



MINISTRY OF HEALTH MALAYSIA

ANAESTHETIC CLINIC PROTOCOLS

NOVEMBER 2012

MOH/P/PAK/236.12(BP)



MEDICAL DEVELOPMENT DIVISION

This document was developed by the Surgical and Emergency Medicine Services Unit, Medical Development Section of the Medical Development Division, Ministry of Health Malaysia and the Drafting Committee/Task Force for the Anaesthetic Clinic Protocols.

Published in November 2012

A catalogue record of this document is available from the library and Resource Unit of the Institute of Medical Research, Ministry of Health;

MOH/P/PAK/236.12 (BP),
MOH Portal: www.moh.gov.my

And also available from the National Library of Malaysia;

ISBN 978-967-0399-24-9

All rights reserved. No part of this publication may be reproduced or distributed in any form or by any means or stored in a database or retrieval system without prior written permission from the Director of Medical Development Division, Ministry of Health Malaysia.

CONTENTS

1. Foreword	1
2. Background	2
3. Objectives	2
4. Function	3
5. Infrastructure	4
6. Anaesthetic Clinic Flow Chart	7
7. Anaesthetic Clinic Medical Therapy Guidelines	9
8. Audit Standards and Tool	10
9. Summary	10
Appendices:	
Appendix 1- Anaesthetic Clinic Referral Form	13
Appendix 2- Pre-operative Assessment Questionnaire	17-22
Appendix 3- Anaesthetic Record Form/GA Form	25-28
Appendix 4- Pre-anaesthetic Assessment Guidelines	31-38
Appendix 5- Anaesthetic Clinic Medical Therapy Guidelines	41-145
(Appendix 5.1-5.10)	
Bibliography	146
References	146
Drafting Committee/Task Force Committee	146-147

Foreword

The anaesthetic clinic is a 'one-stop center' for patients undergoing elective or day care surgery or day of surgery admission where patients are assessed by the anaesthesiologist, undergo laboratory tests and other relevant investigations and referred for medical consultation if necessary.¹ The anaesthetic clinic facilitates elective surgery, reduces the cost of hospitalisation and avoids unnecessary cancellation of elective surgery. It has been proven to yield high level of client satisfaction thus it is now an integral part of a modern anaesthetic service.

The establishment of anaesthetic clinics in Ministry of Health hospitals has been endorsed by the Director General of Health in a form a directive circular and guide on 29 January 2005, and now, a dedicated purpose built anaesthetic clinic exists in all the states and major hospitals especially the new ones. It has been made a requirement for all hospitals providing anaesthetic services to develop an anaesthetic clinic.

This protocol is the first self-contained edition with many improvements of the aforementioned directive/guidelines to incorporate the latest evidenced-based practices and technology advances in assuring the highest quality of care being provided to all patients requiring surgery.

Y.BHG DATIN DR V. SIVASAKTHI

HEAD OF SERVICE FOR ANAESTHESIOLOGY AND INTENSIVE CARE

MINISTRY OF HEALTH

And

CHAIR PERSON FOR THE ANAESTHETIC CLINIC TASK FORCE

1.0 Background

The preoperative evaluation holds the potential to reduce complications and health care costs.² Many hospitals globally have preoperative evaluation centers through which many multidisciplinary health care providers with clinical experience in preoperative care can apply a uniform and consistent preoperative evaluation to all surgical patients.² These centers have demonstrated reductions in surgery cancellation rates, consultation times, costs, the use of preoperative laboratory tests, and improved adherence to perioperative practice guidelines and patient education.³

In Ministry of Health, such preoperative evaluation centers are called the anaesthetic clinics, which have been in existence in Hospital Ipoh and Melaka since year 2000. And over the years, more and more such clinics were set up. The infrastructure of the anaesthetic clinic varies from one hospital to another depending on space availability. However, the functions are similar which consist of, making precise medical diagnoses, evaluating the extent of organ disease, optimizing all medical conditions, assessing and describing physiologic limitations, and ensuring adequate postoperative care following an open and effective communication with the surgical team.

The anaesthetic clinic holds the potential to reduce complications and health care costs. The cost containment results from the increasing efficiency and effectiveness of the anaesthetic clinic by enabling surgeries to be done as out-patients. Being client focus and convenient, the high level of satisfaction among patients is assured. The patients are assessed for fitness to surgery and anaesthesia at these 'one-stop center' thus ensuring increased quality of care. No aspect of medicine requires greater cooperation than the performance of surgery and a perioperative care of a patient than an anaesthetic clinic services.⁴

2.0 Objectives

The anaesthetic clinic is an outpatient clinic that carries out pre-operative assessment of patients scheduled for elective surgery, daycare surgery and day of surgery admission (DSA). It shall be established in all state hospitals and major hospitals. The establishment of an anaesthetic clinic is set with the following general and specific objectives:

2.1 General objectives

2.1.1 To provide a system whereby a patient recommended for surgery is optimised and prepared for surgery

2.1.2 To provide a system for pre-anaesthetic assessment of patients scheduled for elective surgery, daycare surgery and day of surgery admission.

2.2 Specific objectives

2.2.1 To ensure that the patients are in optimal state of health pre-operatively

2.2.2 To ensure anaesthesia management is planned appropriately

2.2.3 To make appropriate referrals to the relevant disciplines as and when necessary

2.2.4 To commence appropriate treatment according to guidelines

2.2.5 To educate patients regarding anaesthesia and other related procedures

2.2.5 To obtain informed consent for anaesthesia

2.2.6 To facilitate day of surgery admission and day care surgery

2.2.7 To establish audit tools to monitor aspects of care and outcomes

3.0 Functions

3.1 The functions of an anaesthetic clinic are as follows:-

3.1.1 Assessment for suitability and/or fitness for anaesthesia

3.1.2 Evaluation of pre-existing medical problems and/or referral to the appropriate specialists if patients are not optimised

3.1.3 Explanation given to patient with regards to the anaesthetic technique and perioperative management which may include ICU care

- 3.1.4 Discussion of anaesthetic risks based on patient's medical condition, planned surgical procedures and other factors
- 3.1.5 Performance and review of necessary investigations e.g. ECG, laboratory blood tests
- 3.1.6 Assessment and referral for 'Autologous Blood Transfusion' where appropriate
- 3.1.7 Preparation of patient for Daycare surgery and Day of Surgery Admission (DSA)
- 3.1.8 To obtain informed consent for anaesthesia
- 3.1.9 To ensure proper documentation and records
- 3.1.10 To monitor quality of care through audit activities
- 3.1.11 Assessment and follow-up of patients after anaesthesia in specific cases (those who experience an adverse perioperative event like allergic reaction to drugs, difficult intubation, postdural puncture , headache, etc)
- 3.1.12 To educate and provide information regarding anaesthesia e.g. information leaflets

4.0 Infrastructure

4.1 Location

The clinic ideally should be located within the specialist outpatient clinics or if not structurally possible within reasonable walking distance, easily identifiable and accessible by patients attending the specialist outpatient clinics.

4.2 Clinic Design Layout

- two (2) examination rooms with tables for doctors and examination couch
- investigation room with facilities for venesection and ECG
- waiting room with space to accommodate at least ten patients
- queue management system to be in place

4.3 Staffing

The minimum staffing requirement for the clinics serving approximately 20 patients a day are as follows:

- One (1) specialist anaesthetisiologist
- One (1) medical officer
- Two (2) staff nurses
- One (1) clerk
- One (1) attendant

There is a need to increase the number of specialists, medical officers, and nurses when the number of patients attending the clinic increases.

4.4 Equipment

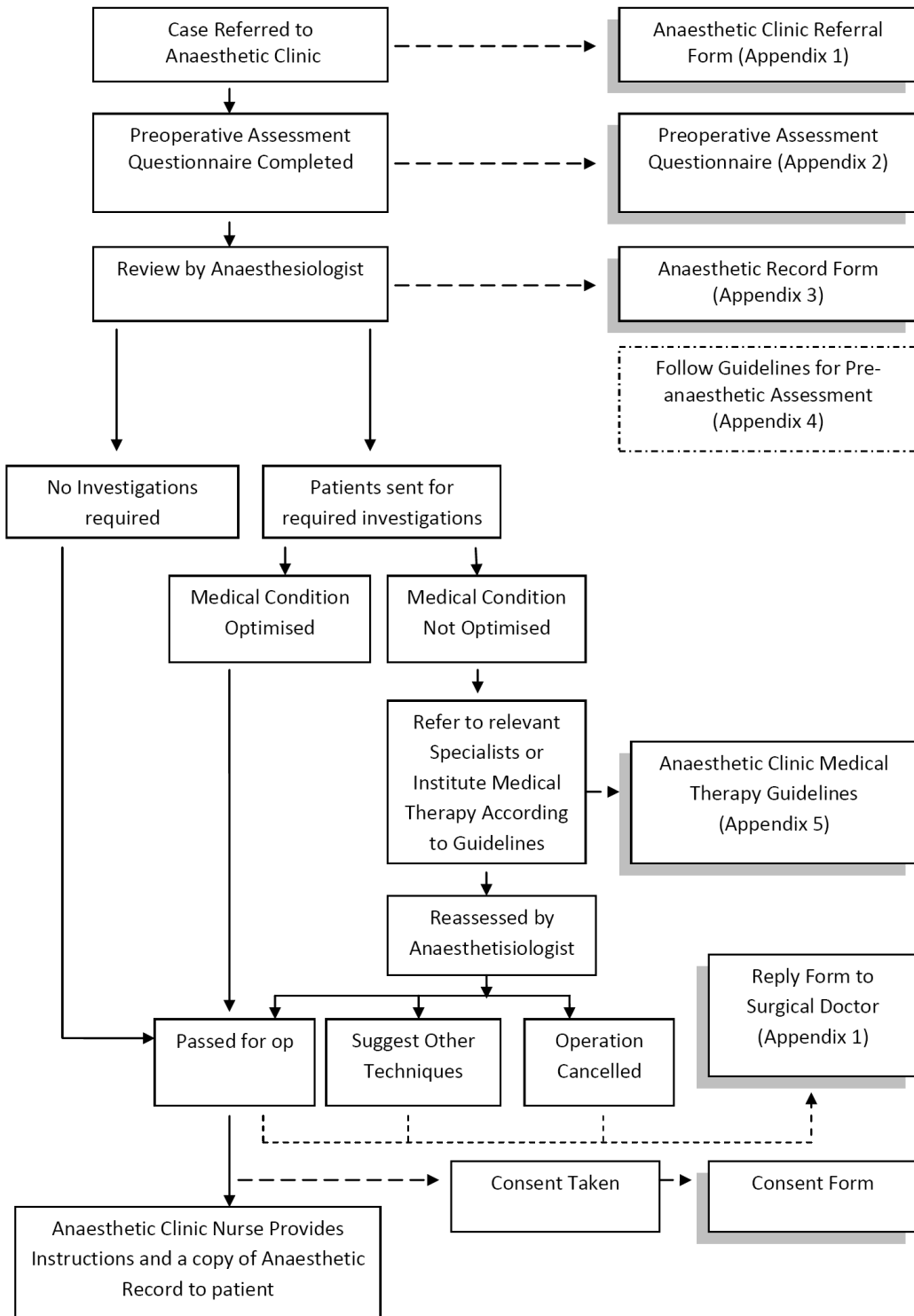
4.4.1 Medical Equipment:-

- Noninvasive blood pressure monitor (NIBP)
- ECG machine
- Pulse oximeter
- Glucometer and Dextrostix
- Peak flow meter
- Weighing scale
- Height scale
- Echocardiography machine would be encouraged/ preferred

4.4.2 Non Medical Equipment:-

- Computers (minimum three)
- Filing cabinets
- Desks and chairs
- Refrigerator (for blood samples)
- Photocopy machine
- Television (TV)/ Video (for patient education)

5.0 Anaesthetic Clinic Flow Chart



Notes:

- i. Patients scheduled for elective surgery are referred to the Anaesthetic Clinic using the Anaesthetic Clinic Referral Form (Appendix 1).
- ii. After registration of the patient, the Anaesthetic Clinic Nurse will provide assistance to the patient to complete the Preanaesthetic Assessment Questionnaire (Appendix 2) to screen for any significant medical problems.
- iii. All patients are then seen by the Anaesthetic Medical Officer and/or the Anaesthesiologist, who will fill up the pre-anaesthetic assessment section of the Anaesthetic Record Form (Appendix 3).
- iv. Investigations are ordered by the anaesthetic doctor, according to the Guidelines for Pre-anaesthetic Assessment (Appendix 4). The investigations should, as far as possible be performed on the day of visit to the Anaesthetic Clinic.
- v. If no investigations are required, the patient is passed for surgery and is given instructions by the Anaesthetic Clinic Nurse. The anaesthetic doctor will then reply to the surgeon using the Reply Form (Appendix 1).
- vi. For patients who require investigations, the results will be reviewed by the anaesthetic doctor. Those with normal investigation results will be passed for surgery.
- vii. For patients whose medical condition is not optimised, treatment may be initiated according to the Anaesthetic Clinic Medical Therapy Guidelines (Appendix 5) or referral be made to relevant specialists.
- viii. When the patient has been optimized, he/she will be reviewed by the anaesthetic doctor at the anaesthetic clinic.
 - When the patient is deemed fit for surgery, the Reply Form will be sent to the surgeon.
 - If the patient is deemed unfit for anaesthesia, the case may be postponed or an alternative technique may be suggested after discussion with the surgeon.
 - If there is no alternative, the surgery will be cancelled.
- ix. Informed Consent should be taken in the anaesthetic clinic using the Consent Form once the patient is passed for surgery.

6.0 Anaesthetic Clinic Medical Therapy Guidelines (refer to appendices for details)

- 6.1 Preoperative Assessment for Patients with Hypertension Requiring Noncardiac Surgery
- 6.2 Preoperative Assessment for Patients with Diabetes Melitus
- 6.3 Preoperative Guide to Assessment and Management of Obstructive Sleep Apnoea (OSA)
- 6.4 Guideline for Preoperative Assessment for Patients with Thyroid Disorders
- 6.5 Preoperative Management of Patients on Anti-thrombotic Therapy and Neural Blockage
- 6.6 Preoperative Assessment for Cardiac Patients Going for Noncardiac Surgery
- 6.7 Preoperative Assessment and Preparation of Patients with PCI
- 6.8 Perioperative Cardiac Risk Reduction Strategies: Perioperative β -Blocker Guidelines and Perioperative Cardiac Risk Reduction Protocol – Statins
- 6.9 Preoperative Assessment and Preparation of Patients with Implantable Pacemaker or Implantable Cardioverter Defibrillator
- 6.10 Indications for Lung Function Test and Arterial Blood Gas for Patients with Scoliosis

7.0 Audit Standards/Audit Tool

ASPECT OF CARE IN THE ANAESTHETIC CLINIC	EXPECTED STANDARD
Patient Satisfaction	≥ 80%
Percentage of elective surgical cancellations after preoperative assessment in the Anaesthetic Clinic	≤ 10%
Percentage of patients undergoing elective surgery who were assessed in the Anaesthetic Clinic	≥30%

8.0 Summary

Anaesthetic Clinic provides comprehensive preanaesthetic patient evaluation, information and patient education about the anaesthetic processes and risks. The anaesthesiologist, who plays a multifaceted role in the perioperative management of patients undergoing surgery in MOH hospitals, functions as the peri-operative physician, who is required for the planning, administration and daily operation of the clinic. It is an essential pathway for preoperative assessment of patients undergoing surgery which includes Day Surgery and Day of Surgery Admission (DSA,) and an effective means of evaluating high-risk elective surgical patients and allows proper planning of their intra and postoperative management. In addition, it also allows follow-up of patients with complications from anaesthesia, if present. Anaesthetic Clinic has been shown to be cost-effective with reduction in surgical delays and cancellations, increases patient and surgeon satisfaction and enables efficient management of hospital resources.

APPENDIX 1

ANAESTHETIC REFERRAL FORM



ANAESTHETIC REFERRAL FORM

Name of Patient	Referring Doctor		
Age	R/N	Department	
Sex	Wt	Date	
Purpose of referral	<input type="checkbox"/>	Pre- operative assessment	<input type="checkbox"/> Post- anaesthetic complication
	<input type="checkbox"/>	Pain clinic	
History			
Results of Investigation & treatment			
Diagnosis			
Type of Operation planned	Date of operation planned		
	Date for subsequent surgical following:		
Signature			
	MAIN OT	<input type="checkbox"/>	MOT <input type="checkbox"/> DAYCARE <input type="checkbox"/> DSA <input type="checkbox"/>

✂ -----

Reply slip to referring doctor

To:

Referring Unit:.....

Name of patient: R/N..... Age..... Sex.....

Dear Dr

Thanks for the referral,

.....

Thank you.

Yours sincerely,

.....

APPENDIX 2

PREOPERATIVE ASSESSMENT QUESTIONNAIRE (PAQ)



**MINISTRY OF HEALTH
PREOPERATIVE ASSESSMENT QUESTIONNAIRE**

In anticipation of your upcoming surgery, please complete this form before your Anaesthetic Clinic session. This information will help us determine the safest anaesthetic care for you during your surgery.

PLEASE TICK (✓) IN THE CORRESPONDING BOX FOR THE CORRECT STATEMENT ABOUT YOUR HEALTH CONDITION.

A. Have you had:					
1. High blood pressure	YES	NO	4. Heart disease	YES	NO
2. Diabetes	YES	NO	5. Stroke	YES	NO
3. Asthma	YES	NO	6. Cough and cold in the past 2 weeks	YES	NO
B. Have you ever experienced the following complaints:					
1. Shortness of breath	YES	NO	4. Chest pain	YES	NO
2. Difficulty in breathing on lying flat	YES	NO	5. Irregular heart beat or palpitation	YES	NO
3. Difficulty in breathing on climbing stairs	YES	NO	6. Chronic cough	YES	NO
C. Have you had the following heart problems:					
1. Heart failure	YES	NO	4. Rheumatic fever	YES	NO
2. Disease of the heart valve	YES	NO	5. Congenital heart disease	YES	NO
3. High blood cholesterol level	YES	NO	6. Cardiac arrest	YES	NO
D. Have you had the following respiratory problems:					
1. Chronic bronchitis	YES	NO	5. Tuberculosis	YES	NO
2. Allergic rhinitis	YES	NO	6. Lung cancer	YES	NO
3. Snoring	YES	NO	7. Abnormal chest X-Ray	YES	NO
4. Chest infection or pneumonia	YES	NO	8. Prolonged bed bound	YES	NO
E. Have you had the following neurological problems:					
1. Seizure or fit	YES	NO	6. Chronic headache	YES	NO
2. Epilepsy	YES	NO	7. Dizziness	YES	NO
3. Fainting	YES	NO	8. Numbness	YES	NO
4. Coma	YES	NO	9. Parkinsonism	YES	NO
5. Paralysis	YES	NO	10. Brain tumor	YES	NO
F. Have you had the following muscle or bone problems:					
1. Osteoporosis	YES	NO	5. Back pain	YES	NO
2. Neck pain or neck stiffness	YES	NO	6. Spine problem	YES	NO
3. Difficulty to open mouth	YES	NO	7. Muscle weakness	YES	NO
4. Joint pain	YES	NO	8. Congenital muscle disease	YES	NO
G. Do you have the following bowel or kidney problems:					

1. Heartburn	YES	NO	5. Jaundice	YES	NO
2. Reflux	YES	NO	6. Liver disease	YES	NO
3. Gastric ulcer	YES	NO	7. Kidney failure	YES	NO
4. Hepatitis	YES	NO	8. Undergoing dialysis	YES	NO
H. Do you have the following blood / endocrine problems:					
1. Anemia or low hemoglobin	YES	NO	5. Blood disease or leukaemia	YES	NO
2. Received blood transfusion before	YES	NO	6. Thalassemia	YES	NO
3. Easily bled	YES	NO	7. Thyroid disease	YES	NO
4. Easily bruised	YES	NO	8. Blood clot in the legs or lungs	YES	NO
I. Are you are allergic to any of the following:					
1. Food e.g.: egg, seafood etc. (name of food:.....)	YES	NO	3. Chemical substance e.g: soap, plaster (name of substance:.....)	YES	NO
2. Drugs (name of the drugs:	YES	NO	4. To any other elements e.g.: latex etc (name:.....)	YES	NO
J. Are you on any of the following medications:					
Drugs for diabetes (name of drugs:	YES	NO	Psychotropic drugs (name of drugs:	YES	NO
Drugs for hypertension (name of drugs:	YES	NO	Steroids (name of drugs:	YES	NO
Drugs for heart disease (name of drugs:	YES	NO	Diuretics (name of drugs:	YES	NO
Drugs for asthma (name of drugs:	YES	NO	Herbal or traditional medicine (name of drugs:	YES	NO
Drugs to prevent blood from clotting (name of drugs:	YES	NO	Any other drugs. Please give name of drugs:		
K. Some personal questions - Do you:			L. Dentures, devices and implants: Do you have:		
Smoke (number of sticks per day:	YES	NO	Dentures, braces, crown	YES	NO
			Loose teeth	YES	NO
Consume alcohol (how many occasions per week:	YES	NO	Implanted pacemaker	YES	NO
			Implanted cardiac implant or stent	YES	NO
Use any addictive drugs / substance abuse (drug name:	YES	NO	Implanted Cardiac Defibrillator	YES	NO
			Prosthetic Heart Valve	YES	NO
Have tattoos or body piercing	YES	NO	Orthopaedic implant	YES	NO
Are you pregnant? If yes, date of LMP:	YES	NO			
			Are you an organ recipient	YES	NO
M. Have you had an anaesthesia before?			N. Have you had an operation before?		
If YES, please give details of anaesthesia as below:			Please give details of past operation as below:		
Type of anaesthesia:	General	Regional	Local	• Type of operation:	

Experience nausea and vomiting	YES	NO	<ul style="list-style-type: none"> • Date : • Any complication: 		
Experience severe headache	YES	NO			
Awareness during anaesthesia	YES	NO			
Had any reaction to blood transfusion	YES	NO			
Been admitted to ICU after surgery	YES	NO	O. Miscellaneous		
Had any other complications of anaesthesia	YES	NO	Any of your blood relatives had complication or died due to anaesthesia	YES	NO
P. For a Day Care patient - Do you:					
Have a responsible adult to take you home (<i>children must be accompanied by 2 adults</i>)	YES	NO	Have someone reliable at home to look after you for 24 hours	YES	NO
Have transport to go home in a private car (<i>motorcycle and bus are not suitable</i>)	YES	NO	Stay within an hour's drive to the hospital	YES	NO
Have a telephone at home	YES	NO	Have easy access to a private car for transport to the hospital in the event of an emergency	YES	NO
Have easy access to lavatory	YES	NO			

I have read and answered the above questions truthfully.

.....
Signature

Name:

IC number:

Patient's name :

IC number:.....

Relation: The patient is my child / parent / guardian

For office use only.

Reviewed by SN:

Date:

Signature:.....

KEMENTERIAN KESIHATAN MALAYSIA
BORANG SARINGAN KESIHATAN PREOPERATIF

Sebelum anda diperiksa oleh Pegawai Perubatan Anestesia, sila lengkapkan borang saringan kesihatan preoperatif ini. Maklumat yang anda berikan adalah penting dan dapat membantu proses anestesia dikendalikan dengan baik dan selamat.

SILA TANDAkan (✓) DI PETAK YANG BERKENAAN BAGI PENYATAAN YANG BENAR MENGENAI KEADAAN KESIHATAN ANDA.

