Cardioversion AF - Full Clinical Guideline

Reference no.: CG-CARDIO/2016/007

Cardioversion for Non-valvular Atrial Fibrillation or Atrial Flutter

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Purpose and Aim

This is a local guideline for use in the Outpatients Cardioversion Service. These guidelines have been developed to ensure the safe and appropriate use of elective DC cardioversion and to encompass recent developments in anticoagulation for atrial arrhythmia (non-vitamin K anticoagulant drugs, NOACs). **NOACs are now the preferred initial anticoagulant for anticoagulant-naïve patients requiring cardioversion.**

Definitions Used

Atrial Fibrillation (AF)

Atrial Fibrillation (AF) is the most common arrhythmia. The incidence of chronic atrial fibrillation in the UK is estimated to be 1.7 per 1000 patient years. In patients over 60 it is 3 per 1000 person years [(1)]. It occurs when chaotic electrical activity develops in the atria. As a result, the atria no longer beat in an organised, regular rhythm, the patient's pulse is irregular and the ventricular filling contributed by the atria (about 20%) is lost. There is also a risk of blood clots developing in fibrillating atria. Across the UK approximately 2 million people suffer with AF (Atrial Fibrillation Association 2009) [(2)].

DC Cardioversion

Electrical Cardioversion is very simple in principle and a highly effective treatment in carefully chosen patients [(2)].

Direct Current (DC) cardioversion is the delivery of a calibrated synchronized shock to the heart, potentially converting the disorganised atrial contractions to normal sinus rhythm. The reasons for restoration and maintenance of sinus rhythm in these patients include symptom relief and increased feeling of well-being [(3,4)].
DC cardioversion is performed electively in patients with significant symptoms or when pharmacotherapy is poorly tolerated or in patients considered likely to benefit from the procedure after cardiological review. It may also be performed acutely when the arrhythmia has caused cardiovascular instability or angina in affected patients.
In elective cases it is usually performed with the patient anti-coagulated, fasted and under a short acting general anaesthesia or conscious sedation to eliminate discomfort.
The DC Cardioversion service at the Derby Hospitals NHS Foundation Trust uses a general anaesthetic and performs this procedure on elective patients who are on a waiting list and who are haemodynamically stable.

Guidelines for Safe Practice

Cardioversion will normally be performed by a competent cardiology/ medical trainee or cardiology speciality registrar. Nurse-led cardioversion may be developed in the future. All care, decisions and patient outcomes must be documented in the patient's record in accordance with the trust policy on record keeping [(5)].

The anaesthetic will be delivered by a consultant anaesthetist or post-fellowship senior trainee as per Royal College of Anaesthetists guidelines (2006) [(6)].

A full discussion of the indications and evidence for cardioversion in AF is beyond the scope of this document but practitioners should refer to the most recent national guideline (NICE CG 180) at https://www.nice.org.uk/guidance/cg180

Choice of anticoagulant prior to cardioversion

We now prefer NOACs rather than warfarin as initial anticoagulant in anticoagulant-naïve patients requiring cardioversion.

All patients without contra-indication and irrespective of CHADS2-Vasc score require anticoagulation to cardioversion where atrial fibrillation onset is unclear, or where AF duration is known to be >48hrs. Traditionally a coumarin anticoagulant (Warfarin or Sinthrome) has been used with the overwhelming majority of patients commenced on warfarin. Due to differences in hepatic drug metabolism and differential effects on vitamin K metabolism there is a wide inter-individual variation in the dose of warfarin required to achieve a stable therapeutic INR (target range usually 2-3 for at least 3 weeks prior to DCCV).

More recently 'Novel' or non-vitamin K oral anticoagulants (NOACs) have become available. These are either direct inhibitors of factor Xa (Rivaroxaban, Apixaban, Edoxaban) or thrombin (Dabigatran). These drugs are marketed as requiring no measurement of blood levels in routine clinical practice although a number of caveats remain with regards to drug interactions and renal function. They cannot be used if a patient has a metallic valve or moderate rheumatic mitral stenosis.

