Article details: 2014-0099	
Title	Incident atrial fibrillation in the emergency department: a population-based assessment of follow-up care
Authors	Clare L. Atzema MD MSc, Bing Yu PhD, Noah Ivers MD PhD, Paula Rochon MD MPH, Douglas S. Lee MD MSc, Michael J. Schull MD MSc, Peter C. Austin PhD
Reviewer 1	Christopher M.B. Fernandes
Institution	Hamilton Health Sciences/McMaster University, Hamilton, Ont.
Reviewer 1 Institution General comments and author response	 Christopher M.B. Fernandes Hamilton Health Sciences/McMaster University, Hamilton, Ont. The authors examine whether follow up care after a new ED diagnosis of atrial fibrillation was associated with emergency physician or family physician characteristics. The authors generally achieve their goal. I would suggest the following changes 1. p 5, line 6–grammar"with" instead of "and" This has been changed – thank you. 2. p6, line 46–while patients may be "enrolled" with a family physician, a number of patients state that they have not seen this physician in years. This may be true, particularly for very healthy patients. But that is less relevant to our study than whether or not they have access to someone that they could see (when they are discharged from an emergency room with a new diagnosis of atrial fibrillation). As long as the family physician with whom they are enrolled is still practicing, they still have that ability to obtain follow-up. In addition, we performed a sensitivity analysis using virtual rostering (essentially, assigning patients to the doctor who bills the most primary care codes for them, instead of who they are 'enrolled' with), and our results didn't change. 3. Is there a difference based on area of province? For instance, patients outside Toronto, especially in the north, may not have ready access to follow up, and also would be lacking personal family physicians 14% of the patients, data not shown): OR 0.91, 95% CI 0.81-1.01)(p=0.08). However, assessing specific areas (by LHIN, or sub-LHIN) might be an interesting future study (although perhaps limited to an Ontario audience). 4. p7, line 11this statement needs a reference. Unfortunately there is no direct reference for this statement. We know this from looking at data held at our research institute, but there is no specific study on research effects of virtual rostering. We think that this makes intuitive sense, however, and prefer to keep it so that r
	anti coagulated for that long a time span? Would 2-3 days not be more
	"timely", which is why we included the number of patients seen at 3 days
	and 30 days, in addition to 7 days. We have also added regression models
	for these time-points, as per the editor's request. Of note, we have
	unpublished survey work on emergency physician's preferences for atrial
	fibrillation patients, and they are very similar to follow-up
	recommendations (7 days) for patients with severe hypertension (Cho DD, in

	press at CJEM). HF guidelines also recommend 7 days. While it isn't perfect (in our next study we have to assess outcomes related to timely follow-up)
	there is a consistency in the number of days that led us to choose 7 days as
	our "timely" follow-up.
	6. p12, line 37in follow up to the previous point, this is also a crucial line.
	Given that very few patients had complications at one week, does this not
	weaken the argument as to what is timely? We don't believe so. There are
	many outcomes of interest here, beyond gross measures of death or re-
	hospitalizations. It is more likely that the patient develops mild heart failure,
	which doesn't kill them immediately but starts a series of events that leads
	to earlier long-term mortality than would have otherwise occurred. Delayed
	follow-up may result in less adherence to evidence-based medication by the
	patient (given that they went without for several weeks, how important is
	that medication really?). There are a myriad of more subtle outcomes that
	are not assessed in the present study (or in any study, as of yet) that are
	likely impacted by delayed follow-up care; we have added this to the
	Discussion (3rd paragraph).
	7. Conclusionsmuch of what is listed here could be deleted. Your paper only
	provides for limited conclusionsonly half of patients achieve follow up within
	a week, related to access to a ranning physician and system wide changes are
	required to achieve better follow up. we have kept the component about
	of the stated goals of the study, and we believe that the conclusions should
	mirror the goals. We argue that nutting the findings into the 'hig nicture' in
	terms of health nolicy is important. Therefore we have kent the statement
	about primary care models in Ontario improving access to care.
	8. Referencesmany of the references are irrelevant, and could be deleted.
	Ideally, you should only have 15-20 references. We have removed references
	that aren't directly relevant. We note that many of the references are
	required for the Methods section, to validate our methodology (which we
	think is very important), and we have had to add a reference for your point
	#4 as well as for the editor's query about IPDB.
	9. You do not need both Box 1 and Figure 1. This paper is particularly
	challenging for a reader, because it refers to these primary care models with
	very similar names (the "alphabet soup" of FHT, FHN, FHO, etc). Members of
	our team (particularly those who were new to these primary care models)
	felt that even with Box 1, a Venn diagram was helpful for the reader who is
	new to these models. In the interests of making the paper as pain-free as
	possible for the reader, we have kept these. We are happy for the editor to
	remove Box 1, if she feels it isn't helpful.
Reviewer 2	Dr. Richard Birtwhistle
Institution	Queen's University Family Medicine, Kingston, Ont.
General comments and	This paper describes a retrospective cohort study of the clinical follow-up of
author response	patients who presented to 157 Emergency Departments in Ontario with a new
	diagnosis of atrial fibrillation (AF). The authors used administrative data from
	2006-2011 from the CIHI-NACRS database linked to the OHIP billings and
	Discharge Abstract Database. Patients were classified as having a regular
	Tamily physician (FP), no family physician or assigned to a virtual roster given
	providus OUUD hillings. Outcomes were record of follow up by ED internist or
	previous OHIP billings. Outcomes were record of follow-up by FP, internist or
	previous OHIP billings. Outcomes were record of follow-up by FP, internist or cardiologist within 3 days, 7 days or 30 days. Follow up was assessed for family physicians practicing in different primary care delivery models (EHT

