

Document number: JHH_0445

Referral for Preoperative Cardiopulmonary Exercise Testing

Sites where Local Guideline applies	John Hunter Hospital
Target audience	Respiratory scientists, anaesthetic doctors, surgeons, perioperative nurses.
This Local Guideline applies to:	
1. Adults	Yes
2. Children up to 16 years	No
3. Neonates – less than 29 days	No
Description	This document provides guidance to nurses and doctors in the perioperative setting when assessing patients before major elective surgery.
Keywords	CPET, cardiopulmonary exercise testing, anaesthetic, perioperative.

[**Go to Guideline**](#)

Replaces existing document?	No
Related Legislation, Australian Standard, NSW Ministry of Health Policy Directive or Guideline, National Safety and Quality Health Service Standard (NSQHSS) and/or other, HNE Health Document, Professional Guideline, Code of Practice or Ethics:	
• See reference list on page 6.	
Note: Over time links in this document may cease working. Where this occurs please source the document in the PPG Directory at: http://ppg.hne.health.nsw.gov.au/	
Prerequisites (if required)	Patients undergoing major elective surgery should be reviewed by a doctor in the perioperative clinic to determine if they meet the criteria for preoperative cardiopulmonary exercise testing.
Local Guideline note	<p>This document reflects what is currently regarded as safe and appropriate practice. This guideline does not replace the need for the application of clinical judgment in respect to each individual patient. If staff believe that the guideline should not apply in a particular clinical situation they must seek advice from their unit manager/delegate and document the variance in the patient's health record.</p> <p>Cardiopulmonary Exercise Testing is a specialised and limited resource which is only available at JHH (within HNELHD). As such, this guideline is not suitable for use outside of this setting.</p>

Date initial authorisation:	24 th May 2022
Authorised by:	JHH Clinical Quality and Patient Care committee
Contact Person:	Co-Director of Perioperative Service, JHH
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Position Responsible for review:
Version:

JHH Perioperative Service Executive Committee
1.0 26th June 2022

PURPOSE AND RISKS

Major surgery can invoke significant physiological stress resulting in increased global oxygen consumption. Prolonged open surgery can more than double oxygen consumption, with complications possibly raising demand further. Patients unable to sustain increased oxygen demand, can develop oxygen debt and 'functional heart failure' where kidneys, lungs and healing may be compromised.

CPET can be useful as an *objective measure* that aims to test how patients cope with raised oxygen demand. It stresses the cardiovascular and respiratory systems, hence is a multisystem examination, able to differentiate a myriad of causes for exercise intolerance.

The patient exercises, on a cycle ergometer or treadmill, and resistance (or work done) is increased through several levels. Expired gases, electrocardiogram, blood pressure and oxygen saturations are all measured and recorded throughout the test.

The test is most useful for:

1. **Major Surgery** such as major open intraabdominal surgery (e.g. cystectomy), major open vascular surgery (e.g. abdominal aortic aneurysm surgery), and major intrathoracic surgery (e.g. oesophagectomy)
2. **Unexplained breathlessness** to differentiate cardiac or respiratory causes
3. **Intermediate-risk surgery, for risk stratification**, adding to discussions regarding appropriateness and invasiveness of surgery, and level of postoperative care.

The test is *not* useful for patients having low risk surgery, or if contraindications exist (see Appendix A - Respiratory Investigations Form)

