

Atrial fibrillation in the Critically-ill Patients

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Occurrence of Atrial Fibrillation in the ICU

Prevalent

- (preexisting)
- A patient with chronic AF develops critical illness.



- (new onset)
- A patient who was previously in sinus rhythm develops new-onset AF (NOAF) while in the ICU, secondary to the physiologic stress of critical illness (e.g., sepsis or pulmonary embolism)

These situations are *different* from AF in *icu* other contexts:

ICU patients are often hemodynamically tenuous, so they may respond poorly to the usual AF therapies (e.g., diltiazem).

DC cardioversion alone has a *low* success rate among critically ill patients (70-80% of patients will usually revert back into AF).

The optimal heart rate for critically ill patients is unknown, but some patients may benefit from a mild compensatory tachycardia. Immediately pushing the heart rate down to a "normal" range (e.g., <100) can be dangerous





Diagnostic Criteria for AF on EKG









12-lead ECG: showing a wide QRS tachycardia.

Lead I strip: Lewis lead obtained with a paper speed of 50 mm/s and twice normal calibration at 20mm/mV. Regular P waves can now be clearly identified.



Heart Rate in AF

For most patients who aren't on medications that suppress the AV node, AF will have a heart rate of ~120-180.

If the heart rate is >>200, consider the possibility of an accessory tract (AF plus Wolff Parkinson White): *shouldn't* be treated with medications that impair the AV node (eg. betablockers, calcium channel blockers, or amiodarone) but use procainamide or ibutilide

If the heart rate is <100, conduction disease is likely



Management







Supportive care, stabilization, and treatment of underlying factors

Rate versus rhythm control.

Anticoagulation management





Case Study

- 75 years-old male with PMH of COPD and diastolic dysfunction who was admitted to the ICU after a perforated diverticulitis procedure. He remained intubated and mechanically ventilation.
- Patient did not have a previous history of atrial fibrillation and he is not on anticoagulation.
- He developed new onset atrial fibrillation with rapid ventricular response of 160-180. His systolic
 blood pressure dropped from 100-120 to the 70's mm and persisted despite fluid bolus.
- Blood pressures ranged from 83/45 to 125/83, lower than usual.



What is the best intervention?

Amiodarone 150 mg then infusion



Echocardiography

Electrical cardioversion and amiodarone

Direct-current cardioversion



Beta blockers



How Much is AF Actually Contributing to the Patient's Instability?



For most critically ill patients, the AF isn't the primary driver of instability





CLINICAL INVESTIGATIONS

Effectiveness of direct-current cardioversion for treatment of supraventricular tachyarrhythmias, in particular atrial fibrillation, in surgical intensive care patients^{*}

Mayr, Andreas MD; Ritsch, Nicole MD; Knotzer, Hans MD; Dünser, Martin MD; Schobersberger, Wolfgang MD; Ulmer, Hanno PhD; Mutz, Norbert MD; Hasibeder, Walter MD

Author Information ⊘

Critical Care Medicine 31(2):p 401-405, February 2003. | DOI: 10.1097/01.CCM.0000048627.39686.79



Mayr A, et al. Crit Care Med. 2003 Feb;31(2):401-5.



Effectiveness of direct-current cardioversion for treatment of supraventricular

tachyarrhythmias, in particular atrial fibrillation, in surgical intensive care patients.



Response Rate to DC Shocks

Mayr A, et al. Crit Care Med. 2003 Feb;31(2):401-5.



Case Study

- 62-year-old male with PMH of HTN and DM.
- Admitted with sepsis and septic shock secondary to pneumonia
- Intubated and on mechanical ventilation requiring norepinephrine at 0.5 mcg/kg/min
- Developed irregular rhythm with tachycardia and SBP in the 90's





What is the best intervention?







Case Study

- An elderly man with a history of diabetes and HTN presented with lethargy and weakness, decreased urine output, and hypotension.
- He had no CP or SOB, and it was unknown if there was a previous history of atrial fib. He was on atenolol, but it was not known if this was simply for hypertension, or for atrial fib. He was not anti coagulated.
- Blood pressures ranged from 83/45 to 125/83, lower than usual. HR ranged from 110 to 145.
- Troponin is 0.13 and UA is positive for nitrite and WBC



Case Study





What is the best intervention?





Echocardiography

Electrical cardioversion



Beta blockers







3 liters of IVF were given







Treatment of Underlying Problems

hemodynamic optimization -

treatment of pain/anxiety/withdrawal

Treatment of electrolyte abnormalities

Respiratory support

Evaluation and treatment of underlying factors <u>Discontinue beta-adrenergic vasopressors as able (especially epinephrine and dobutamine)</u>
Add vasoconstrictors that don't stimulate beta receptors (phenylephrine or vasopressin)

Optimize volume status (fluid or diuresis)

• Fentanyl and adjuvant medications

 <u>Dexmedetomidine may be considered</u> as an anxiolytic that will reduce sympathetic tone and decrease heart rate.