	The findings are that most patients had some follow-up within 30 days but rate of follow-up was best for FFS physicians compared to other models of care at 7 days.
	Assessment This is a well done study using administrative data with interesting findings related to models of care and follow-up. This needs further exploration. The authors accounted for many potential weaknesses that may relate to the findings.
	I have a few comments for the authors to consider. 1. There are no standards for ER follow-up for AF and therefore applying the standard of 7 days may be artificial. How many were seen at 8 days for example. Are patients in the within 30 days group more likely to be seen in the first two weeks post ER visit. We debated representing the data with a graph (showing % who had followed up [y-axis] by day from ER visit [x- axis]), but the team felt that by showing how many had obtained follow-up by 3 days (27%), 7 days (50%), and 30 days (82%) (Table 2), this provided the same information but was anchored by days that clinicians would consider relevant. In response to the last question, since half were seen within 7
	days, and 82% within 30, for patients within the 30 days group, they are more likely to be seen within the first two weeks of post ER visit than the
	last 2 weeks (in other words, follow-up follows the law of diminishing
	2. Where there any differences in outcomes between those who were
	followed up vs. those who were not? We have applied for grant funding to answer this question, and if funding is successful, hope to be able to answer this question by 2016.
	3. Booking a follow-up appointment is dependent on a patient contacting his/her family physician's office. This contact rate is impossible to estimate in this study although it may not vary between models of care. This is an
	interesting point, and brings in the patient factor. We have added the
	"patient factor" into the limitations section. We are inclined to agree with
	the reviewer that attempts likely don't vary substantially between patients
	of different physician remuneration types, but this would make an
	interesting future study.
	4. Why did the authors choose 14 days as the cut-off for model comparison?
	primary care model type and time (in days) tells the reader the instantaneous
	hazard of obtaining follow-up care by the patient's primary care model type.
	Since 7 days was already reported, and we had 30 days as a secondary
	outcome, we chose a time-point in between the two points to provide an
	example. Since the equation is provided in the manuscript, (very) interested
	earlier, to look at the effect of primary care model at different time points.
	5. It would be helpful to know the % of patients were had imputed values. The
	number and percentage of imputed variables is available in Table 1 (listed as "unknown" for each variable with any missing data).
Reviewer 3	Dr. Eddy Lang
Institution	Emergency Department, University of Calgary, Calgary, Alta.
General comments and author response	These authors present the findings of a retrospective cohort study seeking to determine predictors of failed timely follow-up after an initial diagnosis of atrial fibrillation in an Ontario Emergency Department. The study identify

significant gaps in timely follow-up for these patients and more specifically the findings suggest that family practices that are part of a capitation model, as opposed to fee for service, are failing to provide timely care for these patients to a statistically significant degree. Less emphasized was the finding that being seen by an emergency physician with non-typical training credentials (i.e. Other than FM or EM), increases the risk of not receiving timely follow-up. A small error was made in the multiple imputation process that led up to the 7-day logistic regression model, which has since been rectified. The revised data (ORs, Cl and p-values) has changed very minimally, with the exception of this variable (emergency physician with non-typical training credentials), which no longer displays a significant association with the outcome.

