Management of Atrial Fibrillation in the Emergency Department

Ref: Emergency Medicine Clinics of North America, 2005

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Introduction

- Af is most common cardiac arrhythmia
- Sequelae: range from none to devastating: exercise intolerance, CHF, tachycardia-induced cardiomyopathy, and systemic emboli

Pathophysiology

- Af is a supraventricular rhythm disorder due to: ectopic focus, single re-entry circuit, or multiple re-entrant circuits.
- Result in decrease cardiac output especially in VHD, diastolic dysfunction, cardiomyopathy, and CAD → lead to sequelae
- S/S: palpitations, shortness of breath, chest pain, weakness, and near sycope caused by coronary insufficiency, CHF, hypotension, and shock
- Intra-atrial stasis in atrial appendage and cause thromboembolic events

Causes

- Cardiopulmonary causes
- Systemic causes
- Primary (lone) atrial fibrillation

Table 1
Etiology of atrial fibrillation

Serious cardiopulmonary causes	Other causes
Acute myocardial infarction or acute coronary syndrome	Hyperthyroidism
Pulmonary embolism	Ethanol use ("holiday heart")
Cardiomyopathy	Hypothermia
Restrictive heart disease	Drugs: sympathomimetrics, cocaine, amphetamine derivatives, ephedra
Chronic obstructive pulmonary disease	Metabolic causes: hypokalemia
Sleep apnea	Idiopathic: lone AF[a]
Hypertension	
Valvular heart disease	
Left ventricular hypertrophy	
Left ventricular diastolic dysfunction	
Congestive heart disease	
Sick sinus syndrome	
Pericarditis	
Post-cardiac surgery	

[a] Lone atrial fibrillation is most commonly found in younger population (age ≤ 65 yrs) with paroxysmal atrial fibrillation. Diagnosis includes absence of known causative factors and normal left ventricular function.

History Taking

- Ask for presence of chest pain or history of CAD to suggest acute ishemia
- Fevers, or other constitutional symptoms associated with sepsis, acute volume shifts, alcohol ingestion, thyroid disorders, medications, alcohol, or durg use
- Determine the chronicity of the complaint, time of onset of symptoms suggestive of Af
- Note that many episodes of Af were asymptomatic or silent episodes

Physical Examination

- Vital signs
- Cardiopulmonary examination for CHF or VHD: S3 gallop, JVE, pulmonary rales, pedal edema
- Neurologic and vascular examination to determine the possibility of embolic complications

ECG

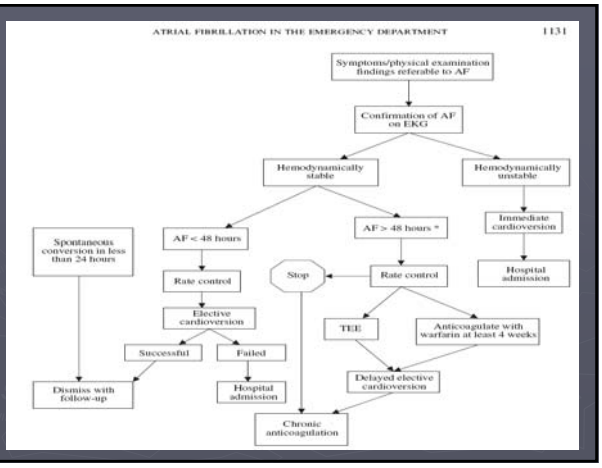
- Undulating low-amplitude fibrillary waves in place of discrete P waves and irregular rhythm
- Wide QRS complexes due to conduction aberrancey or pre-excitation in WPW syndrome
- Avoid AV nodal blocking agents: CCB, BB, and adenosine in WPW syndrome which can lead into VF and sudden cardiac death.
- ST-T changes consistent with ischemia or infarction should be identified.

Laboratory

- Complete blood count
- Electrolyte panel
- Glucose and thyroid function testing
- CXR
- Cardiac biomarkers if ACS suspected
- CT scan for suspicious of pulmonary embolism
- Arterial blood gas assay: carbon monixide exposure, hypercarbia, shock, or acidemia
- 2-D Echo: LV function, wawll motion, chamber size, valvular function, pericardial fluid
- TEE for intra-atrial thrombus in elective cardioversion later at ward

