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ORIGINAL RESEARCH CONTRIBUTION

An International View of How Recent-onset Atrial Fibrillation Is Treated in the Emergency Department

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Abstract

Objectives: This study was conducted to determine if there is practice variation for emergency physicians' (EPs) management of recent-onset atrial fibrillation (RAF) in various world regions (Canada, United States, United Kingdom, and Australasia).

Methods: The authors completed a mail and e-mail survey of members from four national emergency medicine (EM) associations. One prenotification letter and three survey letters were sent to members of the Canadian Association of Emergency Physicians (CAEP; Canada—1,177 members surveyed), American College of Emergency Physicians (ACEP; United States—500), College of Emergency Medicine UK (CEM; United Kingdom—1,864), and Australasian College for Emergency Medicine (ACEM; Australasia—1,188) as per the modified Dillman technique. The survey contained 23 questions related to the management of adult patients with symptomatic RAF (either a first episode or paroxysmal-recurrent) where onset is less than 48 hours and cardioversion is considered a treatment option. Data were analyzed using descriptive and chi-square statistics.

Results: Response rates were as follows: overall, 40.5%; Canada, 43.0%; United States, 50.1%; United Kingdom, 38.1%; and Australasia, 38.0%. Physician demographics were as follows: 72% male and mean (±SD) age 41.7 (±8.39) years. The proportions of physicians attempting rate control as their initial strategy are United States, 94.0%; Canada, 70.7%; Australasia, 61.1%; and United Kingdom, 43.1% ($p < 0.0001$). Diltiazem is the predominant agent for rate control in Canada (65.36%) and the United States (95.22%), while metoprolol is used in Australasia (65.94%) and the United Kingdom (67.64%). Cardioversion is attempted at varying rates in Canada (65.9%), Australasia (49.9%), United Kingdom (49.5%), and the United States (25.9%) ($p < 0.0001$). Pharmacologic cardioversion is attempted first in all regions, with the preferred drug being procainamide in Canada (61.93%) and amiodarone in Australasia (63.39%), the United Kingdom (47.97%), and the United States (22.41%; $p < 0.0001$). If drugs fail, electrical cardioversion is then attempted in Canada (70.64%), Australasia (46.19%), the United States (29.69%), and the United Kingdom (27.78%; $p < 0.0001$).

Conclusions: There is much variation in emergency department (ED) management of RAF among world regions, most markedly for use of rate versus rhythm control, choice of drugs, and use of electrical cardioversion. Canadians are more likely to use an aggressive approach for management of RAF, whereas Americans are more likely to employ conservative management. U.K. and Australasian EPs fall somewhere in the middle. These differences demonstrate the need for better evidence, or better

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Recent-onset atrial fibrillation (RAF) is the most common form of paroxysmal dysrhythmia in patients who present to the emergency department (ED) and is a common management problem.[1] Uncontrolled atrial fibrillation is associated with an increase in risk of stroke, congestive heart failure, and all-cause mortality.[2] Stroke risk in patients with uncontrolled atrial fibrillation is nearly fivefold excess compared to patients without atrial fibrillation.[3]

There is controversy surrounding the optimal management of RAF in the ED.[4,5] Consensus guidelines in Canada, the United States, and Europe stress that there is little evidence to guide ED management of RAF.[6–8] The two competing treatment strategies are rate control and rhythm control. Rate control consists of ventricular rate control with no attempt to convert the patient back into sinus rhythm, and initiation of oral anticoagulation if onset is more than 48 hours. Rhythm control consists of electrical or pharmacologic conversion back to sinus rhythm and anticoagulation for selected patients at high risk. Emergency physicians (EPs) at some Canadian hospitals routinely attempt to convert patients acutely, either pharmacologically or electrically, and then discharge the patient.[9] Although this practice has been shown to be both safe and effective in the short term, we suspect that there is considerable variability in practice between different regions of the world, and to the best of our knowledge, to date there are no published studies exploring this.[10–12]

The objective of this study was to evaluate ED practice variation in the management of RAF with regard to rate control, rhythm control, procedural sedation, anticoagulation, and patient disposition in four English-speaking regions: Canada, the United States, the United Kingdom, and Australasia.

