National Institute for Health and Clinical Excellence

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Atrial fibrillation

The management of atrial fibrillation

NICE clinical guideline 36
Developed by the National Collaborating Centre for Chronic Conditions

NICE clinical guideline 36
Atrial fibrillation: the management of atrial fibrillation

Ordering information
You can download the following documents from www.nice.org.uk/CG036

- The NICE guideline (this document) – all the recommendations.
- A quick reference guide – a summary of the recommendations for healthcare professionals.
- 'Understanding NICE guidance' – information for patients and carers.
- The full guideline – all the recommendations, details of how they were developed, and summaries of the evidence on which they were based.

For printed copies of the quick reference guide or 'Understanding NICE guidance', phone the NHS Response Line on 0870 1555 455 and quote:

- N1054 (quick reference guide)
- N1055 ('Understanding NICE guidance').

This guidance is written in the following context

This guidance represents the view of the Institute, which was arrived at after careful consideration of the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. The guidance does not, however, override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

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Contents

Introduction

Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia and if left untreated is a significant risk factor for stroke and other morbidities. This guideline contains evidence-based guidance on the diagnosis and management of AF as it occurs in emergency, primary, post-operative and secondary care. It also gives recommendations for referral to specialist services.

Patient-centred care

This guideline offers best practice advice on the care of adult patients with atrial fibrillation (AF).

Treatment and care should take into account patients' individual needs and preferences. People with AF should have the opportunity to make informed decisions about their care and treatment. Where patients do not have the capacity to make decisions, healthcare professionals should follow the Department of Health guidelines – 'Reference guide to consent for examination or treatment' (2001) (available from www.dh.gov.uk).

Good communication between healthcare professionals and patients is essential. It should be supported by the provision of evidence-based information offered in a form that is tailored to the needs of the individual patient. The treatment, care and information provided should be culturally appropriate and in a form that is accessible to people who have additional needs, such as people with physical, cognitive or sensory disabilities, and people who do not speak or read English.

Unless specifically excluded by the patient, carers and relatives should have the opportunity to be involved in decisions about the patient's care and treatment.

Carers and relatives should also be provided with the information and support they need.

Key priorities for implementation

The following recommendations have been identified as priorities for implementation.

Identification and diagnosis

- An electrocardiogram (ECG) should be performed in all patients, whether symptomatic or not, in whom atrial fibrillation (AF) is suspected because an irregular pulse has been detected.

Treatment for persistent AF

- As some patients with persistent AF will satisfy criteria for either an initial rate-control or rhythm-control strategy (for example, age over 65 but also symptomatic):
  - the indications for each option should not be regarded as mutually exclusive and the potential advantages and disadvantages of each strategy should be explained to patients before agreeing which to adopt
  - any comorbidities that might indicate one approach rather than the other should be taken into account
  - irrespective of whether a rate-control or rhythm-control strategy is adopted in patients with persistent AF, appropriate antithrombotic therapy should be used.

Treatment for permanent AF

- In patients with permanent AF, who need treatment for rate-control:
  - beta-blockers or rate-limiting calcium antagonists should be the preferred initial monotherapy in all patients
  - digoxin should only be considered as monotherapy in predominantly sedentary patients.

Antithrombotic therapy

- In patients with newly diagnosed AF for whom antithrombotic therapy is indicated (see section 1.8.6), such treatment should be initiated with minimal delay after the appropriate management of comorbidities.

- The stroke risk stratification algorithm (appendix E) should be used in patients with AF to assess their risk of stroke and thromboembolism, and appropriate thromboprophylaxis given.

The following guidance is evidence based. Appendix A shows the grading scheme used for the recommendations: A, B, C, D or good practice point – D(GPP). Recommendations on diagnostic tests are graded A(DS), B(DS), C(DS) or D(DS). A summary of the evidence on which the guidance is based is provided in the full guideline (see section 5).

1 Guidance

For ease of reference, guidance has been split between different types of AF wherever possible. Algorithms for particular types of AF are included in appendix E.

1.1 Identification and diagnosis

This section contains guidance on the opportunistic case finding of patients with AF based on presenting symptoms, and the effectiveness of manual pulse palpation as a screening tool for those in whom AF is suspected. Guidance is also provided on the need for electrocardiography and echocardiography in patients with AF.

1.1.1 Presenting symptoms/pulse palpation

1.1.1.1 In patients presenting with any of the following:

- breathlessness/dyspnoea
- palpitations
- syncope/dizziness
- chest discomfort
- stroke/TIA

manual pulse palpation should be performed to assess for the presence of an irregular pulse that may indicate underlying AF. **C**

1.1.2 Electrocardiography

1.1.2.1 An electrocardiogram (ECG) should be performed in all patients, whether symptomatic or not, in whom AF is suspected because an irregular pulse has been detected. **B(DS)**

1.1.3 Ambulatory ECG recording

1.1.3.1 In patients with suspected paroxysmal AF[1] undetected by standard ECG recording: **B(DS)**

- a 24-hour ambulatory ECG monitor should be used in those with suspected asymptomatic episodes or symptomatic episodes less than 24 hours apart
- an event recorder ECG should be used in those with symptomatic episodes more than 24 hours apart.

1.1.4 Echocardiography

1.1.4.1 Transthoracic echocardiography (TTE) should be performed in patients with AF:

- for whom a baseline echocardiogram is important for long-term management, such as younger patients **D(GPP)**
- for whom a rhythm-control strategy that includes cardioversion (electrical or pharmacological) is being considered **C**
- in whom there is a high risk or a suspicion of underlying structural/functional heart disease (such as heart failure or heart murmur) that influences their subsequent management (for example, choice of antiarrhythmic drug) **D(GPP)**
- in whom refinement of clinical risk stratification for antithrombotic therapy is needed (see section 1.8.6). **C**

1.1.4.2 TTE should not be routinely performed solely for the purpose of further stroke risk stratification in patients with AF for whom the need to initiate anticoagulation therapy has already been agreed on appropriate clinical criteria (see stroke risk stratification algorithm on page 47). **D(GPP)**

[1] Paroxysmal AF spontaneously terminates within 7 days, usually within 48 hours.

1.1.4.3 Transoesophageal echocardiography (TOE) should be performed in patients with AF: **D(GPP)**

- when TTE demonstrates an abnormality (such as valvular heart disease) that warrants further specific assessment
- in whom TTE is technically difficult and/or of questionable quality and where there is a need to exclude cardiac abnormalities
- for whom TOE-guided cardioversion is being considered.

1.2 Cardioversion

This section contains guidance on managing patients with AF undergoing elective cardioversion. It does not cover those patients with haemodynamic instability following the onset of AF for whom emergency cardioversion may be indicated (see section 1.6 below). See the cardioversion treatment algorithm (appendix E, page 42).

1.2.1 Electrical versus pharmacological cardioversion

1.2.1.1 In patients with AF without haemodynamic instability for whom cardioversion is indicated:

- the advantages and disadvantages of both pharmacological and electrical cardioversion should be discussed with patients before initiating treatment **D(GPP)**
- where AF onset was within 48 hours previously, either pharmacological or electrical cardioversion should be performed **B**
- for those with more prolonged AF (onset more than 48 hours previously) electrical cardioversion should be the preferred initial treatment option. **D(GPP)**

1.2.2 Pharmacological cardioversion

1.2.2.1 In patients with persistent AF[2], where the decision to perform pharmacological cardioversion using an intravenous antiarrhythmic agent has been made:

- in the absence of structural heart disease[3], a Class 1c drug (such as flecainide or propafenone) should be the drug of choice **B**
- in the presence of structural heart disease[3], amiodarone should be the drug of choice. **D(GPP)**

1.2.3 Electrical cardioversion with concomitant antiarrhythmic drugs

1.2.3.1 When patients with AF are to undergo elective electrical cardioversion and there is cause for heightened concern about successfully restoring sinus rhythm (such as previous failure to cardiovert or early recurrence of AF), concomitant amiodarone or sotalol[4] should be given for at least 4 weeks before the cardioversion. **B**

1.2.4 Transoesophageal echocardiography-guided cardioversion

1.2.4.1 In patients with AF of greater than 48 hours' duration, in whom elective cardioversion is indicated:

- both TOE-guided cardioversion and conventional cardioversion should be considered equally effective **B**
- a TOE-guided cardioversion strategy should be considered:
  - where experienced staff and appropriate facilities are available **D(GPP)**, and
  - where a minimal period of precardioversion anticoagulation is indicated due to patient choice or bleeding risks. **C**

[2] Persistent AF does not self-terminate, or lasts longer than 7 days (without cardioversion).

[3] Coronary artery disease or left ventricular dysfunction.

[4] Sotalol to be progressively titrated from 80 mg twice daily up to 240 mg twice daily.

1.3 Treatment for persistent AF

This section contains guidance on the most effective treatment strategy for patients with persistent AF and, for those in whom a rhythm-control strategy is indicated, the optimal form of post-cardioversion therapy for maintenance of sinus rhythm. See the rhythm-control treatment algorithm for persistent AF (appendix E, page 43) and the rate-control treatment algorithm for permanent (and some cases of persistent) AF (appendix E, page 44). It also makes recommendations on the optimal form of pericardioversion thromboprophylaxis. For recommendations on the optimisation of antithrombotic therapy according to risks and benefits in patients with persistent AF see section 1.8.