A. Adakah anda pernah menghidapi :					
1. Darah tinggi	YA	TIDAK	4. Penyakit jantung	YA	TIDAK
2. Kencing manis	YA	TIDAK	5. Angin ahmar	YA	TIDAK
3. Asma	YA	TIDAK	6. Batuk atau selsema < 2 minggu lalu	YA	TIDAK
B. Adakah anda pernah mengalami simptom penyakit yang berikut:					
1. Sesak nafas	YA	TIDAK	4. Sakit dada	YA	TIDAK
2. Kesukaran bernafas semasa berbaring	YA	TIDAK	5. Rentak jantung luarbiasa / berdebar	YA	TIDAK
3. Sesak nafas semasa menaiki tangga	YA	TIDAK	6. Batuk yang kronik	YA	TIDAK
C. Adakah anda pernah menghidapi penyakit jantung yang berikut:					
1. Lemah jantung	YA	TIDAK	4. Penyakit jantung rheumatik	YA	TIDAK
2. Penyakit injap jantung	YA	TIDAK	5. Penyakit jantung kongenital	YA	TIDAK
3. Tahap kolesterol tinggi	YA	TIDAK	6. Keadaan jantung berhenti	YA	TIDAK
D. Adakah anda pernah menghidapi masalah pernafasan atau paru-paru berikut:					
1. Bronkitis	YA	TIDAK	5. Penyakit tibi	YA	TIDAK
2. Resdung	YA	TIDAK	6. Barah paru-paru	YA	TIDAK
3. Berdengkur	YA	TIDAK	7. X-ray dada yang tidak normal	YA	TIDAK
4. Jangkitan paru-paru	YA	TIDAK	8. Tiada upaya & terlantar dikatil	YA	TIDAK
E. Adakah anda pernah mengalami masalah saraf atau otak seperti berikut:					
1. Sawan	YA	TIDAK	6. Sakit kepala yang kronik	YA	TIDAK
2. Epilepsi	YA	TIDAK	7. Pitam	YA	TIDAK
3. Pengsan	YA	TIDAK	8. Rasa kebas dikaki, tangan, lain-lain	YA	TIDAK
4. Koma	YA	TIDAK	9. Parkinson	YA	TIDAK
5. Lumpuh anggota badan	YA	TIDAK	10. Barah otak	YA	TIDAK

F. Adakah anda pernah mengalami masalah otot dan tulang seperti berikut:

1. Osteoporosis	YA	TIDAK	5. Sakit belakang	YA	TIDAK
2. Sakit atau kejang di tulang tengkuk	YA	TIDAK	6. Masalah tulang belakang	YA	TIDAK
3. Sukar membuka mulut	YA	TIDAK	7. Lemah mana-mana bahagian otot	YA	TIDAK
4. Sakit sendi	YA	TIDAK	8. Penyakit otot kongenital	YA	TIDAK

G. Adakah anda pernah mengalami masalah sistem penghadaman dan ginjal seperti berikut:

1. Pedih ulu hati	YA	TIDAK	5. Penyakit kekuningan	YA	TIDAK
2. Reflux	YA	TIDAK	6. Penyakit hati	YA	TIDAK
3. Penyakit gastrik	YA	TIDAK	7. Kegagalan buah pinggang	YA	TIDAK
4. Penyakit hepatitis	YA	TIDAK	8. Menjalani dialisis	YA	TIDAK

H. Adakah anda pernah mengalami masalah darah dan sistem hormon seperti berikut:

1. Anemia	YA	TIDAK	5. Penyakit leukemia	YA	TIDAK
2. Pernah menerima transfusi darah	YA	TIDAK	6. Penyakit thalassemia	YA	TIDAK
3. Mudah berdarah	YA	TIDAK	7. Penyakit thyroid	YA	TIDAK
4. Mudah lebam	YA	TIDAK	8. Darah beku di paru-paru atau di kaki	YA	TIDAK

I. Adakah anda mempunyai alahan pada perkara-perkara berikut :

1. Makanan contoh telur, makanan laut (namakan:)	YA	TIDAK	3. Bahan kimia contoh sabun, plaster (namakan:)	YA	TIDAK
2. Ubatan (namakan:)	YA	TIDAK	4. Pada lain-lain bahan cth lateks (namakan:)	YA	TIDAK

J. Adakah anda sedang atau pernah mengambil ubat-ubatan berikut:

Ubat kencing manis (namakan:)	YA	TIDAK	Ubat psikotropik (namakan:)	YA	TIDAK
Ubat darah tinggi (namakan:)	YA	TIDAK	Ubat steroid (namakan:)	YA	TIDAK
Ubat untuk penyakit jantung (namakan:)	YA	TIDAK	Ubat melawaskan kencing (namakan:)	YA	TIDAK
Ubat untuk penyakit asma (namakan:)	YA	TIDAK	Ubat tradisional dan herba (namakan:)	YA	TIDAK
Ubat untuk mencairkan darah (namakan:)	YA	TIDAK	Lain-lain ubat yang tidak tersenarai diatas. Sila namakan:		

K. Soalan peribadi yang berkaitan: Adakah anda				L. Gigi palsu dan implan: Adakah anda mempunyai		
Merokok (berapa batang sehari:)	YA	TIDAK		Gigi palsu, pendakap gigi atau 'crown'	YA	TIDAK
				Gigi yang longgar	YA	TIDAK
Meminum minuman keras (kekerapan dalam seminggu:)	YA	TIDAK		Implan 'pacemaker'	YA	TIDAK
				Implan jantung atau 'stent'	YA	TIDAK
Mengalami ketagihan dadah (namakan dadah:)	YA	TIDAK		Implan 'cardiac defibrillator'	YA	TIDAK
				Injap jantung prostetik	YA	TIDAK
Mempunyai tatu atau tindik	YA	TIDAK		Implan tulang atau sendi.	YA	TIDAK
Hamil (jika ya, tarikh haid terakhir :)	YA	TIDAK		Adakah anda seorang penerima organ	YA	TIDAK
M. Adakah anda pernah menerima anestesia?	YA	TIDAK		N. Pernahkah anda menjalani pembedahan?	YA	TIDAK
Jika ya, sila jawab soalan yang berikut :				Jika ya, sila jawab soalan berikut:		
Jenis anesthesia diterima	Umum	Separa	Setempat	<ul style="list-style-type: none"> Jenis pembedahan: Tarikh: Komplikasi jika ada, nyatakan: 		
Mengalami loya dan muntah	YA	TIDAK				
Sakit kepala selepas pembedahan	YA	TIDAK				
Sedar semasa menerima anestesia umum	YA	TIDAK				
Mengalami reaksi akibat transfusi darah	YA	TIDAK		O. Lain-lain		
Dimasukkan ke ICU selepas pembedahan	YA	TIDAK		Adakah ahli keluarga anda pernah mengalami komplikasi atau kematian semasa anestesia	YA	TIDAK
Lain-lain komplikasi jika ada, nyatakan:	YA	TIDAK				
P. Bagi pesakit-pesakit Rawatan Harian: Adakah anda						
Di iringi oleh seorang penjaga yang bertanggungjawab (<i>kanak-kanak perlu diiringi oleh dua orang dewasa</i>)	YA	TIDAK		Mempunyai seorang penjaga yang bertanggungjawab menjaga anda 24 jam selepas pembedahan	YA	TIDAK
Akan dibawa pulang dengan kereta (<i>motosikal dan bas tidak sesuai</i>)	YA	TIDAK		Tinggal dalam lingkungan sejam perjalanan dari hospital	YA	TIDAK
Mempunyai telefon dirumah	YA	TIDAK		Mempunyai kenderaan untuk ke hospital sekiranya ada kecemasan	YA	TIDAK
Ada bilik mandi dan tandas di rumah	YA	TIDAK				

Saya mengaku telah membaca dan menjawab semua soalan diatas dengan benar.

.....
Tandatangan

Nama:

Nombor KP:

Nama pesakit:

Nombor Kad Pengenalan:

Hubungan: Pesakit adalah anak / ibu / bapa / penjaga

Untuk kegunaan pejabat sahaja.

Disemak oleh JT:

Tarikh:

Tandatangan:

APPENDIX 3

ANAESTHETIC RECORD FORM/GA FORM



ANAESTHETIC RECORD MINISTRY OF HEALTH MALAYSIA

stick patient info here

Patient Profile

Name : _____	BMI : _____	Ethnic Group : _____	R/N : _____	I/C : _____
Sex : _____	> 30 or 35 : _____	Height : _____ mm	Ward : _____	Allergy : _____
Age : _____	Weight : _____	Unit : _____		

Surgery : _____	Dentures <input type="checkbox"/>	Anaesthetic Consent <input type="checkbox"/>	Unit Blood _____
		GSH <input type="checkbox"/>	GXM <input type="checkbox"/>

Pre-op Diagnosis : _____	Op Planned : _____	Emergency / Elective _____
--------------------------	--------------------	----------------------------

Comment

(Disease & drug therapies, Physical exam, Positive finding, Abnormal ECG, CXR and "Problem List"

Date : _____ Anaesthetist : _____	Date : _____ Anaesthetist : _____	Date : _____ Anaesthetist : _____
--------------------------------------	--------------------------------------	--------------------------------------

Essential Data

HB : _____ g %	BP : _____ mmHg	PR : _____ beats/min
Platelet : _____	Creatinine : _____	
Urea : _____ mmol/L	Na : _____ mmol/L	K : _____ mmol/L

Miscellaneous Investigations

Anaesthetic Plan

Physical Status ASA

1	2	3	4	5	6	E
---	---	---	---	---	---	---

Special Order & Pre-anaesthetic Medications	Time Given

Operation Date		Operation Room		GA	RA	GA ANDRA	TIVA
Comment	Drug	TIME	10	20	30	40	50
		S. Start of Surgery	00	10	20	30	40
		R. Reversal	00	10	20	30	40
		RR. Recovery Room	00	10	20	30	40
		I. Induction Time	00	10	20	30	40
			00	10	20	30	40
			00	10	20	30	40
			00	10	20	30	40
			00	10	20	30	40

Gas	O ₂ /N ₂ O / Air
Gases	MAC/End-tidal Agent Bis
	Total Volume/PW
	Volume :
	Sp-O ₂ /FiO ₂ %
Monitoring	Respiration Rate / ETCO ₂
	PiP CO ₂
	Urine (ml/hr) / Temp (C°)
	CVP/PAP/ Cardiac Output (l/min)
	Estimated Bl. Loss (ml)
IV Access	Line 3 ()
	Line 2 ()
	Line 1 ()

I/V Fluids, Blood & Blood Product	(1)	Volume (ml)		
	(2)			
	(3)			
	(4)			
	(5)			
	(6)			
	(7)			
	(8)			
	(9)			
	(10)			
	(11)			
	(12)			
	(13)			
	(14)			
	(15)			
	(16)			
	Pain Score			

General Anaesthesia (circle or underline if used or applicable)

(1) Airway : _____
Oral / nasal

(2) Endotracheal Tube :
(a) Type : PVC / RAE / Supra Glottis Devices/ Armoured /
(b) Oral / nasal (c) Plain / Cuffed
(d) Size (ID) : _____ mm (e) Length : _____ cm

(3) Difficult Intubation : Yes / No _____
Comment : _____

(4) Throat pack : In : _____ Time _____
Out : _____ Time _____

(5) Ventilation
(a) Spontaneous
(b) Controlled _____ manual _____ ventilator type : _____

Settings : V_T : _____ ml/s Rate _____ /min
 P_{aw} _____ cmH₂O I:E _____

(c) Breathing System : Ayre's T-piece with Reel's modification
Circle / Bain / Co-Axial / _____

(7) Accessories : HME / warming mattress / warming blanket

(8) Posture : Supine / lithotomy / Liliat / Riliat / prone / _____

Regional

(1) Type of Block : _____

(2) Position of patient : _____

(3) Needle type and Gauge : _____

(4) Approach (midline, paramedian etc) : _____

(5) Level / Site inserted : _____

(6) Distance : (i) Skin to space _____ cm
(ii) Length of catheter in space _____ cm

(7) Distribution / Level of Analgesia : _____

(8) Complication / Difficulties : _____ Yes / No

Comment : _____

(9) Drug, Amount Used (cone & vol) & Time Given
(a) _____
(b) _____
(c) _____

Monitoring

1 ECG 2 NIBP 3 O₂ analyser
4 Pulse Oximeter 5 Capnometer 6 Nerve Stimulator
7 Multigas analyzer MAC 8 BIS 9 Temperature
9 Other, _____
specify : _____





Infra Op Comment

Surgeon (s) : _____ Anaesthetist : _____
Anaesthetist Assistant : _____

Recovery Room

Recovery Room Order	(Time of arrival : _____)	Post-op Order to ward	(Time of discharge: _____)
Post-Anaesthesia Recovery Score			
No	Parameters	Signs	Score
		(i) Able To Lift the head or has a good hand grip	1
		(ii) None of the above	0
		(i) Able to breathe and cough easily	1
		(ii) Dyspnoic or apnoeic	0
		(i) BP within \pm 20% of pre-operative level	1
		(ii) BP above or below 20% of pre-operative level	0
		(iii) Pulse regular, within 20% of pre-operative rate	1
		(iv) Pulse irregular, above or below 20% of pre-operative rate	0
		(i) Arousable	1
		(ii) Not Responding	0
		(i) Pink	1
		(ii) Dusky	0
Total Score			

Bromage Score

	No Residual Motor Block; full flexion of knee and feet	0
	Partial Block Remains; just able to flex knees with free movement of feet	1
	Almost Complete Block; only able to move feet, unable to flex knees	2
	Complete Motor Block; Unable to move feet or knees	3
Total Score		

RIKER Sedation-Agitation Scale (SAS)

Term	Score
Dangerous Agitation	7
Very Agitated	6
Agitated	5
Calm/And Cooperative	4
Sedated	3
Very Sedated	2
Unarousable	1

EVENT

Intra-Operation

Post-Operation

APPENDIX 4

PREANAESTHETIC ASSESSMENT GUIDELINES



RECOMMENDATIONS FOR PREANAESTHETIC ASSESSMENT

1. INTRODUCTION

The preanaesthetic assessment is an *integral part of safe anaesthetic practice*.^{1,2} It serves to identify associated medical illness and anaesthetic risks, with the ultimate aim of reducing morbidity and mortality associated with anaesthesia and surgery.

The objectives of the pre-anaesthetic assessment are manifold. At times, to achieve these objectives, the anaesthesiologist has to resort to resources such as medical consultation and treatment as well as laboratory and other investigations. In an era where cost containment is important, factors like cost-benefit and benefit-risk ratios will have to be taken into consideration.^{3,4}

With the above considerations, this document provides recommendations on pre-anaesthetic assessment to enhance patient safety.

The objectives of the pre-anaesthetic assessment are to:

- i) Evaluate the patient's medical condition from medical history, physical examination, investigations and, when appropriate, past medical records.
- ii) Optimise the patient's medical condition for anaesthesia and surgery.
- iii) Determine and minimise risk factors for anaesthesia.
- iv) Plan anaesthetic technique and perioperative care.
- v) Develop a rapport with the patient to reduce anxiety and facilitate conduct of anaesthesia.

- vi) Inform and educate the patient about anaesthesia, perioperative care and pain management

- vii) Obtain informed consent for anaesthesia

2. GENERAL PRINCIPLES⁵

- 2.1. The preanaesthetic assessment should be performed by the anaesthesiologist who is to conduct the anaesthesia. If this is not possible, a satisfactory mechanism is required whereby the findings of the preanaesthetic assessment can be conveyed to the anaesthesiologist concerned.

- 2.2. The preanaesthetic assessment should be performed at an appropriate time before the scheduled surgery to allow adequate preparation of the patient. This also applies to day surgery patients.

- 2.3. Preoperative admission is indicated in patients who require further medical evaluation or prior to major surgery. Admission should not be merely for pre-operative investigations which can be done as out-patient.

- 2.4. The preanaesthetic assessment may be conducted a) as a personal interview in the ward, operating theatre or preanaesthetic clinic⁶ or b) using preset questionnaires⁷ assisted by trained nursing or paramedical staff under the supervision of an anaesthesiologist.

- 2.5. Input from other medical specialties may be required in the preanaesthetic management of the patient. However, only the anaesthesiologist may determine a patient's fitness to undergo anaesthesia.

- 2.6. In the case of emergency surgery where early consultation is not always possible, the anaesthesiologist is still responsible for the preanaesthetic assessment. If surgery cannot be delayed in spite of increased anaesthetic risks, documentation to that effect should be made.

3. DETECTING DISEASE AND ASSESSING SEVERITY

- 3.1. A patient's medical history provides vital information to identify disease that may affect perioperative outcome. Medical history should include medical problems, current medication and allergies, previous anaesthesia and family history of anaesthetic complications. System review should focus on those pertinent to anaesthesia and surgery. Menstrual history may be important in women of child-bearing age. Useful information may be obtained from the patient's family doctor or relatives.
- 3.2. Physical examination of the patient is an essential part of the preanaesthetic assessment. Although the cardiovascular and respiratory systems (including the airway) are important in the assessment of the patient, other systems i.e. the renal, hepatic and central nervous systems may also require detailed attention as guided by the history.
- 3.3. Laboratory and radiological investigations complement history and physical examination in detecting and assessing disease. These investigations should not be done as a routine but ordered as guided by the history and physical examination. Guidelines for investigations are presented below (recommended pre-anaesthetic investigations).
- 3.4. Multidisciplinary management⁸, subspecialty referral and medical record retrieval may be helpful in the overall assessment of the patient.

4. RISK ASSESSMENT

- 4.1. The patient's preoperative condition is not the only determinant of perioperative outcome. Other factors such as complexity of surgery, urgency of surgery, surgical skill and factors related to anaesthesia also contribute to outcome. The American Society of Anesthesiologists (ASA) physical status classification provides a useful means to convey information regarding the patient's preoperative condition and has been found to have some predictive value when applied to overall operative mortality.
- 4.2. The patient's functional capacity should be determined as this has been shown to correlate well with maximal oxygen uptake on a treadmill and is prognostically important. This can be qualified in MET (metabolic equivalent) Mobility problems limit this assessment. Patients who can exercise at a MET or greater present a low risk of perioperative morbidity.
- 4.3. In assessing risk factors and optimising the patient for anaesthesia and surgery, the anaesthesiologist may need to consider the nature¹¹ and urgency of the surgery, social and economic factors, or any financial constraints that prevail. It is imperative that the anaesthesiologist be knowledgeable and well-informed to make a balanced judgement with regard to the benefit-risk ratio of anaesthesia and surgery for the high-risk patient. In such cases, risks associated with anaesthesia should be conveyed to the patient and / or the next-of-kin as well as documented in the consent form or the patient's case notes.

5. PREOPERATIVE MEDICATION

Preoperative medication may be prescribed to facilitate the anaesthetic management. The patient's current medication should be reviewed and continued when necessary.

6. CONSENT

The pre-anaesthetic assessment should include confirmation with the patient, the patient's guardian in the case of children below 18 years or the intellectually challenged, of the nature of the anaesthetic procedure and his / her consent for anaesthesia. A written consent should be taken from the patient/guardian who is consenting for the surgery.

7. DOCUMENTATION

A written summary of the pre-anaesthetic assessment, orders or arrangements should be explicitly and legibly documented in the patient's anaesthetic record.

RECOMMENDED PREANAESTHETIC INVESTIGATIONS^{2,11,12}

(These tests are recommended for administration of anaesthesia and are not intended to limit those required for issues specific to their surgical management)

Note:

For healthy patients undergoing short, minimally invasive procedures, investigations may not be necessary. Tests need not be repeated where there is a normal test result available, any changes to medication, new health problem within three months of the date of surgery.

Electrocardiogram

Age above 50 (female)

Age above 40 (male)

Cardiovascular disease

Diabetes Mellitus

Renal disease

Subarachnoid/Intracranial
Bleed,CVA,Head Trauma

Full Blood Count

Age above 60

Clinical anaemia

Haematological disease

Renal disease

Chemotherapy

Procedures with blood loss > 15%

Coagulation Profile

Haematological disease

Liver disease

Anticoagulation

Intra-thoracic/Intra-cranial
procedures

Liver Function Tests

Hepatobiliary disease

Alcohol abuse

Chest X-ray

Age above 60

Significant respiratory disease

Cardiovascular disease

Malignancy

Major Thoracic/Upper Abdominal
Surgery

Renal Profile

Age above 60

Renal disease

Liver disease

Diabetes Mellitus

Cardiovascular disease

Procedures with blood loss > 15%

Random Blood Sugar

Age above 60

Diabetes Mellitus

Liver dysfunction

Sickle test

African

Positive family history

Pregnancy test

Woman who may be pregnant

REFERENCE

1. Roizen MF: Preoperative evaluation. Anesthesia 3rd edition. Churchill Livingstone 1990; 743-772
2. Roizen MF: Preoperative assessment: What is necessary to do? American Society of Anesthesiologists Annual Refresher Course Lectures 1994; 132: 1-7
3. Kerridge R, Lee A, Latchford E, Beehan SJ, Hillman KM. The Perioperative System: A new approach to managing elective surgery. Anaesth Intensive Care 1995; 23: 591-6
4. Boothe P, Firegan BA. Changing the admission process for elective surgery: an economic analysis. Can J Anaesth 1995; 42: 391-4
5. ANZCA College Policy Document Review P7 (1992): The Preanaesthetic consultation
6. Lee A, Lum ME, Hillman KM, Bauman A. Referral of surgical patients to an anaesthetic clinic: a decision-making analysis. Anaesth Intensive Care 1994; 22: 562-7
7. Badner NH, Craen RA, Paul TL, Doyle JA. Anaesthesia preadmission assessment: a new approach through use of a screening questionnaire. Can J Anaesth 1998; 45: 87-92
8. ACC/AHA Task Force Report. Guidelines for perioperative cardiovascular evaluation for noncardiac surgery. Circulation 1996; 93: 1278-1317
9. Vacanti CJ, Van Houten RJ, Hill RC: A statistical analysis of the physical status to postoperative mortality in 68388 cases. Anesth Analg 49: 564 1970.
10. Marx GH, Matteo CV, Orkin LR. Computer analysis of post anaesthetic deaths. Anesthesiology 39: 54, 1973.
11. Pasternak LR: Preoperative evaluation – a systematic approach. American Society of Anesthesiologists Annual Refresher Course Lectures 1995: 421: 1-7
12. Routine Preoperative Investigations: Health Technology Assessment Unit, Medical Development Division, Ministry of Health. (in print)
13. Preoperative assessment- Examination & test/doctor/patient
[www.patient.co.uk/.../Preop assessment-Examination and test.htm](http://www.patient.co.uk/.../Preop%20assessment-Examination%20and%20test.htm)

14. Preoperative investigation.
Haqs.com/fundamentalis/periop/investigation/htm
15. Maxfaxho.co.uk- preoperative investigation
www.maxfaxsho.co.uk/preoperative investigation
16. Can J Anesth/J Can Anesth(2010) 57:58-87 DOI 10.1007/s 12630-009-9209-4
17. Behar JM, Gogalniceanu, P. Bromley; anesthesia. Introduction & preoperative assessment Student BMJ January 2007
18. Oxford Handbook Of Anaesthesia.Keith G. Allman Iain H.Wilson 2001

APPENDIX 5

ANAESTHETIC CLINIC MEDICAL THERAPY GUIDELINES

APPENDIX 5.1

PREOPERATIVE ASSESSMENT FOR PATIENTS WITH HYPERTENSION REQUIRING NONCARDIAC SURGERY



PREOPERATIVE ASSESSMENT FOR PATIENTS
WITH HYPERTENSION REQUIRING NONCARDIAC
SURGERY

ANAESTHETIC CLINIC POLICY FOR PATIENTS WITH HYPERTENSION REQUIRING NONCARDIAC SURGERY.

1. DEFINITION AND CLASSIFICATION OF HYPERTENSION.

Hypertension is defined as persistent elevation of systolic BP of 140 mmHg or greater and/or diastolic BP of 90 mmHg or greater.

Table 1. Classification of blood pressure for adults age 18 and older

Category	Systolic		Diastolic
Optimal	<120	and	<80
Prehypertension	120-139	and/or	80-89
Hypertension			
Stage 1	140-159	and/or	90-99
Stage 2	160-179	and/or	100-109
Stage 3	180	and/or	110

The above classification is based on the average of two or more readings taken at two or more visits to the doctor. When SBP and DBP fall into different categories, the higher category should be selected to classify the individual's BP.

In the Anaesthetic Clinic, treatment will be commenced based on the average of two or more readings taken on the day of visit to the Anaesthetic Clinic, after a period of adequate rest in between these readings in a non-stressful environment. When SBP and DBP fall into different categories, the higher category should be selected to classify the individual's BP.

2. DIAGNOSIS AND ASSESSMENT.

Evaluation of patients with documented hypertension has three objectives:

- (1) To exclude secondary causes of hypertension.
- (2) To ascertain the presence or absence of target organ damage.
- (3) To assess lifestyle and identify other cardiovascular risk factors (**Table 2**) or concomitant disorders that affect risk factors, prognosis and guide treatment.

Such information is obtained from adequate history, physical examination, laboratory investigations and other diagnostic procedures.

2.1 A complete history should include:

- Duration and level of elevated BP if known
- Symptoms of secondary causes of hypertension
- Symptoms of target organ damage, e.g. coronary heart disease (CHD) and cerebrovascular disease
- Symptoms of concomitant disease that will affect prognosis or treatment, e.g. diabetes mellitus, renal disease and gout
- Family history of hypertension, CHD, stroke, diabetes, renal disease or dyslipidaemia
- Dietary history including salt, fat, caffeine and alcohol intake
- Drug history of either prescribed or over-the-counter medication (NSAIDs, nasal decongestants) and herbal treatment
- Lifestyle and environmental factors that will affect treatment and outcome, e.g. smoking, physical activity, work stress and excessive weight gain since childhood.
- Antihypertensive medications → Check for compliance
- Medical Clinic follow up

2.2 The physical examination should include the following:

- General examination including height, weight and waist circumference
- Two or more BP measurements separated by two minutes with the patient either supine or seated; and after standing for at least one minute
- Measure BP on both arms
- Fundoscopy
- Examination for carotid bruit, abdominal bruit, presence of peripheral pulses and radio-femoral delay
- Cardiac examination
- Chest examination for evidence of cardiac failure
- Abdominal examination for renal masses, aortic aneurysm and abdominal obesity

- Neurological examination to look for evidence of stroke
- Signs of endocrine disorders, e.g. Cushing Syndrome, Acromegaly and Thyroid disease.