METHODS

Study Design and Population

We conducted a self-administered survey of physician members of four national emergency medicine (EM) associations: the Canadian Association of Emergency Physicians (CAEP), the American College of Emergency Physicians (ACEP), the College of Emergency Medicine UK (CEM), and the Australasian College for Emergency Medicine (ACEM).

Survey Content and Administration

The 23-question survey was created in both electronic and paper format (Data Supplement S1, available as supporting information in the online version of this paper). All of the authors were involved in survey creation, as well as several other EM faculty members at the Ottawa Hospital Research Institute, and if greater than 75% were in agreement with a question, this question was included in the survey. The survey consisted of questions related to practice of rate control, rhythm control, strategies to prevent thromboembolism, patient disposition, and physician demographics and practice setting.

The survey was distributed using the Dillman modified tailored design method.[13] A prenotification letter was distributed, and 1 week later the survey was distributed. Nonresponders were sent two reminder letters containing the survey at 1-week intervals. In Canada, the United Kingdom, and Australasia the electronic format was sent to all association members, while in the United States the paper format was sent to a 500-person random sample of eligible ACEP members, due to logistic constraints.

Data Analysis

Data were analyzed using descriptive and chi-square statistics.

RESULTS

Overall, 1,917 of 4,725 EPs responded to the survey (response rate of 40.5%). By region, the response rates were Canada 43.0% (506 of 1,176), the United States 50.1% (249 of 497), the United Kingdom 38.1% (710 of 1,864), and Australasia 38.0% (452 of 1,188). The numerator represents returned survey, while the denominator represents all surveys sent out minus the surveys returned undelivered (n = 12).

Physician demographics, rate control, and rhythm control are presented in Table 1. The overall mean (±SD) age was 41.7 (±8.39) years, and median age was 41.0 years (IQR = 35 to 46 years). Practice settings varied between regions with as few as 36.8% of respondents working in a teaching hospital in the United States, to as many as 86.3% in Australasia.

Rate Control

Respondents who replied that they used rate control "always" or "most of the time" were included in the respondent count for use of rate control. As well, responses for preferred rate control drug are only reported for EPs who responded that they use rate control. Rate control is used most often by American EPs (94%). The preferred rate control drug is intravenous (IV) diltiazem in Canada (65%) and the United States (95%), while the preferred drug is IV metoprolol in the United Kingdom (68%) and Australasia (66%).

Rhythm Control

Respondents who replied that they used rhythm control "always" or "most of the time" were included in the respondent count for use of rhythm control. Responses for preferred rhythm control drug and use of electrical cardioversion are only reported for EPs who responded that they use rhythm control. Rhythm control is used most often in Canada (by 65.9% of respondents), followed by Australasia (49.9%), the United Kingdom (49.5%), and the United States (25.9%). The preferred starting approach to rhythm