1.3.1 Rate-control versus rhythm-control

1.3.1.1 As some patients with persistent AF will satisfy criteria for either an initial rate-control or rhythm-control strategy (for example, age over 65 but also symptomatic): **D(GPP)**

- the indications for each option should not be regarded as mutually exclusive and the potential advantages and disadvantages of each strategy should be explained to patients before agreeing which to adopt
- any comorbidities that might indicate one approach rather than the other should be taken into account
- irrespective of whether a rate-control or a rhythm-control strategy is adopted in patients with persistent AF, appropriate antithrombotic therapy should be used.

1.3.1.2 A rate-control strategy should be the preferred initial option in the following patients with persistent AF:

- over 65 **B**
- with coronary artery disease **B**
- with contraindications to antiarrhythmic drugs **D(GPP)**

- unsuitable for cardioversion[5] **D(GPP)**
- without congestive heart failure. **B**

1.3.1.3 A rhythm-control strategy should be the preferred initial option in the following patients with persistent AF:

- those who are symptomatic **D(GPP)**
- younger patients **C**
- those presenting for the first time with lone AF **D(GPP)**
- those with AF secondary to a treated/corrected precipitant **D(GPP)**
- those with congestive heart failure. **C**

1.3.2 Rhythm-control for persistent AF

1.3.2.1 An antiarrhythmic drug is not required to maintain sinus rhythm in patients with persistent AF in whom a precipitant (such as chest infection or fever) has been corrected and cardioversion has been performed successfully, providing there are no risk factors for recurrence. **D(GPP)**

1.3.2.2 In patients with persistent AF who require antiarrhythmic drugs to maintain sinus rhythm and who have structural heart disease[6]:

- a standard beta-blocker should be the initial treatment option **D(GPP)**

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[5] Patients unsuitable for cardioversion include those with:

- contraindications to anticoagulation
- structural heart disease (e.g. large left atrium >5.5 cm, mitral stenosis) that precludes long-term maintenance of sinus rhythm
- a long duration of AF (usually >12 months)
- a history of multiple failed attempts at cardioversion and/or relapses, even with concomitant use of antiarrhythmic drugs or non-pharmacological approaches
- an ongoing but reversible cause of atrial fibrillation (e.g. thyrotoxicosis).

[6] Coronary artery disease or left ventricular dysfunction.

- where a standard beta-blocker is ineffective, contraindicated or not tolerated amiodarone should be used. **A**

1.3.2.3 In patients with persistent AF who require antiarrhythmic drugs to maintain sinus rhythm and who do not have structural heart disease:[7]

- a standard beta-blocker should be the initial treatment option **D(GPP)**
- where a standard beta-blocker is ineffective, contraindicated or not tolerated
  - a Class Ic agent **C** or
  - sotalol[8] **D(GPP)**

  should be given
- where other drug classes are ineffective, contraindicated or not tolerated amiodarone should be administered. **B**

1.3.3 Antithrombotic therapy for persistent AF

1.3.3.1 Before cardioversion, patients should be maintained on therapeutic anticoagulation with warfarin (INR 2.5, range 2.0 to 3.0) for a minimum of 3 weeks. **C**

1.3.3.2 Following successful cardioversion, patients should remain on therapeutic anticoagulation with warfarin (INR 2.5, range 2.0 to 3.0) for a minimum of 4 weeks. **D(GPP)**

1.3.3.3 In patients with persistent AF where cardioversion cannot be postponed for 3 weeks:

- heparin should be given and the cardioversion performed **D**, and
- warfarin should then be given for a minimum of 4 weeks post cardioversion. **D(GPP)**

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[7] Coronary artery disease or left ventricular dysfunction.

[8] Progressively titrated from 80 mg twice daily up to 240 mg twice daily.

1.3.3.4 Anticoagulation should be continued for the long term in patients with AF who have undergone cardioversion where there is a high risk of AF recurrence[9] or where it is recommended by the stroke risk stratification algorithm (see appendix E, page 47). **D(GPP)**

1.3.3.5 In patients with AF of confirmed duration of less than 48 hours undergoing cardioversion, anticoagulation following successful restoration of sinus rhythm is not required. **D(GPP)**

1.3.3.6 Patients with atrial flutter should be given antithrombotic therapy in the same manner as those with AF. **D(GPP)**

1.4 Treatment for permanent AF[10]

This section contains guidance on the most effective drugs for pharmacological rate-control and thromboprophylaxis in patients with permanent AF. See also the rate-control treatment algorithm (appendix E, page 44). For the optimisation of antithrombotic therapy according to risks and benefits in patients with permanent AF refer to section 1.8.

1.4.1 **Rate-control for permanent AF**

1.4.1.1 In patients with permanent AF, who need treatment for rate-control:

- beta-blockers or rate-limiting calcium antagonists should be the preferred initial monotherapy in all patients **A**
- digoxin should only be considered as monotherapy in predominantly sedentary patients. **D(GPP)**

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[9] Factors indicating a high risk of AF recurrence include:

- a history of failed attempts at cardioversion
- structural heart disease (mitral valve disease, left ventricular dysfunction or an enlarged left atrium)
- a prolonged history of AF (>12 months)
- previous recurrences of AF.

[10] Permanent AF is established AF that has not terminated, has terminated but recurred, or for which cardioversion has not been attempted.

1.4.1.2 In patients with permanent AF, where monotherapy is inadequate: **B**

- to control the heart rate only during normal activities, beta-blockers or rate-limiting calcium antagonists should be given with digoxin
- to control the heart rate during both normal activities and exercise, rate-limiting calcium antagonists should be given with digoxin.

1.4.2 Antithrombotic therapy for permanent AF

1.4.2.1 In patients with permanent AF a risk–benefit assessment should be performed and discussed with the patient to inform the decision whether or not to give antithrombotic therapy. **D(GPP)**

1.4.2.2 In patients with permanent AF where antithrombotic therapy is given to prevent strokes and/or thromboembolism (see section 1.8.6):

- adjusted-dose warfarin should be given as the most effective treatment **A**
- adjusted-dose warfarin should reach a target INR of 2.5 (range 2.0 to 3.0) **A**
- where warfarin is not appropriate, aspirin should be given at 75 to 300 mg/day **B**
- where warfarin is appropriate, aspirin should not be coadministered with warfarin purely as thromboprophylaxis, as it provides no additional benefit. **B**

1.5 Treatment for paroxysmal AF

This section contains guidance on the most effective drugs for the suppression of paroxysms and thromboprophylaxis for patients with paroxysmal AF. See the rhythm-control for paroxysmal AF algorithm (appendix E, page 45). It also considers in which patients a 'pill-in-the-

pocket'[11] treatment strategy is safe and effective. For the optimisation of antithrombotic therapy according to risks and benefits in patients with paroxysmal AF refer to section 1.8.

1.5.1 Rhythm-control for paroxysmal AF

1.5.1.1 Where patients have infrequent paroxysms and few symptoms, or where symptoms are induced by known precipitants (such as alcohol, caffeine), a 'no drug treatment' strategy or a 'pill-in-the-pocket' strategy should be considered and discussed with the patient. **D(GPP)**

1.5.1.2 In patients with symptomatic paroxysms (with or without structural heart disease[12], including coronary artery disease) a standard beta-blocker should be the initial treatment option. **D(GPP)**

1.5.1.3 In patients with paroxysmal AF and no structural heart disease[12]:

- where symptomatic suppression is not achieved with standard beta-blockers, either
  - a Class Ic agent (such as flecainide or propafenone) **D(GPP)** or
  - sotalol[13] **D(GPP)**

  should be given
- where symptomatic suppression is not achieved with standard beta-blockers, Class Ic agents or sotalol, either
  - amiodarone **B** or
  - referral for non-pharmacological intervention (see section 1.9.3) **A**

  should be considered.

[11] A drug management strategy for paroxysmal AF in which the patient self-administers antiarrhythmic drugs only upon the onset of an episode of AF.

[12] Coronary artery disease or left ventricular dysfunction.

[13] Progressively titrated from 80 mg twice daily up to 240 mg twice daily.

1.5.1.4 In patients with paroxysmal AF and coronary artery disease:

- where standard beta-blockers do not achieve symptomatic suppression, sotalol should be given[14] **D(GPP)**
- where neither standard beta-blockers nor sotalol achieve symptomatic suppression, either
  - amiodarone **B** or
  - referral for non-pharmacological intervention (see section 1.9.3) **A**

  should be considered.

1.5.1.5 In patients with paroxysmal AF with poor left ventricular function:

- where standard beta-blockers are given as part of the routine management strategy and adequately suppress paroxysms, no further treatment for paroxysms is needed **D(GPP)**
- where standard beta-blockers do not adequately suppress paroxysms, either
  - amiodarone **B** or
  - referral for non-pharmacological intervention (see section 1.9.3) **A**

  should be considered.

1.5.1.6 Patients on long-term medication for paroxysmal AF should be kept under review to assess the need for continued treatment and the development of any adverse effects. **D(GPP)**

1.5.2 Treatment strategy for paroxysmal AF

1.5.2.1 In patients with paroxysmal AF, a 'pill-in-the-pocket' strategy should be considered in those who: **C**

- have no history of left ventricular dysfunction, or valvular or ischaemic heart disease; and

[14] Progressively titrated from 80 mg twice daily up to 240 mg twice daily.