In anticoagulant naïve patients prior to cardioversion for atrial fibrillation or atrial flutter our preferred option is for the patient to be commenced on a NOAC. This approach has the advantage of stable predictable anticoagulation and improves the efficiency of the service for patients with less delay to cardioversion and fewer cancellations due to inadequate INR. There is a wealth of safety data on cardioversion using NOACs from the major phase III clinical trials. Patients should be counselled that the contra-indications to NOAC anticoagulation are the same as to warfarin anticoagulation and that there is currently no specific NOAC reversal agent (except dabigatran) but that overall bleeding risk is the same or less than with warfarin.

In patients already taking warfarin (e.g. for AF, DVT/PE or prosthetic valve) or who prefer to start on warfarin after discussion then NOAC will not be used warfarin will be commenced. We recommend weekly INRs and the INR must be 2 or greater for 3 consecutive weeks before cardioversion. In order to reduce the chance of the INR dropping below 2 in this period, we suggest a target INR of 3.. The INR will be checked at

cardioversion pre-clerking and must be ≥2 on the day of cardioversion. Once the cardioversion has been undertake, the target INR can be reduced to the usual recommendation of 2.5, with INR tests as needed. Anticoagulation will be long term for the majority of patients (even if cardioversion is successful) but a small number with a low CHADSVACS score (usually zero or 1 in females) may be advised to stop after 4 weeks.

Choice of NOAC

The choice of NOAC is at GP discretion and will be prescribed by the GP prior to cardioversion. A detailed description of the various NOACs, their indications, interactions and limitations in patients with CKD can be found at http://www.derbyshiremedicinesmanagement.nhs.uk/assets/Clinical_Guidelines/Formulary_by_BNF_chapter_prescribing_guidelines/BNF_chapter_2/Atrial_fibrillation.pdf
Or via the Royal Derby hospital 'flo' pages (clinical guidelines-cardiology-atrial fibrillation GP shared guideline). Care must be taken to prescribe the correct dose, depending on creatinine clearance, age and weight.

As an example Apixaban 5mg bd would be appropriate for the majority of patients. The minimum period of NOAC anticoagulation is 3 weeks before cardioversion. It is important patients are advised regarding the importance of consistent compliance to NOAC use before cardioversion (important as this cannot easily be measured) and the risk of thromboembolism if compliance is poor. This advice should be recorded in the notes at the time of pre-cardioversion clerking, and verbal confirmation of compliance by the patient confirmed and recorded in the notes on the day of cardioversion (this is important and in lieu of INR checks). **If >1 dose of NOAC is missed then this omission must be reported and cardioversion will be delayed (see 'pre-clerking' below)**

Inclusion and Exclusion Criteria for DCC

In many cases it may be possible to convert the heart rhythm from AF (or Atrial Flutter), to normal heart rhythm (sinus rhythm) if the following criteria are met:

- If Atrial Fibrillation has been present for only a relatively short period of time (usually less than one year).
- If the heart has not been damaged by disease or by the AF itself. In patients with reduced ejection fractions and cardiac damage the risks and benefits of the procedure will have been assessed by the cardiologist and anaesthetist and discussed with the patient.
- If the cause of the AF has been treated e.g. hyperthyroidism or viral cardiomyopathy.

Possible reasons for exclusion from or postponement of Cardioversion include:

- INR results unsatisfactory
- NOAC non-compliance
- Transient cause of AF not controlled
- Other illness present

Implementation

Patients must give informed written consent prior to the procedure, either in pre-clerking or on the day of appointment. The Anaesthetist will have assessed the patient as fit for the procedure and have discussed the anaesthetic risks with the patient and ascertained that the patient understands the risks and still wishes to proceed. If the risks from anaesthetic are very high the anaesthetist may advise not to proceed. This will occur after discussion with the Cardiology Consultant wherever possible.