Table 1
Demographics, Rate Control, and Rhythm Control

	Canada (*n* = 506)	United States (*n* = 249)	United Kingdom (*n* = 710)	Australasia (*n* = 452)
Demographics	*n* = 485	*n* = 251	*n* = 631	*n* = 423
Male (%)	338 (69.7)	201 (80.1)	437 (69.3)	310 (73.3)
Mean (±SD) age, years	41.7 (8.91)	47.5 (8.87)	38.3 (7.20)	43.9 (6.5)
Median (IQR) age, years	40.0 (34–46)	48.0 (39–53)	37.0 (32–42)	42.5 (38–47)
Setting they perform most EM clinical activity (%)				
Teaching hospital	322 (66.5)	91 (36.8)	379 (59.7)	364 (86.3)
Nonteaching hospital	162 (33.5)	156 (63.2)	256 (40.3)	58 (13.7)
Rate control (%)	*n* = 506	*n* = 249	*n* = 710	*n* = 452
Use of rate control medication	358 (70.7)	234 (94.0)	309 (43.1)	276 (61.1)
Preferred rate control drug (358:230:309:276)*				
IV diltiazem	234 (65.36)	219 (95.22)	8 (2.59)	12 (4.35)
IV metoprolol	117 (32.68)	10 (4.35)	209 (67.64)	182 (65.94)
IV verapamil	6 (1.68)	1 (0.43)	5 (1.62)	10 (3.62)
Other	2 (0.28)	0	87 (28.16)	72 (26.09)
Rhythm control (%)	*n* = 506	*n* = 249	*n* = 710	*n* = 452
Attempt to convert patients to sinus rhythm	332 (65.9)	65 (25.9)	345 (49.5)	224 (49.9)
Starting approach to rhythm control (332:65:343:224)*				
Pharmacologic	168 (50.60)	42 (64.62)	289 (84.26)	168 (75.00)
Electrical	163 (49.10)	23 (35.38)	52 (15.16)	55 (24.55)
Not applicable	1 (0.30)	0	2 (0.58)	1 (0.45)
Attempt electrical cardioversion if pharmacologic is unsuccessful (327:64:342:223)*	231 (70.64)	19 (29.69)	95 (27.78)	103 (46.19)
Preferred drug for use in pharmacologic cardioversion (331:58:344:224)*				
IV procainamide	205 (61.93)	8 (13.79)	0	7 (3.13)
IV amiodarone	57 (17.22)	13 (22.41)	165 (47.97)	142 (63.39)
PO propafenone	40 (12.08)	6 (10.34)	4 (1.16)	0
IV digoxin	3 (0.91)	10 (17.24)	13 (3.78)	1 (0.45)
IV flecainide	0	0	132 (38.37)	31 (13.84)
IV sotalol	3 (0.91)	1 (1.72)	11 (3.20)	25 (11.16)
IV ibutilide	3 (0.91)	12 (20.69)	3 (0.87)	0
Other	2 (0.60)	4 (6.90)	15 (4.36)	14 (6.25)
Not applicable	18 (5.44)	4 (6.90)	1 (0.29)	4 (1.79)
Service that oversees electrical cardioversion in ED (503:188:644:437)*				
Emergency medicine	419 (83.30)	121 (64.36)	367 (56.99)	366 (83.75)
Cardiology	53 (10.54)	67 (35.64)	216 (33.54)	55 (12.59)
Other	31 (6.16)	0	61 (9.47)	16 (3.66)

PO = by mouth.
*Numbers in parentheses are denominators for the specific question.

control is pharmacologic cardioversion in all regions, although electrical cardioversion is used first by 49% of respondents in Canada, 35% in the United States, 25% in Australasia, and 15% in the United Kingdom. Canadians will most often attempt electrical cardioversion if pharmacologic cardioversion is unsuccessful at 71%, followed by Australasia at 46%, and the United Kingdom and the United States at less than 30% each. The drug of choice for pharmacologic cardioversion is IV procainamide in Canada (62%) and IV amiodarone in the United States (22%), the United Kingdom (48%), and Australasia (63%).

Use of Procedural Sedation in Electrical Cardioversion

Results for use of procedural sedation in electrical cardioversion, anticoagulation, and disposition are presented in Table 2. The services that oversee procedural sedation are usually EM in Canada (94.2%), the United States (93.3%), and Australasia (96.4%) and anesthesia in the United Kingdom (55.0%).

Anticoagulation Use

Anticoagulation with heparin when performing electrical cardioversion is most common among EPs in the United Kingdom (49.4%) and Australasia (39.1%). It is rarely used by EPs in the United States (23.6%) and Canada (13.0%).

Disposition

In Canada and Australasia, patients are usually discharged home after successful cardioversion (84.6 and 75.7%, respectively). In the United States and the United Kingdom, patients are not usually discharged home (47.6 and 27.2%). If cardioversion is unsuccessful, admission of patients to the hospital is commonplace in the United States (81.3%), the United Kingdom (86.3%), and Australasia (61.7%), while uncommon in Canada (24.3%). More than 50% of EPs in all regions refer patients to cardiology if cardioversion is unsuccessful.

At ED discharge, warfarin is most often prescribed in Canada and the United States (31.5 and 41.8%) and rarely prescribed in the United Kingdom and Australasia (15.1 and 20.5%). However, antiplatelet agents are prescribed more often than warfarin in all regions. Canadian EPs most often calculate the CHADS2 risk score for determining risk of thromboembolic event in patients with atrial fibrillation and use of anticoagulant therapy (35.5%).