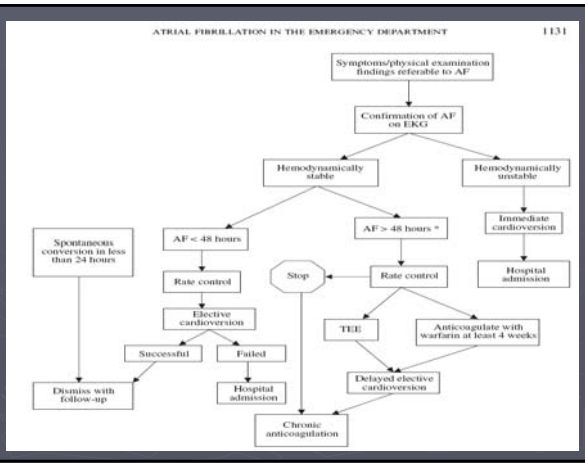
Management of Af

- Associated symptoms
- Stability of vital signs
- Duration of dysrhythmia
- Categorize into:
  - Hemodynamically unstable patient
  - Af of less than 48 hours
  - Af of more than 48 hours



Hemodynamically Unstable Patient

- ABCs
- Urgent rate and rhythm control in RVR: emergent synchronized cardioversion
- MVR or SVR: treat underlying causes and require admission for further cardiovascular evaluation



Hemodynamically Stable Patient: Rate Control

- Adequate rate control by agents that depress AV node conduction: BB, CCB, Digoxin
- BB: metoprolol, propranolol, esmolol → benefit in IHD, contraindication in COPD and asthma
- CCB: diltiazem, verapamil → use cautiously in CHF for hypotension
- Digoxin: limited role in acute rate control for long onset of action: hours
- Avoid above in WPW, may use procainamide and amiodarone in WPW

Hemodynamically Stable Patient: Rhythm Control

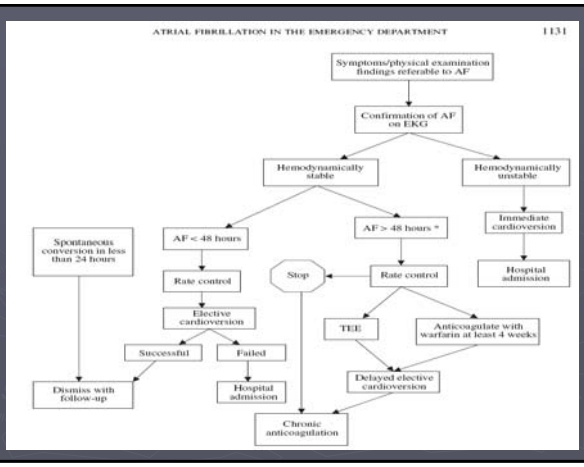
- RACE trial: rate control was not inferior to rhythm control at the end of 12 months with primary endpoint of CV death, CHF, TIA/CVA, bleeding. Women and hypertensive pts had worse outcomes with rhythm control
- AFFIRM trial:65 yrs pts of Af for at least 6 hrs in the past 6 months who had risk factors for stroke/death → increase in mortality in rhythm control (p = .07), higher cost in rhythm control
- Conclusion: if ventricular rate and symptoms could be controlled, rate control is preferred.

Hemodynamically Stable Patient: Rhythm Control

- Rhythm control is more suitable in the following selected groups of pts (50% of all Af)
  - Younger pts with lone Af (15% of all Af)
  - Highly symptomatic pts
  - Significant CHF
  - Pts contraindicated for anticoagulation or rate control

Hemodynamically Stable Patient: Rhythm Control

- **New onset Af < 48 hr** (low likelihood of atrial thrombus, <1%) → CARDIOVERSION
- Timing of cardioversion: ?, immediately in ED or after period of observation; 50% of pts spontaneously cardiovert rhythm within 24 hrs

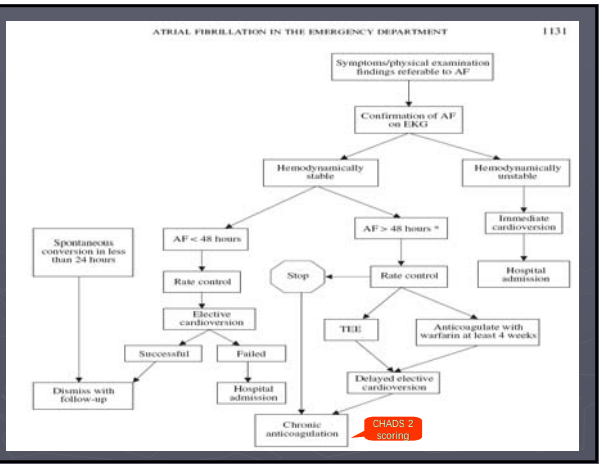


Cardioversion: chemical vs Electrical

- Chemical: no need sedation, but take longer for onset, has proarrhythmic potential (3%~5%), monitor up to 12 hrs, lower success rate (50%)
- Electrical:
  - high success rate (89%)
  - need sedation
  - Aborted if failure to convert despite max energy setings.
  - Biphasic better than monophasic
  - Complications are rare: failure to convert, cardiac damage, anesthetic complications
  - Effectiveness increased by pretreatment with ibutilide

