November 2021

Anticoagulation Protocol

For patients post cardiac surgery

Prepared by:
Mr Aladdin Bashir, Speciality Doctor
Mr Clinton Lloyd, Consultant Cardiac Surgeon
Dr Mohandas Jayarajah, Consultant Cardio Anaesthetist
Mr Sameh Atta, Speciality Registrar Higher Cardio-Thoracic Surgery

CABG	Aspirin 300mg loading dose Thrombo-prophylactic Clexane dosage Aspirin 150mg od for 1 year; then Aspirin 75mg lifelong
	If recent ACS & Trop +ve: Aspirin 300mg loading dose Thrombo-prophylactic Clexane dosage Aspirin 75mg + Clopidogrel 75mg od for 1 year; then Aspirin 75mg od lifelong
Radial artery	Diltazem 120mg MR od for 6/52
MV repair MVR Tissue TR Repair Pericardial Patch repair	**Protocol A** Start warfarin Day 1 Thrombo-prophylactic Clexane dosage – until INR >2.0 Add Aspirin 75mg daily if additional risk factor (CABG, CVA etc) Warfarin for 3 months; Target INR 2.5 or **Protocol B** Thrombo-prophylactic Clexane dosage – until day 3 DOAC from Day 3 after wires out (apixaban 5mg bd/rivaroxaban 20mg od (adjust according to weight/eGFR) Add Aspirin 75mg daily if additional risk factor (CABG, CVA etc)
MVR Mechanical	Start Warfarin day 1, Start Therapeutic Clexane Day 1 until INR >2.5 Warfarin lifelong, (Target INR 3.0) Add Aspirin 75mg daily if additional risk factor (CABG, CVA etc)
AVR Tissue	Aspirin 75mg od lifelong Thrombo-prophylactic Clexane dosage
AVR Mechanical	Start Warfarin day 1, Start Thrombo-prophylactic Clexane Day 1 until INR >2.0 Therapeutic Clexane from Day 3 if INR < 2.0 Warfarin lifelong, (Target INR 2.5) Add Aspirin 75mg daily if additional risk factor (CABG, CVA etc)
Major Aortic	Aspirin 75mg lifelong
AF	K^+ ,Mg^+, B Blocker, Amiodarone

AF Anticoagulation (with non-valvular heart disease)	Anticoagulate if >24h in AF and CHADSVASc >2 and acceptable HASBLED risks
	Warfarin or DOAC + Aspirin or Clopidogrel if isolated coronary disease Warfarin or DOAC in all other patients

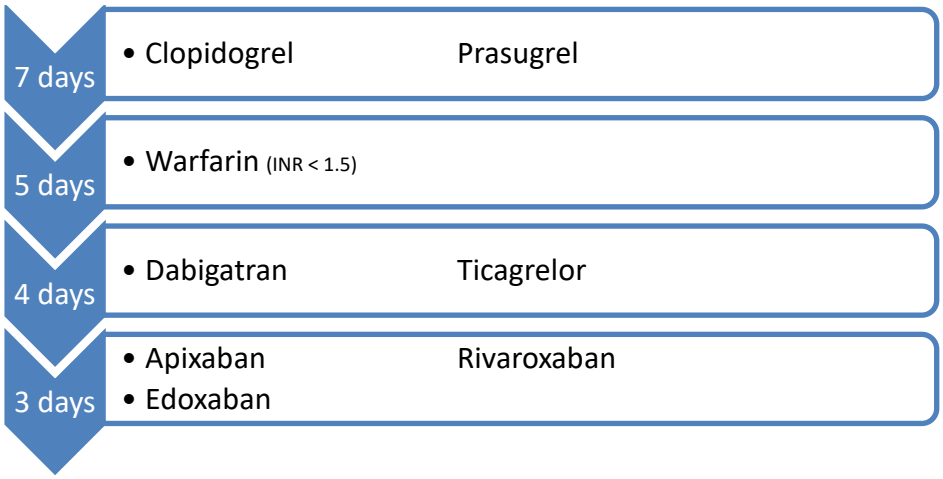
Unless otherwise contra-indicated

When a combination of procedures / circumstances exist, please check with the surgical team