Table 2
Use of Procedural Sedation in Electrical Cardioversion, Anticoagulation, and Patient Disposition

	Canada (*n* = 506)	United States (*n* = 249)	United Kingdom (*n* = 710)	Australasia (*n* = 452)
Procedural sedation in electrical cardioversion (%)	*n* = 503	*n* = 194	*n* = 645	*n* = 438
Service that oversees procedural sedation for electrical cardioversion (503:194:645:438)*				
Emergency medicine	474 (94.23)	181 (93.30)	270 (41.86)	422 (96.35)
Anesthesia	19 (3.78)	10 (5.15)	355 (55.04)	6 (1.37)
Other	10 (1.99)	3 (1.55)	20 (3.10)	10 (2.28)
Preferred drug for use in procedural sedation				
Propofol	472 (93.10)	122 (47.84)	441 (61.42)	398 (87.67)
Fentanyl	291 (57.40)	57 (22.35)	154 (21.45)	220 (48.46)
Midazolam	111 (21.89)	80 (31.37)	366 (50.97)	138 (30.40)
Ketamine (IV)	70 (13.81)	20 (7.84)	57 (7.94)	28 (6.17)
Other	23 (4.54)	51 (20.00)	22 (3.06)	20 (4.41)
Use of anticoagulation (%)	*n* = 499	*n* = 195	*n* = 628	*n* = 437
Use heparin with electrical cardioversion (always or most of the time) (499:195:628:437)*	65 (13.03)	46 (23.59)	310 (49.37)	171 (39.13)
Obtain a transesophageal echocardiogram before electrical cardioversion (499:197:639:438)*	7 (1.40)	11 (5.58)	18 (2.81)	7 (1.60)
Disposition (%)	*n* = 500	*n* = 233	*n* = 663	*n* = 443
Discharged home after successful cardioversion (488:233:639:437)*	413 (84.63)	111 (47.64)	174 (27.23)	331 (75.74)
If cardioversion unsuccessful				
Discharged home from ED (429:201:485:357)*	149 (34.73)	15 (7.46)	15 (3.09)	59 (16.53)
Admitted (436:235:618:410)*	106 (24.31)	191 (81.28)	533 (86.25)	253 (61.71)
Refer to cardiology (455:212:560:406)*	265 (58.24)	174 (82.08)	371 (66.25)	314 (77.34)
Follow-up plan if discharged directly from ED				
Cardiology	355 (70.02)	214 (83.92)	446 (62.12)	367 (80.84)
Family doctor	294 (57.99)	73 (28.63)	269 (37.46)	203 (44.93)
Medicine	123 (24.26)	40 (15.69)	79 (11.00)	40 (8.81)
Other	30 (5.92)	7 (2.75)	46 (6.41)	17 (3.74)
Medications prescribed at ED discharge				
Warfarin (489:220:570:424)*	154 (31.49)	92 (41.82)	86 (15.09)	87 (20.52)
Antiplatelet agent (468:215:610:420)*	181 (38.68)	99 (46.05)	322 (52.79)	203 (48.33)
Calculate CHADS2 CVA risk score for these patients (501:207:664:442)*	178 (35.53)	14 (6.76)	98 (14.76)	108 (24.43)
Not familiar	144 (28.74)	94 (45.41)	338 (50.90)	157 (35.52)

CVA = cerebrovascular accident.
*Numbers in parentheses are denominators for the specific question.

DISCUSSION

This survey demonstrates clear variation in practice between regions, and we believe that this reflects the lack of strong evidence or synthesis of evidence to create guidelines for management of RAF. We are particularly struck by the considerable difference in practice between Canada and the United States. Remuneration of EPs is similar in both countries, so this is unlikely to be a factor. We speculate that U.S. EPs are less likely to cardiovert and more likely to admit RAF patients because U.S. cardiologists seem to take a more conservative approach. We note that the 98-page U.S. guidelines for atrial fibrillation offer no recommendations for ED management.[7,14] In discussions with U.S. ED colleagues, we are told that frequently they receive no support from their cardiologists to manage RAF more aggressively. This is despite several U.S. studies supporting cardioversion in the ED.[15–18] Von Besser and Mills[19] recently reviewed published ED studies and concluded that aggressive management in U.S. EDs should be acceptable. Other Canadian and Australian studies have also evaluated aggressive management of RAF in the ED.[12,20–22]