Prior to Pre – Clerking

1. The decision for elective DC cardioversion should be documented in the medical notes by the referring cardiology consultant/registrar/cardiac outreach nurse. The cardiologist should write to the GP requesting initiation of anticoagulation (ideally a NOAC).
2. **NOAC A/C:** The Specialist Nurse will contact the patient to check the date of NOAC initiation and record the drug and dose. The specialist nurse will arrange a date for pre-clerking one week prior to cardioversion with the minimum NOAC period 3 weeks.
3. **Warfarin A/C:** The Specialist Nurse will contact the anti-coagulation clinic to request a weekly INR (at a higher target of 2.5-3.5 until after cardioversion) and optimisation of Warfarin levels within the 8 week waiting list target. This information is regularly reviewed by the nurse specialist and facilitated by the Admin team
4. The INR needs to be within therapeutic range for at least three weeks prior to DCC.
5. The specialist nurse will arrange a date for pre-clerking one week prior to cardioversion once the patient's INR is within the therapeutic range.
6. The patient will be told by letter to stop taking any Digoxin 48 hours prior to the DCC.
7. If anti-arrhythmic drugs have been prescribed then these need to be given for a specific period as defined by the consultant Cardiologist in the medical notes.

Pre – Clerking: Measurements, tests and assessments

In Pre-clerking the Specialist Nurse will ensure that the following are assessed and recorded in the medical notes and patient admission booklet:

1. Perform Echocardiogram
2. Perform 12-lead ECG and evaluate rhythm
3. Past Medical History
4. Record current medications
5. Establish baseline observations: height; weight; BMI (Body Mass Index); Blood Pressure; Heart rate; Oxygen saturations, and Blood Glucose
6. Identify/confirm any allergies referring for advice if necessary
7. Discuss social circumstances and transport arrangements as necessary
8. Review of previous blood results and requesting further tests prior to DCC
9. **NOAC A/C and missed doses:** Record discussion with patient regarding importance of complete compliance with NOAC, importance of reporting any missed doses to the cardioversion team and risk of stroke if compliance poor**. If >1 dose missed in run-in period then the 3 week anticoagulation period should 'restart' from the first day of consistent compliance (i.e. only a single missed dose is permissible and >1 missed dose should be reported and will delay cardioversion).**
10. The patient should be given information on the procedure, their medical condition, alternative treatments, lifestyle and an information sheet (DHFT Patient Information 2007) [(10)]. This should detail the nature of the treatment, and post procedural care.
11. If the patient at pre-clerking is in sinus rhythm they are discharged home under the care of the GP.
12. Any Informed consent must be obtained from the patient by a suitably trained health care professional and recorded in the patient's health records.
13. Haemodynamic stability should be assessed and any abnormalities brought to the attention of the Cardiology ST, Specialist Registrar or Consultant.
14. Patient is given a date for the DCC

15. **Assess the patient for major anaesthetic risk factors (see below) and contact the consultant anaesthetist if necessary.**
16. If any major anaesthetic risk factors are present when assessed by the Specialist Nurse during pre-clerking then the following guidance should be followed.
17. **Advise the patient of the crucial importance of compliance with the NOAC (as this cannot be easily measured), risk of TIA/stroke if non-compliant and minimum duration of 3 weeks anticoagulation prior to DCCV (after initiation of NOAC or for warfarin after achieving INR consistently >2)**
18. **Advise patient that anticoagulation must continue for 4 weeks post successful cardioversion (if CHADS2-Vasc score 0 or 1 in female) or indefinitely at the direction of the cardiologist.**

Major Anaesthetic Risk Factors.

The Anaesthetist should be contacted if the patient is found to have any of the following risk factors at pre-clerking:

1. Patients with an exercise tolerance of less than a flight of stairs due to shortness of breath or chest pain.
2. Patients unable to walk more than 20 feet/ 6 metres on the flat due to shortness of breath or chest pain.
3. Patients with congenital heart disease.
4. Patients with rare or unusual syndromes of any sort.
5. Patients with a BMI of >40.
6. Patients who have had major problems with anaesthetics in the past.
7. Any patient with valve disease described as "severe" on their echo.
8. Any patient with long QT syndrome or tri-fascicular block on their pre-AF ECG.
9. Any patient who is wheelchair bound.
10. Any patient on renal dialysis.