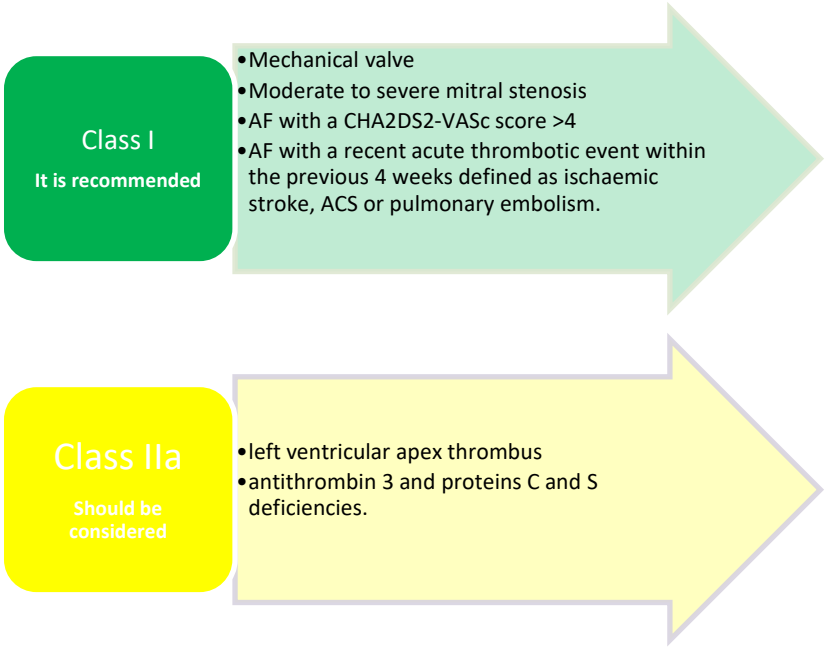
Detailed information below.

Preoperative anticoagulation and bridging

In patients treated with Oral Anticoagulants (OACs) and antiplatelet agents who are undergoing elective surgery, these medications should be discontinued before surgery as below:



Candidates for bridging:



Preoperative bridging:

1- UFH: should be administered in the hospital as a continuous intravenous infusion. It is recommended that administration be discontinued at least 6 h preoperatively.
The target APTT ratio is 1.5-2.5 the control value in seconds.
2- LMWH: does not require hospital admission and continuous intravenous infusion. Therefore, LMWH is more practical for patients awaiting elective surgery. LMWH should occur >12 h preoperatively.

Postoperative bridging:

LMWH is our bridging strategy for mechanical prostheses from Day 1 post mechanical MVR and from Day 3 for mechanical AVR.

- Once the INR is in the adequate target range (Aortic > 2.0, Mitral and Tricuspid > 2.5), bridging should be discontinued.

Postoperative anticoagulation:

1- Mechanical prostheses.

Patients undergoing mechanical valve implantations require lifelong treatment with VKA guided by INR.

Target INR of 2.5

- aortic prostheses without additional risk factors for thromboembolism.

Target INR of 3

- patients with risk factors (e.g. AF, venous thromboembolism, hypercoagulable state and left ventricular ejection fraction [LVEF] <35%) and/or mitral and tricuspid prostheses.

2- **Aortic Tissue prostheses**.

- ASA 75mg is recommended in all patients with bioprosthetic AVR who have no indication for anticoagulation during the first 3 months.
- The use of DOACs in patients with bioprosthetic AVR who have indication for anticoagulation is recommended such as AF, CVA etc.

3- **Mitral/Tricuspid Tissue prostheses or Mitral/Tricuspid repair**

- It is recommended to consider anticoagulation with VKA or DOACs during the first 3 months after mitral and tricuspid valve tissue replacement or repair.

4- **Other indications.**

In patients undergoing any cardiac operation with a preoperative indication for OACs other than heart valve replacement or repair, the preoperative regimen of VKAs or DOACs should be reinitiated after surgery.