- have a history of infrequent symptomatic episodes of paroxysmal AF; and
- have a systolic blood pressure greater than 100 mmHg and a resting heart rate above 70 bpm; and
- are able to understand how to, and when to, take the medication.

1.5.3 Antithrombotic therapy for paroxysmal AF

1.5.3.1 Decisions on the need for antithrombotic therapy in patients with paroxysmal AF should not be based on the frequency or duration of paroxysms (symptomatic or asymptomatic) but on appropriate risk stratification, as for permanent AF (see section 1.8.6). **B**

1.6 Treatment for acute-onset AF

This section contains guidance for managing patients during an acute episode of AF, whether of new onset or not. It considers the need for thromboprophylaxis in such patients, and the most appropriate emergency intervention in those cases where the AF is causing haemodynamic instability. See also the haemodynamically unstable AF treatment algorithm (appendix E, page 46).

1.6.1 Acute AF in haemodynamically unstable patients

1.6.1.1 In patients with a life-threatening deterioration in haemodynamic stability following the onset of AF, emergency electrical cardioversion should be performed, irrespective of the duration of the AF. **D**

1.6.1.2 In patients with non-life-threatening haemodynamic instability following the onset of AF:

- electrical cardioversion should be performed **D**
- where there is a delay in organising electrical cardioversion, intravenous amiodarone should be used **D**

- for those with known Wolff–Parkinson–White syndrome: **D(GPP)**
  - flecainide may be used as an alternative for attempting pharmacological cardioversion
  - atrioventricular node-blocking agents (such as diltiazem, verapamil or digoxin) should not be used.

1.6.1.3 In patients with known permanent AF where haemodynamic instability is caused mainly by a poorly controlled ventricular rate, a pharmacological rate-control strategy should be used. **D**

1.6.1.4 Where urgent pharmacological rate-control is indicated, intravenous treatment should be with one of the following: **D**

- beta-blockers or rate-limiting calcium antagonists
- amiodarone, where beta-blockers or calcium antagonists are contraindicated or ineffective.

1.6.2 Antithrombotic therapy for acute-onset AF

1.6.2.1 In patients with acute AF who are receiving no, or subtherapeutic, anticoagulation therapy: **D(GPP)**

- in the absence of contraindications, heparin should be started at initial presentation
- heparin should be continued until a full assessment has been made and appropriate antithrombotic therapy has been started, based on risk stratification (see section 1.8.6).

1.6.2.2 In patients with a confirmed diagnosis of acute AF of recent onset (less than 48 hours since onset), oral anticoagulation should be used if: **D(GPP)**

- stable sinus rhythm is not successfully restored within the same 48-hour period following onset of acute AF; or

- there are factors indicating a high risk of AF recurrence;[15] or
- it is recommended by the stroke risk stratification algorithm (see appendix E, page 47).

1.6.2.3 In patients with acute AF where there is uncertainty over the precise time since onset, oral anticoagulation should be used, as for persistent AF (see section 1.3.3). **D(GPP)**

1.6.2.4 In cases of acute AF where the patient is haemodynamically unstable, any emergency intervention should be performed as soon as possible and the initiation of anticoagulation should not delay any emergency intervention. **D(GPP)**

1.7 Post-operative AF

This section contains guidance on both the prophylaxis of post-operative AF using antiarrhythmic drugs, and its treatment. For guidance on the need for thromboprophylaxis in post-operative AF refer to section 1.6 above.

1.7.1 Drug prophylaxis for post-operative AF

1.7.1.1 In patients undergoing cardiothoracic surgery:

- the risk of post-operative AF should be reduced by the administration of one of the following:
  - amiodarone **A**
  - a beta-blocker **A**
  - sotalol **A**
  - a rate-limiting calcium antagonist **B**
- digoxin should not be used. **B**

[15] Factors indicating a high risk of AF recurrence include:

- a history of failed attempts at cardioversion
- structural heart disease (mitral valve disease, left ventricular dysfunction or an enlarged left atrium)
- a prolonged history of AF (>12 months)
- previous recurrences of AF.

1.7.1.2 In patients undergoing cardiac surgery on pre-existing beta-blocker therapy, this treatment should be continued unless contraindications develop (such as post-operative bradycardia or hypotension). **A**

1.7.2 Treatment for post-operative AF

1.7.2.1 Unless contraindicated, a rhythm-control strategy should be the initial management option for the treatment of post-operative AF following cardiothoracic surgery. **C**

1.7.2.2 Unless contraindicated, post-operative AF following non-cardiothoracic surgery should be managed as for acute-onset AF with any other precipitant. **D(GPP)**

1.7.2.3 In the prophylaxis and management of post-operative AF, the appropriate use of antithrombotic therapy and correction of identifiable precipitants (such as electrolyte imbalance or hypoxia) is recommended. **D(GPP)**

1.8 Antithrombotic therapy

This section contains guidance on the most effective antithrombotic therapy in patients with AF who have had a stroke or transient ischaemic attack (TIA) and in asymptomatic patients with AF. It also provides recommendations and an algorithm (see appendix E, page 47) for the optimisation of thromboprophylaxis in all patients with AF according to risks and benefits.

1.8.1 Initiating antithrombotic therapy

1.8.1.1 In patients with newly diagnosed AF for whom antithrombotic therapy is indicated (see section 1.8.6), such treatment should be initiated with minimal delay after the appropriate management of comorbidities. **D(GPP)**

1.8.2 Antithrombotic therapy in acute stroke patients[16]

1.8.2.1 In all patients with AF who have had an acute stroke, any uncontrolled hypertension should be appropriately managed before antithrombotic therapy is started. **D(GPP)**

1.8.2.2 In patients with AF and an acute stroke: **D(GPP)**

- imaging (CT scan or MRI) should be performed to exclude cerebral haemorrhage
- in the absence of haemorrhage, anticoagulation therapy should begin after 2 weeks
- in the presence of haemorrhage, anticoagulation therapy should not be given
- in the presence of a large cerebral infarction, the initiation of anticoagulation therapy should be delayed.

1.8.2.3 In patients with AF and an acute TIA: **D(GPP)**

- imaging (CT scan or MRI) should be performed to exclude recent cerebral infarction or haemorrhage
- in the absence of cerebral infarction or haemorrhage, anticoagulation therapy should begin as soon as possible.

1.8.3 Antithrombotic therapy following a stroke or TIA

1.8.3.1 In patients with AF who are either post-stroke, or have had a TIA:

- warfarin should be administered as the most effective thromboprophylactic agent **A**
- aspirin or dipyridamole should not be administered as thromboprophylactic agents unless indicated for the treatment of comorbidities or vascular disease. **D(GPP)**

[16] NICE is developing a clinical guideline on the diagnosis and management of stroke (publication expected 2008).

1.8.3.2 Treatment of post-stroke or post-TIA patients with warfarin should only begin after treatment of relevant comorbidities (such as hypertension) and assessment of the risk–benefit ratio. **D(GPP)**

1.8.4 Antithrombotic therapy for asymptomatic AF

1.8.4.1 Patients with asymptomatic AF should receive thromboprophylaxis as for symptomatic AF (refer to section 1.3.3 for persistent AF, section 1.4.2 for permanent AF and section 1.5.3 for paroxysmal AF). **D(GPP)**

1.8.5 Risks of long-term anticoagulation

1.8.5.1 Both the antithrombotic benefits and the potential bleeding risks of long-term anticoagulation should be explained to and discussed with the patient. **D(GPP)**

1.8.5.2 The assessment of bleeding risk should be part of the clinical assessment of patients before starting anticoagulation therapy. Particular attention should be paid to patients who:

- are over 75 years of age **D**
- are taking antiplatelet drugs (such as aspirin or clopidogrel) or non-steroidal anti-inflammatory drugs **C**
- are on multiple other drug treatments (polypharmacy) **C**
- have uncontrolled hypertension **C**
- have a history of bleeding (for example, peptic ulcer or cerebral haemorrhage) **C**
- have a history of poorly controlled anticoagulation therapy. **D(GPP)**

1.8.6 Risk factors for stroke and thromboembolism

1.8.6.1 The stroke risk stratification algorithm (appendix E) should be used in patients with AF to assess their risk of stroke and thromboembolism, and appropriate thromboprophylaxis given. **C**

1.8.6.2 Risk stratification should be reconsidered whenever individual risk factors are reviewed. **D(GPP)**

1.9 Monitoring and referral

This section contains guidance on the follow-up of patients with AF post cardioversion and on identifying the patients for whom self-management of anticoagulation is safe and effective. It also offers guidance on which patients with AF benefit from referral for specialist non-pharmacological interventions.

1.9.1 Anticoagulation self-monitoring

1.9.1.1 In patients with AF who require long-term anticoagulation, self-monitoring should be considered if preferred by the patient and the following criteria are met: **C**

- the patient is both physically and cognitively able to perform the self-monitoring test, or in those cases where the patient is not physically or cognitively able to perform self-monitoring, a designated carer is able to do so
- an adequate supportive educational programme is in place to train patients and/or carers
- the patient's ability to self-manage is regularly reviewed
- the equipment for self-monitoring is regularly checked via a quality control programme.