Patients with the following conditions are not suitable to be anaesthetised for anything other than a life threatening event and so will be cancelled as being too high a risk for an elective procedure such as cardioversion:

1. Patients with angina at rest.
2. Patients on home oxygen.
3. Patients who have had an MI within the last 3 months. These patients can be deferred until 3 months or more after their acute coronary event.
4. Patients with an exercise tolerance of less than 10 feet/ 3 metres on the flat where their limitation is cardiovascular in nature.

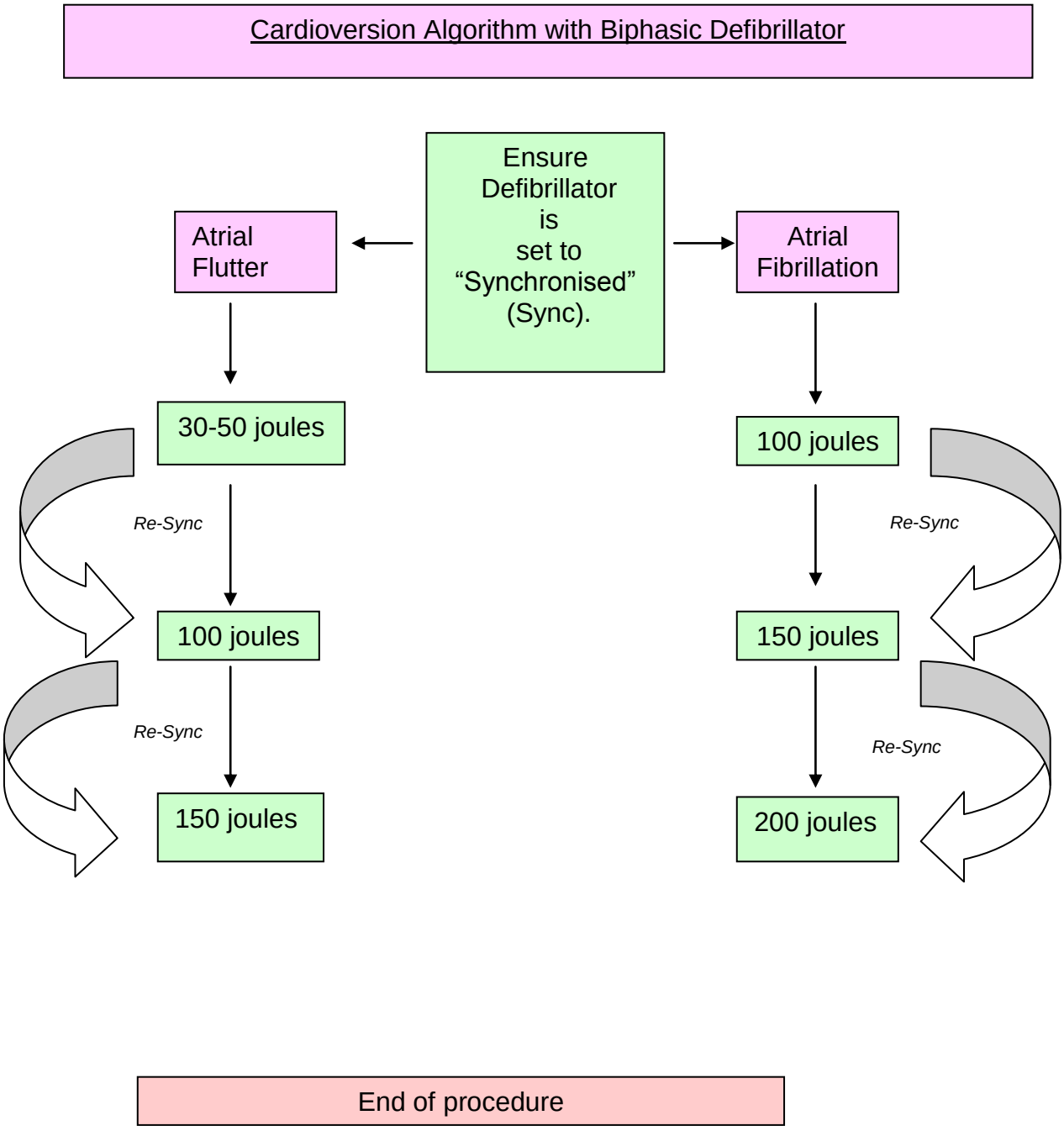
Day of the procedure

Only nurses as laid out in the Scope document that have been assessed as competent and held on the central Trust Training database are permitted to perform the procedure in the Nurse Led service. On the day of the cardioversion procedure the nurse will check the following:

1. Blood tests such as INR and U&E's should be reviewed.
2. Patient should be "monitored" to establish heart rhythm. If the patient is in sinus rhythm then the procedure would be cancelled and the patient would go home and be seen in clinic.

3. Informed consent should be gained for DCC prior to the procedure, if not already gained in pre-clerking. The consent form should be checked and filed suitably in medical notes.
4. The patient is prepared using a Trust approved pre-theatre checklist contained within the Cardioversion admission booklet. This includes a positive patient Identification procedure requiring name, date of birth, and hospital number.
5. The anaesthetist will assess the patient in accordance with routine practice and decide on the patient's suitability for DCC.