• Hypokalemia and hypomagnesemia

CPAP for heart failure, BiPAP for COPD, HFNC for pneumonia).

• Avoid anchoring excessively on AF as the cause of the patient's hemodynamic instability.

• For ongoing instability, evaluate broadly and treat appropriately. For example, uncontrolled AF could be a manifestation of sepsis, PE, thyrotoxicosis, or any cause of shock.





Rate vs. Rhythm Control

FAVERS RATE CONTROL	FAVORS RHYTHM CONTROL		
 Chronic atrial fibrillation A-fib started >48 hours ago and the patient is not anticoagulated 	New onset AF in the contest of		
	critical illness		
	 AF seems to impair hemodynamics 		
	Atrial flutter		

Failure of rate control strategy





ORIGINAL ARTICLE

Rate Control versus Rhythm Control for Atrial Fibrillation after Cardiac Surgery

A. Marc Gillinov, M.D., Emilia Bagiella, Ph.D., Alan J. Moskowitz, M.D., Jesse M. Raiten, M.D., Mark A. Groh, M.D., Michael E. Bowdish, M.D., Gorav Ailawadi, M.D., Katherine A. Kirkwood, M.S., Louis P. Perrault, M.D., Michael K. Parides, Ph.D., Robert L. Smith, II, M.D., John A. Kern, M.D., <u>et al.</u>, for the CTSN^{*}

> Similarly low rates of persistent atrial fibrillation 60 days after onset: Sinus rhythm in 84.2% and 86.9% (P=0.41).

Gillinov AM, et al. N Engl J Med. 2016 May 19;374(20):1911-21.



Agents

RATE CONTROL

RHYTHM CONTROL

- Beta blockers (metoprolol or esmolol)
- Nondihydropyridine calcium channel blocker
- Digoxin

- Magnesium ~ 1-2 hours
- Amiodarone within 24 hours
- Ibutilide: 1-2 hours
- DC



Magnesium vs Amiodarone



Moran JL, et al. Parenteral magnesium sulfate versus amiodarone in the therapy of atrial tachyarrhythmias: a prospective, randomized study. Crit Care Med. 1995 Nov;23(11):1816-24.



Magnesium followed by Amiodarone

> J Intensive Care Med. 2008 Jan-Feb;23(1):61-6. doi: 10.1177/0885066607310181.

Efficacy of magnesium-amiodarone step-up scheme in critically ill patients with new-onset atrial fibrillation: a prospective observational study

Mengalvio E Sleeswijk¹, Jaap E Tulleken, Trudeke Van Noord, John H J M Meertens, Jack J M Ligtenberg, Jan G Zijlstra

MgSO4 bolus (0.037 g/kg body weight in 15 minutes) was followed by continuous infusion (0.025 g/kg body weight/h). Intravenous amiodarone (loading dose 300 mg, followed by continuous infusion of 1200 mg/24 h) was given to those not responding to MgSO4 within 1 hour.

The 24-hour conversion rate was 90% and recurrence rate was 24%

Sleeswijk ME, et al. J Intensive Care Med. 2008 Jan-Feb;23(1):61-6.



Rate Control Agents

Factor	Beta blockers	Diltiazem	Amiodarone	Digoxin
Hemodynamic stability	May cause hypotension Useful in mild/moderate systolic failure	May cause hypotension Inferior to beta blockers systolic failure	Good agent for patients with borderline instability	Least likely to cause hypotension May be useful in severe systolic failure
Contraindications	Asthma exacerbation Decompensated heart failure	Decompensated heart failure	Thyroid disease Active liver disease	Renal failure (relative) Hypokalemia/hypomagnesemia Planned cardioversion s/p cardiac transplantation
Likelihood of cardioversion	\downarrow	\leftrightarrow	$\uparrow \uparrow$	1
Other factors to consider	Prior favorable response to beta-blockers	Prior favorable response to diltiazem		
Chronic indication to continue on this agent	Chronic systolic heart failure Hypertension	Hypertension		Severe systolic heart failure with AF and frequent admissionas



Anticoagulation in New Onset Atrial



Fibrillation in the ICU



A retrospective study cohort was identified of 2,304 patients age 65 years or older, hospitalized with a primary diagnosis of ACS, acute pulmonary disease or sepsis, and a complication of new-onset AF during admission from 1999 to 2015

Quon MJ, Behlouli H, Pilote L. JACC Clin Electrophysiol. 2018 Mar;4(3):386-393



Our Practice

For most patients with new-onset AF due to critical illness, the risks of anticoagulation seem to generally outweigh potential benefits.

However, this remains largely unknown.

For some patients at high stroke risk and low bleeding risk, anticoagulation might be beneficial.





Thank You