Specifically, for multiple imputation, 5 datasets are created, leaving no missingness (in the emergency physician variables, in this case) in the resulting single (weighted average) dataset. This was done first for the cox regression model (our sensitivity analysis). Then using that same imputed dataset, which contained the time to event outcomes, the logistic regression model was run, with the 7-day outcome simply converted from the time to event/follow-up variable. That was the data we submitted to CMAJ Open. However we should have first created the 7 day outcome variable (yes/no) in the incomplete (for emergency physician variables) dataset, based on the time until seen in follow-up, THEN run the multiple imputation including that outcome variable (not the time-to-event variable). With the 5 new datasets from the multiple imputation step, the only variable that changed in the final weighted single dataset was the emergency physician with nontypical training credentials. We apologise for the error and confusion. When working with population-based datasets, multiple steps are required, and occasionally one is overlooked.

The study strengths include originality of the question and the clever design invoked to address it. The methods are robust and at low risk of bias, the manuscript is concise and clear. The clinical relevance of the work is high but there could be alternative interpretation of their findings which if incorporated would make the paper more balanced and less of an indictment of a particular primary care policy. My take for instance is that the problem may be best addressed by increased attention to early anticoagulation at the time of ED discharge as well as the creation of rapid access AF clinics that can address issues of rate control and stroke prevention in a timely manner. There is evidence to support these approaches. We agree that addressing anticoagulation in the ED should be a priority (we have a paper coming out that shows that patients who receive a prescription in the ED have higher use of anticoagulation a year later than those who are referred to the primary care provider to start it). However we don't believe that emergency physicians are likely to do this if only half of their patients get seen within a week. We believe that optimizing primary care follow-up is critical for these changes to occur. While a rapid access AF clinic is likely to be helpful in certain urban areas, establishing such clinics (and employing the staff to run them) across the province isn't feasible, and ultimately they have to tie in with the primary care provider anyway. Our own work has demonstrated much less success with these clinics than we had anticipated. Therefore we believe that the primary care provider should be, in general, the primary focus.

The study's primary limitation is the focus on follow-up within 7 days as the outcome of primary interest. The provocative results can be interpreted as disparaging to the novel models of primary care practice that have developed in Ontario when in fact the quality of care may be better in those settings with more appropriate management of stroke risk and rhythm or rate control of atrial fibrillation. The situation is akin to reading a restaurant review that emphasizes the timeliness of order-taking and meal provision over taste. This is a good point. However we believe that in patients with a new diagnosis of atrial fibrillation, "time is of the essence". Like the "golden hour" of trauma, there is likely a golden period of influence with patients, and if they are initiated on anticoagulation and/or rate control in the ED (which is itself dependent on the availability of timely outpatient follow-up care), they are likely to interpret the medications as much more important than if they are initiated (by a very thorough family physician in one of the slower primary care models) in the weeks after the diagnosis was made. This likely leads to much better adherence to evidence-based medications: our work (hopefully soon to be published) substantiates this belief. In addition, if even a few patients have a stroke in the intervening period between ED discharge and the very high quality care they will receive several weeks later, we would argue that the high-quality care is a moot point now.

I imagine that looking at incident stroke or use of medications is beyond the scope of the analysis presented here but this would have of course provided far greater insight as to the value of the two models in terms of other patient and system-important outcomes. We have applied for funding and are crossing our fingers...

Specific comments / suggestions

1. Abstract: I note the absence of a study objective. Unfortunately CMAJ's word count is very tight (250 words), and with the names of the primary care models, we are already over it.

2. Abstract: Background: The ED has fewer resources than....? Seems speculative and perhaps more of a philosophical focus as opposed to a resource issue. By this statement we are referring to discharge planners in the ED. Great research has been done on hospital wards (eg, Kriplani, JAMA, 2007) showing the poor transition of care between hospital discharge and primary care, and in response to this type of work discharge planners were implemented on hospital wards across North America. While we know of social workers (as there are on the wards) and geriatric nurses (also on wards) in the ED, we know of very few full-time ED discharge planners in Canadian and American EDs.