1.9.2 Follow-up post cardioversion

1.9.2.1 Following successful cardioversion of AF routine follow-up to assess the maintenance of sinus rhythm should take place at 1 month and 6 months. **D**

1.9.2.2 At the 1-month follow-up the frequency of subsequent reviews should be tailored to the individual patient taking into account comorbidities and concomitant drug therapies. **D**

1.9.2.3 At each review the clinician should take the opportunity to re-assess the need for, and the risks and benefits of, continued anticoagulation. **D(GPP)**

1.9.2.4 At 6 months, if patients remain in sinus rhythm and have no other need for hospital follow-up, they should be discharged from secondary care with an appropriate management plan agreed with their GP. **D**

1.9.2.5 Patients should be advised to seek medical attention if symptoms recur. **D(GPP)**

1.9.2.6 Any patient found at follow-up to have relapsed into AF should be fully re-evaluated for a rate-control or rhythm-control strategy (see section 1.3.1). **D(GPP)**

1.9.3 Referral

1.9.3.1 Referral for further specialist intervention (for example, pulmonary vein isolation, pacemaker therapy, arrhythmia surgery, atrioventricular junction catheter ablation or use of atrial defibrillators) should be considered in the following patients:

- those in whom pharmacological therapy has failed **B**
- those with lone AF **B**
- those with ECG evidence of an underlying electrophysiological disorder (such as Wolff–Parkinson–White syndrome). **C**

1.9.3.2 The reasons for referral for specialist intervention should be explained and discussed with the patient. **D(GPP)**

2 Notes on the scope of the guidance

All NICE guidelines are developed in accordance with a scope document that defines what the guideline will and will not cover. The scope of this guideline

was established, after a period of consultation, at the start of the guideline development process; it is available from www.nice.org.uk/page.aspx?o=233242

3 Implementation in the NHS

The Healthcare Commission assesses the performance of NHS organisations in meeting core and developmental standards set by the Department of Health in 'Standards for better health' issued in July 2004. Implementation of clinical guidelines forms part of the developmental standard D2. Core standard C5 says that national agreed guidance should be taken into account when NHS organisations are planning and delivering care.

NICE has developed tools to help organisations implement this guidance (listed below). These will be available on our website (www.nice.org.uk/CG036) 1 month after this guidance is issued.

- Slides highlighting key messages for local discussion.
- Costing tools
  - Costing report to estimate the national savings and costs associated with implementation.
  - Costing template to estimate the local costs and savings involved.
- Implementation advice on how to put the guidance into practice and national initiatives which support this locally.
- Audit criteria to monitor local practice (see appendix D).

4 Research recommendations

The Guideline Development Group has made the following recommendations for research, on the basis of its review of the evidence. The Group regards these recommendations as the most important research areas to improve NICE guidance and patient care in the future. The Guideline Development

Group's full set of research recommendations is detailed in the full guideline (see section 5).

4.1 Cardioversion

In patients scheduled for elective cardioversion, what is the optimal form of cardioversion, in terms of the precardioversion use of antiarrhythmic drugs, the mode of cardioversion (electrical or pharmacological), the cost effectiveness of each procedure and the impact on quality of life?

Why this is important

Despite cardioversion being a core treatment for many patients with AF, there is little evidence that compares the different modes (electrical and pharmacological), particularly in terms of cost effectiveness. Further, the studies that have considered the efficacy of preloading with antiarrhythmic drugs prior to electrical cardioversion have not reported long-term efficacy in maintaining sinus rhythm, nor the cost effectiveness of this strategy.

4.2 Echocardiography

What is the cost effectiveness of performing a routine echocardiographic examination in all newly diagnosed AF patients, compared to only selective examination based on clinical criteria?

Why this is important

Echocardiography allows cardiac abnormalities such as left ventricular impairment to be diagnosed earlier than would be possible from signs and symptoms alone. However, no study has addressed the issue of whether performing routine echocardiography on all newly diagnosed AF patients would be more cost effective in terms of being able to diagnose and treat heart disease earlier than performing echocardiography only on those patients in whom there is a clinical suspicion of undiagnosed heart disease.

4.3 Anticoagulation with antiplatelet therapy

Is there any additional benefit, in terms of overall vascular events, from combined anticoagulation with antiplatelet therapy for any subgroups of

patients with AF such as those with prior myocardial infarction or stent implantation?

Why this is important

In the general AF population, the evidence suggests that combined therapeutic anticoagulation with antiplatelet therapy does not reduce the incidence of stroke or thromboembolism compared to therapeutic anticoagulation alone, and it may increase the incidence of bleeding. However, it is unclear whether there are certain subgroups of patients with AF for whom the therapeutic effects of combination therapy may be greater than either monotherapy. In particular, it is unclear whether combination therapy is justified in those AF patients who have stent implantation or a history of myocardial infarction.

4.4 Pill-in-the-pocket treatment

What is the clinical and cost effectiveness of 'pill-in-the-pocket' treatment for those with paroxysmal AF compared to hospital-based administration or continuous antiarrhythmic therapy?

Why this is important

Some patients with paroxysmal AF may have paroxysms infrequently. In these patients, the continuous use of antiarrhythmic drugs to suppress paroxysms may not be justified relative to their toxicity. No study has been undertaken in such patients in a UK population to determine whether a 'pill-in-the-pocket' treatment strategy would be clinically or cost effective compared to either the emergency department administration of treatment or continuous antiarrhythmic drug therapy.

4.5 Anticoagulation in paroxysmal AF

What is the optimal anticoagulation strategy for those patients with paroxysmal AF who have infrequent paroxysms, and those who have more frequent paroxysms?

Why this is important

The frequency of paroxysms in patients with paroxysmal AF varies widely between patients. It remains unclear, however, whether the risk of stroke or thromboembolism varies between those with only infrequent paroxysms and those with more frequent paroxysms. It is also unclear whether, if the risk of stroke or thromboembolism is reduced in those with infrequent paroxysms, the use of anticoagulation is justified in such a low-risk group.

5 Other versions of this guideline

The National Institute for Health and Clinical Excellence commissioned the development of this guidance from the National Collaborating Centre for Chronic Conditions. The Centre established a Guideline Development Group, which reviewed the evidence and developed the recommendations. The members of the Guideline Development Group are listed in appendix B. Information about the independent Guideline Review Panel is given in appendix C.

The booklet 'The guideline development process: an overview for stakeholders, the public and the NHS' has more information about the Institute's guideline development process. It is available from www.nice.org.uk/guidelinesprocess and copies can also be ordered by telephoning 0870 1555 455 (quote reference N0472).

5.1 Full guideline

The full guideline, 'National Clinical Guideline for the Management of Atrial Fibrillation', is published by the National Collaborating Centre for Chronic Conditions and is available from www.rcplondon.ac.uk/ncc-cc, the NICE website (www.nice.org.uk/CG036fullguideline) and the website of the National Library for Health (www.nlh.nhs.uk).

5.2 Quick reference guide

A quick reference guide for healthcare professionals is also available from the NICE website (www.nice.org.uk/CG036quickrefguide) or from the NHS Response Line (telephone 0870 1555 455; quote reference number N1054).

5.3 Understanding NICE guidance: information for patients and carers

A version of this guideline for people with AF and their carers ('Understanding NICE guidance') is available from the NICE website (www.nice.org.uk/CG036publicinfo) and the NHS Response Line (0870 1555 455; quote reference number N1055).

6 Related NICE guidance

Radiofrequency ablation for atrial fibrillation in association with other cardiac surgery. *NICE interventional procedure guidance* no. 121 (2005). Available from www.nice.org.uk/IPG121

Cryoablation for atrial fibrillation in association with other cardiac surgery. *NICE interventional procedure guidance* no. 122 (2005). Available from www.nice.org.uk/IPG122

Microwave ablation for atrial fibrillation in association with other cardiac surgery. *NICE interventional procedure guidance* no. 123 (2005). Available from www.nice.org.uk/IPG123

Percutaneous radiofrequency ablation for atrial fibrillation. *NICE interventional procedure guidance* no. 168 (2006). Available from www.nice.org.uk/IPG168

High-intensity focused ultrasound for atrial fibrillation as an associated procedure with other cardiac surgery. *NICE interventional procedure guidance* no. 175 (2006). Available from www.nice.org.uk/IPG175

7 Review date

The process of reviewing the evidence is expected to begin 4 years after the date of issue of this guideline. Reviewing may begin before this if significant evidence that affects the guideline recommendations is identified. The updated guideline will be available within 2 years of the start of the review process.

Appendix A: Grading scheme

The classification of recommendations and the levels of evidence for intervention studies used in this guideline are adapted from the Scottish Intercollegiate Guidelines Network ('SIGN 50: a guideline developers' handbook'), and summarised in the tables on page 33.

The classification of recommendations and levels of evidence for the accuracy of diagnostic tests are adapted from 'The Oxford Centre for Evidence-Based Medicine levels of evidence' (2001) and the 'Centre for Reviews and Dissemination report No. 4' (2001). They are summarised in the tables on page 34 and are being used on a pilot basis.