Anticoagulation

- Increase risk for thromboembolism and stroke in **pts > 48 hrs**, hence, tx with anticoagulant therapy for at least 3 to 4 weeks before cardioversion or TEE before cardioversion



CHADS 2 Scoring System for pts Requiring Chronic Anticoagulation

Table 2
CHADS 2 score

CHADS 2 score	95% CI	Yearly risk of stroke (%)
0	<1.2-3.0>	1.9
1	<2.0-3.8>	2.8
2	<3.1-5.1>	4.0
3	<4.6-7.3>	5.9
4	<6.3-11.1>	8.5
5	<8.2-17.5>	12.5
6	<10.5-27.4>	18.2

Yearly risk of stroke in patients with chronic atrial fibrillation without antithrombotic therapy. Prior stroke, 2 points; congestive heart failure, 1 point; hypertension, 1 point; diabetes, 1 point; age 75 years or older, 1 point.

CHADS 2 scoring system

- Score 0: low risk → aspirin
- Score 1~2: intermediate risk → aspirin or warfarin
- Score > = 3: high risk → warfarin

Other Treatment Options

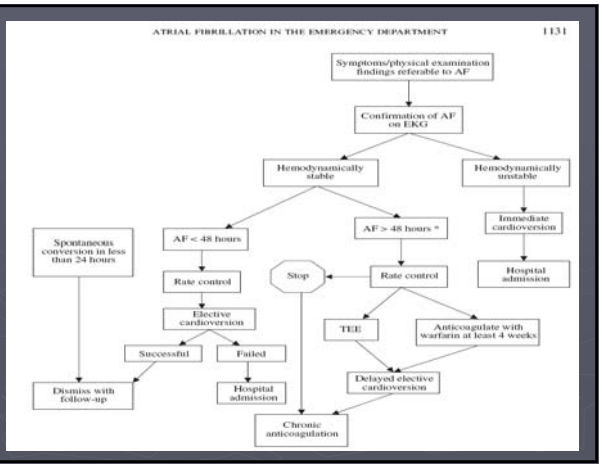
- Radiofrequency ablation (circumferential pul. Vein isolation)
- Surgical maze ablation

Disposition

- Pts with significant comorbidities, hemodynamic instability, or ACS will requre admission to the hospital
- Pts who responds well to therapy or converts to normal sinus rhythm without above complications → OBS for few hrs → MBD and OPD follow up

Summary

- > 50% of acute Af pts will convert spontaneously to sinus rhythm within a 24 hrperiod
- Identifying the time of onset is critical to initiation of anticoagulation and decision of cardioversion
- Chronic Af: rate control and anticoagulation
- Hemodynamic unstable → immediate cardioversion



Rate control VS rhythm control

Ref: Management of atrial fibrillation *Lancet 2007; 370: 604–18*

- Several clinical trial trials shown no significant differences between the two strategies with respect to mortality, major bleeding, and thromboembolic events

Hohnloser SH, Kuck KH, Lilienthal J *Lancet 2000; 356: 1789–94*
Van Gelder IC *N Engl J Med 2002; 347:* 1834–40
Carlsson J, Miketic *J Am Coll Cardiol 2003; 41: 1690–96*

- Restoration and maintenance of sinus rhythm in patients with persistent atrial fibrillation was associated with improvements in quality-of-life measures and exercise performance.

Carlsson J *J Am Coll Cardiol 2003; 41: 1690–96.*
Hohnloser SH *Lancet 2000; 356: 1789–94*
Van Gelder IC *N Engl J Med 2002; 347:* 1834–40.

- The presence of sinus rhythm (with or without AADs) was associated with a significant reduction in the risk for death, but AAD use was associated with increased mortality
- A strategy to maintain sinus rhythm without the adverse effects of antiarrhythmic medications may confer a survival advantage

Corley SD *Circulation 2004; 109: 1509–13*

- The reasons for the lack of advantage of sinus rhythm maintenance in clinical trials are not clear but could relate to the toxicity associated with antiarrhythmic medications, negating the advantages of sinus rhythm

Corley SD *Circulation 2004; 109: 1509–13*

- A group of younger patients (eg, age <40 years) with valvular heart disease and atrial fibrillation showed a significant benefit of rhythm control with respect to reduction in mortality and improvement in functional class, quality of life, and exercise time

Vora A. *Curr Opin Cardiol 2006; 21: 47–50.*

NICE guidelines

- Rate-control strategy preferred in
  - older than 65 years with coronary artery disease
  - with contraindications to AADs
  - with no congestive heart failure
  - unsuitable for cardioversion

NICE guidelines

- Rhythm-control strategy preferred in
  - Symptomatic patients
  - younger patients (eg, age <65 years)
  - presenting for the first time with lone atrial fibrillation
  - those with the disorder that is secondary to a treated or corrected precipitant.