3. Abstract: Results: Reporting ORs provides limited insight as to the scope of the problem in absolute terms. Can the authors report how many fewer patients out of a denominator of 100 would receive timely follow-up as a result of being in one practice model or another? If no room for this in the abstract it merits inclusion in the results. We support the idea of presenting the results in a way that optimizes reader comprehension, but statistically this isn't a simple re-wording of the results. Please see the paper on how to do this, published by one our our co-authors, Austin PC. J Clin Epidemiol. 2010 Jan;63(1):46-55. In sum, it would require new and somewhat difficult programming, and given the limited benefit in stating the results another

	 way compared to the labor required to provide those results, we have not performed the additional analyses. 4. Intro page 4 line 37. Why is cardiology f/u a requirement? I don't think this would be true in most cases. Cardiology follow-up is recommended in both the Canadian and the European AF guidelines, therefore we have kept it. 5. Methods. I presume FHNs began prior to the inception of the cohort, correct? Yes – FHNs began in 2001, FHGs in 2003, FHO 2005. The cohort is fiscal year 2007 to fiscal year 2011. 6. Methods. I think the equation will be lost on 99.9% of the readership. Probably very true. But in the interests of transparency (and allowing very motivated readers who want to know the effect at 8 days, like Dr Birtwhistle (reviewer #2)), we have kept it in the MS. 7. Results. 95% of these patients had a GPI Seems high. Why does this not correlate with recent CIHI estimates? Actually Ontarian's are more likely than other Canadians to have a family doctor. Our numbers are very similar to other reports: http://healthydebate.ca/2011/09/topic/community-long-term-care/accessing-primary-care. 8. Page 10 line 27. Sentence seems contradictory to the gist of the paper. With apologies, we aren't sure what this refers to. On page 10 line 27 the results are reported (capitation-based models with lower adjusted odds of 7 day follow-up than fee-for-service based model). This is consistent with our message. On "page 10 of 32" (CMAJ labels the pages in addition to page numbers), these are the data analyses, so this isn't likely what you were referring to. We aren't sure how to answer this query. 9. Interpretation. Policy-maker sentence seems out of place. We think it is important to point out the potential larger implication: as we noted above, in Ontario 95% of the population has a family doctor now (higher than in other provinces), so perhaps the focus should shift from linking patients to family physicians to improving their access to those fa
	has a handle on what is being asked – very sorry. Perhaps it is meant to be, "this is probably happening"?
Reviewer 4	Dr. Jean-Pierre Pellerin,
Institution	UMF CH de Verdun, Quebec
General comments and author response	This is a good paper. Thank you! It illustrates the proportion of patients with a new diagnosis of Atrial fibrillation, that are followed-up during the first week once they have quit the Emergency Department. Fifty percent are in this category and 18% are not follow-up even after 30 days. That means 2,546 patients with no follow-up.
	Even if it is a retrospective study, the sampling is large and well documented. We have no reason to believe that this sampling is biased in regard of the goals of the authors. The statistical analysis is appropriate in order to characterize the influential factors on timely follow-up. Logistic regression and Cox proportional Hazards model serve as comparison tool and for sensitivity analysis.