Classification of recommendations on interventions

Recommendation grade	Evidence
A	• At least one meta-analysis, systematic review, or randomised controlled trial (RCT) that is rated as 1^{++}, and is directly applicable to the target population, **or** • A systematic review of RCTs or a body of evidence that consists principally of studies rated as 1+, is directly applicable to the target population and demonstrates overall consistency of results, **or** • Evidence drawn from a NICE technology appraisal
B	• A body of evidence that includes studies rated as 2^{++}, is directly applicable to the target population and demonstrates overall consistency of results, **or** • Extrapolated evidence from studies rated as 1^{++} or 1^{+}
C	• A body of evidence that includes studies rated as 2^{+}, is directly applicable to the target population and demonstrates overall consistency of results, **or** • Extrapolated evidence from studies rated as 2^{++}
D	• Evidence level 3 or 4, **or** • Extrapolated evidence from studies rated as 2^{+}, **or** • Formal consensus
D(GPP)	• A good practice point (GPP) is a recommendation for best practice based on the experience of the Guideline Development Group
IP	• Recommendation from NICE Interventional Procedures guidance

Levels of evidence for intervention studies

Level of evidence	Type of evidence
1^{++}	• High-quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1^{+}	• Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
1^{-}	• Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
2^{++}	• High-quality systematic reviews of case–control or cohort studies • High-quality case–control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal
2^{+}	• Well-conducted case–control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal
2^{-}	• Case–control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal
3	• Non-analytical studies (for example, case reports, case series)
4	• Expert opinion, formal consensus

Classification of recommendations on diagnostic tests

Grade	Evidence
A(DS)	• Studies with level of evidence Ia or Ib
B(DS)	• Studies with level of evidence II
C(DS)	• Studies with level of evidence III
D(DS)	• Studies with level of evidence IV

DS, diagnostic studies.

Levels of evidence for studies of the accuracy of diagnostic tests

Levels of evidence	Type of evidence
Ia	• Systematic review (with no or minor variations in the directions and degrees of results between studies) of level-1 studies, which are studies that use: – a blind comparison of the test with a validated reference standard (gold standard) – a sample of patients that reflects the population to whom the test would apply
Ib	• Level-1 studies
II	• Level-2 studies, which are studies that have only one of the following: – the population is narrow (the sample does not reflect the population to whom the test would apply) – a poor reference standard is used (defined as that where the 'test' is included in the 'reference', or where the 'testing' affects the 'reference') – the comparison between the test and reference standard is not blind – the study is a case–control study • Systematic reviews of level-2 studies
III	• Level-3 studies, which are studies that have at least two of the features listed for level-2 studies • Systematic reviews of level-3 studies
IV	• Consensus, expert committee reports or opinions and/or clinical experience without explicit critical appraisal; or based on physiology, bench research or 'first principles'

Appendix B: The Guideline Development Group

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Information Scientist, NCC-CC

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General Practitioner, Moorfield House Surgery, Leeds

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Senior Charge Nurse, Leeds Teaching Hospitals NHS Trust

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Consultant Physician in General and Elderly Care Medicine, Pontypridd and Rhondda NHS Trust

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Project Manager, NCC-CC

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Appendix C: The Guideline Review Panel

The Guideline Review Panel is an independent panel that oversees the development of the guideline and takes responsibility for monitoring its quality. The Panel includes experts on guideline methodology, health professionals and people with experience of the issues affecting patients and carers. The members of the Guideline Review Panel were as follows.

Dr Peter Rutherford (Chair)

Senior Lecturer in Nephrology, University of Wales College of Medicine

Dame Helena Shovelton

Chief Executive, British Lung Foundation

Dr Rob Higgins

Consultant in Renal and General Medicine, University Hospitals Coventry and Warwickshire NHS Trust, Coventry

Dr John Young

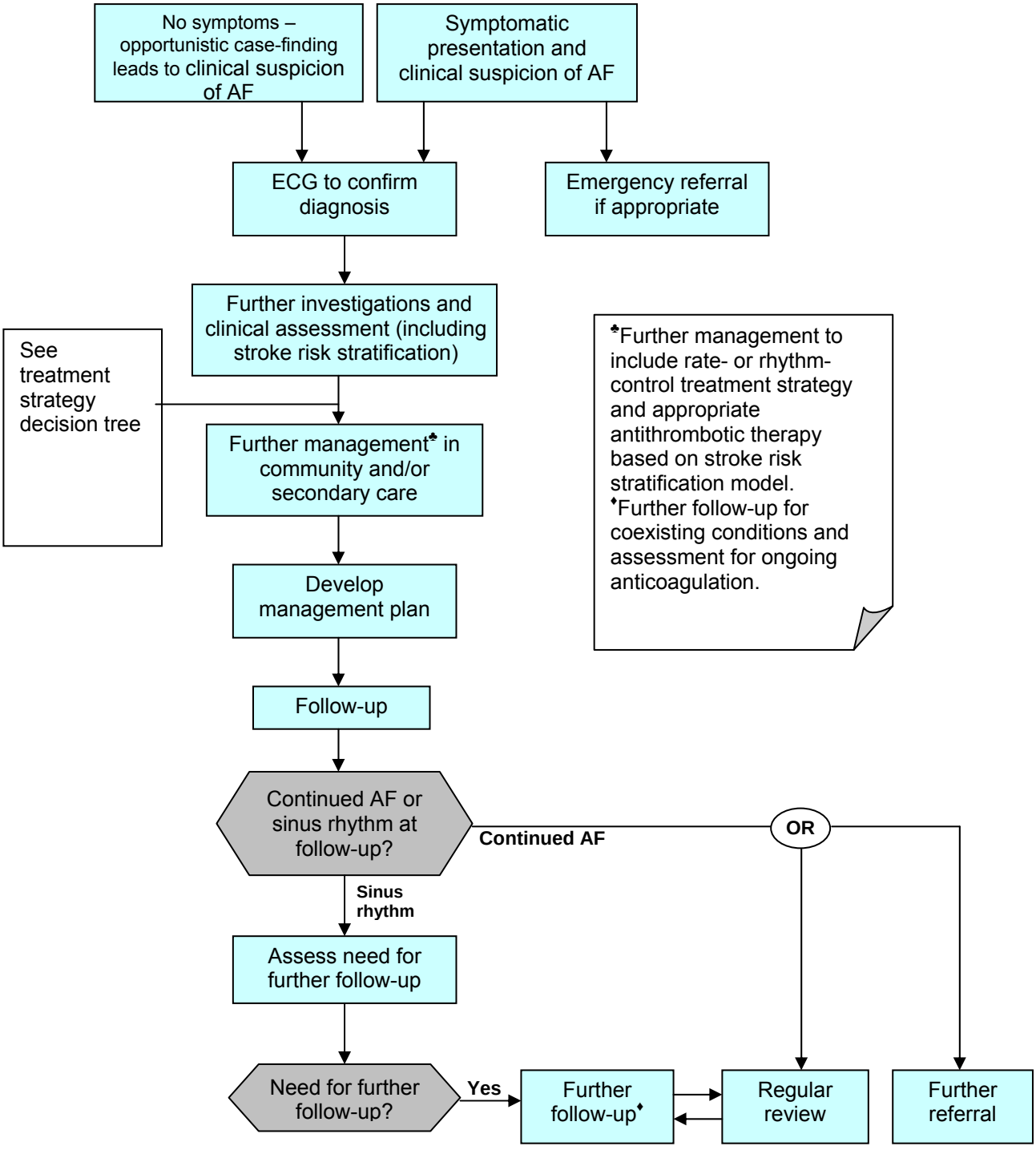
Medical Director, Merck Sharp & Dohme (MSD)

Appendix D: Technical detail on the criteria for audit

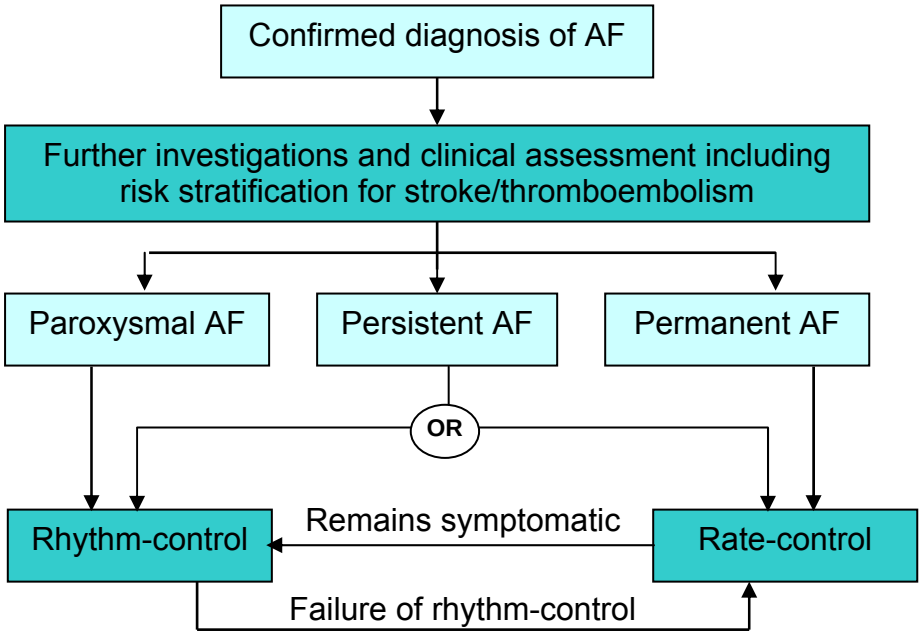
Criterion	Exception	Definition of terms
1. All people presenting to primary or secondary care with a history of hypertension, heart failure, diabetes or stroke and noted to have an irregular pulse to be offered an ECG and any new diagnosis of AF recorded.	None.	Percentage of patient records with a new diagnosis of AF made following an ECG made on the basis of detection of an irregular pulse.
2. All AF patients in whom a rate-control or rhythm-control strategy is initiated to have their involvement in choosing a treatment strategy recorded.	Post-operative or haemodynamically unstable patients, or those otherwise not able to engage in a decision-making process.	Percentage of patient records with a record of involvement of the patient in the decision-making process.
3. All patients who are prescribed digoxin as initial monotherapy for rate-control to have the reason for this prescription recorded where it is not obvious (e.g. sedentary patient, presence of contraindication to alternative agents).	None.	Percentage of patient records with a prescription of digoxin for initial rate-control monotherapy where the reason for digoxin prescription is: a) sedentary patient; b) presence of contraindications to beta-blockers or rate-limiting calcium antagonists; c) other reasons.
4. and 5. All patients should be assessed for risk of stroke/thromboembolism and given thromboprophylaxis according to the stroke risk stratification algorithm (see appendix E) and have this assessment and any antithrombotic therapy recorded.	Haemodynamically unstable patients or those in whom assessment is impossible or inappropriate.	Percentage of patient records with a record of risk assessment and thromboprophylaxis consistent with the stroke risk stratification algorithm.