6. The anaesthetist decides in which order the patients will have their procedures done.
7. DCC will take place in theatre.
8. Staff required for the procedure must include: Anaesthetist; ODA; Theatre HCA, and Cardioversion Nurse Specialist.
9. During the list undertaken by the specialist nurse the Cardiology ST2 or SpR on call will be contactable in an emergency.
10. The patient will be attached to a cardiac monitor and baseline observations recorded, including: BP; Heart rate; temperature; oxygen saturations, respirations.
11. The nurse and anaesthetist discuss the best position for the pads to be placed. The specialist nurse will then position the pads accordingly prior to the anaesthetising of the patient.
12. The patient will be cannulated by the nurse and given a general anaesthetic by the anaesthetist who remains present through the entire procedure.
13. DCC is performed in accordance with the algorithm as attached.
14. Once the shock has been delivered the patient is "monitored" by the specialist nurse for a response / rhythm change.
15. The anaesthetist will monitor the patient for any reaction to the procedure and/or anaesthetic.
16. Further shocks will be delivered as per the CCU Management Guidelines booklet (2009) [(11)]. if the first is unsuccessful up to a maximum of three shocks.
17. The heart rhythm is monitored by the nurse to ascertain the success of the procedure (For return to normal sinus rhythm- see algorithm).

Algorithm for DC Cardioversion



Paddle position is sometimes changed at the discretion of the anaesthetist.

The biphasic defibrillator MUST be set on a Synchronised setting (sync)

