence to the guidelines for blood pressure control pre-operatively.
3. Capillary blood glucose for diabetic patients.
4. INR for patients taking warfarin.
5. ECG for patients with recent history of chest pain, or with clinical tachy- or bradycardia.

Any additional investigations should be performed only after consideration of the indications for that individual patient.

FASTING GUIDELINES FOR CATARACT SURGERY UNDER LOCAL ANAESTHESIA

If there is **any** concern that a GA may be necessary, then the usual fasting guidelines for general anaesthesia should be followed.

All other patients (requiring local anaesthetic) may have a light breakfast or lunch and free fluids up until the time of surgery.

GUIDELINES FOR AIR TRAVEL AND SURGERY

Air travel is a known risk factor for venous thromboembolism (VTE). However, the risk has probably been overstated. Long haul flights carry the greatest risk, with an estimated incidence of pulmonary embolus (PE) of 1 per million passengers for those travelling in excess of 5000km (approx. 6 hours).

The increased risk of VTE is mainly due to prolonged immobility in relatively cramped conditions, but a mild degree of hypoxia, and slightly low cabin pressures may contribute. A similar risk may be caused by long car journeys.

Certain types of surgery particularly predispose to VTE, including lower limb arthroplasty, other major lower limb Orthopaedic surgery (eg ACL reconstruction), and major abdominal and pelvic surgery.

The combination of high risk surgery and long-haul flights is therefore probably best avoided. What constitutes a safe period to wait is not clear, but 4 weeks is probably a reasonable compromise with no evidence of VTE.

RECOMMENDATION

Patients requiring surgery from one of the high-risk groups outlined above should not undergo the procedure for a period of 4 weeks before or after a flight of more than 5 hours duration. This may clearly need to be modified in the light of clinical urgency.

Patients travelling on short-haul flights (eg Europe) and those undergoing minor surgical procedures are not at significantly higher risk than the general population.

Recent air travel is one of a whole range of risk factors, many of which are not modifiable. These include smoking, malignant disease, obesity, previous history of VTE, use of the oral contraceptive pill, recent MI, history of heart failure or stroke, trauma especially spinal cord and lower limb, pregnancy, and varicose veins.

Each patient should be considered for thrombo-prophylaxis on an individual basis after evaluation of all the risk factors to which they are exposed.

Flight/road travel duration	Low risk procedure	Intermediate risk procedure	High risk procedure	High risk patient
< 5 hours	No restriction	No restriction	No surgery 4 weeks either side of flight/travel	No surgery 4 weeks either side of flight/travel
> 5 hours	No lower limb surgery 4 weeks either side of flight. Upper limb surgery – no restriction	No surgery 4 weeks either side of flight/travel	No surgery 6 weeks before or after flight/travel No flight/travel for 3 months after surgery	No surgery 6 weeks either side of flight/travel

REFERENCES

1. Giangrande P. Air Travel and Thrombosis. *B J Haematol.* 2002. 117:509-512
2. Gajic et al. Long-haul air travel before major surgery: a prescription for thromboembolism? *Mayo Clin Proc.* 2005. 80(6):728-31
3. Gallus A. Travel and Venous Thrombosis. *Curr Opin Pulm Med.* 2002. 8:372-378
4. Anderson F. Risk Factors for Venous Thromboembolism. *Circulation.* 2003. 1-9 to 1-16
5. Watson HG, Baglin TP. Guidelines on travel-related venous thrombosis. *British Journal of Haematology.* 2010. 152:31-34