This study exposes RAF as a dysrhythmia in need of high-quality evidence to guide various aspects of ED management. The large AFFIRM trial (Atrial Fibrillation Follow-up Investigation of Rhythm Management) compared rate versus rhythm control and dealt with various presentations of atrial fibrillation and included very few patients with RAF.[23] Therefore, the applicability of this trial to ED management is unclear.

LIMITATIONS

Emergency physicians were the target population in this survey, and our approach was to sample the four national EM organizations from four English-speaking regions. This could present a sampling bias, as some EPs in these regions do not belong to these organizations.

While we surveyed members of the largest EM professional group in each country, we found some differences in the demographic characteristics. Most Canadian, UK, and Australasian respondents work

primarily in teaching settings, while the U.S. respondents work primarily in nonteaching settings. We believe that these differences reflect the realities of how formal EM is practiced in the various countries.

The response rate, although comparable to other studies undertaking physician surveys, still presents a possible bias in interpretation of results. We did not attempt to identify respondents who employ rate and rhythm control strategies simultaneously. As well, we cannot be sure if the variability we are reporting represents differences in patient populations, practice cultures, or medicolegal climates or in the availability of medications, equipment, or personnel.

CONCLUSIONS

There is much variation in ED management of recent onset atrial fibrillation among four English-speaking world regions, most markedly for use of rate versus rhythm control, choice of drugs, and use of electrical cardioversion. These differences demonstrate the need for better evidence, or better synthesis of existing knowledge, to create guidelines to guide ED management of this common dysrhythmia.

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Supporting Information

The following supporting information is available in the online version of this paper:

Data Supplement S1. 5-minute survey of current emergency department practice for managing recent-onset atrial fibrillation.

The document is in PDF format.

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NIH creates Office of Emergency Care Research

Will coordinate and foster research and training in the emergency setting

To help improve health outcomes of patients who require emergency care, the National Institutes of Health has created a new Office of Emergency Care Research (OECR). The office is a focal point for basic, clinical and translational emergency care research and training across NIH.

"NIH has supported research to advance emergency care for years; however, now we have a single office to coordinate and foster our activities in this arena," said NIH Director Francis S. Collins, M.D., Ph.D. "The NIH Office of Emergency Care Research will focus on speeding diagnosis and improving care for the full spectrum of conditions that require emergency treatment."

Although OECR will not fund grants, it will foster innovation and improvement in emergency care and in the training of future researchers in this field by:

- Coordinating funding opportunities that involve multiple NIH institutes and centers.
- Working closely with the NIH Emergency Care Research Working Group, which includes representatives from most NIH institutes and centers.
- Organizing scientific meetings to identify new research and training opportunities in the emergency setting.
- Catalyzing the development of new funding opportunities.
- Informing investigators about funding opportunities in their areas of interest.
- Fostering career development for trainees in emergency care research.
- Representing NIH in government-wide efforts to improve the nation's emergency care system.

The creation of OECR is the culmination of more than five years of discussions between NIH and the emergency medicine community. OECR also responds to reports about the nation's emergency medical system issued in 2006 by the Institute of Medicine.

OECR is housed in NIHs National Institute of General Medical Sciences (NIGMS), which supports basic research and research training. While a search is being conducted for a permanent director, OECR is being led on an acting basis by Walter J. Koroshetz, M.D., deputy director of the National Institute of Neurological Disorders and Stroke (NINDS). Assisting him is Alice M. Mascette, M.D., senior clinical science advisor in the Division of Cardiovascular Sciences of the National Heart, Lung, and Blood Institute (NHLBI).

A steering committee chaired by the director of NIGMS oversees the office. This committee also includes the directors of NHLBI, NINDS and the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development and the National Institute of Nursing Research.

For more information about the Office of Emergency Care Research, visit http://www.nigms.nih.gov/About/Overview/OECR/.

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