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Treatment of Stable Atrial Fibrillation in the Emergency Department: A Population-Based Comparison of Electrical Direct-Current versus Pharmacological Cardioversion or Conservative Management

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Objective

- To compare the success rates and short-term complications of three treatment approaches, pharmacological and direct-current cardioversion (DCC), or wait-and watch among stable atrial fibrillation (AF) patients in the emergency department (ED).

Study design

- Retrospectively compare the outcomes of the three optional treatment approaches in stable AF patients who were cardioversion compatible in ED within one year
- Success of chemical or electrical cardioversion interventions was defined as a return to sinus rhythm, as demonstrated on a 12-lead ECG and sustained throughED discharge.

Patient selection

- AF duration < 48 h, or, for longer-lasting AF, with an international normalized ratio (INR) of 2–5.
- Patients who underwent emergency DCC for clinically hemodynamic instability AF were excluded

Cardioversion Treatments

- DCC protocol in the ED included short-acting sedation with benzodiazepines, and optionally with morphine or pethidine.
- The initial shock was synchronized monophasic 50 J, followed by 100, 150, 200, 300 and 360 J, as necessary

Pharmacological cardioversion

- Propafenone (300 mg x 2 p.o. at 2- to 3-hour intervals)
- Procainamide (100 mg i.v. bolus over 5 min up to a total dose of 1 g and then followed by continuous i.v. 2–4 mg/min)
- Amiodarone (300 mg continuous i.v. for 30–60 min, followed by 1,200 mg/24 h continuous i.v.)

Rate control

- Digoxin (0.25 mg i.v. at 2- to 3-hour intervals up to a total dose of up to 1.5 mg)
- Verapamil (5–10 mg i.v. bolus during 3–5 min)
- Beta Blockers (metoprolol – 2.5–5.0 mg i.v. bolus during 2 min, which could be repeated at a 15- to 30-min interval for up to a total dose of 15 mg)

Table 1. Baseline characteristics by treatment for patients eligible for cardioversion

	Cardioversion treatment administered, n (%)				
	DCC	pharmacological	wait & watch	p value unweighted	p value weighted
Total	85 (22.7)	56 (15.0)	233 (62.3)		
Age					
≤60 years	29 (34.1)	16 (28.6)	43 (18.4)		
61–74 years	35 (42.3)	31 (55.4)	93 (41.6)	0.0005	0.79
≥75 years	20 (23.5)	93 (16.1)	90 (39.9)		
Male sex	44 (51.7)	19 (34.0)	106 (45.5)	0.113	0.72
Duration of fibrillation					
<48 h	77 (91.7)	53 (94.6)	225 (98.2)		
≥48 h	7 (8.3)	0 (0)	4 (1.8)	0.002[a]	0.03
Medical history					
Hypertension	34 (40.0)	29 (51.8)	124 (53.2)	0.11	0.79
Diabetes	6 (7.2)	6 (10.9)	34 (14.6)	0.20	0.89
Cardiomyopathy	2 (2.4)	2 (3.6)	8 (3.4)	0.46	0.79
Valvular disease	13 (15.3)	5 (8.9)	23 (9.9)	0.52	0.71
CHF	5 (6.0)	2 (5.0)	33 (14.2)	0.019	0.50
COPD	6 (7.1)	4 (7.3)	17 (7.3)	0.998	0.93
1st AF episode	20 (24.7)	9 (16.7)	39 (17.7)	0.348	0.28
Medications at home					
Coumadin	19 (23.2)	15 (26.8)	40 (57.6)	0.236	<0.001
Aspirin	30 (36.6)	19 (33.9)	92 (40.7)	0.584	0.61
Ca-channel blockers	17 (20.0)	8 (14.3)	40 (17.2)	0.675	0.79
β-Blockers	11 (12.9)	4 (7.1)	29 (12.5)	0.50	0.01
Treating physician					
Senior ED	48 (56.5)	16 (28.6)	91 (39.1)		
Resident	37 (43.5)	40 (71.4)	142 (60.9)	0.002	0.59