Few modifications should be brought to the document
1 In p. 7 line 27. The authors write that the sampling goes from April 1, 2006
1. In p.7, line 27. The authors while that the sampling goes from April 1, 2000
to March 31, 2010. In the Abstract, p2, line 18 and in the title of figure 1, they
indicate 2011 in place of 2010. Thank you for taking the time to point this
out! This typo was an oversight on our part (and has been fixed).
2. P.10, line 18-49: except of the OR 0.59; 95% Cl, 0.48-0.72, the authors don't
give any numbers to describe their results as they do in the abstract. This
should be corrected for more precision. It is not usual to learn more by the
abstract than by the Results section. Because the data is already in Table 2
and Figure 2, we did not want to repeat it in the text as well (which we have
been told by editors to avoid). It also allowed us to get closer to the word
count limit (which we are already over)! However since two reviewers asked
for the data to be presented in the text, we have added it (and are boning
the aditor will be lenient with the word count limit)
By the way, there is a light discremency between the $OE^{0/2}$ (I for the patients
By the way, there is a light discrepancy between the 95% Ci for the patients
without ramily doctors in page 10 (lines 15-18) vs the 95% Cl in the abstract
(lines 34-35). Again, thank you for being so observant – it would be terrible if
the paper went to press with an error. This has been fixed.
3. The results are more discuss and elaborate in the abstract. However, the
results (OR and 95% CI) mentioned in the abstract are slightly different than
those in the figure 2 for FHN/FHT, FHN/no FHT, FHO/FHT and FHO/FHT. The
authors don't say a word about these differences. It should be related to the
n. Thank you for pointing this out – the Figure 2 that was submitted was not
the most up to date version of Figure 2. The data analysis took months due
to the complexity of the primary care enrollment tables and dealing with
the FR missing data. Hence we had several data outputs, and unfortunately
didn't notice that the figure data hadn't been undated as the data in the
abstract had. This has been corrected (and changes are minimal – OP from
0.72 to 0.72 for example, and no change in a values) and are now
0.72 to 0.75, for example, and no change in p-values) and are now
Consistent inroughout the manuscript.
4. Why the authors don't reported the OK (OR 0,59 and 95% CI) concerning
patients without Family Doctors in their diagram. Even if this OR is based on
few patients it gives a good comparison to contrast the other main results.
Moreover, the authors introduce their results in the abstract and in the
'Findings' part with this data. It should be important to notice. There is a good
answer to this, but it is complicated (and took us a while to understand
when we were running the analyses). The short answer is that the OR for
having a family doctor can't be put in the same model (or figure) with the
other family physician characteristics.
The long answer is that one cannot look at the primary care model type in
the same regresson model that contains the OR 0.59 (whether the patient
has a family doctor or not), because all of the variables will come up
'missing' for the 5% of patients who do not have a family physician. Because
they don't have a family doctor, the family physician age, sex, years of
practice, and remuneration type variables come up as 'missing'. So we had
to run an initial model with all the incident atrial fibrillation natients in it
with only the "has a family physician" variable in it. We only present the OP
of "has a family physician" variable in the namer (the results are similar
or has a ranny physician or that model in the paper (the results are similar
for the other variables to Table 2 and Figure 2, so adding another table or
rigure seemed redundant). Then to look at the effect of primary care model
type of the family physician (as well as family physician age, sex, etc), we

	 had to restrict that model analysis to ONLY patients with a family physician (and remove the "has a family dr" variable, since they all do). This allowed all the other family physician variables to be present (not missing). We hope that makes sense. 5. In figure 2 and 3, the 'n' on which are based the calculations should be reported. This had been added to the Figure legend (n=14,146).
Reviewer 5	Dr. Susan Baxter
Institution	Simon Fraser University, Faculty of Health Science, Vancouver, BC
Institution General comments and author response	Simon Fraser University, Faculty of Health Science, Vancouver, BC 1. Your data is impressive; the analysis exhaustive and the appendices and tables, comprehensive - almost overwhelmingly so. What I find puzzling, though, is why atrial fib appears in your title as the primary focus when the real point of your article would seem to be that the payment model of the physician doing the follow-up care determines the timeliness of the follow-up post a dx of atrial fib in the ED. This was an interesting finding (the primary care model type), and certainly of interest to us. However, our objectives, as stated in the Methods section of the Abstract and the final sentence of the Introduction, were to look at emergency physician and family physician characteristics associated with timely followup care, which includes primary care model type. We were also interested in emergency physician sex, years of practice, and family physician sex, years of practice. We were surprised to find that these factors were not associated with timely follow-up care, but they were definitely of interest to us – the significant findings get more attention, but the negative findings are important too. Atrial fibrillation in particular was chosen because, while there has been some research looking at follow-up care. Patients with chronic cardiovascular diseases fulfill this criterion, so this is why atrial fibrillation was selected (we are also looking at heart failure and severe hypertension in related studies). 2. I'm also not sure why patient characteristics are only included in your tables and not mentioned at all in the body of the piece. Surely the characteristics of the patient have something to do with the person's speed in making an appointment with a primary care physician or cardiologist or internist? In fact this aspect of your piece disturbs me most; the implication that all patients are essentially cardboard cut-outs and all that matters is the diagnosis they were given in the ED. Actually in the Discussion (last paragraph) we not
	2013 and www.sunnybrook.ca/eddischarge); however, the goal of the current study was to look at physician (emergency and family)