Warfarin:

The standard oral loading dose on the 1st post-operative day is 1 mg/10kg OR twice pre-operative dose (assuming no new Cyt p450 drugs started), with a maximum 1st dose of 10mg. Patients whose rhythm is dependent on the epicardial pacing wires can have the first dose on the 2nd post-operative day. The INR is checked daily and the warfarin dose is adjusted according to the schedule.

Day 2		Day 3		day 4	
INR	dose	INR	dose	INR	dose
< 1.8	5 mg	< 1.5	10 mg	< 1.5	10 mg
1.8	1 mg	1.5-2.0	5 mg	1.5-1.7	7 mg
> 1.8	Nil	2.0-2.5	3 mg	1.8-2.0	6 mg
		2.6-3.0	2 mg	2.1-2.6	5 mg
		3.1-3.4	1 mg	2.7-3.0	4 mg
		> 3.5	Nil	3.1-3.5	3 mg
				> 3.5	Nil

DOACs:

In contrast to VKAs, one should restart DOACs after surgery with caution due to the more immediate antithrombotic effects and the increased risk for bleeding.

DOACs can be restarted in day 3 postoperatively; post pacing wires and central line removal.

	Dabigatran	**Rivaroxaban**	**Apixaban**	**Edoxaban**
Standard dose	150 mg BD	20 mg OD	5 mg BD	60 mg OD
Lower dose	110 mg BD			30 mg OD
Reduced dose		15 mg OD	2.5 mg BD	30 mg OD
Dose-reduction criteria	Dabigatran 110 mg BD in patients with: • Age >_80 years • Concomitant use of verapamil, or • Increased bleeding risk	CrCl 15 - 49 mL/min	At least 2 of 3 criteria: • Age >_80 years, • Body weight <_60 kg, or • Serum creatinine >_1.5 mg/dL (133 lmol/L)	If any of the following: • CrCl 30 - 50 mL/min, • Body weight <_60 kg, • Concomitant use of dronedarone, ciclosporine, erythromycin, or ketoconazole