Risk Category: Clinical Care & Patient Safety

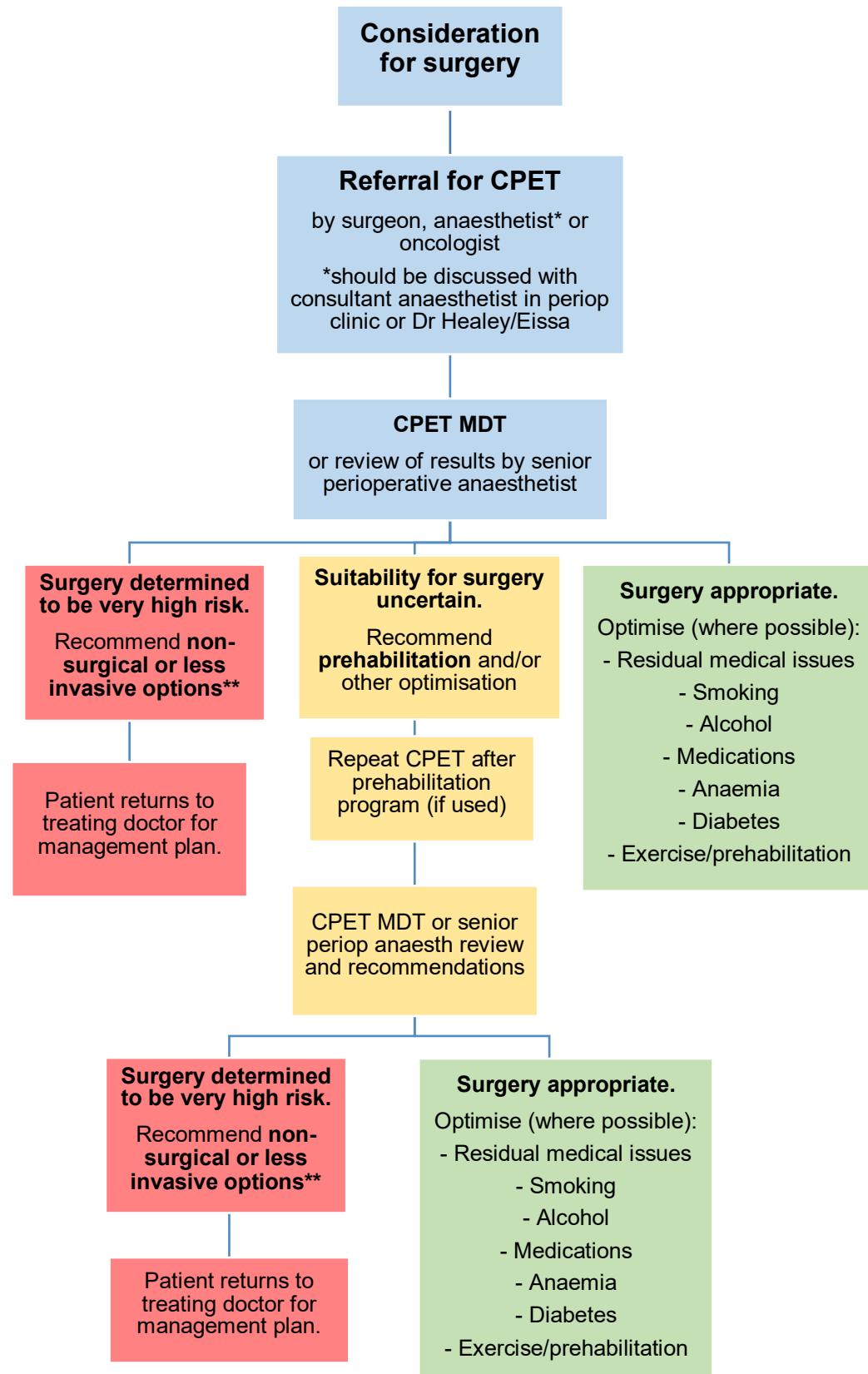
GLOSSARY

Acronym or Term	Definition
CPET	Cardiopulmonary Exercise Testing
MDT	Multidisciplinary Team

GUIDELINE

This Guideline does not replace the need for the application of clinical judgment in respect to each individual patient.

CPET Referral and Review Process:

Patient perioperative pathway

All time points must be documented in the patient's health record.

Surgery deferral **MUST be discussed with the surgeon.