Table 2. Cardiovascular Risk Factors

<p>Major risk factors</p> <ul style="list-style-type: none"> Hypertension Cigarette smoking Central obesity (waist circumference >90 cm for men, >80 cm for women) Physical inactivity Dyslipidaemia Diabetes mellitus Microalbuminuria Estimated GFR* <60 mL/min Age (>55 years for men, >65 years for women) Family history of premature cardiovascular disease (men <55 years or women <65 years) <p>Target Organ Damage</p> <p>Heart</p> <ul style="list-style-type: none"> • Left ventricular hypertrophy • Angina or prior myocardial infarction • Prior coronary revascularisation • Heart failure <p>Brain</p> <ul style="list-style-type: none"> • Stroke or transient ischemic attack <p>Chronic kidney disease</p> <p>Peripheral arterial disease</p> <p>Retinopathy</p>

*GFR, glomerular filtration rate.

If the examination or investigations suggest the presence of a secondary cause, the patient should be referred to Medical for evaluation. If there is evidence of TOD (Target Organ Damage) (**Table 3**), further tests should be considered.

Table 4 stratifies the risk of a patient with hypertension developing a major cardiovascular event, which includes cardiovascular death, stroke or myocardial infarction. This classification is a useful guide for therapeutic decisions.

Table3. Manifestations of target organ damage (TOD)/ target organ complication (TOC)

Organ system	Manifestations
Cardiac	Left ventricular hypertrophy, coronary heart disease, heart failure
Cerebrovascular	Transient ischaemic attack, stroke
Peripheral vasculature	Absence of one or more major pulses in extremities (except dorsalis pedis) with or without intermittent claudication
Renal	GFR <60 ml/min / 1.73 m ² , proteinuria (1+ or greater), microalbuminuria (2 out of 3 positive tests over a period of 4-6 months)
Retinopathy	Haemorrhages or exudates, with or without papilloedema

Table4. Risk Stratification.

Co-existing Condition BP Levels (mmHg)	No RF No TOD No TOC	TOD or RF (1-2), No TOC	TOD or RF (≥3) or Clinical atherosclerosis	Previous MI or Previous Stroke or Diabetes
SBP 120 – 139 and/or DBP 80 – 89	Low	Medium	High	Very High
SBP 140 – 159 and/or DBP 90 – 99	Low	Medium	High	Very High
SBP 160 – 179 and/or DBP 100 – 109	Medium	High	Very High	Very High
SBP 180 – 209 and/or DBP 110 – 119	High	High	Very High	Very High
SBP ≥210 and/or DBP ≥120	Very High	Very High	Very High	Very High
Risk Level	Risk of major CV Event in 10 years		Management	
Low	<10%		Lifestyle changes	
Medium	10 – 20%		Drug treatment and lifestyle changes	
High	20 – 30%		Drug treatment and lifestyle changes	
Very high	>30%		Drug treatment and lifestyle changes	

TOD = Target organ damage (LVH, retinopathy, proteinuria)

TOC = Target organ complication (heart failure, renal failure)

RF = additional risk factors (smoking, TC >6.5 mmol/L, family history of premature vascular disease)
Clinical atherosclerosis (CHD, carotid stenosis, peripheral vascular disease, transient ischaemic attack, stroke)

1. PERIOPERATIVE APPROACHES FOR HYPERTENSION PATIENT.

- Numerous studies (13,15,16,17,18,19) have shown that stage 1 or stage 2 hypertension (**Table 1**) is not an independent risk factor for perioperative cardiovascular complications.
- However, hypertension is common, and treatment has been shown to be associated with decreased rates of death due to stroke and CHD in the nonsurgical setting.
- The perioperative evaluation is a unique opportunity to identify patients with hypertension and initiate appropriate therapy.
- As a universally measured variable with a recognized association with CAD, hypertension serves as a useful marker for potential CHD
- Several investigators have demonstrated exaggerated intraoperative blood pressure fluctuation with associated ECG evidence of myocardial ischaemia in patients with preoperative blood pressure elevation. This effect can be modified by treatment.
- Because intraoperative myocardial ischaemia correlates with postoperative cardiac morbidity, it follows that control of blood pressure preoperatively may help reduce the tendency to perioperative ischaemia.
- Patients with previously undiagnosed or untreated hypertension has been shown to correlate with blood pressure lability under anaesthesia .
- In patients undergoing therapy for hypertension, a thorough review of current medications and dosages, along with awareness of known intolerance to previously prescribed drugs, is essential.
- If the initial evaluation establishes hypertension as mild or moderate, and there are no associated metabolic or cardiovascular abnormalities, there is no evidence that it is beneficial to delay surgery.
- Several investigators have established the value of effective preoperative blood pressure control among patients with established hypertension, and antihypertensive medications should be continued during the perioperative period.

2. MANAGEMENT OF HYPERTENSION

4.1 General guidelines

- There are many drugs available for the treatment of hypertension. **Appendix 1**
- The ideal drug must be efficacious, free from side-effects, able to prevent all the complications of hypertension, easy to use and beneficial to the patients.
- **Figure 1** outlines the management of a non-surgical patient with hypertension (Level III).
- In patients with newly diagnosed uncomplicated hypertension and no compelling indications, choice of first line monotherapy includes ACEIs, ARBs, CCBs and diuretics. Beta-blockers are no longer recommended for first line monotherapy in this group of patients. (Level I
- Beta-blockers may be considered in younger people, particularly:
 - Those with an intolerance or contraindication to ACEIs and ARBs or
 - Women of child-bearing potential or
 - Patients with evidence of increased sympathetic drive
- Ideally, individualisation should be based on scientific evidence of reduction in endpoints (**Table 5**).

FIGURE 1. Algorithm for the Management of Hypertension

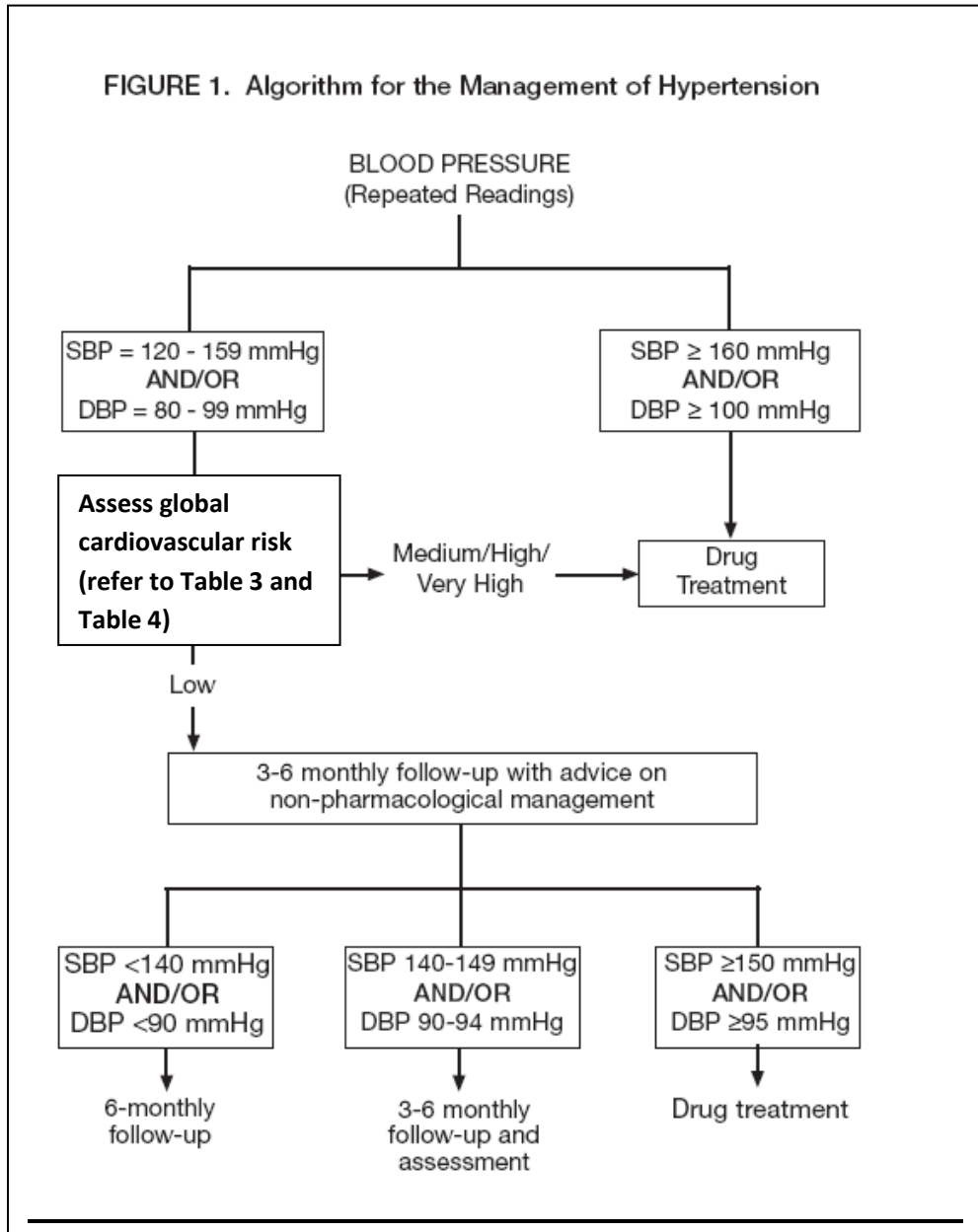


Table5. Choice of antihypertensive drugs in patients with concomitant condition

Concomitant disease	Diuretics	β -blockers	ACEIs	CCBs	Peripheral β -blockers	ARBs
Diabetes mellitus (without nephropathy)	+	+/-	+++	+	+/-	++
Diabetes mellitus (with nephropathy)	++	+/-	+++	++*	+/-	+++
Gout	+/-	+	+	+	+	+
Dyslipidaemia	+/-	+/-	+	+	+	+
Coronary heart disease	+	+++	+++	++	+	+
Heart failure	+++	+++ [#]	+++	+ [⊙]	+	+++
Asthma	+	-	+	+	+	+
Peripheral vascular disease	+	+/-	+	+	+	+
Non-diabetic renal impairment	++	+	+++	+*	+	++
Renal artery stenosis	+	+	++ [§]	+	+	++ [§]
Elderly with no co-morbid conditions	+++	+	+	+++	+/-	+

The grading of recommendation from (+) to (+++) is based on increasing levels of evidence and/or current widely accepted practice

+/- Use with care

- Contraindicated

* Only non-dihydropyridine CCB

Metoprolol, bisoprolol, carvedilol – dose needs to be gradually titrated

⊙ Current evidence available for amlodipine and felodipine only

§ Contraindicated in bilateral renal artery stenosis

ACEI- angiotensin-converting enzyme inhibitor ARB - angiotensin receptor blocker CCB - calcium channel blocker

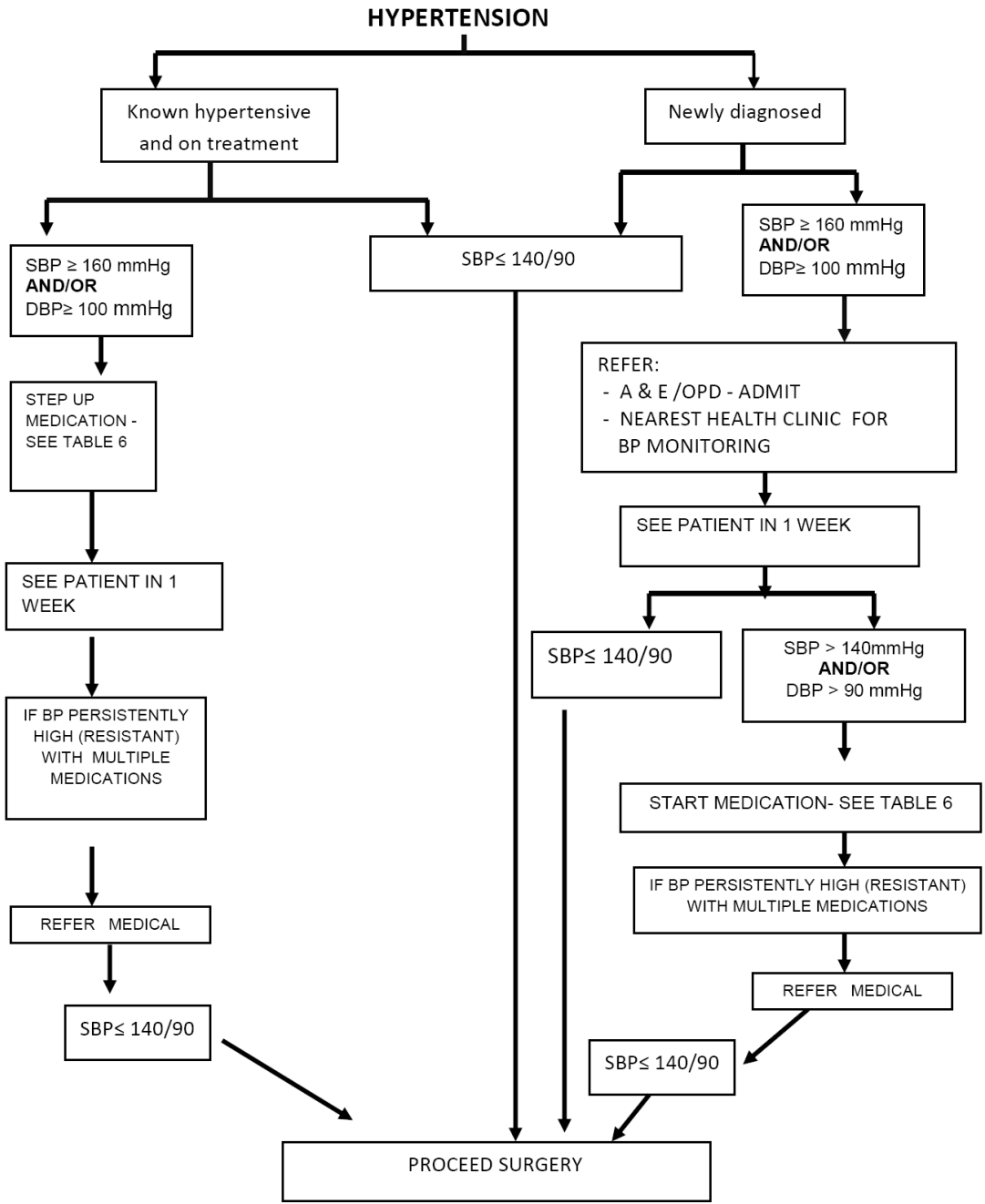
4.2. Guidelines for Hypertensive Patients going for surgery.

- **Figure 2** outlines the algorithm for the management of hypertensive patients requiring elective/emergency surgical procedures.
- Treatment will be based on local availability of drugs and individual patients
- Below are the suggested therapy according to sequence; (**Table 6**)

Table 6: Suggested Oral Hypertensive Drug Therapy

	Drug	Dose
1	Hydrochlorothiazide	12.5mg stat and then OD (Max dose: 25mg OD)
2	Perindopril	2mg stat and then 4mg OD (Max dose: 8mg OD) (monitor renal function)
3	Amlodipine	5mg stat and then OD (Max dose: 10mg OD)
4	Atenolol	50mg stat and then OD (if HR high, not asthmatic) if no contraindications (Max dose 100mg OD, must make sure HR>60/min)

Figure2. Outline Algorithm for the Management of Hypertensive Patients Requiring Elective Surgical Procedures.



Note:
 If a young hypertensive is identified, medical referral for investigation of hypertension to rule out secondary causes of hypertension must be made.

REFERENCES

1. ACC/AHA 2007 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery.
2. Becker RC, Terrin M, Ross R, et al. Comparison of clinical outcomes for women and men after acute myocardial infarction. *Ann Intern Med* 1994; 120: 638–45.
3. Raby KE, Barry J, Creager MA, Cook EF, Weisberg MC, Goldman L. Detection and significance of intraoperative and postoperative myocardial ischemia in peripheral vascular surgery. *JAMA* 1992; 268: 222–7.
4. Detsky AS, Abrams HB, Forbath N, Scott JG, Hilliard JR. Cardiac assessment for patients undergoing noncardiac surgery: a multifactorial clinical risk index. *Arch Intern Med* 1986; 146: 2131–4.
5. Chobanian AV, Bakris GL, Black HR, et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. *JAMA* 2003; 289: 2560–72
6. Stone JG, Foex P, Sear JW, Johnson LL, Khambatta HJ, Triner L. Myocardial ischemia in untreated hypertensive patients: effect of a single small oral dose of a beta-adrenergic blocking agent. *Anesthesiology* 1988;68:495–500.
7. Prys-Roberts C, Meloche R, Foex P. Studies of anaesthesia in relation to hypertension: I: cardiovascular responses of treated and untreated patients. *Br J Anaesth* 1971; 43:122–37.
8. Magnusson J, Thulin T, Werner O, Jarhult J, Thomson D. Haemodynamic effects of pretreatment with metoprolol in hypertensive patients undergoing surgery. *Br J Anaesth* 1986; 58: 251– 60.
9. Slogoff S, Keats AS. Does perioperative myocardial ischemia lead to postoperative myocardial infarction? *Anesthesiology* 1985; 62:107–14.
10. The fifth report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC V). *Arch Intern Med* 1993; 153: 154–83.

11. Bedford RF, Feinstein B. Hospital admission blood pressure: a predictor for hypertension following endotracheal intubation. *Anesthesia Analgesia* 1980; 59: 367–70.
12. Goldman L, Caldera DL. Risks of general anesthesia and elective operation in the hypertensive patient. *Anesthesiology* 1979; 50: 285–92.
13. The Clinical Practice Guideline Management of Hypertension 3rd edition February 2008.
14. Lindholm LH, Carlberg B, Samuelsson O. Should β -blockers remain first choice in the treatment of primary hypertension? A Meta Analysis. *Lancet* 2005; 366: 1545-53.
15. Ashton CM, Petersen NJ, Wray NP, et al. The incidence of perioperative myocardial infarction in men undergoing noncardiac surgery. *Ann Intern Med* 1993;118: 504 – 10.
16. Lette J, Waters D, Bernier H, et al. Preoperative and long-term cardiac risk assessment: predictive value of 23 clinical descriptors, 7 multivariate scoring systems, and quantitative dipyridamole imaging in 360 patients. *Ann Surg* 1992; 216: 192–204.
17. Eagle KA, Coley CM, Newell JB, et al. Combining clinical and thallium data optimizes preoperative assessment of cardiac risk before major vascular surgery. *Ann Intern Med* 1989; 110:859–66.
18. Raby KE, Barry J, Creager MA, Cook EF, Weisberg MC, Goldman L. Detection and significance of intraoperative and postoperative myocardial ischemia in peripheral vascular surgery. *JAMA* 1992;268:222–7.
19. Detsky AS, Abrams HB, Forbath N, Scott JG, Hilliard JR. Cardiac assessment for patients undergoing noncardiac surgery: a multifactorial clinical risk index. *Arch Intern Med* 1986;146: 2131–4.
20. Brabant SM, Bertrand M, Eyraud D, Darmon PL, Coriat P. The hemodynamic effects of anesthetic induction in vascular surgical patients chronically treated with angiotensin II receptor antagonists. *Anesth Analg* 1999; 89: 1388 –92.
21. Comfere T, Sprung J, Kumar MM, et al. Angiotensin system inhibitors in a general surgical population. *Anesth Analg* 2005;100: 636–44.

22. Bertrand M, Godet G, Meersschaert K, Brun L, Salcedo E, Coriat P. Should the angiotensin II antagonists be discontinued before surgery? *Anesth Analg* 2001; 92:26–30.
23. Coriat P, Richer C, Douraki T, et al. Influence of chronic angiotensin converting enzyme inhibition on anesthetic induction. *Anesthesiology* 1994; 81: 299–307.

Appendix 1

Antihypertensive drugs currently available in Malaysia

<p><i>Diuretics</i> Amiloride-Hydrochlorothiazide Bumetanide Chlorothiazide Chlorthalidone Frusemide Hydrochlorothiazide Indapamide Spironolactone Triamterene-Hydrochlorothiazide</p>	<p><i>Combined alpha/beta-blockers</i> Carvedilol Labetalo</p>
<p><i>Beta-blockers</i> Acebutolol Atenolol Betaxolol Bisoprolol Esmolol Metoprolol Nadolol Nebivolo Oxprenolol Pindolol Propranolol Sotalol Timolol</p>	<p><i>Direct vasodilators</i> Hydralazine Minoxidil Nitroglycerin Sodium Nitroprusside</p>
<p><i>Calcium channel blockers</i> Amlodipine Diltiazem Felodipine Isradipine Lacidipine Lercanidipinel Nicardipine Nifedipine Verapamil</p>	<p><i>ACE inhibitors</i> Captopril Enalapril Fosinopril Imidapril Lisinopril Perindopril Quinapril Ramipril</p>
<p><i>Centrally acting drugs</i> Alpha-methyl dopa Clonidine Moxonidine</p>	<p><i>Alpha-blockers</i> Alfuzosin Doxazosin Prazosin Terazosin</p> <p><i>Angiotensin receptor blockers</i> Candesartan Irbesartan Losartan Olmesartan Telmisartan Valsartan</p> <p><i>Fixed-dose combination drugs</i> Atenolol/chlorthalidone Candesartan/hydrochlorothiazide Irbesartan/hydrochlorothiazide Losartan/hydrochlorothiazide Metoprolol/chlorthalidone Oxprenolol/chlorthalidone Perindopril/indapamide Pindolol/clopamide Valsartan/hydrochlorothiazide Telmisartan/hydrochlorothiazide</p>

APPENDIX 5.2

PREOPERATIVE ASSESSMENT FOR PATIENTS WITH DIABETES MELLITUS



PREOPERATIVE ASSESSMENT FOR PATIENTS WITH DIABETES MELLITUS

1. Perioperative Concerns:

A variety of metabolic diseases may accompany cardiac disease and diabetes mellitus is the most common. Patients with diabetes mellitus who undergo surgery have an increased risk of developing perioperative complications. They are particularly at greater risk for infectious, metabolic, electrolyte, renal and cardiac complications during and after surgery.

The primary goal of perioperative care for the diabetic patient undergoing surgery is a safe and effective outcome without complications. The guidelines are primarily intended for elective cases.

2. Diagnosis Value and Screening Test.

Table 1: Values for Diagnosis

	Fasting	Random
Venous Plasma Glucose	≥ 7.0 mmol/L	≥ 11.1 mmol/L

In the symptomatic individual, one abnormal glucose value is diagnostic.

In the asymptomatic individual, 2 abnormal glucose values are required.

Table 2: Diagnostic values for Type 2 Diabetes Mellitus/Glucose Intolerance – oral glucose tolerance test (OGTT) [IDF 2005] ^{5 (Level III)}

OGTT Plasma Glucose Values (mmol/L)		
Category	0-hour	2-hour
Normal	$< 6.1^*$	< 7.8
IFG	$6.1^* - 6.9$	-
IGT	-	$7.8 - 11.0$
DM	≥ 7.0	≥ 11.1

* ADA uses 5.6 mmol/L ²

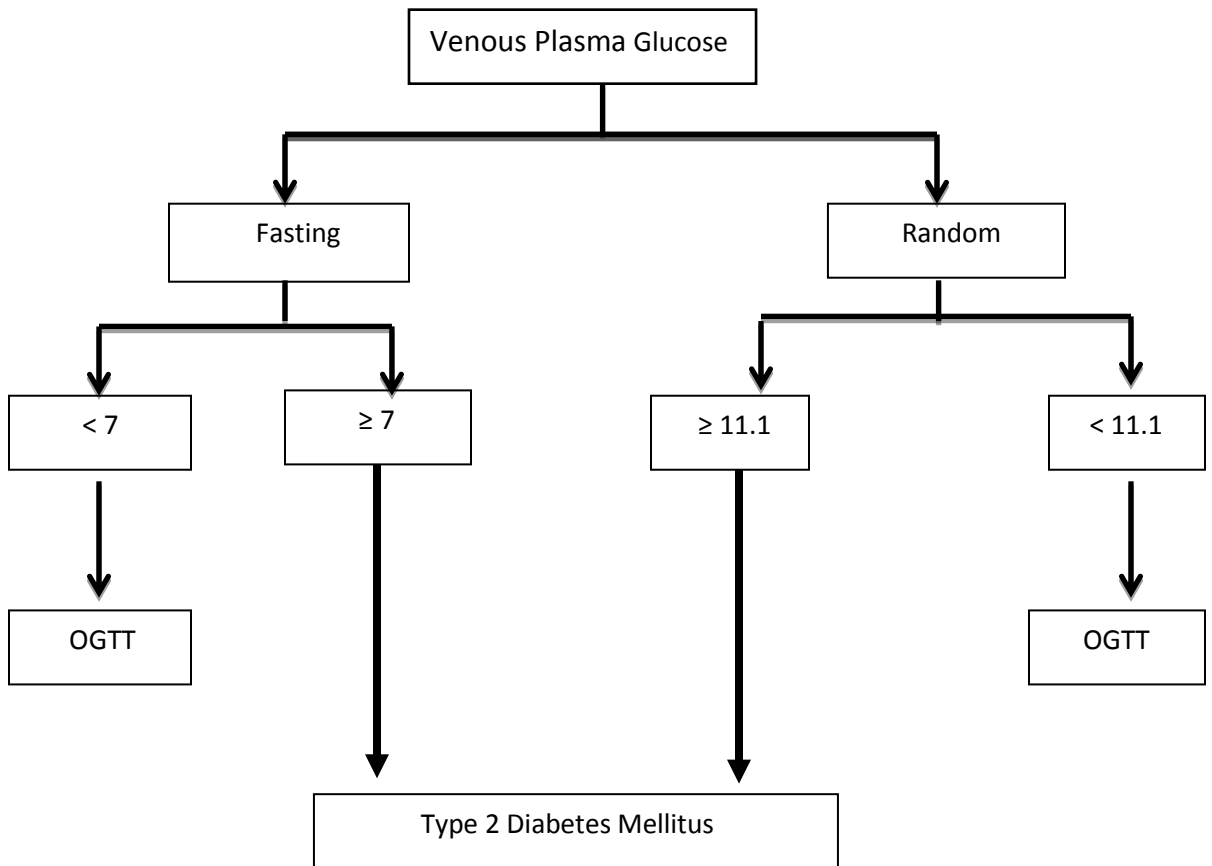
In children and adolescents, the glucose load in OGTT is based on body weight (1.75g per kg body weight, maximum of 75g).