characteristics.
3. You mention socio-economic status on page 8 but never bring it up in the body of the article. Income quintiles do appear in two of your Tables but they would seem incidental and, if I am reading your quintiles correctly, where quintile 1 usually indicates the poorest 20% of people, then your data run
counter to the bulk of research where lower SES correlates to poorer health. Here, there appears to be a higher incidence of atrial fib in higher income
groups. Which seems odd. (If you are using 1 to indicate the richest 20% then
you need to clarify.) Because the primary goal of the study was to assess
physician factors on receiving follow-up care after ED discharge with a new
diagnosis of atrial fibrillation, we did not discuss other factors (and SES was
not statistically significant at any level in the adjusted analysis – see Table
3). The number of higher SES (quintile 5, as is customary) patients in the
cohort is higher, but remember that this is an ED cohort (it is not incident in
the population). Our previous work has found that predictors of ED use
among people with atrial fibrillation include HIGHER SES (they are more
likely to come to the ER with their symptoms than lower SES patients).
4. You appear to have focused almost entirely on your methods, tables and
stats to the exclusion of all else. Unfortunately, even so we are over the
CIVIAJ word count of 2500 words. It is very difficult when the titles of the
primary care models have to be spelled out each time they are compared in
nations were diagnosed with atrial fib in the ED in Ontario over a five year
neriod: some 18% did not visit a primary care physician over the next 30
days - and it was the navment model of the community physician that
seemed to be the determining factor in whether or not patients received
timely care. I don't know why that is (especially since I don't live in Ontario
and am not familiar with the payment models) since you don't really explain
it but my overall sense was that actually, most people did, in fact, receive
reasonable care (particularly since quite a lot of those patients previously
had a cardiac related diagnosis and, presumably, had already seen a
physician and were taking meds for their condition). We may be
misunderstanding the reviewer's point, but it is not particularly important if
patients are taking medications for other cardiac conditions – what is
important, as noted in the first paragraph of the paper, is medication for
anticoagulation. They would not have been taking anticoagulant medication
if the diagnosis was new. The first paragraph of the paper delineates the
major risk of atrial fibrillation: stroke (and strokes caused by atrial
fibrillation are associated with a 50% mortality rate at 1 year). Treatment for
the other cardiovascular conditions would not prevent them from having a
stroke. In addition, the second paragraph of the introduction delineates why
tachycardiomyonathy / heart failure and symptoms/quality of life (nus
multiple FR visits)). For these reasons, we would disagree that most people
received reasonable care when almost a fifth of them did not see a physician
within 30 days of ED discharge with their new diagnosis of atrial fibrillation.
, , ,
The Tables do provide the data, although we agree it would be nice to have
more space to explain and interpret the findings for readers. We have
applied for funding to 'prove' that follow-up care that is delayed results in a
myriad of negative health care outcomes for these patients.
5. Your 2013 article in the Ann of Emerg Med covers atrial fib in the ED fairly

well; not sure what the point of this piece was. Certainly you could expand on the follow-up care and that might have policy implications, but, as it stands, these 32 pages are a lot of a data searching for a theme. There were several papers in Ann Emerg Med in 2013: one was a population-based description of atrial fibrillation in the ED. But while we found that many patients were being seen in the province's EDs with this disease, we did not assess followup care (at all). In the second paper we restricted to only patients over age 65, and allowed any visit for atrial fibrillation to be included (it didn't need to be a new diagnosis of atrial fibrillation). It is very likely that some of those visits didn't require follow-up care (prescription renewal, for example). In addition, outcomes were assessed at 90 days post-ED visit. The current paper restricts to patients who NEED follow-up care, and assesses who is getting it during the time-period that emergency physicians typically recommend they get it within (7 days). In light of the risks of untreated atrial fibrillation (noted in the first two paragraphs of the introduction), the theme is that these patients aren't getting the timely follow-up care emergency physicians think they are when they are discharged (18% had no care within 30 days!) Unfortunately the word count prohibits us from adding more on outcomes after discharge from the ER (and another reviewer asked for fewer references, not more).