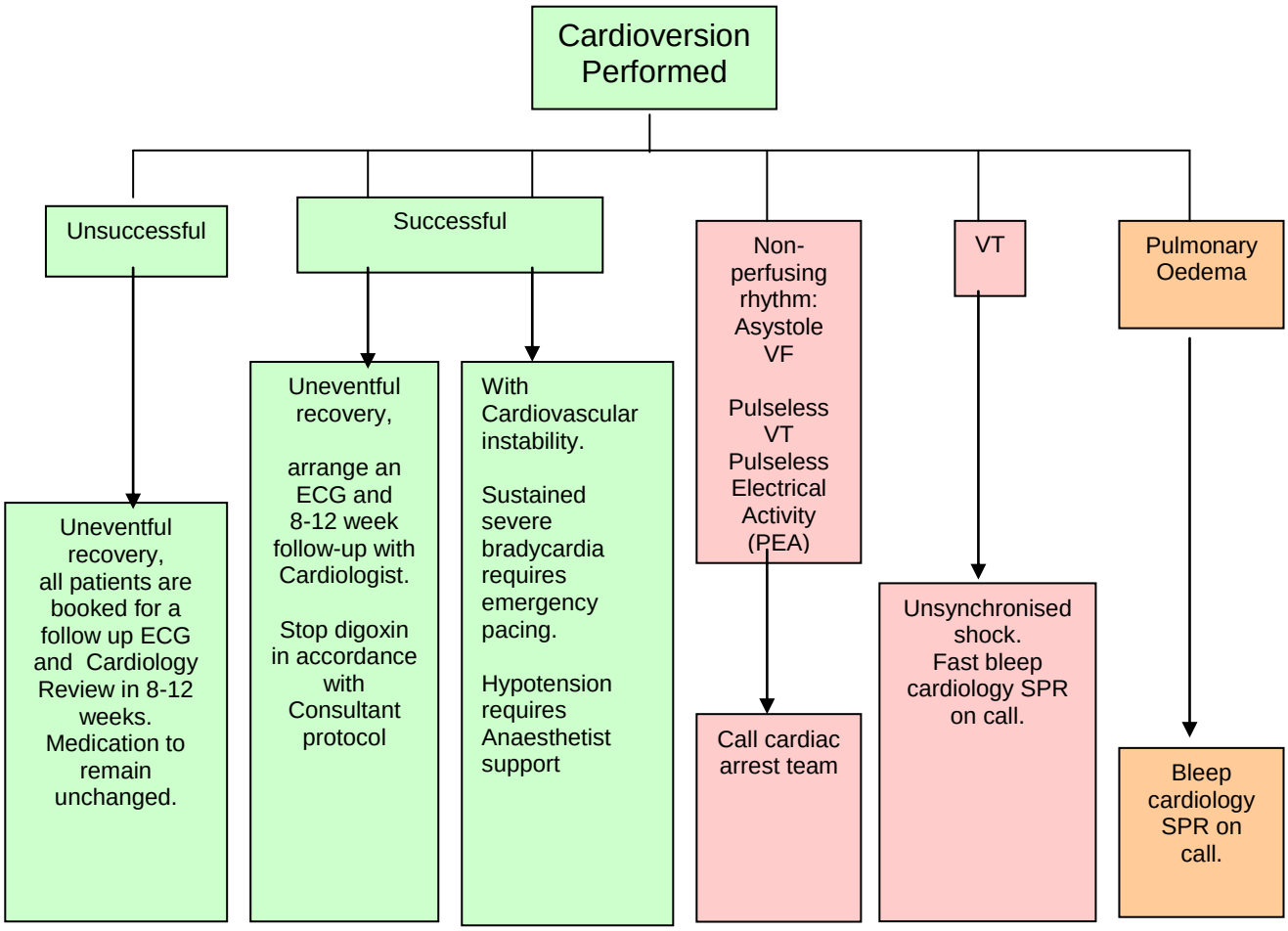
Early reversion to AF:

Following a DC shock patients may exhibit sinus rhythm transiently then AF may recur. If the patient is sedated and fewer than 3 shocks have been delivered then continue algorithm as above.

If AF recurs after an initially successful 3rd shock do not perform any more shocks. Routine use of A-P pad position is not recommended.

Record events clearly in the notes (including if any SR noted and any bradycardia/ anaesthetic issues) which can be helpful in guiding future therapy.

The possible clinical outcomes, and the need for medical intervention are outlined below:



Risks related to Cardioversion

There are a number of risks associated with the procedure itself although rare. These are:

1. Slow heart rhythm (bradycardia) – usually very transient and at most needing treatment with Atropine or Ephedrine.
2. Fast heart rhythm (such as Ventricular Tachycardia) which may need a follow up shock before the patient regains consciousness. Very rare.
3. Thrombo-embolic events such as Stroke. This is very unusual if the patient has been fully anti-coagulated before the procedure, if the duration of the AF is short, or if an Echocardiogram (TOE) has not demonstrated a clot in the heart.
4. Skin burns or irritation from the electrodes (patches) – unusual with modern patch electrodes but can happen more frequently with older metal paddle electrodes.
5. Early reversion of normal rhythm back to AF – this may require further shocks if still under anaesthesia or referral to cardiology outpatients if this occurs post procedure.
6. General anaesthetic risks – dependent upon the pre-existing co-morbidities of the patient.