*ADA – American Diabetes Association

IDF - International Diabetes Federation

3. Screening Process.

Algorithm1. Screening for Type 2 diabetes mellitus at Anaesthetic Clinic



OGTT : Refer Health Clinic / Out Patient.

4. PERIOPERATIVE EVALUATION AND PREPARATION

4.1 Perioperative evaluation

- The preoperative assessment of the patient with diabetes mellitus should focus on the long-term complications of diabetes (microvascular, macrovascular, and neuropathic), which may potentiate risk. (**Table 2**)

Table 2. Preoperative Assessment of the Surgical Candidate with Diabetes Mellitus

Operative risk assessment

Routine risk factors

Cardiac

Pulmonary

Renal

Hematologic

Diabetes-related risk factors

Macrovascular complications

Microvascular complications

Neuropathic complications

Diabetes therapeutic regimen

Reestablish correct diagnostic classification of diabetes

Pharmacological regimen

Medication type

Dosage

Timing

Meal plan

Carbohydrate content

Timing of meals

Activity level

Hypoglycemia

Frequency

Awareness

Severity

Anticipated surgery

Type of surgical procedure

Inpatient or outpatient

Type of anaesthesia

Start time

Duration of procedure

- The preoperative physical examination should include:
 - General Examination
 - An evaluation of cardiovascular status including blood pressure, heart rate and rhythm, and a cardiac examination.
 - Neurological examination.
- The preoperative tests should be done for all patients with diabetes mellitus before surgery:
- Target Blood Glucose:
 - Fasting Blood Sugar (FBS): < 7 mmol/L
 - Random Blood Sugar (RBS): < 11 mmol/L
 - Glycosylated Haemoglobin (HbA1c): < 6.5%
- Renal profile
- Fasting Lipid profile
- Urine analysis particularly for albuminuria
- Electrocardiogram (ECG).

Any additional tests indicated would depend on the patient's medical problems and the type of surgery planned.

4.2. Target for Sugar Control.

Table3. Target for Type 2 Diabetes Mellitus

	Levels
Glycaemic Control*	
Fasting	4.4 – 6.1 mmol/L
Non-fasting	4.4 – 8.0 mmol/L
HbA1c	<6.5 % *
Lipids	
Triglycerides	≤1.7 mmol/L
HDL cholesterol	≥1.1 mmol/L
LDL cholesterol	≤2.6 mmol/L [#]
Exercise	150 mins/week
Blood Pressure	
Normal Renal Function ^{15, 16 (Level III)}	≤130/80 mmHg [§]
Renal Impairment/Gross Proteinuria	≤125/75 mmHg

* Glycaemic target should be individualized to minimize risk of hypoglycaemia. ^{17 (Level I)} The taskforce acknowledges the increased CVD death in the intensive group of the ACCORD study. ^{17 (Level I)} However, the taskforce believes it is due to the overall treatment strategies that were employed to achieve the HbA1c target rather than the reduction in HbA1c. This is also collaborated by the ADVANCE study. ^{18 (Level I)}

In Individuals with overt CVD, LDL cholesterol target is <1.8 mmol/L.

§ In children and adolescents, blood pressure (BP) should be <95th percentile for age and sex. ^{19 (Level III)}

Modified from the International Diabetes Federation Western Pacific Region (IDF-WPR) Type 2 Diabetes Practical Targets and Treatment, Fourth Edition, 2005.²⁰

* Standard International (SI) unit of HbA1c is being changed from % to millimeter of HbA1c per mole of Hb (mmol/ mol); **6.5% = 48mmol/mol**

4.3. Medication.

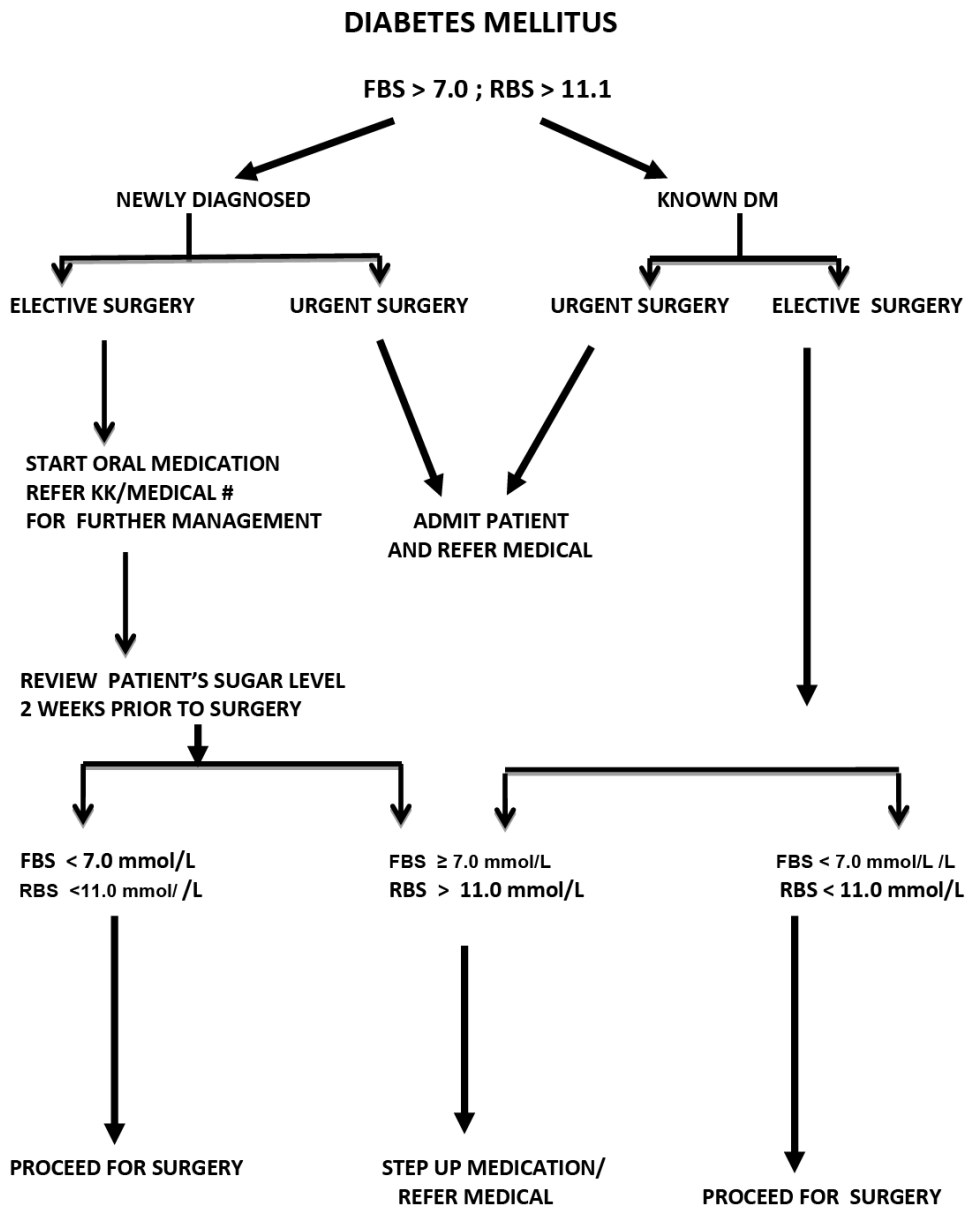
4.3.1. Oral Agent Monotherapy

- As first line therapy, refer Table 4.

Table 4. Oral Agent Monotherapy.

	Non CKD*	CKD
First line	metformin	Creatinine \geq130 Refer Medical
Alternative	sulphonylurea (SU) e.g. Glizlazide, Glibenclamide α - glucosidase inhibitor (AGI). (Acarbose)	Refer Medical

CKD* = Chronic Kidney Disease



Letter to PKK – state the date of surgery.

Figure 1. Proposed algorithm for perioperative management of patients with Diabetes Mellitus at the Anaesthetic Clinic.

5. PERIOPERATIVE MANAGEMENT.

Principles of management:

1. Stabilise blood sugar 2-3 days before elective operation.
2. Convert oral hypoglycaemics to insulin in NIDDM for major surgery or one with poor control on oral hypoglycaemic drugs.
3. Short acting drugs are preferred to long acting ones.
4. If possible the patient should be scheduled early in the OT list to limit the duration of preoperative fasting
5. Bedside blood glucose concentration monitoring using reagent strip and refractometer is usually adequate
6. Stopped Metformin 2 days before major surgery and Chlorpropamide 3 days before surgery

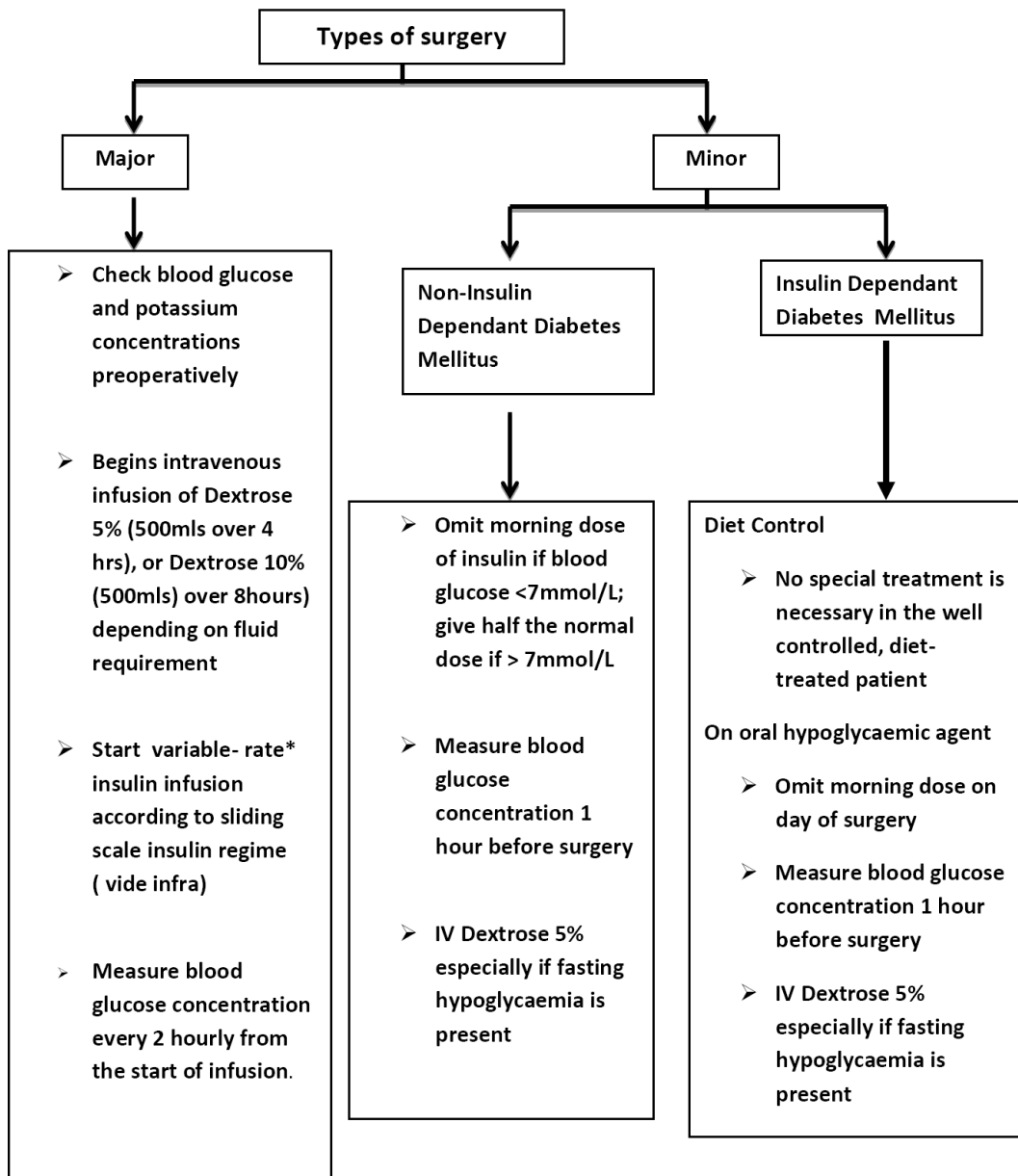


Figure 2: Proposed algorithm for perioperative management of patients with Diabetes Mellitus in the ward.

INSULIN INFUSION REGIMES

Various types of infusion regimes have been recommended, the most common ones being the GIK (Glucose Insulin Potassium) or Alberti regime, and insulin infusion according to sliding scale. The Alberti regime is simpler, does not utilise an infusion pump but offers less accurate glycaemic control

GIK Regime (Alberti regime)

Insulin added to 500ml of Dextrose 10% and the solution is infused at 100ml/hr, 10mmol potassium chloride is added to the solution if serum potassium is <3.5mmol/L.

<u>Blood Glucose concentration (mmol/L)</u>	<u>Insulin added (U)</u>
<5	omit
5-10	10
10- 15	15
>20*	20

* requires hourly review

Sliding scale insulin regime

Variable rate infusion of insulin 50U in 50mls 0.9% saline (concentration of insulin 1U/ml), adjusted according to blood glucose concentration.

<u>Blood Glucose concentration (mmol/L)</u>	<u>Infusion rate (ml/hr)</u>
< 5	omit
5-10	1
10-15	3
15-20	4
>20*	5

*Increase rate of infusion by 2mls/hr if blood glucose concentration remains high, check half-hourly and adjust infusion rate accordingly.

Approximate guide : Insulin infusion rate= $\frac{\text{Blood glucose concentration}}{5}$

References

- [1]. Harris MI, Flegal KM, Cowie CC, et al. Prevalence of diabetes, impaired fasting glucose, and impaired glucose tolerance in U.S. adults. *Diabetes Care* 1998;21:518-24.
- [2]. Hirsch IB, McGill JB. Role of insulin in management of surgical patients with diabetes mellitus. *Diabetes Care* 1990;13:980-91.
- [3]. Stagnaro-Green A. Perioperative glucose control: does it really matter? *The Mount Sinai Journal of Medicine* 1991;58:299-304.
- [4]. Furnary AP, Zerr KJ, Grunkemeier GL. Continuous intravenous insulin infusion reduces the incidence of deep sternal wound infection in diabetic patients after cardiac surgical procedures. *Ann Thorac Surg* 1999;67:352-62.
- [5]. Pomposelli JJ, Baxter JK, Babineau TJ, et al. Early postoperative glucose control predicts nosocomial infection rate in diabetic patients. *Journal of Parenteral and Enteral Nutrition* 1998;22:77-81.
- [6]. Scherpereel PA, Tavernier B. Perioperative care of diabetic patients. *Eur J Anaesthesiol* 2001;18:277-94.
- [7]. Hirsch IB, McGill JB, Cryer PE. Perioperative management of surgical patients with diabetes mellitus. *Anesthesiology* 1991;74:346-59.
- [8]. Naito Y, Tamai S, Shingu K, et al. Responses of plasma adrenocorticotrophic hormone, cortisol, and cytokines during and after upper abdominal surgery. *Anesthesiology* 1992;77:426-31.
- [9]. Gallacher SJ, Thomson G, Fraser WD, et al. Neutrophil bactericidal function in Diabetes Mellitus: evidence for association with blood glucose control. *Diabet Med* 1995;12:916-20.
- [10]. Scott J. Jacober, DO; James R. Sowers, MD. An Update on Perioperative Management of Diabetes.
- [11]. Garber AJ, Moghissi ES, Bransome EDJ, et al. American College of Endocrinology position statement on inpatient diabetes and metabolic control. *Endocrine Practice* 2004;10:77-82
- [12]. Gu W, Pagel PS, Warltier DC, Kersten JR. Modifying cardiovascular risk in Diabetes Mellitus. *Anesthesiology* 2003;98:774-9.

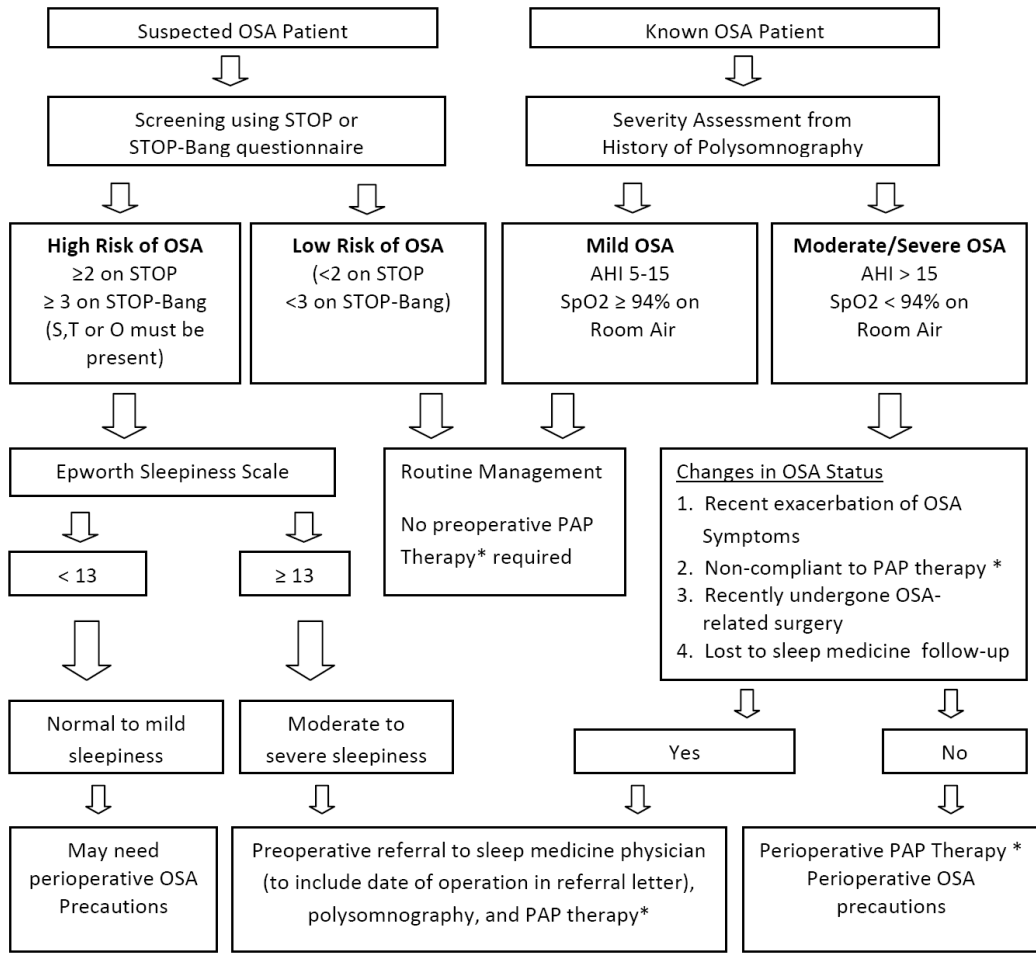
- [13] Yki-Järvinen H, Ryysy L, Nikkilä K, et al. Comparison of Bedtime Insulin Regimens in Patients with Type 2 Diabetes Mellitus. A Randomized, Controlled Trial. *Ann Intern Med* 1999; 130: 389– 396.
- [14] Ponsen HH, Elte JWF, Lehert P, et al. Combined Metformin and Insulin Therapy for Patients with Type 2 Diabetes Mellitus. *ClinTher*2000; 22: 709 – 718.
- [15] Avilés-Santa L, Sinding J, Raskin P. Effects of Metformin in Patients with Poorly Controlled, Insulin Treated Type 2 Diabetes Mellitus. A Randomized, Double-blind, Placebo-controlled Trial.*Ann Intern Med* 1999; 131: 182 – 188.
- [16] Wright A, Burden ACF, Paisey RB, et al. Sulphonylurea Inadequacy: Efficacy of Addition of Insulin Over 6 Years in Patients with Type 2 Diabetes in The United Kingdom Prospective Diabetes Study (UKPDS 57). *Diabetes Care* 2002; 25: 330 – 336.
- [17] Raskin P, Rendell M, Riddle MC, et al. A Randomized Trial of Rosiglitazone Therapy in Patients with Inadequately Controlled Insulin-treated Type 2 Diabetes. *Diabetes Care* 2001; 24: 1226 –1232.
- [18] Chiasson J-L, Josse RG, Hunt JA, et al. The Efficacy of Acarbose in The Treatment of Patientswith Non-insulin-dependent Diabetes Mellitus. A Multicenter Controlled Clinical Trial.*Ann InternMed* 1994; 121: 928 – 935.
- [19] Coniff RF, Shapiro JA, Seaton TB, et al. A Double-blind Placebo Controlled Trial Evaluating The Safety and Efficacy of Acarbose For The Treatment of Patients with Insulin-requiring Type II Diabetes.*Diabetes Care* 1995; 18: 928 – 932.
- [20] Lee CY. Manual of Anaesthesia.Singapore:McGraw-Hill Education (Asia);2006.

APPENDIX 5.3

PERIOPERATIVE GUIDE TO ASSESSMENT AND MANAGEMENT OF OBSTRUCTIVE SLEEP APNOEA (OSA)



Preoperative Evaluation of the Patient of Known or Suspected Sleep Apnea in the Anaesthetic Clinic



* PAP Therapy – Positive Airway Therapy – including continuous PAP, bilevel PAP, or autotitrating PAP. Modified from Seet E, & Chung F: Management of sleep apnea in adults – functional algorithms for the perioperative period: continuing professional development. Can J Anesth. 2010;57:849-65.

**A patient who has had corrective airway surgery (e.g. uvulopalatopharyngoplasty, surgical mandibular advancement) should be assumed to remain at risk for OSA complications unless a normal sleep study has been obtained and symptoms have not returned.

** For surgical patients deemed to be at high risk for OSA, and for whom surgery cannot be delayed for diagnostic tests and OSA treatment, the best course is to proceed with surgery but assume the patient has moderate to severe OSA.

***Patients with grade IV tonsils (kissing tonsils) should not be referred to the sleep medicine physician preoperatively. Patients with grade I to III tonsils will subject to the above algorithm.

1. **Assess with STOP-Bang Scoring Model:**

High Risk of OSA
Answering Yes to 2 or more questions on STOP
Answering Yes to 3 or more items on STOP-Bang (S,T or O must be present)

S	Snoring : Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?	Y	N
T	Tired: Do you often feel tired, fatigued or sleepy during the daytime?	Y	N
O	Observed: Has anyone observed you stop breathing during your sleep?	Y	N
P	Blood Pressure : Do you have or are you being treated for high blood pressure?	Y	N
B	BMI : BMI more than 35kg/m ²	Y	N
A	Age : Age over 50 years	Y	N
N	Neck circumference : Neck circumference greater than 40cm	Y	N
G	Gender : Male	Y	N

Adapted from Chung F, et al. Anesthesiology. 2008; 108:812-21

Other clinical signs and symptoms which may suggest the possibility of OSA:

Diurnal Symptoms

- Memory and concentration dysfunction
- Sexual dysfunction
- Gastro-oesophageal reflux
- Behavioural irritability (irritability, depression, chronic fatigue, delirium)

Nocturnal Symptoms:

- Falls asleep easily in a non-stimulating environment (eg. watching television, riding in or driving a car) despite adequate 'sleep'
- Awakens from sleep with choking sensation/noisy breathing
- Frequent arousals from sleep (shifting position, extremities movement)
- Morning headaches
- Wake up with dry mouth
- Nocturnal sweating
- Nocturia

Other predisposing characteristics of OSA:

- Waist circumference > 40 inches
- ENT conditions: septal deviation, tonsillar and adenoidal hypertrophy (tonsils nearly touching or touching in midline)
- Craniofacial abnormalities
 - Anatomical nasal obstruction
 - Retrognathia/Micrognathia
 - Macroglossia
 - Down syndrome, Achondroplasia, Acromegaly

2. Epworth Sleepiness Scale

This scale determines the level of a person's daytime sleepiness. It assesses how likely a patient is to doze off or fall asleep in the following situations, in contrast to feeling just tired. This refers to their usual way of life in recent times.