APPENDICES

Appendix A – Respiratory Investigations Request Form
Appendix B – Basic Interpretation of Results

REFERENCES

1. Anaesthesia Tutorial of the week 217. Cardiopulmonary exercise testing. Drury & Carlisle. <https://www.wfsahq.org/resources/anaesthesia-tutorial-of-the-week>
2. Introduction to Cardiopulmonary Exercise Testing. Robertson, Luks & Glenny. Springer 2013
3. Moran J, Wilson F, Guinan E, McCormick P, Hussey J, Moriarty J. Role of cardiopulmonary exercise testing as a risk-assessment method in patients undergoing intra-abdominal surgery: a systematic review. Br J Anaesth. 2016 Feb;116(2):177-91.
4. Older P, Levett D. Ann Am Thorac Soc Vol 14, Supplement 1, pp S74–S83, Jul 2017

Appendix A – Respiratory Investigations Request Form

Respiratory Function Request
Fax to: (02) 4921 3469 Phone: (02) 4921 3462
Pulmonary Function Laboratory**Department of Respiratory & Sleep Medicine****John Hunter Hospital, Lookout Road, New Lambton, NSW 2305**

Drs M Hensley, N Saltos, P Gibson, D Arnold, P Wark & S Pradeepan

Indicate tests required – please circle

(PTO for test information and contraindications)

Tests 1-8 take 15 minutes per test; tests 9-13 take 45 minutes per test

1. Spirometry / Flow-volume Curves Pre and/or post BD (see note A)
2. TLCO (Transfer factor, diffusing capacity)
3. Plethysmographic Lung Volumes
4. Exhaled Nitric Oxide (eNO)
5. Maximal Respiratory Pressures
6. 6-Minute Walk Test On and off O₂ comparison (see note B)
7. Arterial Blood Gases
8. Skin Prick Testing (see note C)
9. Hypertonic Saline Challenge (see notes C and D)
10. Sputum induction (using hypertonic saline) (see note B)
11. Cardiopulmonary Exercise Test (CPX) (see note B)
12. Exercise Provocation Testing (see notes B, C and D)
13. Altitude Simulation Testing
14. Overnight Oximetry Room air Other _____
15. Other, specify: _____

PATIENT INSTRUCTIONS

- A. On the day of these tests, inhaled medications should be avoided unless absolutely necessary.
- B. Tests 6, 11 & 12 involve either walking or cycling exercise – clothes suitable for exercise should be worn (i.e. comfortable shoes and no skirts/dresses)
- C. Antihistamines should be avoided for 5 days prior
- D. Inhaled medications should be avoided for length of action

Appt date: ____/____/____

Appt time: _____

Surname:	MRN:
Other names:	
Address:	
DOB:	Sex: Male/Female
Phone:	
Referring MO (print):	
Report to:	
Cc:	
Clinical Notes/Reason for Referral:	
Signed: _____ / ____ / ____	

Appendix B – Basic Interpretation of Results

This table allows basic interpretation of CPET results as they pertain to perioperative risk based on objective fitness. Note, the patient may have other clinical sources of risk which are not represented here.

Low Risk Category	AT>11mls/Kg/min Peak VO ₂ >15mls/Kg/min VE/VCO ₂ @ AT <33	<ul style="list-style-type: none"> - Likely lower risk of mortality or complications if all 3 present. - Further testing unlikely to assist - Optimisation may still be possible
Caution	AT 9-11mls/Kg/min VE/VCO ₂ @ AT 33-40	<ul style="list-style-type: none"> - Risk profile depends on surgery type - Perioperative staff can advise: <ul style="list-style-type: none"> • If further testing is required • If optimisation possible/necessary
High Risk Category	AT <9mls/Kg/min Peak VO ₂ <14mls/kg/min VE/VCO ₂ @ AT >40	<ul style="list-style-type: none"> - Definite higher risk group for major surgery if any of these present - MDT meeting advisable to discuss patient options, further testing and optimisation