(Atrial Fibrillation Association 2009)

Actions to take in the case of complications

Contact the medical registrar or Core trainee for CCU or, if out of hours, the on-call emergency team.

Observations during cardioversion procedure

Check patient's tolerance of the procedure

The patient should be fully monitored throughout with ECG, NIBP, pulse oximetry and with additional capnography and oxygen analysis if intubated.

Stop shocking once the heart rhythm converts back to sinus rhythm or after a maximum of three shocks as per above algorithm.

If the patient does convert to sinus rhythm but reverts back to AF while still under anaesthetic another shock may be given at the discretion of the anaesthetist at the energy level of the previously successful shock.

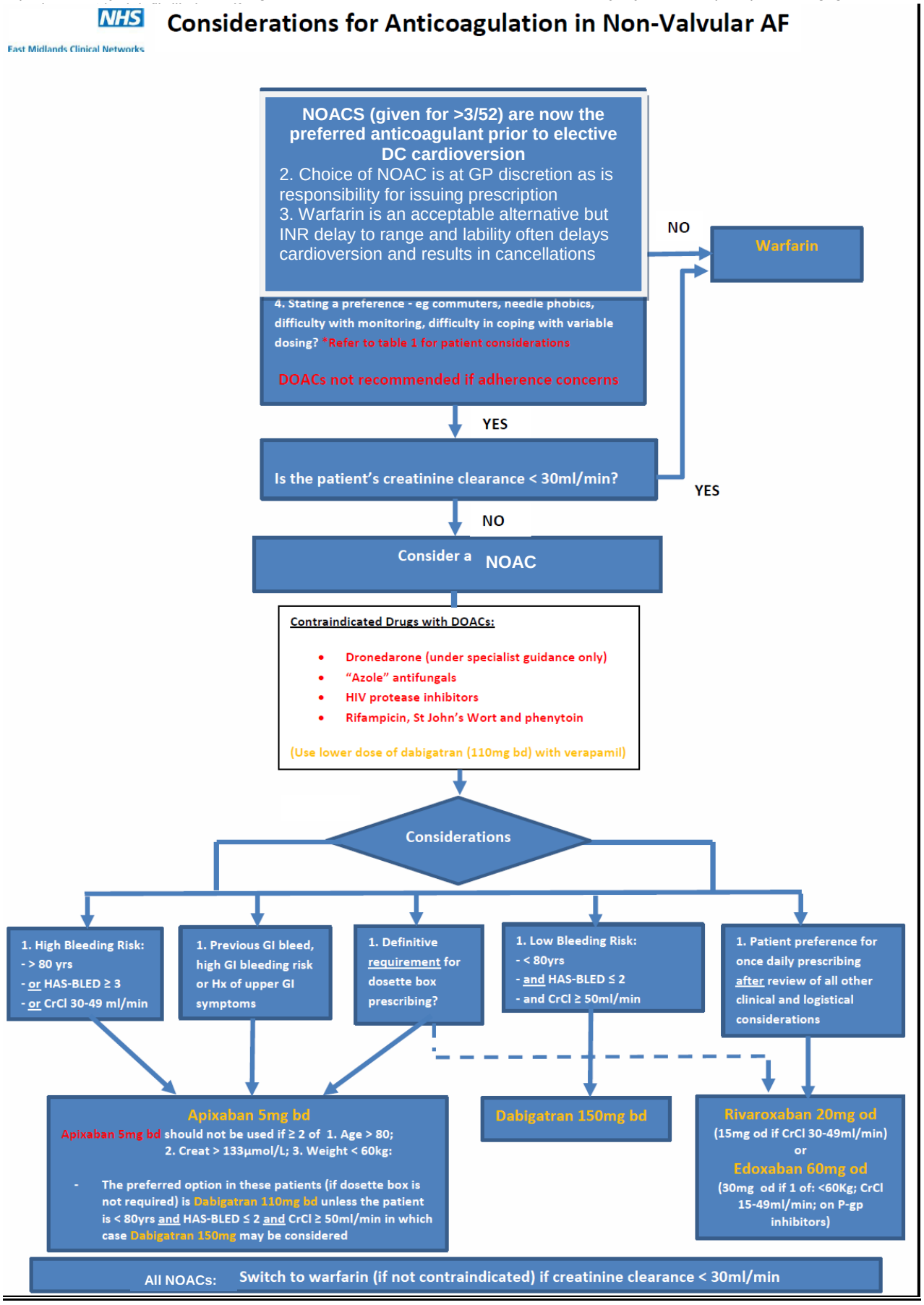
If the heart rhythm does not convert back to sinus rhythm after following the protocol outlined above, no further shocks are to be given and the procedure is ended. The patient will be discharged after completing the recovery procedure and seen in clinic within 6-8 weeks.