Appendix E: The algorithms

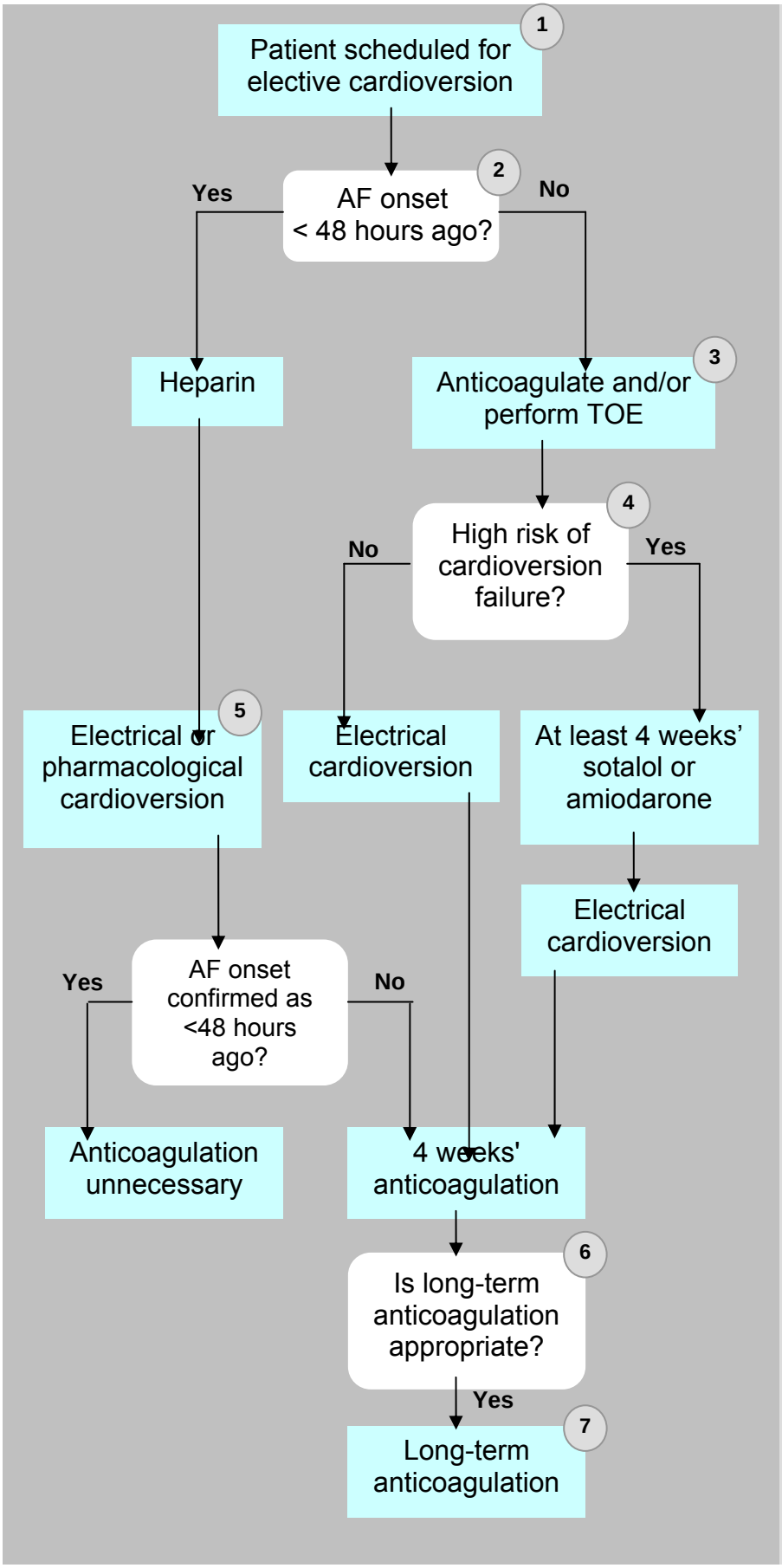
AF care pathway



Treatment strategy decision tree

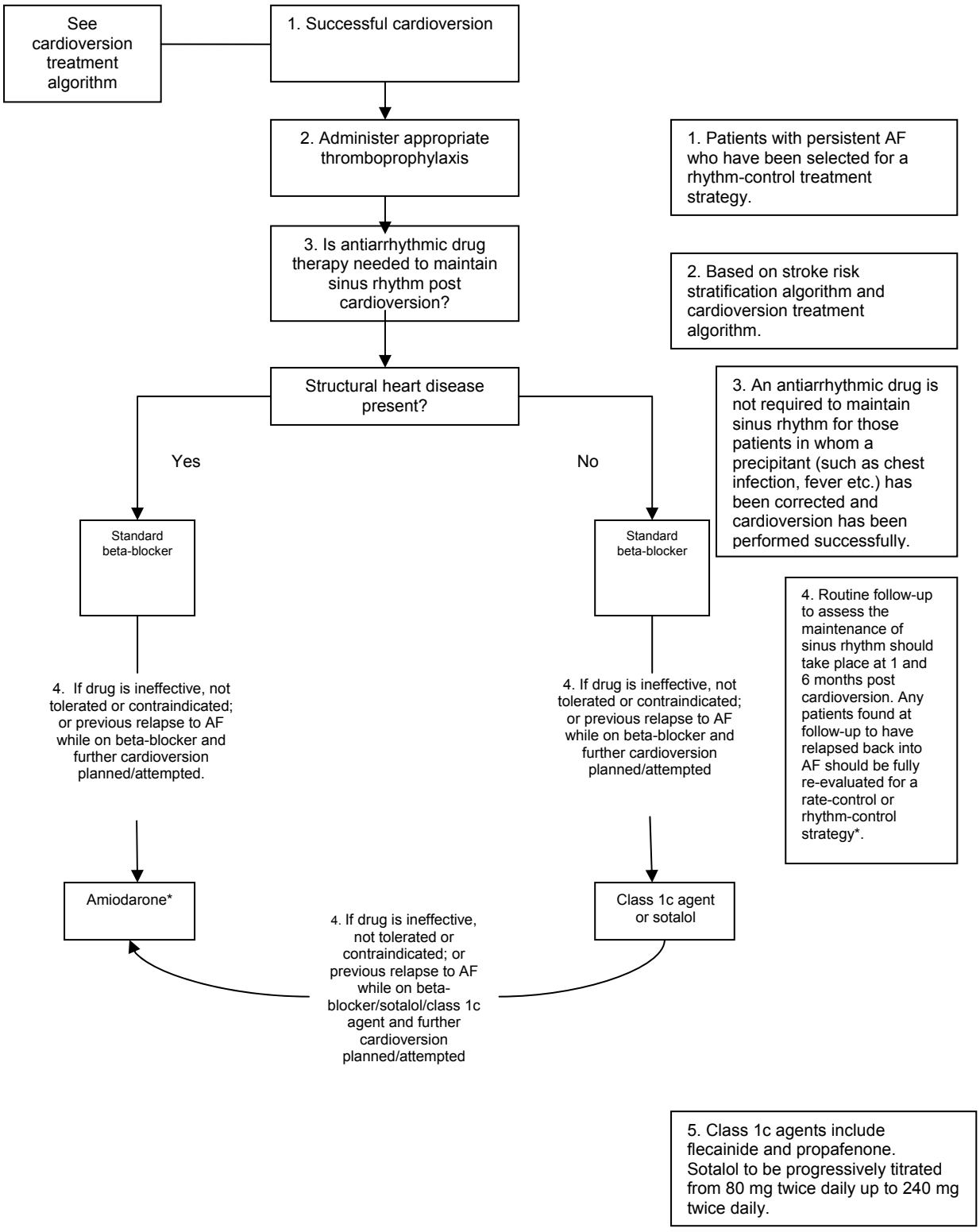


Cardioversion treatment algorithm



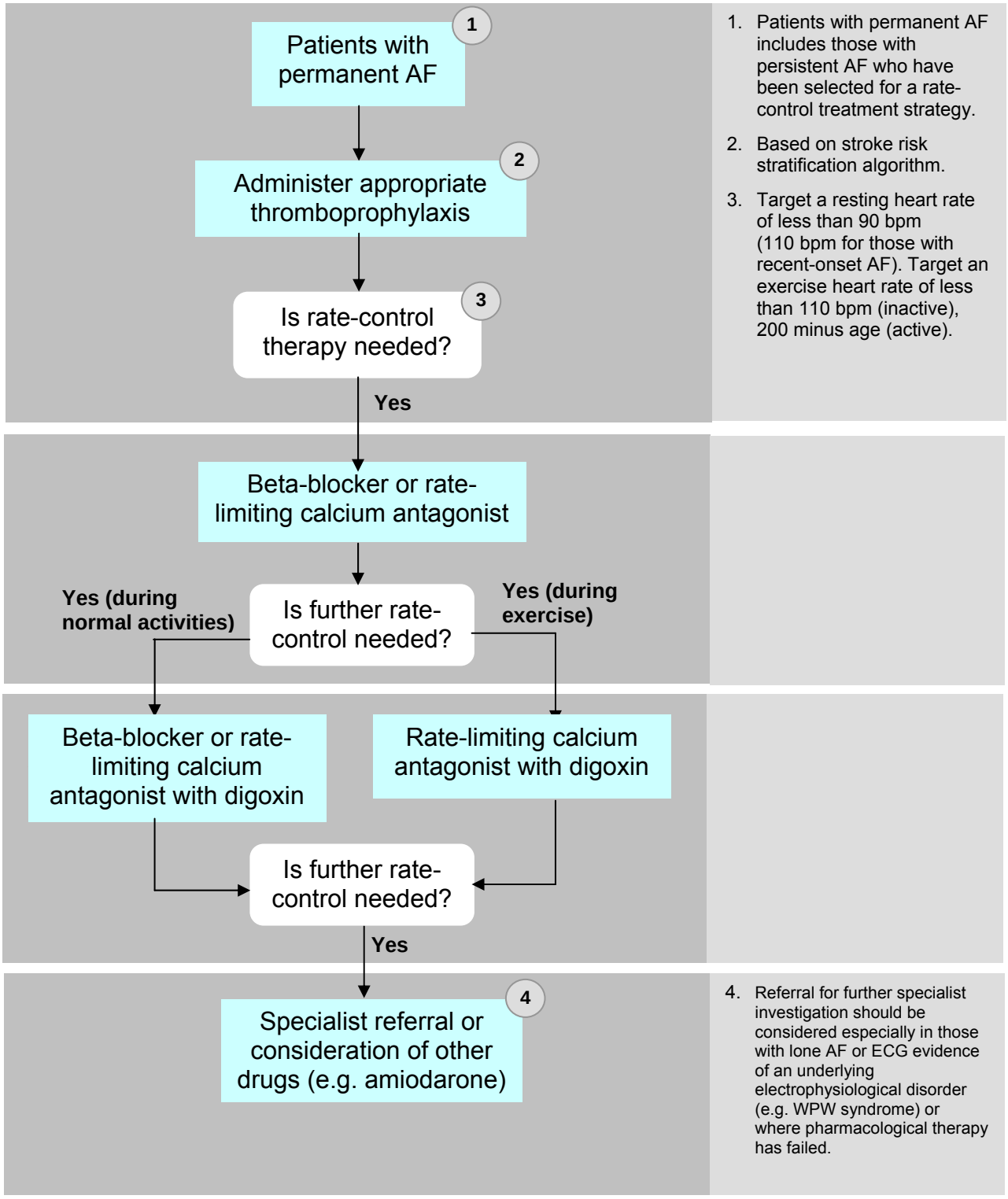
1. Perform TTE examination before rhythm-control treatment strategy involving cardioversion.
2. Also consider patient preference following a discussion of the advantages and disadvantages of each option.
3. Administer at least 3 weeks' therapeutic anticoagulation prior to cardioversion or perform TOE-guided cardioversion, depending on preference, contraindications and practicalities.
4. High risk of cardioversion failure suggested by previous failure or AF recurrence.