0 - No chance of falling asleep	2 - Moderate chance of falling asleep
1 - Slight chance of falling asleep	3 - High chance of falling asleep

Situation	Chance of Falling Asleep			
Sitting and reading	0 <input type="radio"/>	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Watching TV	0 <input type="radio"/>	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Sitting inactive in a public place (e.g. a theater or a meeting)	0 <input type="radio"/>	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
As a passenger in a car for an hour without a break	0 <input type="radio"/>	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Lying down to rest in the afternoon as circumstances permit	0 <input type="radio"/>	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>
Sitting and talking to someone	0 <input type="radio"/>	1 <input type="radio"/>	2 <input type="radio"/>	3 <input type="radio"/>

Sitting quietly after lunch without alcohol	0	1	2	3
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In a car while stopped for a few minutes in traffic	0	1	2	3
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Total Score				

The higher the score, the greater the chance of a diagnosis of Obstructive Sleep Apnea.

<u>Epworth Scoring Results:</u>			
0-8	:	Normal	13-16 : Moderate sleepiness
9-12	:	Mild sleepiness	17-24 : Severe sleepiness

3. **Specific Anaesthetic Concerns & Principles of Management**

- a. Sedative premedication: Avoid sedative premedication
- b. Possible difficult airway: Detailed airway assessment & plan of anaesthesia
: Important correlates of difficult intubation :
1. Mallampati Score ≥ 3
 2. Neck circumference $> 40\text{cm}$ or
 3. Waist circumference $> 105\text{cm}$ (42 inches; same for both genders)
- c. Positive Airway Pressure : Positive Airway Pressure Devices should be continued till the night before op and resumed as soon as possible after operation
: Patient to bring own device to hospital.
- d. Gastro-oesophageal reflux disease : Proton pump inhibitors or antacids for premedication
: Rapid sequence induction with cricoid pressure if GA is required
- e. Opioid-related respiratory depression : Minimise opioids for analgesia
: Regional and multimodal analgesia recommended if feasible

- f. Carry –over sedation effects from GA : Consider regional blocks as a sole anaesthetic technique
: Avoid neuraxial opioids
- g. Post-extubation airway obstruction : Resume use of positive airway pressure device as soon as possible
: Consider the need for ICU backup

4. Severity of Sleep Apnea

a. If a sleep study is available, use the table below:

Severity of OSA	Adult AHI (per hour of sleep)
None	<5
Mild OSA	5-15
Moderate OSA	15-30
Severe OSA	≥30


AHI = Apnea-hypopnea index

BMI= Body Mass Index

OSA = Obstructive Sleep Apnea

- b. If a sleep study is not available, a STOP-Bang score of ≥ 3 should be treated as moderate sleep apnea unless one or more of the signs or symptoms above is severely abnormal, when they should be treated as though they have severe sleep apnea:
- markedly increased BMI
 - markedly increased neck circumference
 - respiratory pauses that are frightening to the observer
 - patient regularly falls asleep within minutes after being left unstimulated

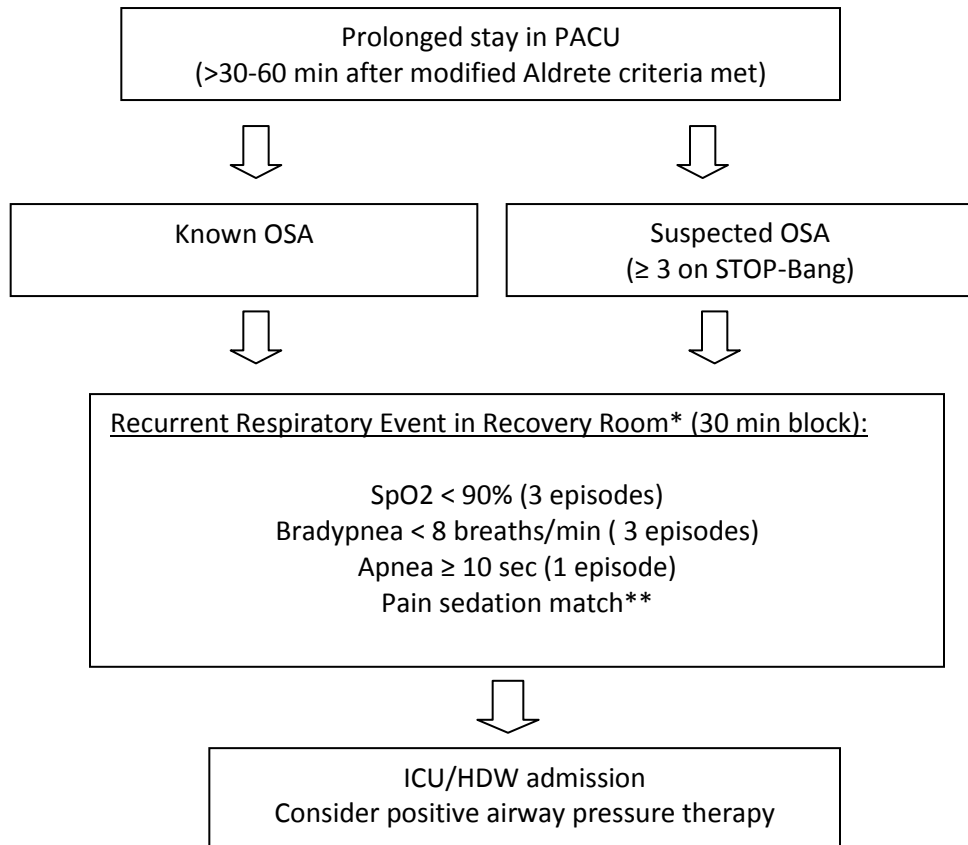
5. Estimation of Perioperative Risk of Complications and Preoperative Criteria to ICU/HDW Admission for the Known or Suspected Obstructive Sleep Apnea Patient after General Anaesthesia

	OSA Scoring System	Points	Total	
A.	Severity of sleep apnea based on sleep study (or clinical indicators if sleep study not available) Point score of 0-3.	None	0	
		Mild	1	
		Moderate	2	
		Severe	3	
B.	Invasiveness of surgery and anaesthesia. Point of score 0-3	Superficial surgery under local or peripheral nerve block anaesthesia without sedation	0	
		Superficial surgery with moderate sedation or general anaesthesia	1	
		Peripheral surgery with spinal or epidural anaesthesia (with no more than moderate sedation)	1	
		Peripheral surgery with general anaesthesia	2	
		Airway surgery with moderate sedation	2	
		Major surgery, general anaesthesia	3	
		Airway surgery, general anaesthesia	3	
C.	Requirement for postoperative opioids. Point score of 0-3.	None	0	
		Low-dose oral opioids	1	
		High-dose oral opioids (>codeine 60mg q4h or equivalent), parenteral or neuraxial opioids	3	
D.	Estimation of perioperative risk. Overall score = the score for A plus the greater of the score for EITHER B OR C . Overall score = A + [B or C] Point score of 0-6.			
E.	If patient has been on continuous positive airway pressure (CPAP) or non-invasive positive-pressure ventilation (NIPPV) before surgery and will be using his or her appliance consistently during the postoperative period – MINUS 1 POINT			
F.	If a patient has mild or moderate OSA with a resting arterial PaCO ₂ > 50mmHg – ADD 1 POINT			
G.	TOTAL SCORE ** TOTAL SCORE ≥ 4  POSTOPERATIVE ICU/HDW BED REQUIRED [Score of 4 – Increased perioperative risk from OSA] [Score of 5 or 6 – Significantly increased perioperative risk of OSA]			

*The above table, which has not been clinically validated, is meant only as a guide, and clinical judgment should be used to assess the risk of an individual patient.

** Exacerbation of respiratory depression may occur on the 3rd postoperative day as sleep patterns are re-established and “REM rebound” occurs. This usually returns to preoperative levels on the 7th postoperative day.

6. **Recovery Room Criteria for ICU/HDW Admission for the Known or Suspected Obstructive Sleep Apnea Patient after General Anaesthesia**



* Recurrent Respiratory Event in Recovery Room – any event occurring > once in each 30-min evaluation period (not necessary to be the same event)

** Pain-sedation mismatch = simultaneous occurrence of high pain scores and high sedation levels.

Modified from Seet E, & Chung F. Management of sleep apnea in adults –functional algorithms for the perioperative period: continuing professional development. Can J Anesth. 2010;57:849-65

All OSA patients must have continuous pulse oxymetry monitoring postoperatively.

Adapted from:

1. “Perioperative Management of OSA Patients – Practical Solutions and Care Strategies” by UC San Diego School of Medicine & University of Toronto – an assimilation of material presented at the ‘Challenges in the Perioperative Management of OSA Patients Symposium’, held in October 2010.
This guideline was released on 26 April 2010.
2. Practice Guidelines for the Perioperative Management of Patients with Obstructive Sleep Apnea –
A Report by the American Society of Anaesthesiologists Task Force on Perioperative Management
of Patients with Obstructive Sleep Apnea. *Anesthesiology* 2006; 104: 1081-93

Other references:

1. Subramanyam R, & Chung F. Perioperative Management of Obstructive Sleep Apnea Patients. *MedicaMundi* 54/3 2010.
2. Adebola O. Adesanya et al. Perioperative Management of Obstructive Sleep Apnea. *Chest* 2010;138;1489-1498.
3. Shafazand S. Perioperative Management of Obstructive Sleep Apnea: Ready for Prime Time? *Cleveland Clinic Journal of Medicine* 2009; Volume 76; Supplement 4.
4. Candiotti K. Obesity, Obstructive Sleep Apnea, and Diabetes Mellitus: Anaesthetic Implications. *BJA* 2009;103;23-30.
5. Clinical Guideline for the Evaluation, Management and Long-term Care of Obstructive Sleep Apnea in Adults. *JSSM* 2009. Vol. 5. No. 3.

APPENDIX 5.4

GUIDELINE FOR PREOPERATIVE ASSESSMENT OF PATIENTS WITH THYROID DISORDER



GUIDELINE FOR PREOPERATIVE ASSESSMENT OF PATIENTS WITH THYROID DISORDER

1. For all symptomatic patients, REFER Specialist Medical Clinic for early appointment
2. If clinically asymptomatic , but only have laboratory thyroid abnormalities
 - If biochemically hyper or hypothyroid : REFER Specialist Medical Clinic
 - If subclinical hypothyroidism or subclinical hyperthyroidism to send for Free T3 Level [Thyroid Function Test (TFT) in some hospitals does not involve Free T3]. If normal free T3, can proceed for surgery. (Subclinical is defined biochemically as a normal serum free thyroxine (T4) concentration in the presence of an abnormal serum thyrotropin (TSH) concentration)
 - If TSH ↑ : Repeat TFT in 4 weeks time
 - Delineate urgency of surgery. Ascertain risk of thyroid storm or myxoedema coma. Investigate the cause of hypothyroidism/ hyperthyroidism.
3. A repeat Thyroid Function Test after starting treatment for hyperthyroidism or hypothyroidism is done in 4 weeks' time
4. For all patients started on treatment, post-operatively **REFER** Medical/Endocrine for follow up
5. Need to discuss with Surgical Department to fix a date for surgery and refer patient at least 1 month prior to surgery for control of thyrotoxicosis and goitre.

APPENDIX 5.5

PREOPERATIVE MANAGEMENT OF PATIENTS ON ANTI-THROMBOTIC THERAPY AND NEURAL BLOCKAGE



PREOPERATIVE MANAGEMENT OF PATIENTS
ON ANTI-THROMBOTIC THERAPY AND
NEURAL BLOCKAGE

PERIOPERATIVE MANAGEMENT OF PATIENTS ON ANTI-THROMBOTIC THERAPY

Bridging dose regimens

Three dose regimens have been studied:

1. A high-dose (therapeutic-dose) heparin bridging regimen involves administering an anticoagulant dose that is similar to that used for the treatment of acute Venous Thromboembolism (VTE) or an acute coronary syndrome (e.g: enoxaparin 1 mg/kg bid or 1.5 mg/kg daily, dalteparin 100 International Units/kg bid or 200 International Units/kg daily, tinzaparin 175 International Units/kg daily, IV un-fractionated heparin (UFH) to attain an activated partial thromboplastin time [aPTT] 1.5 to 2 times the control aPTT).
 2. A low-dose (prophylactic-dose) heparin regimen involves administering a dose that is used, typically, to prevent postoperative VTE (e.g: enoxaparin 30 mg bid or 40 mg daily, dalteparin 5,000 International Units daily, UFH 5,000-7,500 International Units bid).
 3. An intermediate-dose regimen has recently been studied for bridging and is intermediate in anticoagulant intensity between high- and low-dose regimens (e.g: enoxaparin 40 mg bid).
- Our recommendations relating to the need for bridging anticoagulation (section 2.4) will not refer to a specific bridging dose regimen and will deal with the issue of whether bridging is needed in a more generic sense.

Indication for Vitamin K Antagonist (VKA) Therapy

Risk Stratum	Mechanical Heart Valve	Atrial Fibrillation	VTE
High >10%	<ul style="list-style-type: none"> Any mitral valve prosthesis Any caged-ball or tilting disc aortic valve prosthesis Recent (within 6 mo) stroke or transient ischemic attack 	<ul style="list-style-type: none"> CHADS 2 score of 5 or 6 Recent (within 3 mo) stroke or transient ischemic attack Rheumatic valvular heart disease 	<ul style="list-style-type: none"> Recent (within 3 mo) VTE Severe thrombophilia (e.g: deficiency of protein C, protein S, or anti-thrombin; anti-phospholipid antibodies; multiple abnormalities)
Moderate 5-10%	<ul style="list-style-type: none"> Bi-leaflet aortic valve prosthesis and one or more of the of following risk factors: atrial fibrillation, prior stroke or transient ischemic attack, hypertension, diabetes, congestive heart failure, age \geq 75 years 	<ul style="list-style-type: none"> CHADS 2 score of 3 or 4 	<ul style="list-style-type: none"> VTE within the past 3-12 mo Non-severe thrombophilia (e.g: heterozygous factor V Leiden or prothrombin gene mutation) Recurrent VTE Active cancer (treated within 6 mo or palliative)
Low <5%	<ul style="list-style-type: none"> Bi-leaflet aortic valve prosthesis without atrial fibrillation and no other risk factors for stroke 	<ul style="list-style-type: none"> CHADS 2 score of 0 to 2 (assuming no prior stroke or transient ischemic attack) 	<ul style="list-style-type: none"> VTE 12 mo previous and no other risk factors

*CHADS 2 = congestive heart failure, hypertension, age \geq 75 years, diabetes mellitus, and stroke or transient ischemic attack; VKA 5

*High-risk patients may also include those with a prior stroke or transient ischemic attack occurring >3 mo before the planned surgery and a CHADS 2 score < 5, those with prior thrombo-embolism during temporary interruption of VKAs, or those undergoing certain types of surgery associated with an increased risk for stroke or other thrombo-embolism (e.g: cardiac valve replacement, carotid endarterectomy, major vascular surgery)

Assessing Risk for Bleeding

<ul style="list-style-type: none"> • Urologic surgery and procedures consisting of transurethral prostate resection, bladder resection, or tumor ablation; nephrectomy; or kidney biopsy in part due to untreated tissue damage (after prostatectomy) and endogenous urokinase release 32-34 	<ul style="list-style-type: none"> • Pacemaker or implantable cardioverter defibrillator device implantation in which separation of infra-clavicular fascial layers and lack of suturing of unopposed tissues within the device pocket may predispose to hematoma development 35-38
<ul style="list-style-type: none"> • Colonic polyp resection, typically of large (i.e: 1-2 cm long) sessile polyps, in which bleeding may occur at the transected stalk following hemostatic plug release 39 	<ul style="list-style-type: none"> • Surgery and procedures in highly vascular organs, such as the kidney, liver, and spleen
<ul style="list-style-type: none"> • Bowel resection in which bleeding may Occur at the bowel anastomosis site 	<ul style="list-style-type: none"> • Major surgery with extensive tissue injury (e.g: cancer surgery, joint arthroplasty, reconstructive plastic surgery) 40,41

1. In patients who require temporary interruption of a VKA before surgery, we recommend stopping VKAs approximately 5 days before surgery (Grade 1C)
2. In patients who require temporary interruption of a VKA before surgery, we recommend resuming VKAs approximately 12 to 24 h after surgery (Grade 2C)
3. In patients with a mechanical heart valve, atrial fibrillation, or VTE at high risk for thrombo-embolism, we suggest bridging anticoagulation (Grade 2C).
4. In patients with a mechanical heart valve, atrial fibrillation, or VTE at moderate risk for thrombo-embolism, the bridging or no-bridging approach chosen is, based on an assessment of individual patient and surgery-related factors.
5. In patients at moderate to high risk for cardiovascular events who are receiving ASA therapy and require non-cardiac surgery, we suggest continuing ASA around the time of surgery (Grade 2C). In patients at low risk for cardiovascular events who are receiving ASA therapy, we suggest stopping ASA 7 to 10 days before surgery (Grade 2C).
6. In patients who are receiving ASA and require CABG surgery, we suggest continuing ASA around the time of surgery y (Grade 2C). In patients who are receiving dual anti-platelet drug therapy and require CABG surgery, we suggest continuing ASA around the time of surgery and stopping clopidogrel/prasugrel 5 days before (Grade 2C) (Cardiac anaesthetist)
7. In patients who are receiving bridging anticoagulation with therapeutic-dose IV UFH, we suggest stopping UFH 4 to 6 h before surgery (Grade 2C)

8. In patients who are receiving bridging anticoagulation with therapeutic-dose SC LMWH, we suggest administering the last preoperative dose of LMWH approximately 24 h before surgery (Grade 2C).
9. In patients who are receiving bridging anticoagulation with therapeutic-dose SC LMWH and are undergoing high-bleeding-risk surgery, we suggest resuming therapeutic-dose LMWH 48 to 72 h after surgery (Grade 2C).
10. Large observational studies are planned to assess best perioperative practices in patients who are receiving new oral anticoagulants, such as dabigatran, rivaroxaban, and apixaban, and new antiplatelet drugs, such as prasugrel and ticagrelor.

References:

James D. Douketis, MD, FCCP; Alex C. Spyropoulos, MD, FCCP; Frederick A. Spencer , MD; Michael Mayr, MD; Amir K. Jaffer, MD, FHM; Mark H. Eckman, MD; Andrew S. Dunn, MD ; and Regina Kunz , MD , MSc (Epi) Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines, CHEST 2012; 141(2)(Suppl):e326S–e350S

Recommendation for neural blockage and anticoagulant

ANTICOAGULANT	Type	Recommendation	Notes
Warfarin	1-3 d 4-5 d Low dose	Avoid block Caution with block Epidural analgesia Catheter removed	when INR <1.5, INR 1.5-3, with great caution. Monitor neurologic and low dose of LA even after 24hr catheter removal INR >3, withhold warfarin
Un-fractionated heparin	<10000Ü/day > 10000Ü/day	No contraindication. risk and benefit catheter removed	Give heparin after >1hr after block Check platelet count after 4d of therapy 2-4hr after the last dose , repeat APPT and Re-heparin after 1hr Monitor neurologic and low dose of LA
LMWH High dose enoxaparin 1 mg/kg every 12 hrs, enoxaparin 1.5 mg/kg daily, dalteparin 120 U/kg every 12 hrs, dalteparin 200 U/kg daily, tinzaparin 175 U/kg daily	Pre-op High dose 2hr before surgery Post-op OD dosing Post-op BD dosing	10-12hr after the last dose 24hr after last dose Avoid block > 6-8hr post-op Catheter removed give>24hr post-op catheter removed before the 1 st dose and restart after 2hr	Anti –Xa levels are not helpful in predictive bleeding. Present of bloody needle and catheter should delay the first dose 24hr postoperatively > 10-12hr after last dose and > 2hr before next dose
Anti-platelets Platelet GPIIb/IIIb	NSAIDs Ticlopidine Clopidogrel Abciximab Eptifbatide /tirofiban	No increased risk 14d 7d, 5-7d 24-48h 4-8h	Platelet function should be normalised and documented Monitor neurologic and low dose of LA
Synthetic pentasaccharide	Fondaparinux		Block used in clinical trials

- Clinical trial-(single-needle pass, atraumatic needle placement, avoidance of indwelling neuraxial catheters)
- Monitor neurological- maximal 2 hr a part, neurological assessment
- Low dose of LA- drugs minimizing sensory and motor block to facilitate assessment of neurologic function
- Other medications- medications include anti-platelet medications, Low-molecular Weight Heparin (LMWH) and oral anticoagulants

Practical Aspects of Perioperative Antithrombotic Therapy Management

Patient on Warfarin therapy

Antithrombotic	Risk stratum	Warfarin stopped 5 d	Bridging	Pre-op	Post-op
Warfarin	High	Y	Y	Therapeutic IV UFH 4-6h Therapeutic dose SC LMWH 24h	12-24h if high risk of bleeding 48-72h
	Moderate	Y	Risk-benefit	-	-
	Low	Y	N	-	-

	Risk stratum	ASA stopped 7-10d	Clopidogel/prasugrel stopped 5d	Ticlopidine stopped 10-14d
Anti-platelet	High	N	Y	Y
	Moderate	N	-	-
	Low	Y	-	-

APPENDIX 5.6

PREOPERATIVE ASSESSMENT OF CARDIAC PATIENTS



PREOPERATIVE ASSESSMENT OF CARDIAC PATIENTS

History:

1. The history should seek to identify serious cardiac conditions such as unstable coronary syndromes, prior angina, recent or past MI, decompensated HF, significant arrhythmias, and severe valvular disease (Table 1)

Table 1 . Active Cardiac Conditions for Which the Patient Should Undergo Evaluation and Treatment Before Noncardiac Surgery (Class I, Level of Evidence: B)

Condition	Examples
Unstable coronary syndromes	Unstable or severe angina* (CCS class III or IV) [†] Recent MI [‡]
Decompensated HF (NYHA functional class IV; worsening or new-onset HF)	
Significant arrhythmias	High-grade atrioventricular block Mobitz II atrioventricular block Third-degree atrioventricular heart block Symptomatic ventricular arrhythmias Supraventricular arrhythmias (including atrial fibrillation) with uncontrolled ventricular rate (HR greater than 100 bpm at rest) Symptomatic bradycardia Newly recognized ventricular tachycardia
Severe valvular disease	Severe aortic stenosis (mean pressure gradient greater than 40 mm Hg, aortic valve area less than 1.0 cm ² , or symptomatic) Symptomatic mitral stenosis (progressive dyspnea on exertion, exertional presyncope, or HF)

CCS indicates Canadian Cardiovascular Society; HF, heart failure; HR, heart rate; MI, myocardial infarction; NYHA, New York Heart Association.

*According to Campeau.¹⁰

[†]May include stable angina in patients who are unusually sedentary.

[‡]The American College of Cardiology National Database Library defines recent MI as more than 7 days but less than or equal to 1 month (within 30days)

2. All preoperative assessments either elective or emergency must have a MET (Metabolic Equivalent of Task) scoring done to assess the functional capacity of the patient prior to any surgical procedures.

➤ MET Algorithm (Table 2)

Table 2 ESTIMATED ENERGY REQUIREMENTS FOR VARIOUS ACTIVITIES

METABOLIC EQUIVALENT OF TASK (MET) SCORE

1 MET ↓ 4 METS	CAN YOU...	4 METS ↓ ≥ 10 METS	CAN YOU...
	Take care of yourself?		Climb a flight of stairs or walk up a hill?
	Eat, dress or use the toilet?		Walk on level ground at 4 mph (6.4kph)?
	Walk indoors around the house?		Do heavy work around the house like scrubbing floors or lifting or moving heavy furniture?
	Walk a block or 2 on level ground at 2-3 mph (3.2-4.8 kph)?		Participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football?
Do light housework around the house like dusting or washing the dishes?	Participate in strenuous sports like swimming, singles tennis, football, basketball or skiing?		

kph indicates kilometers per hour; MET, metabolic equivalent; and mph, miles per hour.*Modified from Hlatky et al (11), copyright 1989, with permission from Elsevier, and adapted from Fletcher et al (12).