Post Procedure

1. Following the procedure when spontaneous breathing has returned the patient is moved to recovery for observation by theatre recovery team.
2. Once recovered and the patient is stable and maintaining own airway they are returned to the care of the specialist nurse.
3. An ECG will be performed to ascertain whether the patient is in sinus rhythm.
4. The nurse who performed the procedure will discuss the outcome of the procedure with the patient.
5. Digoxin must be omitted for 48 hours prior to DC Cardioversion due to an increased risk of Torsades des Pointes and Asystole. If the procedure is successful Digoxin can then be discontinued permanently in accordance with the Cardiology consultant's directions.
6. Following successful / unsuccessful Cardioversion, all patients will be sent a follow up appointment for 8-12 weeks by the consultants' secretary.
7. A discharge summary will be completed by the Specialist nurse and filed within the medical notes.
8. All patients should be advised not to drive, operate machinery, drink alcohol or make important decisions for 24hours post anaesthetic and be accompanied home by a relative or a carer.
9. All patients must have a relative/carer staying with them overnight for the first night after the anaesthetic.
10. All procedural treatments and aftercare should be recorded in the relevant nursing and medical documentation.
11. **Advise patient that anticoagulation must continue for 4 weeks post successful cardioversion (if CHADS2-Vasc score 0 or 1 in female) or indefinitely at the direction of the cardiologist.**
12. If the patient is taking warfarin, they can go back to usual (not weekly) INR checks, target 2-3 (inform anticoagulation clinic).
13. If cardioversion is successful, antiarrhythmic medications should generally be continued until clinic review and digoxin stopped.

Appendix 1 Guide to choice of NOAC (adapted with permission from

http://www.derbyshiremedicinesmanagement.nhs.uk/assets/Clinical_Guidelines/Formulary_by_BNF_chapter_prescribing_guidelines/B



References

1 Ruigomez et al.(2002) Incidence of chronic atrial fibrillation in general practice and its treatment pattern. Journal of Clinical Epidemiology.55: 358-36
2 Atrial Fibrillation Association (2009) Atrial Fibrillation and DC Cardioversion.
3 Mead GE, Elder A, Flapan AD, Cordina J.(2005) Electrical cardioversion for atrial fibrillation and flutter. Cochrane Database of Systematic Reviews. Issue 3
4 Mudd J. (2009) NHS Evidence- Cardiovascular- annual evidence update on atrial fibrillation: Cardioversion.
5 DOH (2001) Essence of Care: Patient Focused benchmarking for Health care Practitioners.
6 Royal College of anaesthetists (2006) Raising the Standard: A Compendium of Audit Recipes (second edition)
7 DHFT (2007) Cardioversion Patient Information Sheet
8 The Derby Hospitals Coronary Care Unit Management guidelines 2016 (available on 'flo'/ DHFT intranet).

For any additional information the following references may be useful

1 NHS Institute for Innovation and Improvement (2001) Re-designing Cardio version Services available at: www.institute.nhs.uk/nhs_live/case-studies/redesign_cardioversion_services.html
2 DHFT (2008) Trust policy & procedure for Consent ref No: CL-RM/2008/042Taking consent policy.

Documentation Controls

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