5. Intravenous amiodarone as drug of choice in those with structural heart disease; flecainide in those without structural heart disease.
6. As determined by the stroke risk stratification algorithm or where there is a high risk of AF recurrence. Patients with a history of AF >12 months, mitral valve disease, LV dysfunction, enlarged left atrium or a history of AF recurrence are at a higher risk of AF recurrence.
7. Anticoagulation should be administered to a target INR of 2.5 (range 2.0 to 3.0).

Rhythm-control treatment algorithm for persistent AF

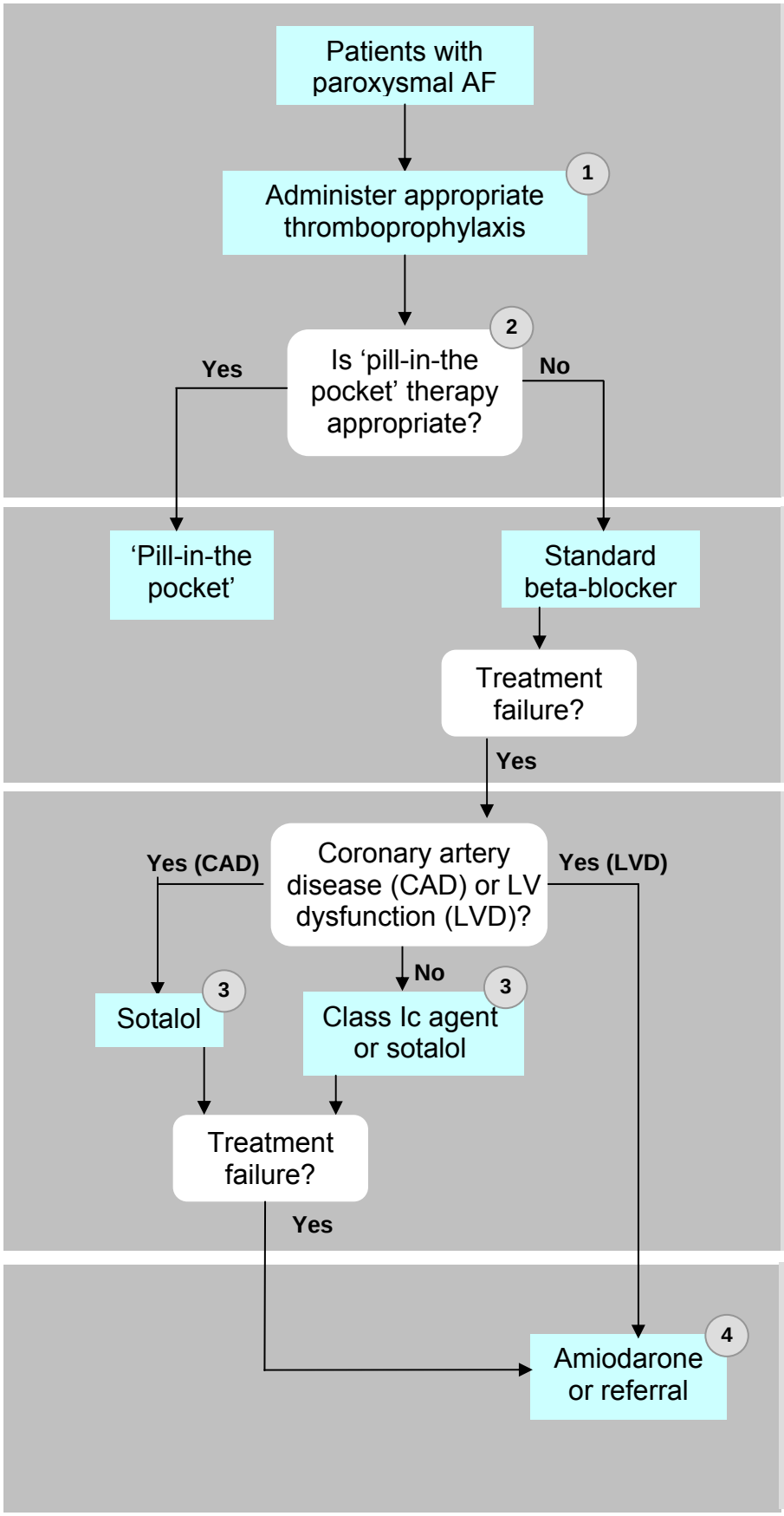


* If rhythm-control fails, consider the patient for rate-control strategy, or specialist referral for those with lone AF or ECG evidence of underlying electrophysiological disorder (e.g. Wolff–Parkinson–White [WPW] syndrome).