3. Identifying surgical risk – for all patients going for surgery , the surgical risk can be divided into 3 classes:
 - a. High (cardiac risk >5%) – Vascular surgeries
 - b. Intermediate (with 1-5% cardiac risk stratified) - Intra-thoracic, intra-peritoneal surgery
 - c. Low (cardiac risk <1%) - endoscopic procedures, superficial procedures, cataract surgery, breast surgery

Table 3. Cardiac Risk * Stratification for Noncardiac Surgical Procedures.

Risk Stratification	Procedure Examples
Vascular (reported cardiac risk often more than 5%)	Aortic and other major vascular surgery Peripheral vascular surgery
Intermediate (reported cardiac risk generally 1% to 5%)	Intraperitoneal and intrathoracic surgery Carotid endarterectomy Head and neck surgery Orthopedic surgery Prostate surgery
Low # (reported cardiac risk generally less than 1%)	Endoscopic procedures Superficial procedures Cataract surgery Breast surgery Ambulatory surgery

*Combined incidence of cardiac death and non fatal myocardial infarction.

These procedures do not generally require further preoperative cardiac testing.

4. Cardiac evaluation and stepwise approach to Perioperative Cardiac Assessment and Algorithm For noncardiac surgery (Figure 1)

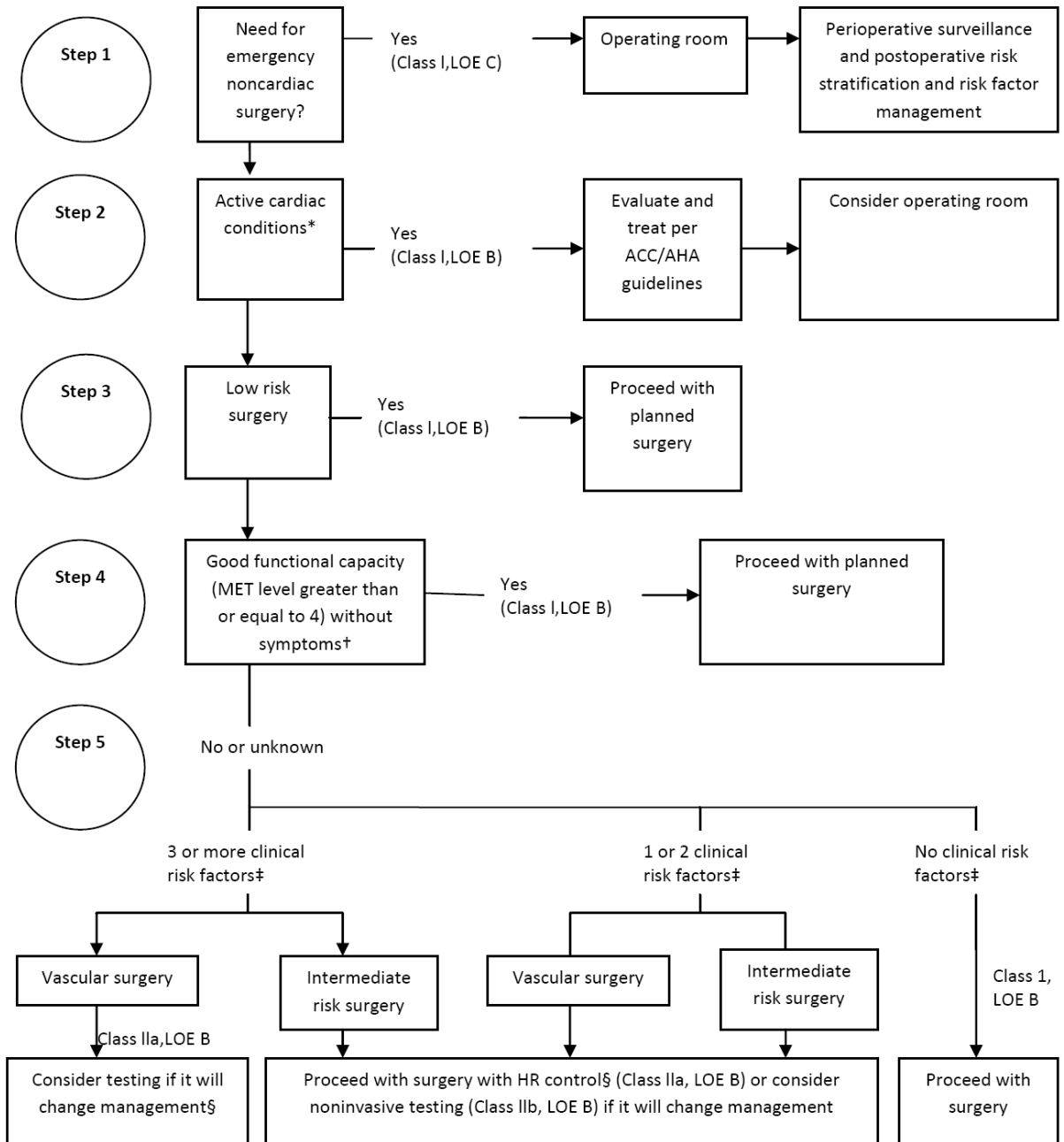


Figure 1. Cardiac evaluation and care algorithm for noncardiac surgery based on active clinical conditions, known cardiovascular disease, or cardiac risk factors for patients 50 years of age or greater. *See Table 1 for active clinical conditions. †See Table 2 for estimated MET level equivalent. ‡Clinical risk factors include ischemic heart disease, compensated or prior HF, diabetes mellitus, renal insufficiency, and cerebrovascular disease. §Consider perioperative beta blockade (see Table 11) for populations in which this has been shown to reduce cardiac morbidity/mortality. ACC/AHA indicates American College of Cardiology/American Heart Association; HR, heart rate; LOE, level of evidence; and MET, metabolic equivalent.

Figure 1 presents, in algorithmic form, a framework for determining which patients are candidates for cardiac testing.

Step 1: The consultant should determine the urgency of noncardiac surgery.

Step 2: Does the patient have 1 of the active cardiac conditions in Table 2? If not, proceed to step 3.

In patients being considered for elective noncardiac surgery, the presence of unstable coronary disease, decompensated HF, or severe arrhythmia or valvular heart disease usually leads to cancellation or delay of surgery until the cardiac problem has been clarified and treated appropriately.

Step 3: Is the patient undergoing low-risk surgery? Many procedures are associated with a combined morbidity and mortality rate less than 1%, even in high-risk patients. Therefore, interventions based on cardiovascular testing in stable patients would rarely result in a change in management, and it would be appropriate to proceed with the planned surgical procedure.

Step 4: Does the patient have good functional capacity, without symptoms? Functional status has been shown to be reliable for perioperative and long-term prediction of cardiac events.

Step 5: If the patient has poor functional capacity, is symptomatic, or has unknown functional capacity, then the presence of clinical risk factors will determine the need for further evaluation.

- If the patient has no clinical risk factors, then it is appropriate to proceed with the planned surgery, and no further change in management is indicated.
- If the patient has 1 or 2 clinical risk factors, then it is reasonable to either proceed with the planned surgery, with heart rate control with beta blockade, or consider testing if it will change management.
- In patients with 3 or more clinical risk factors, the surgery-specific cardiac risk is important. The surgery specific cardiac risk (Table 3) of non-cardiac surgery is related to 2 important factors.
- If the patient is undergoing vascular surgery, testing should only be considered if it will change management.
- For nonvascular surgery, the degree of hemodynamic cardiac stress dictates the surgery-specific risk. In these patients who are considered ready to undergo intermediate-risk surgery, proceeding with the planned surgery with tight heart rate control with beta blockade or further cardiovascular testing if it will change management.

2. Preoperative Evaluation

2.1 Assessment of LV Function

Recommendations for Preoperative Noninvasive Evaluation of LV Function

CLASS IIa

1. It is reasonable for patients with dyspnea of unknown origin to undergo preoperative evaluation of LV function. (*Level of Evidence: C*)
2. It is reasonable for patients with current or prior HF with worsening dyspnea or other change in clinical status to undergo preoperative evaluation of LV function if not performed within 12 months. (*Level of Evidence: C*)

CLASS IIb

1. Reassessment of LV function in clinically stable patients with previously documented cardiomyopathy is not well established. (*Level of Evidence: C*)

CLASS III

1. Routine perioperative evaluation of LV function in patients is not recommended. (*Level of Evidence: B*)

2.2. Assessment of Risk for CAD and Assessment of Functional Capacity

The 12-Lead ECG

Recommendations for Preoperative Resting 12-Lead ECG

CLASS I

1. Preoperative resting 12-lead ECG is recommended for patients with at least 1 clinical risk factor* who are undergoing vascular surgical procedures. (*Level of Evidence: B*)
2. Preoperative resting 12-lead ECG is recommended for patients with known CHD, peripheral arterial disease, or cerebrovascular disease who are undergoing intermediate-risk surgical procedures. (*Level of Evidence: C*)

CLASS IIa

1. Preoperative resting 12-lead ECG is reasonable in persons with no clinical risk factors who are undergoing vascular surgical procedures. (*Level of Evidence: B*)

CLASS IIb

1. Preoperative resting 12-lead ECG may be reasonable in patients with at least 1 clinical risk factor who are undergoing intermediate-risk operative procedures. (*Level of Evidence: B*)

CLASS III

1. Preoperative and postoperative resting 12-lead ECGs are not indicated in asymptomatic persons undergoing low-risk surgical procedures. (*Level of Evidence: B*)

2.2.1 Noninvasive Stress Testing

Recommendations for Noninvasive Stress Testing Before Noncardiac Surgery

CLASS I

1. Patients with active cardiac conditions (see Table 2) in whom noncardiac surgery is planned should be evaluated and treated per ACC/AHA guidelines[†] before noncardiac surgery. (*Level of Evidence: B*)

CLASS IIa

1. Noninvasive stress testing of patients with 3 or more clinical risk factors and poor functional capacity (less than 4 METs) who require vascular surgery[‡] is reasonable if it will change management. (*Level of Evidence: B*)

CLASS IIb

1. Noninvasive stress testing may be considered for patients with at least 1 to 2 clinical risk factors and poor functional capacity (less than 4 METs) who require intermediate-risk noncardiac surgery if it will change management. (*Level of Evidence: B*)
2. Noninvasive stress testing may be considered for patients with at least 1 to 2 clinical risk factors and good functional capacity (greater than or equal to 4 METs) who are undergoing vascular surgery. (*Level of Evidence: B*)

CLASS III

1. Noninvasive testing is not useful for patients with no clinical risk factors undergoing intermediate-risk noncardiac surgery. (*Level of Evidence: C*)
2. Noninvasive testing is not useful for patients undergoing low-risk noncardiac surgery. (*Level of Evidence: C*)

Preoperative assessments of patients especially in the Anaesthesia Clinic based on:

Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery ***The ACC/AHA Guidelines 2007*** A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 2002 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery)

APPENDIX 5.7

PREOPERATIVE ASSESSMENT AND PREPARATION OF PATIENTS WITH PERCUTANEOUS CORONARY INTERVENTION (PCI)



PREOPERATIVE ASSESSMENT AND PREPARATION
OF PATIENTS WITH PERCUTANEOUS CORONARY
INTERVENTION (PCI)

Preanaesthesia Assessment & Preparation of Patients with Recent Coronary Artery Stents – Percutaneous Coronary Intervention (PCI) Requiring Non Cardiac Surgery

Perioperative Concerns:

Perioperative stent thrombosis is a life-threatening complication for patients with either bare-metal (BMS) or drug-eluting stents (DES). There is a need to balance the risks of bleeding vs perioperative stent thrombosis (ST).

Regarding perioperative approach in patients with coronary stents there is no accepted standard or optimal approach for management. The key questions in such patients during pre anaesthesia evaluation are:

- When was the PCI done?
- What is the type of stent?
- How many stents were placed?
- Was the revascularisation complete?
- Drug regime and any irregularities of the treatment?
- History of any adverse cardiac event/stent thrombosis?
- Urgency of surgery? Can the surgery be delayed?
- Bleeding risk during surgery?
- History of conditions prone to stent thrombosis?
- Whether antiplatelet medication is to be maintained in perioperative period or stopped before operation?

Antiplatelet Therapy and Timing of Noncardiac Surgery:

At present, there is no definitive standard of care for the management of surgical patients with coronary artery stents. The 2007 AHA/ACC/Society for Cardiovascular Angiography and Interventions/American College of Surgeons/American Dental Association Science Advisory concluded that premature discontinuation of dual-antiplatelet therapy markedly increases the risk of catastrophic stent thrombosis, MI, and death. They recommend postponing all elective procedures for which there is a significant risk of bleeding until dual-antiplatelet therapy is completed.

Table 1. Duration of Antiplatelet Therapy and Timing of Noncardiac Surgery

Dilatation without stenting	2–4 weeks of dual-antiplatelet therapy
	Surgery postponed for 2–4 weeks (vital surgery only)
PCI and BMS	4–6 weeks minimum of dual-antiplatelet therapy
	Elective surgery postponed ≥ 6 weeks, but not for more than 12 weeks, when restenosis may begin to occur
PCI and DES	12 months of dual-antiplatelet therapy
	Elective surgery postponed for ≥ 12 months
In patients in whom coronary revascularization with PCI is appropriate for mitigation of cardiac symptoms and who need elective noncardiac surgery in the subsequent 12 months, it is recommended to do balloon angioplasty or BMS placement followed by 4 to 6 weeks of dual-antiplatelet therapy.	
Aspirin :- lifelong therapy, whichever is the revascularisation technique	

(From 2007 AHA/ACC Science Advisory and Society of Cardiovascular Angiography DES Task Force Recommendations for Timing of Noncardiac Surgery after PCI and 2007 ACC/AHA Recommendations for Preoperative Coronary Revascularization and Chassot P-G, Delabays A, Spahn DR. Perioperative antiplatelet therapy: the case for continuing therapy in patients at risk of myocardial infarction. Br J Anaesth 2007;99:316 –328).

PCI =percutaneous coronary intervention; BMS =bare-metal stent; DES =drug-eluting stent

Table. 2 Factors Increasing the Risk of Stent Thrombosis with Drug – Eluting Stents.

- Stent(s) implanted in the left main coronary artery
 - Stent(s) implanted in bifurcations or crossing arterial branch points
 - Greater total stent length (multiple stents and/or overlapping stents)
 - Noncardiac surgery because of the prothrombotic state induced by surgery
 - Surgery early after stent implantation because stent endothelialisation may not yet be complete at the time of surgery
 - Preoperative discontinuation of dual-antiplatelet therapy
 - Flow dynamics suggests that longer and smaller diameter stents, as well as those placed at bifurcations, are at an increased risk of thrombosis
 - Heightened platelet activity (surgery, malignancies, diabetes)
 - In-stent restenosis
 - Left ventricular dysfunction
 - Localized hypersensitivity vasculitis (possibly to the stent polymer or antiproliferative drug)
 - Penetration by stent into necrotic core
 - Plaque disruption into non-stented segment
 - Renal failure/insufficiency
 - Diabetes
 - Resistance to antiplatelet medications
 - Inappropriate discontinuation of antiplatelet drug therapy.
-

Preoperative Evaluation in Patients with Coronary Artery Stents

Important aspects of the preoperative assessment are included in Table 3.

Table. 3

1	Determine the type of stent(s): BMS, SES, PES
2	When were stent(s) implanted?
3	Determine location of stent(s) in coronary circulation
4	How complicated was the revascularization (longer length, overlapping stents)
5	Were there any complications during the revascularization (i.e., malapposition)?
6	Is there a previous history of stent thrombosis?
7	What antiplatelet regimen is being followed?
8	Determine patient's comorbidities, if any, to further ascertain level of risk (ejection fraction, diabetes, renal insufficiency) see Table 2
9	What is the recommended duration of dual-antiplatelet therapy for that specific patient?
10	Consultation with an interventional cardiologist, or preferably, patient's cardiologist to elucidate procedural complexities, review current antiplatelet management, and discuss optimal patient management strategy

BMS = bare-metal stent;

DES = drug-eluting stent;

PES = paclitaxel-eluting stent;

SES = sirolimus-eluting stent.

Backup Medical Services in Anticipation of Perioperative Stent Thrombosis :-

Definitive care is immediate percutaneous coronary intervention.

24-hour access to an interventional cardiology suite should be readily available.

Approach to a patient for major surgery following recent coronary artery stenting

Regarding perioperative approach in patients with coronary stents, there is no accepted standard or optimal approach for management. Multidisciplinary discussion between the cardiologist, surgeon, anaesthesiologist and haematologist should take place.

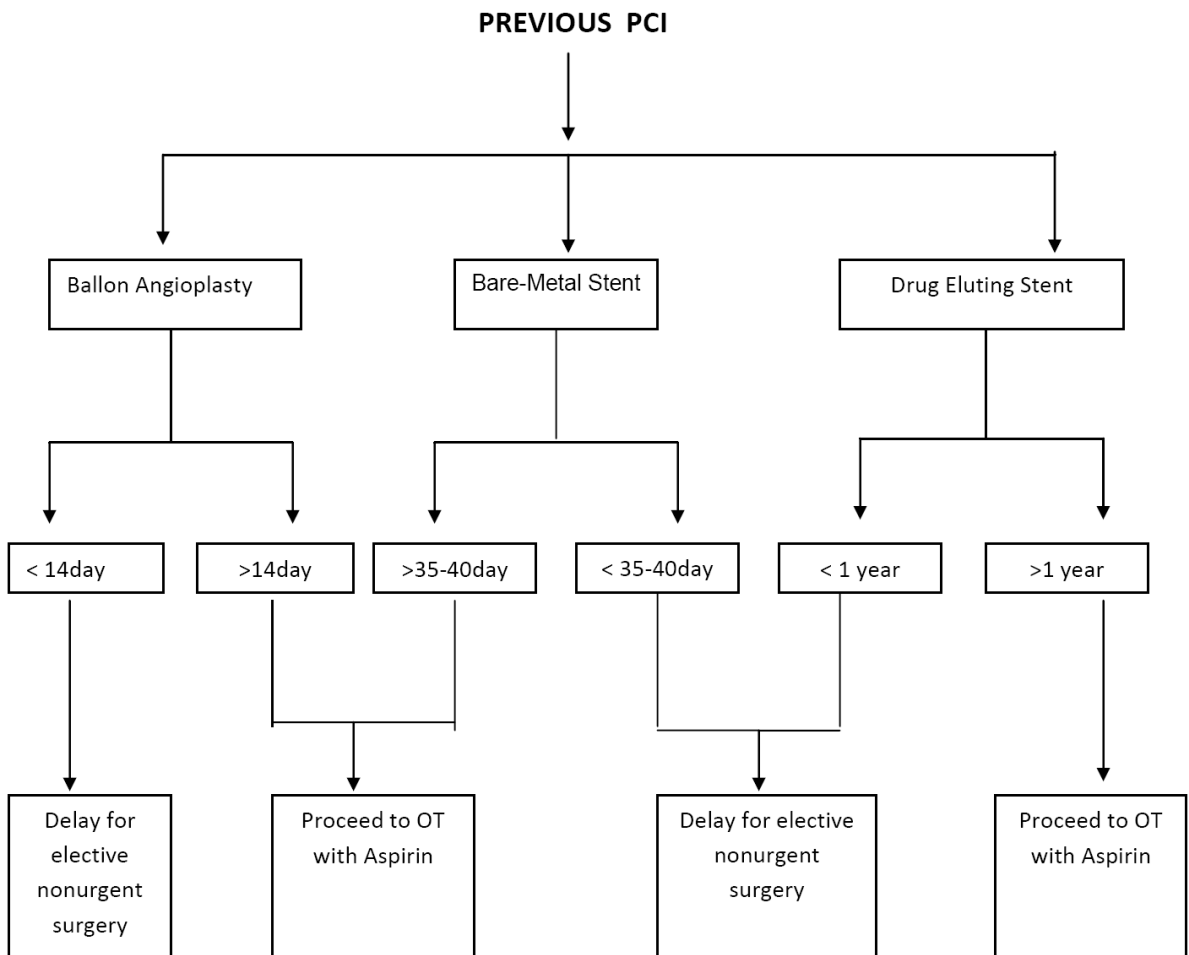
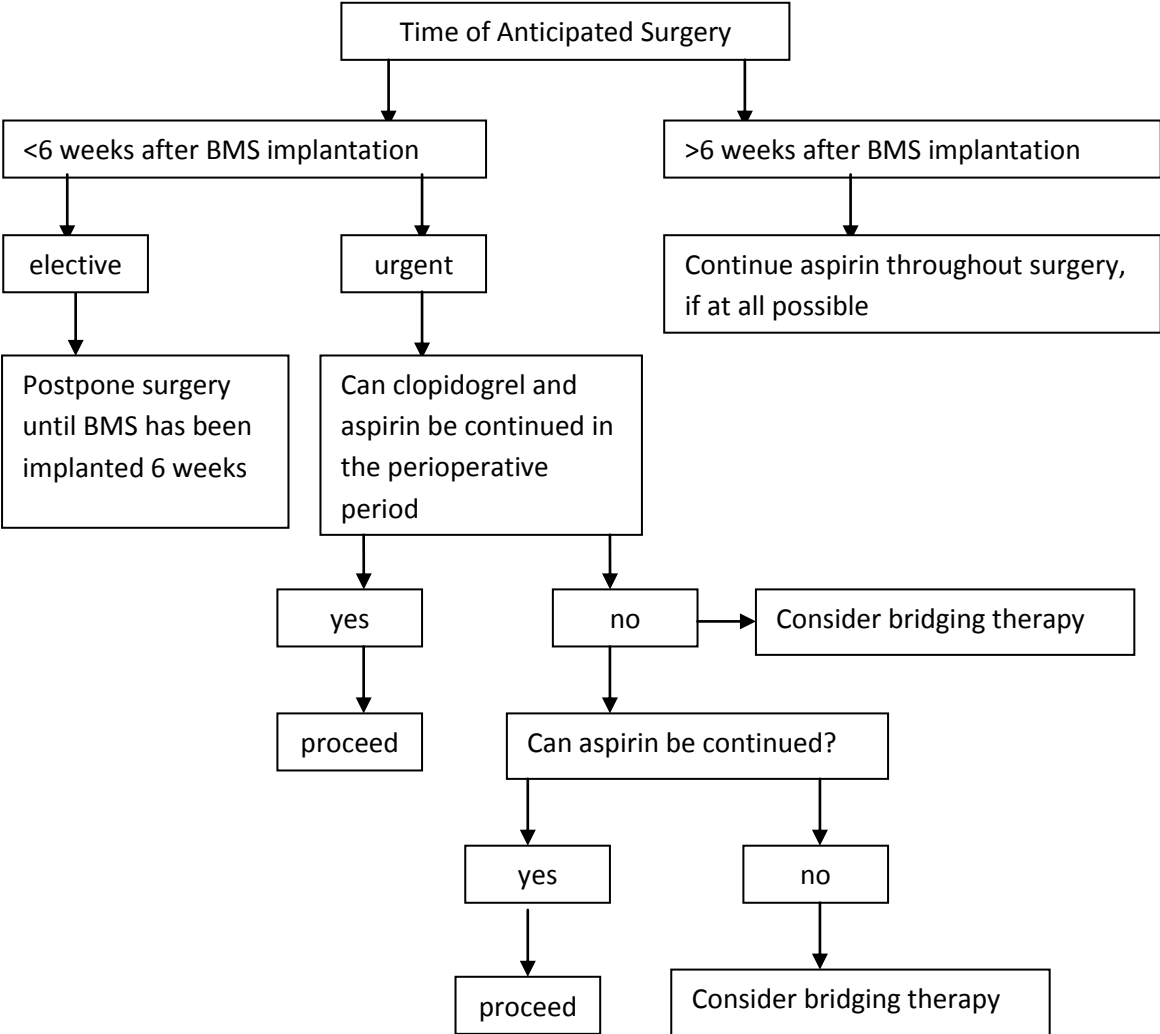


Figure 1. Proposed Approach to the Management of Patients with previous PCI who require noncardiac surgery. ACC/AHA 2007 Perioperative Guidelines

Proposed algorithm for perioperative management of patients with Bare-Metal Stents (BMS).



- Perform surgery where 24 hour interventional cardiology coverage is available.
- Restart clopidogrel/aspirin as soon as possible after surgery

Figure 2. Proposed algorithm for perioperative management of patients with bare-metal stents based on current literature.

*The 2007 ACC/AHA perioperative guidelines state, “it appears reasonable to delay elective noncardiac surgery for 4–6 weeks to allow for at least partial endothelialisation of the stent, but not for more than 12 weeks, when restenosis may occur.”

Proposed algorithm for perioperative management of patients with Drug-Eluting Stents (DES).