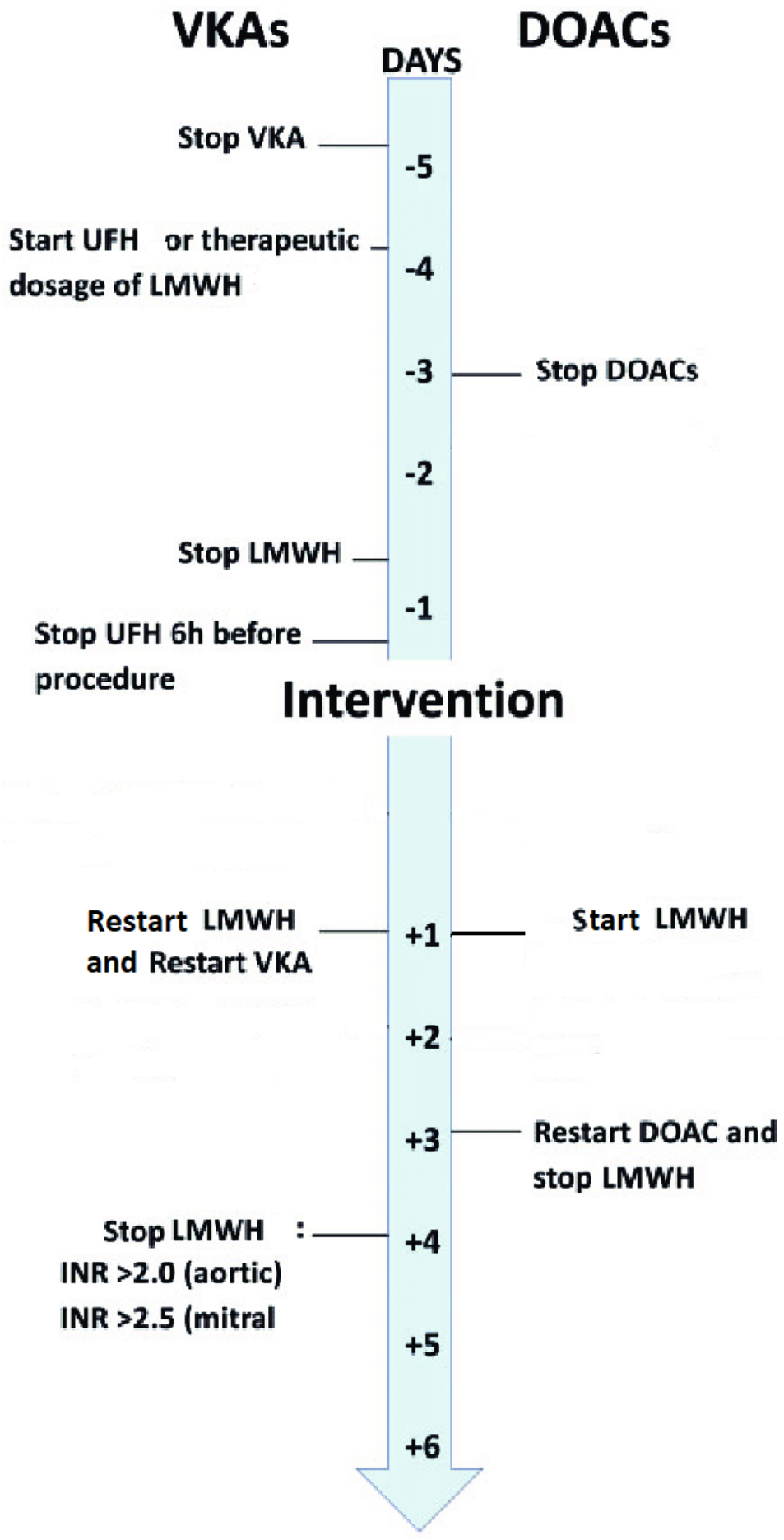
Thromboembolism prevention for postoperative atrial fibrillation

Anticoagulation therapy is necessary for patients who have had cardiac surgery who develop AF to avoid early stroke and death.

Starting early with a therapeutic dose of UFH or LMWH should be considered within 12–48 h after surgery.

If atrial fibrillation/atrial flutter is intermittent but persistent despite Amiodarone loading, oral anti-coagulation should be commenced prior to discharge home as follows below and maintained for at least 4 weeks.

- Patients with valvular AF (mechanical valve prostheses, moderate-to-severe mitral stenosis, bioprosthesis and valve rings in the mitral and tricuspid position) VKAs is recommended.
- Patients with non-valvular AF (e.g. post CABG, tissue AVR) DOAC is recommended.


VKAs
DOACs
DAYS
Stop VKA
-5
Start UFH or therapeutic dosage of LMWH
-4
-3
Stop DOACs
-2
Stop LMWH
-1
Stop UFH 6h before procedure
Intervention
Restart LMWH and Restart VKA
+1
Start LMWH
+2
+3
Restart DOAC and stop LMWH
Stop LMWH :
INR >2.0 (aortic)
INR >2.5 (mitral
+4
+5
+6

Trust Guidelines

University Hospitals Plymouth NHS Trust

Guidance Title: Anticoagulation Protocol for patients post cardiac surgery

Date	Version
Nov 2021	**1.0**

Accountabilities	
Lead	Mr Aladdin Bashir (Speciality Doctor) Mr Clinton Lloyd (Consultant Cardiac Surgeon) Dr Mohandas Jayarajah (Consultant Cardio Anaesthetist) Mr Sameh Atta, Speciality Registrar Higher Cardio-Thoracic Surgery
Reviewed by (Group)	Cardiothoracic team
Approved by (Lead)	Mr Clinton Lloyd (Consultant Cardiac Surgeon)

Links to other documents

Version History		
1.0	Nov 2021	Guideline created

Last Approval	Due for Review
Nov 2021	Nov 2023