Rate-control treatment algorithm for permanent (and some cases of persistent) AF

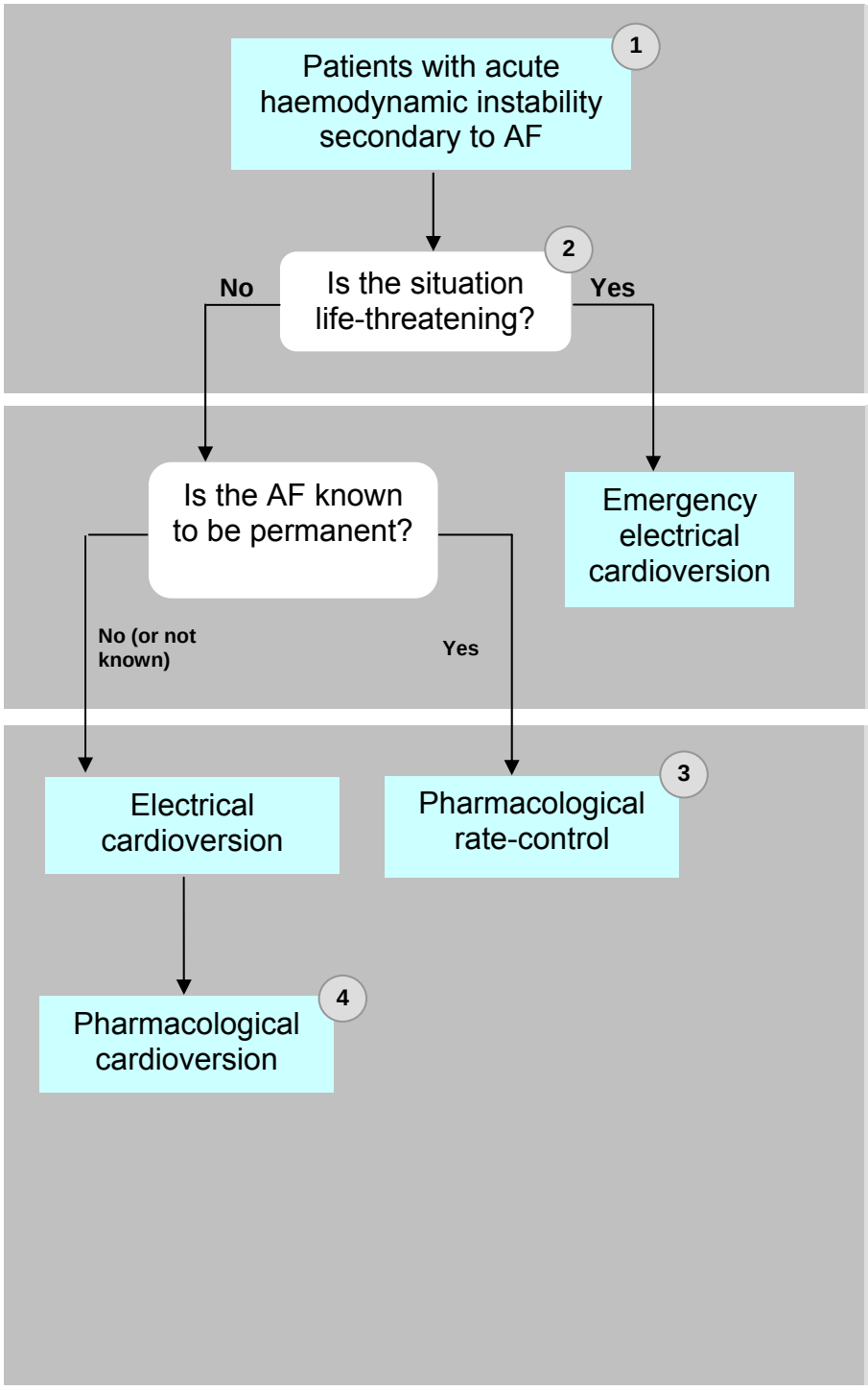


Rhythm-control treatment algorithm for paroxysmal AF



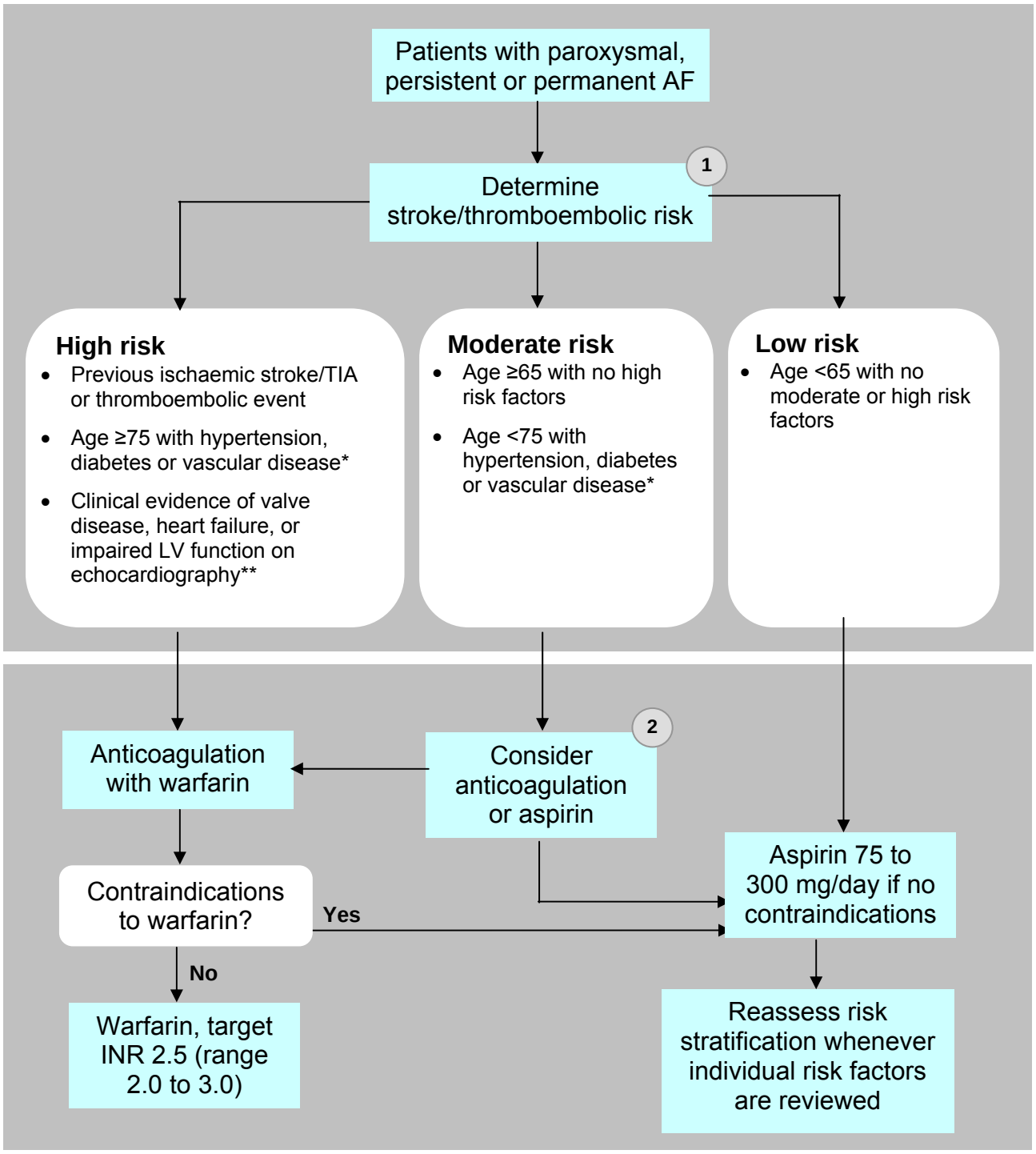
1. Based on stroke risk stratification algorithm.
2. Consider a 'pill-in-the-pocket' strategy for those who i) have no history of LV dysfunction, or valvular or ischaemic heart disease, ii) have a history of infrequent symptomatic episodes of paroxysmal AF, iii) have a systolic blood pressure > 100 mmHg and a resting heart rate above 70 bpm, iv) are able to understand how to, and when to, take the medication.
3. Sotalol to be progressively titrated from 80 mg twice daily up to 240 mg twice daily.
4. Referral for further specialist investigation should be considered, especially in those with lone AF or ECG evidence of an underlying electrophysiological disorder (e.g. WPW syndrome) or where pharmacological therapy has failed.

Haemodynamically unstable AF treatment algorithm



1. Diagnosis to be confirmed by ECG. Check electrolytes and review chest X-ray. Attempt to establish aetiology of acute haemodynamic instability.
2. Any emergency intervention should be performed as soon as possible, and the initiation of anticoagulation should not delay any emergency intervention.
3. Where urgent pharmacological rate-control is indicated, intravenous treatment should be with i) beta-blockers or rate-limiting calcium antagonists, ii) amiodarone, where beta-blockers or calcium antagonists are contraindicated or ineffective.
4. Where there is a delay in organising electrical cardioversion, intravenous amiodarone should be used. In those with known WPW syndrome, flecainide is an alternative (atrioventricular node-blocking agents such as diltiazem, verapamil or digoxin should not be used).

Stroke risk stratification algorithm



1. Note that risk factors are not mutually exclusive, and are additive to each other in producing a composite risk. Since the incidence of stroke and thromboembolic events in patients with thyrotoxicosis appears similar to that in patients with other aetiologies of AF, antithrombotic treatments should be chosen based on the presence of validated stroke risk factors.
2. Owing to lack of sufficient clear-cut evidence, treatment may be decided on an individual basis, and the physician must balance the risk and benefits of warfarin versus aspirin. As stroke risk factors are cumulative, warfarin may, for example, be used in the presence of two or more moderate stroke risk factors. Referral and echocardiography may help in cases of uncertainty.

*Coronary artery disease or peripheral artery disease.

** An echocardiogram is not needed for routine assessment, but refines clinical risk stratification in the case of moderate or severe LV dysfunction and valve disease.