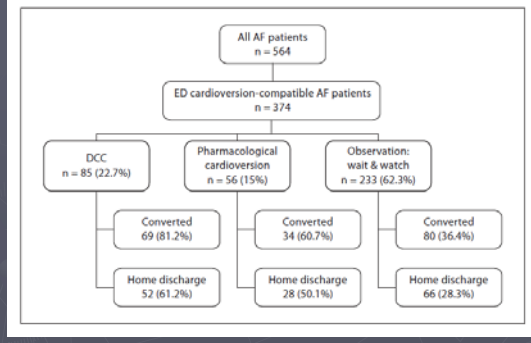


Table 2. Cardioversion rate and discharge destination from ED according to treatment group

	Converting treatment administered, n (%)[a]					
	DCC	pharmacological	wait & watch	total	p value unweighted	p value weighted
Cardioversion rate	69 (78.2)	34 (59.2)	80 (37.9)	183 (58.3)	<0.001	<0.001
Discharge from ED						
Home	52 (52.9)	28 (47.9)	66 (32.1)	146 (44.0)	<0.001	<0.01
ED observation unit	5 (7.8)	5 (9.7)	20 (8.4)	30 (8.6)		
Hospital	28 (39.3)	23 (42.4)	147 (59.5)	198 (47.4)		

Table 3. Probable and possible number of AF-treatment-related complications within 7 and 14 days among 146 home-discharged AF patients and in-hospital mortality, according to treatment group

Time after discharge	AF-treatment-related complications	DCC	Pharmacological cardioversion	Wait & watch approach	Total (%)[a]
1–7 days	probable	–	pulmonary edema (1)	–	1 (0.7)
	possible	chest pain (2)	hemoptysis (1) unstable AP (1) non-specific abdominal pain (1)	chest pain (3) unstable AP (1) arrhythmia (1) drug intoxication (1)	11 (7.5)
8–14 days	probable	–	CHF (2)	CHF (2)	4 (2.7)
	possible	abdominal pain (2) unstable AP (1) SVT (1)	chest pain (1) unstable AP (1)	chest pain (5) unstable AP (2) functional deterioration (1) bleeding disorders (1)	15 (10.3)
Died during hospitalization		–	–	(3)	3 (0.8)[b]

Table 4. ORs of the success of cardioversion by multiple logistic regression, weighted by inverse propensity score

Variable	Reference	OR	95% CI	p
Treatment				
Electrical, DCC	wait & watch	6.00	3.38–10.66	<0.001
Chemical	wait & watch	2.47	1.45–4.20	
Treating physician				
Senior	resident	1.75	1.08–2.71	0.02
Age				
≤60 years	≥75	1.65	0.86–3.17	0.24
61–74 years	≥75	1.45	0.85–2.46	
Gender				
Female	male	0.73	0.46–1.16	0.19
Comorbidity	none	1.33	0.79–2.21	0.28

C index = 0.731.

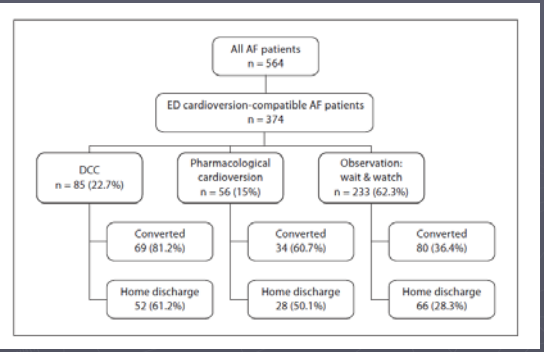
Discussion

- DCC was 2.43 times more successful than pharmacological treatment in converting AF patients to sinus rhythm (95% CI 1.36–4.33, p = 0.003).
- A significantly higher rate of DCC patients in our study were also discharged to their home (53%) compared with pharmacologically treated patients (48%) or those of the wait-and-watch approach (32%), p < 0.01.

- The rate of re-admission to the hospital within 14 days of discharge due to propable AF-treatment-related complications was extremely low, with only 5 patients (3.4%), and none of them from the DCC group
- A total of 3 patients died during hospitalization , all 3 from the wait-and watch group.

Underuse of DCC

- Senior physicians are probably more self confident and less hesitant on performing what may be perceived as an aggressive therapy
- During night shifts, the ED staff consists of junior physicians who may prefer to take the wait-and-watch approach and finally to hospitalize patients.



Conclusion

- Successfulness of treatment depends strongly on the type of cardioversion (DCC or pharmacological cardioversion), and also on the seniority of the treating physician, while age, gender or the existence of comorbidities are weak predictors for the successfulness of treatment

Conclusion

- DCC was found to be the most effective treatment, with few short-term complications following conversion of stable AF patients to sinus rhythm in the ED

Thank you for your attention