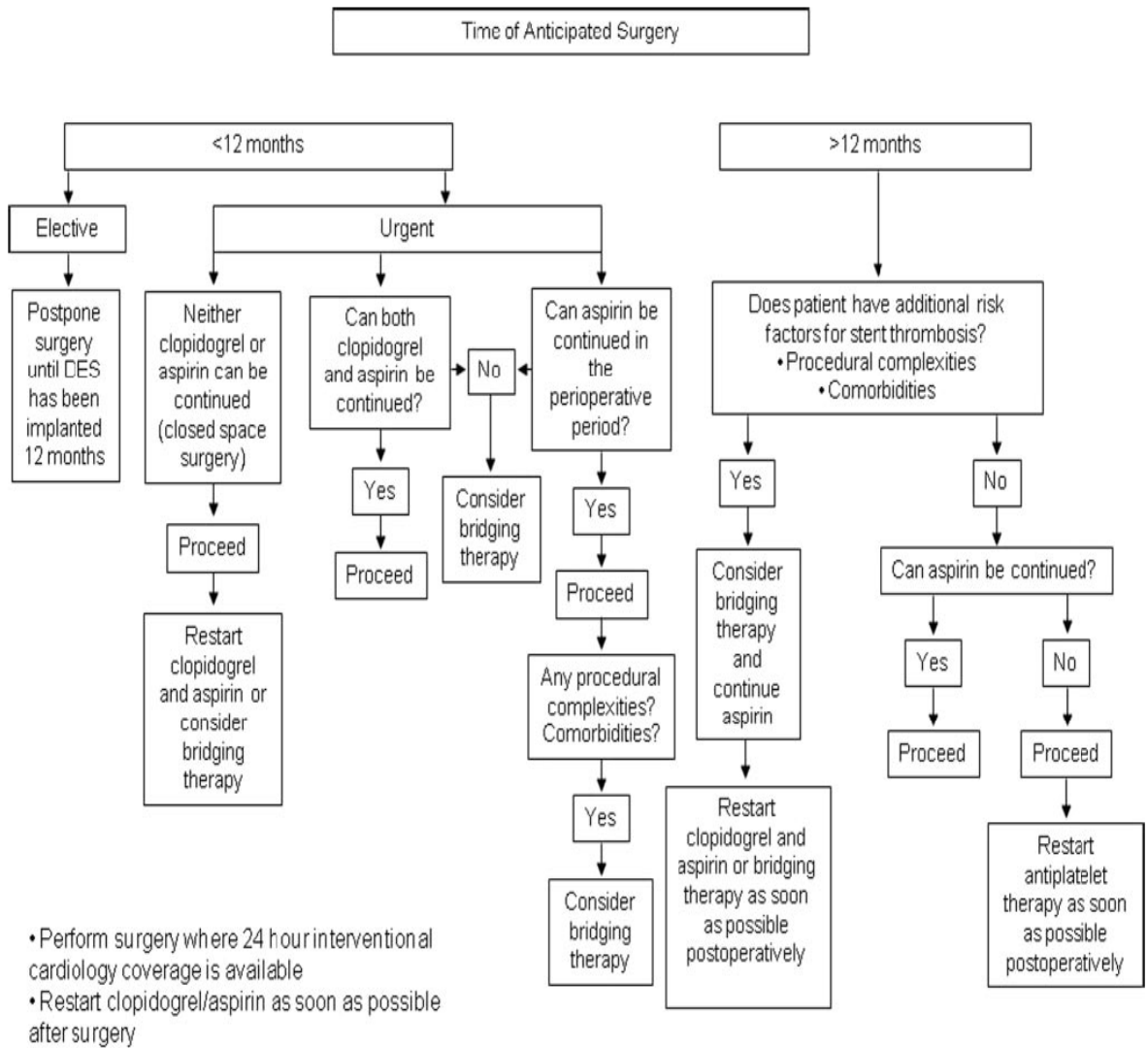


Figure 3. Proposed algorithm for perioperative management of patients with drug-eluting stents based on current literature.

Algorithm for elective surgical procedure

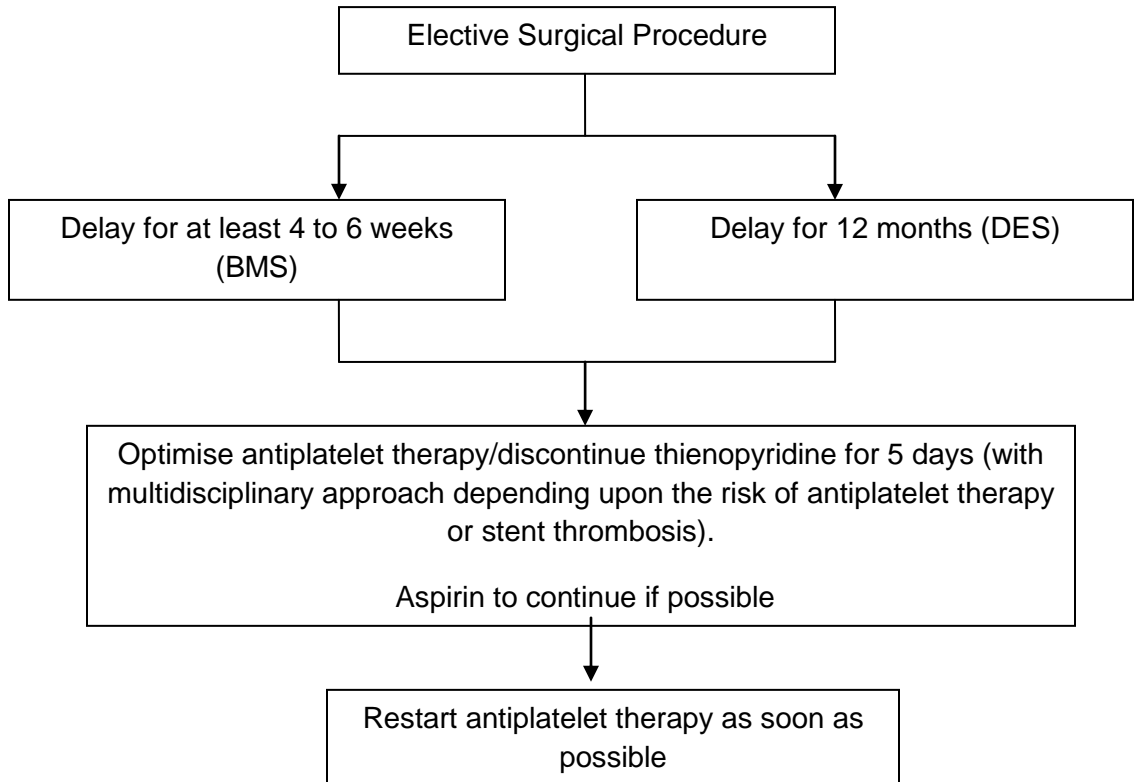


Figure 4. Algorithm for Elective Surgical Procedures

It is the consensus that all elective procedures should be delayed for at least 4-6 weeks in patients who have received BMS.

Preanaesthetic evaluation for elective surgery in patients with DES plays a significant role in decision making and risk assessment.

Earlier reports suggested that if there is no major risk of bleeding, all elective surgeries within 6 months after DES implantation should be managed similar to urgent surgery.

However the current consensus is that elective surgeries should be delayed for 12 months after DES placement.

Algorithm for urgent surgical procedure in patients with Drug-Eluting Stent

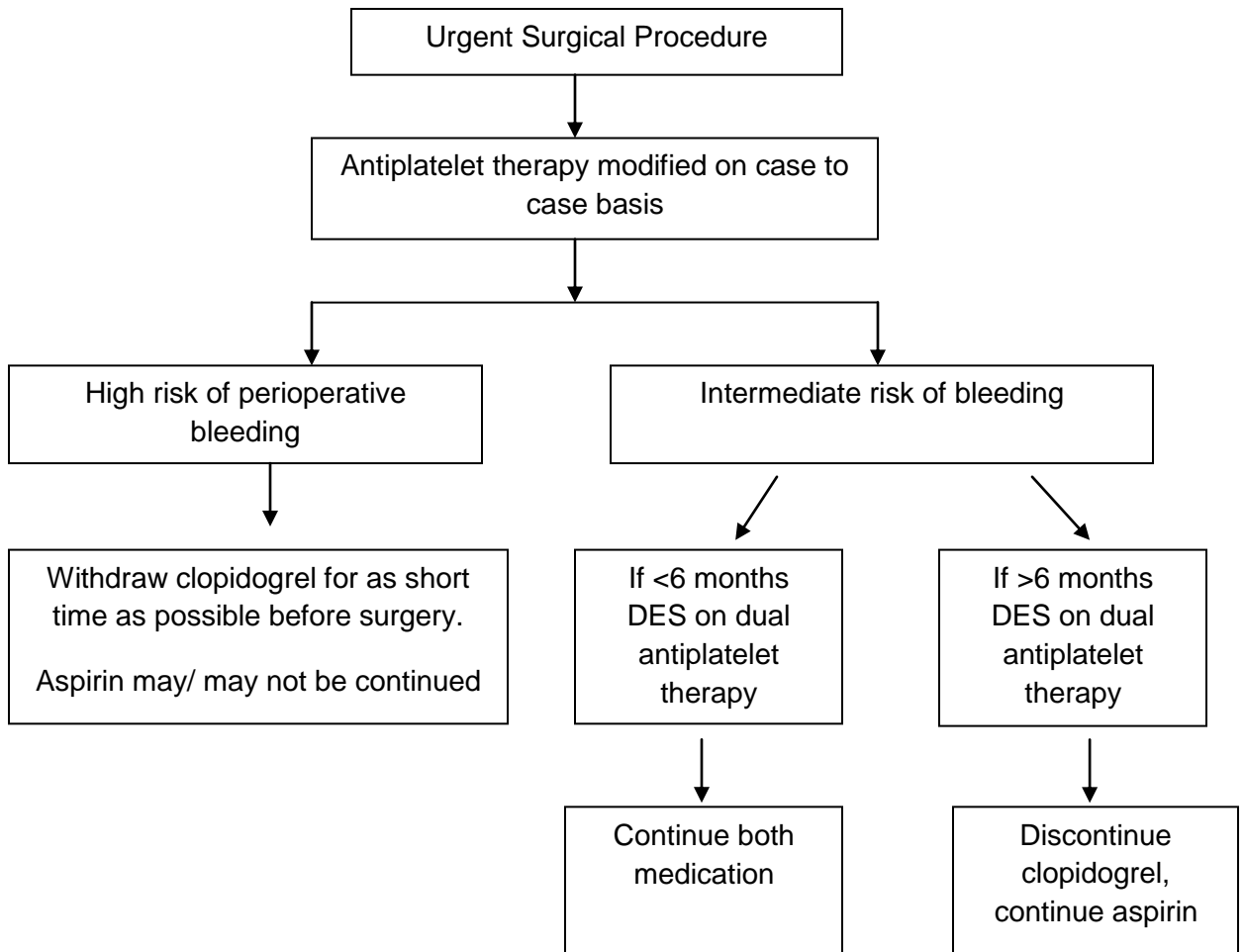


Figure 5. Algorithm For Urgent Surgical Procedures in Patients with Drug-Eluting Stent

For urgent surgical procedures:

- Modification of antiplatelet medication should be individualised.
- When there is high risk of bleeding, as per latest guidelines, clopidogrel should be withheld for as short period as possible and restarted as soon as possible though the earlier recommendations were to stop for at least 5 days before surgery (Fig 5).
- Continuation of aspirin should be based on the nature of surgery. If there is intermediate risk of bleeding and the length of dual antiplatelet medication is less than 6 months, continue both medications; if more than 6 months, discontinue clopidogrel and continue aspirin.

Table. 4. ACC/AHA Science advisory Panel Recommendations

ACC/AHA Science advisory Panel Recommendations:

Consider use of bare-metal stents or balloon angioplasty rather than drug-eluting stents in patients due to undergo noncardiac surgery within 12 months.

Healthcare providers to only discontinue antiplatelet therapy after discussion with the patients' cardiologist.

Patient education to ensure patients understand the need for continuous anti-platelet therapy and the risks of premature discontinuation.

Postpone elective procedures with a significant bleeding risk for 12 months after stenting.

For patients with DES where clopidogrel must be discontinued, continue aspirin, restarting clopidogrel as soon as possible after the procedure.

Concepts about regional anaesthesia:

- In patients with coronary artery stents, particularly DES, the use of regional anesthesia (RA), particularly neuraxial blockade, attenuates the hypercoagulable perioperative state by blunting the sympathetic response
- Dual antiplatelet therapy presents problems for regional anaesthesia.
- The placement of neuraxial block in patients taking dual antiplatelet therapy should follow the Guidelines for Regional Anesthesia in the Patient Receiving Antithrombotic or Thrombolytic Therapy American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (Third Edition) ASRA.
 - Clopidogrel should be stopped for minimum of 7 days and ticlopidine for a minimum of 14 days.
 - The timing of the removal of epidural catheter and early re-instatement of the antiplatelet therapy must be considered. Current ASRA guidelines recommend removal of an epidural catheter 1 h before administration of UFH, and 2 h before LMWH
 - Delaying start of dual antiplatelet therapy in a patient of neuro-axial catheter removal may expose the patient to an unacceptable risk of stent thrombosis.
 - Aspirin and NSAID do not represent an additional risk of spinal haematoma, in patients receiving spinal or epidural anaesthesia.

CONCLUSION

- The management of patients with coronary artery stents during the perioperative period is an important patient safety issue.
- Figures 1 and 2 present recommendations based on the currently available literature. Communication between the patient's cardiologist, surgeon, and anaesthesiologist is essential to minimise the risk of catastrophic stent thrombosis, MI, and death.
- Elective surgery should be avoided until the appropriate course of dual antiplatelet therapy is completed, as determined by the patient's cardiologist.
- Clinical judgment is of utmost importance in balancing the risk/benefit ratio of dual-antiplatelet therapy interruption versus continuation.
- Aspirin should never be interrupted unless the risk of bleeding far outweighs the risk of stent thrombosis.
- Surgical procedures should be performed where 24-hour interventional cardiology is available, as perioperative stent thrombosis acutely results in cardiogenic shock/arrest requiring emergent PCI.

REFERENCES

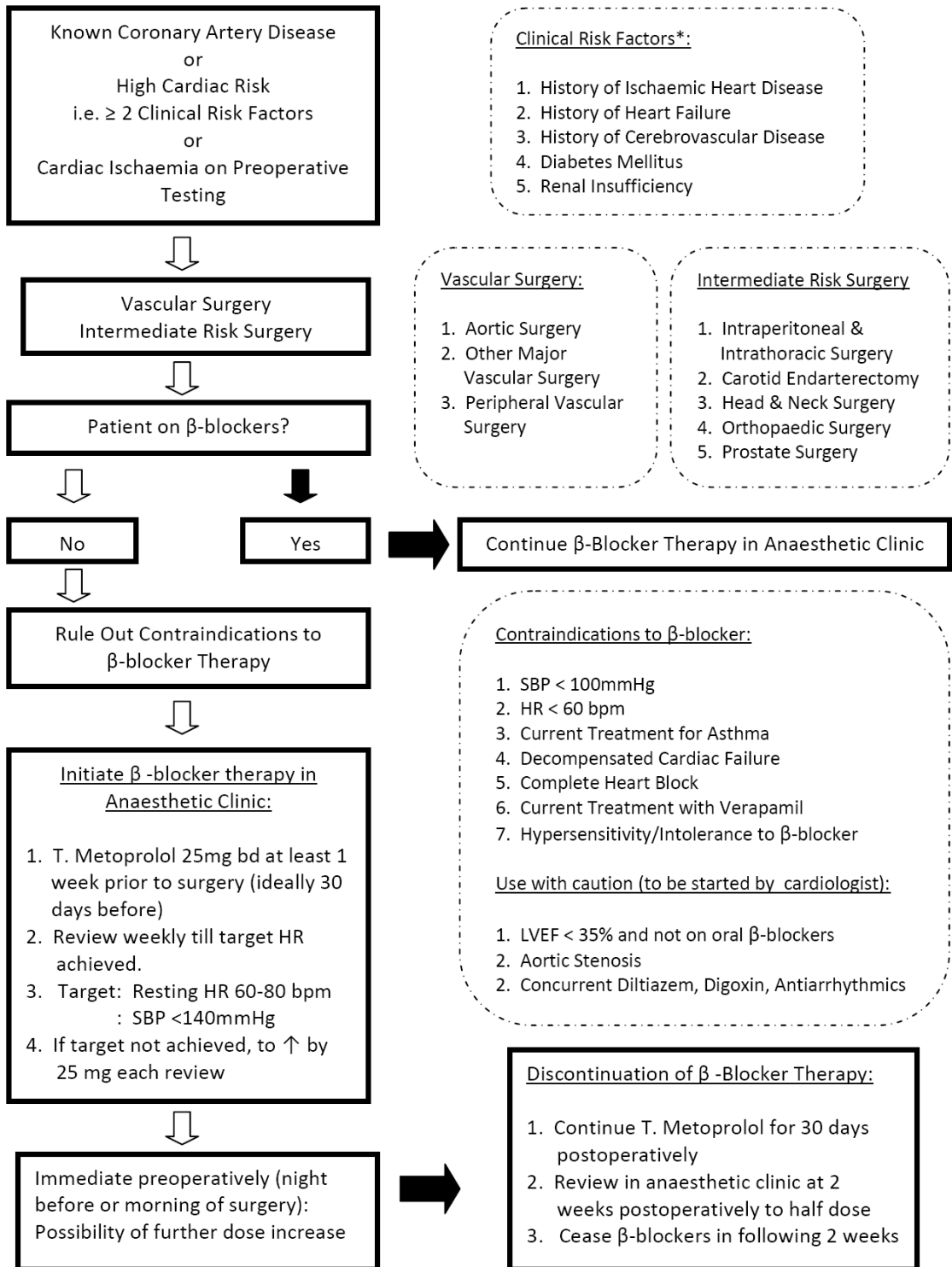
1. Lisa T. Newsome, Robert S. Weller, J. C. Gerancher, Michael A. Kutcher, Roger L. Royster Coronary Artery Stents: II. Perioperative Considerations and Management.
2. Kiran Usha et al. Recent coronary stent and major surgery Indian Journal of Anaesthesia, October PG Issue 2009.
3. From 2007 AHA/ACC Science Advisory and Society of Cardiovascular Angiography DES Task Force Recommendations for Timing of Noncardiac Surgery after PCI and 2007 ACC/AHA Recommendations for Preoperative Coronary Revascularization and Chassot P-G, Delabays A, Spahn DR. Perioperative antiplatelet therapy: the case for continuing therapy in patients at risk of myocardial infarction. *Br J Anaesth* 2007;99:316–328.
4. Fleisher LA, Beckman JA, Brown KA, Calkins H, Chaikof E, Fleishmann KE, Freeman WK, Froehlich JB, Kasper E, Kersten JR, Riegel B, Robb JF. ACC/AHA 2007 Guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery. A report of the American College of Cardiology/American Heart Association TaskForce on Practice Guidelines (Writing Committee to Revise the 2002 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery). *Circulation* 2007;116: e418–99.
5. Grines CL, Bonow RO, Casey DE Jr, Gardner JT, Lockhart PB, Moliterno DJ, O’Gara P. Whitlow P. AHA/ACC/SCAI/ ACS/ADA Science Advisory. Prevention of premature discontinuation of dual antiplatelet therapy in patients with coronary artery stents. A science advisory from the American Association, American College of Cardiology Society of Cardiovascular Angiography and Interventions, American College of Surgeons, and American Dental Association, with representation from the American College of Physicians. *Circulation* 2007;115:813–18.
6. Eagle KA, Berger PB, Calkins H, Chaitman BR, Ewy GA, Fleischmann KE, Fleisher LA, Froehlich JB, Gusberg RJ, Leppo JA, Ryan T, Schlant RC, , Smith SC Jr. American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1996 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery). ACC/AHA guideline update for perioperative cardiovascular evaluation for noncardiac surgery— executive summary. *Circulation* 2002;105:1257–67.
7. Regional Anesthesia in the Patient Receiving Antithrombotic or Thrombolytic Therapy American Society of Regional Anesthesia and Pain Medicine Evidence-Base Guidelines (Third Edition).

APPENDIX 5.8

PREOPERATIVE CARDIAC RISK REDUCTION STRATEGIES



Perioperative β -Blocker Guidelines



HR – Heart Rate SBP – Systolic Blood Pressure bpm = beats per minute

Definition:

* Clinical Risk Factors:

1. History of Ischaemic Heart Disease defined as:

- History of myocardial infarction or positive treadmill test
- Use of nitroglycerin
- Current complains of chest pain thought to be secondary to ischaemia
- ECG with abnormal Q waves
- Previous PCI or CABG

2. History of Heart Failure defined as:

- History of heart failure or pulmonary oedema
- Signs & symptoms of heart failure
 - Paroxysmal nocturnal dyspnea
 - Peripheral oedema
 - Bilateral crepitations
 - Third heart sound
 - X-ray with pulmonary vascular redistribution.

3. History of Cerebrovascular Disease defined as:

- History of transient ischaemic attack or stroke

4. Diabetes Mellitus with or without preoperative insulin therapy

5. Renal Insufficiency with preoperative serum creatinine > 175µmol/L

Perioperative Cardiac Risk Reduction Protocol – β -blockers – The details

1. Review Indication:

Known Coronary Artery Disease or High Cardiac Risk i.e. ≥ 2 Clinical Risk Factors or Cardiac Ischaemia on Preoperative Testing undergoing Vascular or Intermediate-Risk Surgery. Refer flow chart (Page 1) and Page 2 for details.

2. Exclude Contraindications:

- SBP < 100mmHg
- HR < 60 bpm
- Current Treatment for Asthma
- Decompensated Cardiac Failure
- Complete Heart Block
- Current Treatment with Verapamil
- Hypersensitivity/Intolerance to β -blocker

Caution in (to be initiated by cardiologist):

- LVEF < 35% and not on oral β -blockers
- Aortic Stenosis
- Concurrent Diltiazem, Digoxin, Antiarrhythmics

3. Initiating β -blocker Therapy:

- In β -blocker naïve patients, initiate T. Metoprolol 25mg bd at least 1 week prior to surgery (ideally 30 days before).
- Review weekly till target HR achieved.
- Target : Resting HR 60-80 bpm
 : SBP <140mmHg
- If target not achieved, to increase by 25 mg each review
- Card to patient - number/person to call in the case of life-threatening side effects
 - Date of commencement
 - Date of adjustment of dose & the dosage
 - Date of operation
 - Date of postoperative dose reduction
 - Date of discontinuation

- Also attach card to GA Form and patient's notes (Total 3 similar cards)
 - Advise patient regarding β -blocker treatment & its adverse effects:
 - Dizziness, lightheadedness
 - Wheezing, trouble breathing, shortness of breath
 - Swollen or cold hands and feet
- Continue β -blocker therapy if patient is already on β -blocker.

4. Monitoring:

- During preoperative review, to recheck target heart rate and blood pressure.
- Possibility of further dose increase.

5. Postoperative:

- Restart β -blockers as soon as condition permits.
- Continue for 30 days postoperatively.

