Critical Review Form
Therapy

Synchronized Emergency Department Cardioversion of Atrial Dysrhythmias Saves Time, Money and Resources, *J Emerg Med* 2005; 28: 27-30

Objective: **"To compare the outcomes and patient charges of the Emergency Department (ED) electrical cardioversion strategy with those of a contemporaneous control group treated in the traditional manner." (p. 27)**

Methods: **This was a case-control study evaluating a convenience sampling of acute onset (less than 48-hours symptoms or uncertain duration of symptoms with therapeutic INR>2) atrial fib/flutter at St. Luke's Hospital in Bethlehem PA over an unspecified period. In the experimental group, patients were enrolled at the discretion of the emergency physician when an investigator was present and available in the ED. The experimental intervention was immediate electrical cardioversion with the protocol details at the discretion of the treating physicians (pad placement, sedative, energy level, etc.) ED physicians performed all sedations and cardioversions.**

The control group was identified by an electronic search of all ED patients admitted during the study period from the ED with a diagnosis of AF. Using Systematic Sampling (Floyd 1993) investigators then selected every n^{th} patient and reviewed the record to ensure that the patient would have been eligible if investigator had been in the ED and that no other reason for admission could be identified. A single investigator then abstracted data from the medical record using the same data collection sheet used for the prospectively enrolled patients. The two groups were then compared, but no details are provided on the primary outcome, power calculation, or analytical methods for hypothesis testing. Telephone follow-up and chart review were used to assess for recidivism and complications.

Guide		Comments
I.	**Are the results valid?**	
A.	**Did experimental and control groups begin the study with a similar prognosis (answer the questions posed below)?**	
1.	Were patients randomized?	No, this is a case-control study not an RCT.

2.	Was randomization concealed (blinded)?	Not to patients, families or clinicians.
3.	Were patients analyzed in the groups to which they were randomized?	No randomization so intention-to-treat is irrelevant.
4.	Were patients in the treatment and control groups similar with respect to known prognostic factors?	Uncertain. "The elective synchronized cardioversion (EDCV) and control groups did not differ with regard to presenting rhythm, time in AF/Flutter, gender, age, vital signs on arrival, or chief complaint." (p. 28 and Table 1). However, there are multiple other variables that could have impacted the decision on whether to ED cardiovert or admit including co-morbid illness burden. $CHADS_2$ score (risk-benefit analysis for anticoagulation), socio-economic status, ethnicity, health literacy, etc.
B.	**Did experimental and control groups retain a similar prognosis after the study started (answer the questions posed below)?**	
1.	Were patients aware of group allocation?	Yes, no randomization or blinding.
2.	Were clinicians aware of group allocation?	Yes
3.	Were outcome assessors aware of group allocation?	Presumably yes, but they could easily have been blinded.
4.	Was follow-up complete?	Yes. "One-hundred percent of the study patients were contacted by telephone, all except one of those at least 3 weeks after cardioversion to assess for complications, recidivism and satisfaction." (p. 29) However, the IRB determined that "personal or telephone contact of patients in the historical control group would require prior consent; we did not attempt to contact them." (p. 28) If significant numbers of complications that did not result in hospital recidivism or if alternative hospitals were used, these methods would not have identified such complications.

II.	What are the results (answer the questions posed below)?	
1.	How large was the treatment effect?	• 30 cardioversions were performed on 24 patients (age range 25-82 years) with mean age 63 years, 63% males and mean SBP 127 mmHg. • The **presenting rhythm was A-fib in 83% with mean duration 539 minutes** compared with 443 minutes in the control group (p=0.606) • **97% (29/30) of cardioversion attempts were successful**, usually at low energy levels 71% (15/21) $\leq$ 100 watt-seconds. • Six cardioversion patients were admitted, but four had no clear indication for admission. One admitted patient in the cardioversion group had severe mitral valve disease and bradycardia so the analysis was run both with and without this case. • **Mean hospital length of stay (excluding the mitral valve case) was 11.6 hours in the cardioversion group verses 55.6 hours in the standard care group** (p<0.001) and **median hospital charge $1598 EDCV vs. $4271 in standard of care** (p=0.001). • The mean follow-up period was 19 weeks (range 9 days – 50 weeks) without any reports of thromboembolic events or other adverse patient events. • Five patients had recurrent AF within 4 weeks of EDCV. • All but one patient expressed satisfaction with EDCV.
2.	How precise was the estimate of the treatment effect?	No reported 95% CI's.

III.	How can I apply the results to patient care (answer the questions posed below)?	
1.	Were the study patients similar to my patient?	Probably, although additional demographic details would help to assess the external validity and extrapolate these findings to our ED patients with acute-onset atrial fibrillation.
2.	Were all clinically important outcomes considered?	Yes, patient satisfaction, costs, and effectiveness of EDCV including possible adverse effects. However, the IRB did not allow assessment of adverse events in control group.
3.	Are the likely treatment benefits worth the potential harm and costs?	Probably. "The marked decrease in overall hospital days and charges, apparently highly satisfactory outcomes, and very high patient acceptance, implies that this may be the strategy of choice in selected patients with new onset AF and no other indications for admission." (p. 30)

Limitations

1) **Case-control design without propensity scores to adjust for prognostic inequalities.**

2) **No blinding of outcome assessors.**

3) **No follow-up for the control group (because of IRB restrictions).**

4) **Insufficient demographic detail and no modeling (LR, Cox proportional hazards) to ensure that populations similar and that EDCV safe/effective independent of population characteristics.**

5) **No standardization of EDCV methods (co-intervention bias) or follow-up protocol (ascertainment bias).**

6) **No power calculation which may be unethical in research.**

7) **No primary outcome or analytical plan were presented.**

Bottom Line

Single-center (likely underpowered) case-control design indicating that ED cardioversion of acute onset atrial fibrillation in physician-selected patients is often immediately effective at restoring normal sinus rhythm while reducing hospital length of stay and costs without significantly increasing adverse effects. Future randomized controlled trials should test this hypothesis while identifying the ideal patients for ED cardioversion.