6. Complications & Side Effects:

- Dizziness, lightheadedness
- Fatigue, tiredness
- Bronchospasm
- Swollen or cold hands and feet
- Allergic Reaction

Card Sample

Date of commencement :

Date of adjustment of dose & the dosage:

Date of operation:

Date of postoperative dose reduction :

Date of discontinuation :

Perioperative Cardiac Risk Reduction – β -blockers

Number to call in the case of the following symptoms:

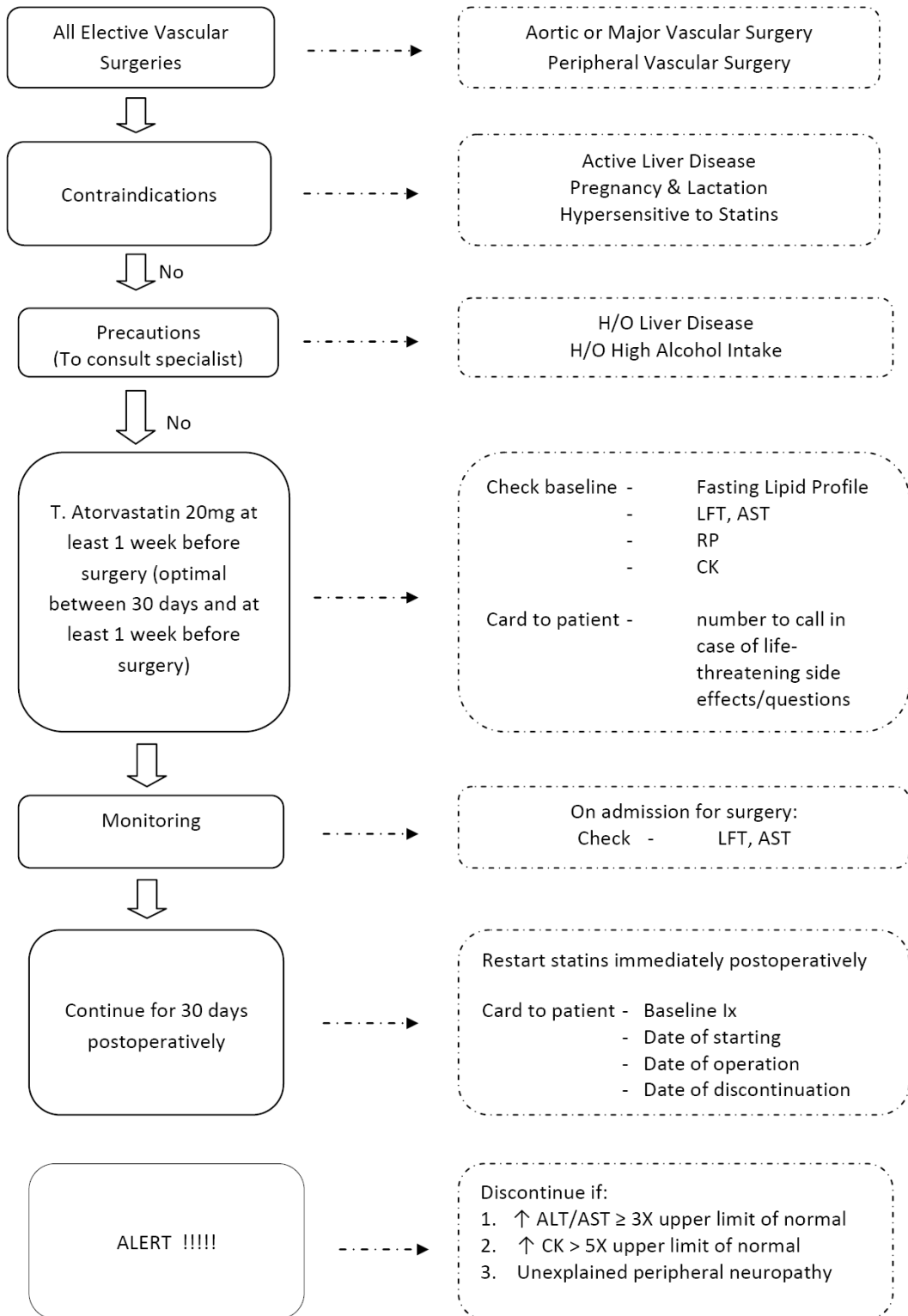
1. Dizziness, lightheadedness
2. Wheezing, trouble breathing, shortness of breath
3. Swollen hands or feet

Office hours (0800-1700Hr)	After office hours (1700-0800Hr)
Anaesthetic Clinic Number	Hospital general line Request to connect to on- call anaesthetic specialist

References:

1. 2009 ACCF/AHA Focused Update on Perioperative Beta Blockade. JACC 2012.
2. ACC/AHA 2007 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery. JACC 2007;50;17; 159-241.
3. Guidelines for pre-operative cardiac risk assessment and perioperative cardiac management in non-cardiac surgery. European Heart Journal 2009; 30: 2769-2812.
4. Dunkelgrun et al. Bisoprolol and fluvastatin for reduction of perioperative cardiac mortality and Myocardial infarction in intermediate-risk patients undergoing noncardiac surgery. A randomized controlled trial. (DECREASE IV). Ann Surg 2009; 100: 1043-1049.
5. Auckland City Hospital β -blocker guidelines.

Perioperative Statin Guidelines – Flow Chart



Perioperative Cardiac Risk Reduction Protocol – Statins – The details

1. Review Indication:

- All Elective Vascular Surgeries – Aortic or Major Vascular Surgeries
- Peripheral Vascular Surgeries

2. Exclude Contraindications:

- Active liver disease
- Pregnancy & lactation
- Hypersensitive to statins

Caution in (to consult with specialist)

- History of liver disease
- History of high alcohol intake

3. Initiating Statins Treatment:

- Check baseline
 - Fasting Lipid profile (FLP)
 - LFT, AST
 - RP
 - CK
- Card to patient - number/person to call in the case of life-threatening side effects
- Advise patient regarding statin treatment & its adverse effects
 - statins should be taken in the evening for maximal effect
 - they should seek medical advice if they develop muscle symptoms (pain, tenderness or weakness). If this occurs, CK should be measured.
- Initiate T. Atorvastatin 20mg ON at least 1 week before surgery. Optimal time is between 30 days and at least 1 week before surgery.

- Serve statin on the evening before surg. Do not discontinue statins as it may cause a rebound effect on cardiovascular risks.
- There is inadequate data on the use of statins in emergency surgery yet.
- For patients currently taking statins, statins should be continued.

4. **Monitoring:**

- On admission for surgery:
 - Check - LFT
 - CK in the presence of definite unexplained muscle symptoms (pain, tenderness, weakness)
 - Enquire about adverse effects

5. **Postoperative:**

- Restart statins immediate postoperatively (withholding statins for > 4 days has been shown to have rebound effect on cardiovascular risks perioperatively)
- Continue for 30 days postoperatively
- Card to patient
 - Baseline Investigations
 - Date of commencement
 - Date of operation
 - Date of discontinuation of statins – patient to discontinue according to dates

6. **Discontinue statins if:**

- Increase in serum ALT or AST $\geq 3x$ upper limit of reference range
- Increase in CK to $> 5x$ upper limit of reference range
- Unexplained peripheral neuropathy

7. Complications & Side Effects:

***** 2 important side effects – Increase in Transaminases & Rhabdomyolysis *****

- Gastrointestinal symptoms
 - Abdominal pain
 - Constipation
 - Flatulence
 - Nausea & Vomiting
 - Diarrhoea
- Biochemical profile
 - **Increase liver transaminases (ALT/AST)**
 - Increase CK
- Muskuloskeletal symptoms
 - Myositis - muscle pain + increase in CK > 10x upper limit of normal
 - Myopathy – any complaint coincident with start of therapy
 - Myalgia- CK Normal
 - **Rhabdomyolysis *****
- Others
 - Itchiness
 - Rash & Hypersensitivity - rare
 - Arthralgia
 - Insomnia, Headache

8. Drug Interactions:

- Cyclosporin A
- Gemfibrozil
- Antifungal
- Macrolides
- Warfarin
- Digoxin

Card Sample

Perioperative Cardiac Risk Reduction – Statins

Date of commencement:

Date of operation :

Date of discontinuation:

	Baseline	On admission
BU/Creatinine		
ALT/AST		
CK		
FLP		

HKL Peri-operative Cardiac Risk Reduction – Statins

Number to call in the case of the following symptoms:

1. Muscle pain, tenderness, weakness
2. Right upper abdominal pain/tenderness

Office hours (0800-1700Hr)	After office hours (1700-0800Hr)
Anaesthetic Clinic Number	General Hospital Line Request to connect to on- call anaesthesiologist

References

- *ACC/AHA 2007 Perioperative Guidelines*
- *European Society of Cardiology Guidelines for pre-operative cardiac risk assessment and perioperative cardiac management in non-cardiac surgery*
- D.W. Schneck, R.H. Knopp, C.M. Ballantyne, R. McPherson, R.R. Chitra and S.G. Simonson, Comparative effects of rosuvastatin and atorvastatin across their dose ranges in patients with hypercholesterolemia and without active arterial disease. *Am J Cardiol* 91 (2003), pp. 33–41
- *Pre-operative risk assessment and risk reduction before surgery. J Am Coll Cardiol* 2008;51:1913-1924. Poldermans et al
- *Improved postoperative outcomes associated with preoperative statin therapy. Anesthesiology* 2006;105:1260-1272. quiz 1289–1290.
- *Fluvastatin XL use is associated with improved cardiac outcome after major vascular surgery. Results from a randomized placebo controlled trial: DECREASE III. Eur Heart J* 2008;29 Schouten et al
- *Effect of statin withdrawal on frequency of cardiac events after vascular surgery. Am J Cardiol* 2007;100:316-320. Schouten et al
- Lindenauer PK, Pekow P, Wang K, Gutierrez B, Benjamin EM. Lipid-lowering therapy and in-hospital mortality following major noncardiac surgery. *JAMA*. 2004; 291: 2092–9.
- Poldermans D, Bax JJ, Kertai MD, et al. Statins are associated with a reduced incidence of perioperative mortality in patients undergoing major noncardiac vascular surgery. *Circulation*. 2003; 107: 1848–51.
- O'Neil-Callahan K, Katsimaglis G, Tepper MR, et al. Statins decrease perioperative cardiac complications in patients undergoing noncardiac vascular surgery: the Statins for Risk Reduction in Surgery (StaRRS) study. *J Am Coll Cardiol*. 2005; 45: 336–42.
- Kertai MD, Boersma E, Westerhout CM, et al. A combination of statins and beta-blockers is independently associated with a reduction in the incidence of perioperative mortality and nonfatal myocardial infarction in patients undergoing abdominal aortic aneurysm surgery. *Eur J Vasc Endovasc Surg*. 2004; 28: 343–52.
- Kennedy J, Quan H, Buchan AM, Ghali WA, Feasby TE. Statins are associated with better outcomes after carotid endarterectomy in symptomatic patients. *Stroke*. 2005; 36: 2072–6.
- Ward RP, Leeper NJ, Kirkpatrick JN, Lang RM, Sorrentino MJ, Williams KA. The effect of preoperative statin therapy on cardiovascular outcomes in patients undergoing infrainguinal vascular surgery. *Int J Cardiol*. 2005; 104: 264–8.\
- McGirt MJ, Perler BA, Brooke BS, et al. 3-hydroxy-3-methylglutaryl coenzyme A reductase inhibitors reduce the risk of perioperative stroke and mortality after carotid endarterectomy. *J Vasc Surg*. 2005; 42: 829–36.

- Hindler K, Shaw AD, Samuels J, Fulton S, Collard CD, Riedel B. Improved postoperative outcomes associated with preoperative statin therapy. *Anesthesiology*. 2006; 105: 1260–72.
- Durazzo AE, Machado FS, Ikeoka DT, et al. Reduction in cardiovascular events after vascular surgery with atorvastatin: a randomized trial. *J Vasc Surg*. 2004; 39: 967–75.
- Le MY, Godet G, Coriat P, et al. The impact of postoperative discontinuation or continuation of chronic statin therapy on cardiac outcome after major vascular surgery. *Anesth Analg*. 2007; 104: 1326–33.
- Schouten O, Kertai MD, Bax JJ, et al. Safety of perioperative statin use in high-risk patients undergoing major vascular surgery. *Am J Cardiol*. 2005; 95: 658–60.
- Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. *Circulation*. 2002; 106: 3143–421
- Fluvastatin and bisoprolol for the reduction of perioperative cardiac mortality and morbidity in high-risk patients undergoing non-cardiac surgery. DECREASE IV Study
- *Scottish Intercollegiate Guidelines Network (SIGN). Lipids and primary prevention of coronary heart disease. A National Clinical Guideline. www.sign.ac.uk [September 1999]*
- *BNF 2.12*
- *Current Problems in Pharmacovigilance 2002; 28: 8-9.*
- *JBS2: Joint British Societies' guidelines on prevention of cardiovascular disease in clinical practice. Heart 2005; 91 (Supp 5).*
NICE (May 2008).Lipid modification - Cardiovascular risk assessment and the modification of blood lipids for the primary and secondary prevention of cardiovascular disease

APPENDIX 5.9

PREOPERATIVE EVALUATION AND PREPARATION OF PATIENTS WITH IMPLANTABLE PACEMAKER OR IMPLANTABLE CARDIOVERTER DEFIBRILLATOR



PREOPERATIVE EVALUATION AND PREPARATION
OF PATIENTS WITH IMPLANTABLE PACEMAKER OR
IMPLANTABLE CARDIOVERTER DEFIBRILLATOR

Preoperative Evaluation and Preparation of Patient with Implantable Pacemaker or Implantable Cardioverter Defibrillator

Introduction

Implantable pacemakers and implantable cardioverter defibrillators (ICDs) are increasingly being used. More patients with these devices are likely to present for elective or emergency surgery.

Implantable Pacemakers and implantable ICDs in patients face problems resulting from:-

- Electrical interference from the use of surgical diathermy / electro-cautery
- Energy induced into heart lead systems causing tissue heating at lead tips through high frequency current.

Appropriate precautions are needed to avoid these complications.

Manufacturers of implantable pacemakers and ICDs warn against the use of surgical diathermy / electro-cautery, – especially the monopolar mode of operation. However, there are situations where the risk/benefit analysis favours the use of surgical diathermy/electro-cautery.

Thus, where surgical diathermy/electro-cautery is deemed essential, consider using bipolar surgical diathermy/electro-cautery --bearing in mind that even bipolar mode may cause hazardous electrical interference.

Pre-Anaesthetic Assessment

1. Identification of patients having these devices through routine pre-admission screening. To specifically ask for this in pre-admission patient declaration forms (if applicable) & to independently ask patient again to verify it.
2. Recording pacemaker/ICD details.
The presence of the pacemaker/ICD should be clearly noted:-
 - (a) in patient notes
 - (b) marked for the attention of key clinical and surgical staff (surgeon, anaesthetist, cardiologist etc).

Patients with these devices are usually provided with a registration card or 'passport' recording details of the device and its manufacturer. Where possible the following key information should be noted for future reference:

- device manufacturer, model number, serial number
- implanting hospital, follow-up hospital
- date of implant
- reason for implant (e.g. heart block etc)

3. Clarification of indication for device implant and device status

In advance of the surgical procedure, the patient's pacemaker/ICD follow-up clinic should be contacted to confirm their cardiac condition and to determine in particular:

- Indication for device implant
- extent of any heart failure
- degree of pacemaker dependency
- implant complexity (bradycardia support, arrhythmia control, cardiac re-synchronisation therapy)
- if the device is at or approaching replacement phase
- if the device is subject to a manufacturer or regulatory agency safety advisory notice
- if the device is part of a clinical investigation where restrictions may apply

4. Additional Perioperative Support prior to the surgery

- The anaesthetist and surgeon involved should discuss the implications of the patient having an implanted pacemaker/ICD.
- Where surgical diathermy/electrocautery cannot be avoided, the surgical team should contact the patient's cardiac follow-up centre for advice depending on the risk of malfunction:-
 - a) Where the surgical procedure is remote from the pacemaker/ICD and the device has been checked and verified within the last three months (especially battery condition), risk of malfunction will be minimal.
 - b) Where the procedure will be close to the implant and where the use of surgical diathermy/electro-cautery is likely, then risk of malfunction is increased.

Consequently, the patient's follow-up clinic should be contacted to advise to what extent support may be required from a cardiac pacing/ICD physiologist before, during and/or after the surgical procedure :

- To confirm the correct functioning of the pacemaker/ICD and to check the condition of the battery and leads etc prior to surgery
- To advise if adjustments to sensing/pacing parameters are required (the majority of devices will not require changes prior to or after surgery)
- To programme an ICD prior to surgery to a 'monitor only' mode to prevent inappropriate therapy/shock delivery, in the event of accidental sensing of electrical interference
- To programme a pacemaker to avoid or minimise inappropriate inhibition, or high rate pacing through the 'tracking' of electrical interference, where there is a degree of pacemaker dependency
- To programme rate response function to 'off' in those devices that use the minute ventilation method of physiological pacing
- To programme the implant's 'sleep mode' to OFF if late surgery is planned
- To confirm device functionality on completion of surgery.

Preanaesthetic Considerations for Intraoperative Management

At the time of surgery the following should be considered when surgical diathermy/electro-cautery is to be used on patients having an implantable pacemaker/ICD:

- availability of cardio-pulmonary resuscitation, temporary external/transvenous pacing, and external defibrillation equipment
- availability of appropriate cardiac personnel
- monitoring the patient's ECG from the beginning and before the induction of anaesthesia
- if using an ECG monitor which has a 'paced' mode, to carefully consider whether the use of this mode would be advantageous or not. (In the unlikely event of pacing pulses failing to capture the heart, an ECG monitor set to 'paced' mode may misinterpret the pacing spikes as the patient's QRS complexes. It may then incorrectly display a heart rate when the patient is actually in asystole)
- use of an alternative method of detecting a patient's pulse such as an arterial line or pulse oximeter (as a minimum)

- where detectable pacemaker inhibition occurs, the surgeon should be informed immediately and diathermy either used intermittently or discontinued
- if monopolar diathermy/electro-cautery is used:–
 - > to limit its use to short bursts
 - > to ensure that the return electrode is anatomically positioned so that the current pathway between the diathermy electrode and return electrode is as far away from the pacemaker/defibrillator (and leads) as possible
- where either monopolar or bipolar diathermy/electrocautery is used –
 - > ensure that cables attached to diathermy/electrocautery equipment are kept well away from the site of implant
- consider alternative external/transvenous pacing where pacing from the implant is significantly affected during the use of diathermy/electrocautery
- for patients where the ICD is deactivated and where access to the anterior chest wall will interfere with surgery (or the sterile field), consider connecting the patient to an external defibrillator using remote pads.

Emergency procedures

Wherever possible, the steps outlined above (see **Preanaesthetic Considerations for Intraoperative Management**) should be followed when handling emergency cases.

Where it is not possible for the pacemaker/ICD to be checked before surgery then device function should be checked as soon as feasible postoperatively.

Ensure availability of:-

- cardiopulmonary resuscitation,
- temporary external/transvenous pacing
- external defibrillation equipment

For patients with ICDs, consideration may be given to positioning a clinical magnet over the implant site to inhibit inappropriate shock delivery through noise detection. However, it should be noted that:-

- inhibition of shock delivery will only be effective during magnet placement and that this should be secured to the patient for the duration of surgery using Micropore tape (or equivalent)
- any subsequent VT/VF will need to be treated using external defibrillation equipment, shock delivery cannot be inhibited for those ICDs where the clinician has programmed the device not to respond to an external magnet
- where a magnet has been applied the ICD must be checked postoperatively to determine therapy delivery status.

For patients with pacemakers, securing a magnet over the pacemaker implant site will not necessarily guarantee asynchronous (non-sensing) pacing. Magnet response may vary between manufacturers' models and according to particular programmed settings.

Clinical magnets for this application may be made available from the local cardiac pacing centre.

If an ICD is deactivated, consider connecting the patient to an external defibrillator using remote pads if access to the anterior chest wall will interfere with surgery or the sterile field.

In the event of a prolonged, life-threatening arrhythmia, conventional advanced life support procedures should be followed.

Some pacemakers are programmed to allow a lower intrinsic or paced rate during the patient's sleeping period (night rate). This mode is initiated automatically at the time set by the patient's clinician and a reduction in paced rate may therefore be observed in patients undergoing night surgery. Appropriate heart rate can be restored via temporary external/transvenous 'overdrive' pacing.

About implantable pacemakers and cardioverter defibrillators

Monitoring and Appropriate Response to Intracardiac Electrical Signals

- Highly sophisticated electronic medical implants which monitor and respond to very small electrical signals sensed within the heart.
- Some pacemakers treat bradycardia. Some are also able to treat heart arrhythmias through particular methods of pacing.
- Pacemakers are now available to provide corrective resynchronisation of left and right sides of the heart.
- Early implantable cardioverter defibrillators were designed to mainly treat arrhythmias such as ventricular tachycardia or ventricular fibrillation through pacing and shock delivery but now incorporate complex pacing functions.

Tolerance To Electrical And Magnetic Interference Fields

Both pacemakers and cardioverter defibrillators have been designed with a high degree of tolerance to electrical and magnetic interference fields special filtering components have been incorporated to minimise the effects of these.

Problems may arise if:-

- the energy level of a nearby field is very high, or
- the electrical field nearby has a frequency component that is close to cardiac range.

Adverse Effects of Electrical Interference

Interference generated by monopolar surgical diathermy/electrocautery may:-

- temporarily inhibit pacemaker output, or may give rise to a temporarily increase in pacing rate
- cause devices to enter a safety mode of operation with subsequent restricted function.
- programmed parameters may be reset to the manufacturer's default settings, thereby losing patient settings programmed by the clinician.
- Where a device's internal power source has significantly depleted to a point where device replacement is needed, such interference can cause the device to stop functioning completely.
- In ICDs there is a possibility that the interference signal may be misinterpreted as ventricular tachycardia or ventricular fibrillation causing inappropriate initiation of therapy.

- Where a pacemaker (or an ICD with a pacing function) uses an impedance-based rate responsive pacing function (e.g. minute ventilation), then signals from physiological/cardiac monitoring equipment can be sensed by the implant resulting in inappropriate high rate pacing.
 - Temporarily programming the device to a non-rate response mode will prevent this.
 - Alternatively, a monitoring device that does not employ thoracic impedance measurements could be used.

- Pacemakers and ICDs have a magnetic switch which will respond to a magnet when positioned over the implant site. The nature of the response to magnet placement will depend upon how the device is currently programmed by the clinician.
 - For some pacemakers, placing a magnet over the device may result in asynchronous pacing, whilst in others a period of device diagnostics is initiated after which pacing is resumed.
 - For ICDs, placing a magnet over the device can inhibit delivery of shock therapy but only where the device is programmed to respond in this way.
 - Placing a magnet over an implantable pacemaker or cardioverter defibrillator will therefore not necessarily modify or suspend therapy. Further information about magnet status should be confirmed by the patient's follow-up/implanting centre.

Reference:

[Medicines and Healthcare Products Regulatory Agency \(MHRA\) www.mhra.gov.uk/](http://www.mhra.gov.uk/)

APPENDIX 5.10

INDICATIONS FOR LUNG FUNCTION AND ARTERIAL BLOOD GAS FOR PATIENT WITH SCOLIOSIS



INDICATIONS FOR LUNG FUNCTION
AND ARTERIAL BLOOD GAS FOR PATIENT
WITH SCOLIOSIS

Indications for Lung Function Test in Patients undergoing Scoliosis Surgery

1. Clinical reduction in cardiopulmonary reserve
2. Age of onset of scoliosis < 8 years old
3. Cobb's angle > 60°
4. Anterior approach involving thoracic cavity

Indications for Arterial Blood Gas in Patients Undergoing Scoliosis Surgery:

1. Clinical reduction in cardiopulmonary reserve
2. Age of onset of scoliosis < 8 years old
3. Cobb's angle > 100°
4. If Lung Function Test is not possible in indicated patients

Bibliography

1. DG Circular No 15/2004: Guidelines on the Establishment of Anaesthetic Clinic in MOH Hospitals, 29 January 2005
2. A proposal For The Establishment of Anaesthetic Clinics in KKM Hospitals, Ng SH et al (Taskforce), January 2004
3. Lee CY, Manuals of Anesthesia, Singapore: Mc Graw-Hill Education (Asia), 2006

References

1. Ng SH et al (Taskforce), Executive Summary A proposal For The Establishment of Anaesthetic Clinics in KKM Hospitals, January 2004
2. Michota F.A and Frost S.D, The preoperative evaluation: Use the history and physical examination rather than routine testing, Cleveland Clinic Journal of Medicine, January 2004, vol 71, no 1, page 63-69
3. Schiff JH et al, The anaesthesia Preoperative Evaluation Clinic (APEC): a prospective randomized controlled trial assessing impact on consultation time, direct costs, patient education and satisfaction with anaesthesia care, Minerva Anaesthesiology, Jul 2010;76(7):475-6
4. Roizen MF, Preoperative evaluation of patients: a review, Ann Acad Med Singapore, Nov 1994, 23(6 Supp): 49-55

Drafting /Task Force Committee Members;

1. Datin Dr V.Sivasakthi, Hospital Kuala Lumpur
2. Dato' Dr Jahizah Hj Hassan, Hospital Pulau Pinang
3. Dato' Dr S.Balan, Hospital Sultanah Aminah, Johor Baru
4. Dr Arbayah Rais, Hospital Selayang
5. Dr Aisai Abdul Rahman, Hospital Sultanah Nur Zahirah, Kuala Terengganu
6. Dr Sushila Sivasubramaniam, Hospital Selayang
7. Dr Harijah Wahidin, Hospital Melaka
8. Dr Haslinda Abd Hashim, Hospital Selayang
9. Dr Kok Meng Sum, Hospital Kuala Lumpur
10. Dr Nita Salina Abdullah, Hospital Sultanah Aminah, Johor Baru
11. Dr Patimah Amin, Medical Development Division

Other contributors/reviewers from Internal Medicine;

1. Dato' Abdul Razak Mutallif, Institute of Respiratory Medicine, KL
 2. Dr Zanariah Hussein, Hospital Putrajaya
 3. Dr Noel Thomas Ross, HKL
 4. Dr Mohamed Badrulnizam Long Bidin, HKL
 5. Dr Ashari Yunus, Institute of Respiratory Medicine, KL
- Secretarial help from Puan Mazrina Adzemi, Sister Chee Yet Yang and and Puan Syezerin Erni Abu Bakar, Medical Development Division



MINISTRY OF HEALTH
MEDICAL DEVELOPMENT DIVISION,
DEPARTMENT OF SURGICAL & AMBULATORY EMERGENCY,
5TH FLOOR, BLOCK E1, COMPLEX E, FEDERAL GOVERNMENT ADMINISTRATIVE CENTRE,
62590 PUTRAJAYA MALAYSIA.
TEL : 603 8883 3888 FAX : 6038883 1155