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# New-onset Atrial Fibrillation during Hospitalization

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## To the Editor

Current guidelines(1) acknowledge that atrial fibrillation (AF) may be triggered by potentially reversible, or acute, causes such as surgery (cardiac and non-cardiac), hyperthyroidism, myocarditis/pericarditis, myocardial infarction, pulmonary embolism, pneumonia and alcohol intoxication. Incidence and risk for new-onset AF associated with acute conditions are unclear.

We investigated the epidemiology of new-onset AF associated with acute conditions in a population-based sample of hospitalized patients using 2011 data from the California State Inpatient Database.(2) We excluded patients younger than 40 years, in whom AF is rare (incidence < 0.1%).(1) We abstracted demographics, comorbidities, and guideline-defined, (1) AF-associated acute conditions using *ICD-9-CM* codes that were present on admission. Because alcohol intoxication generally resolves at admission, we did not report alcohol-associated new-onset AF. We identified new-onset AF through *ICD-9-CM* 427.3 not present on admission. Surgical procedures were defined by Diagnosis Related Group and *ICD-9-CM* codes. We performed multivariable logistic regression for new-onset AF adjusting for demographics, comorbid conditions, and acute conditions (Table 1). We conducted analyses investigating associations between infection site and new-onset AF, and associations between increasing infection and myocardial infarction severity and new-onset AF. Procedures were approved by the Boston University Medical Campus Institutional Review Board.

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We identified 2,275,588 patients hospitalized in California during 2011. Patients were aged 66±14 years, 53% were women, 61% white, 9% black, 8% Asian, and 21% Hispanic. Any AF diagnosis was present during 342,778 (15%) hospitalizations, with new-onset AF manifesting as 22,780 (6.7%) AF cases. Of new-onset AF cases, 18,575 (81.5%) were associated with guideline-identified acute conditions.(1)

**Table 1** demonstrates the proportion of new-onset AF cases during hospitalization associated with each acute condition and the multivariable-adjusted odds ratio for risk of new-onset AF associated with each condition. Most cases of new-onset AF were associated with non-cardiac surgery (37.2% of new-onset AF) and infection (34.9%). Cardiac surgery was associated with 21.9% of new-onset AF cases, and conferred a 50-fold increased adjusted odds of AF when compared to other hospitalized patients. Conditions such as pulmonary embolism, thyrotoxicosis, and myo/pericarditis showed modest associations with new-onset AF (adjusted OR 1.43-1.78), but represented fewer than 2.5% of cases.

Among infectious conditions, pneumonia [12.2% of new-onset AF; adjusted odds ratio (OR) 2.6] urinary tract infection [11.6%; adjusted OR 1.4], and intra-abdominal infection [10.5%; adjusted OR 1.6] were associated with new-onset AF. Greater disease severity was associated with increased new-onset AF risk (i.e., infection alone: OR 1.30, septic shock: OR 4.53; myocardial infarction alone: OR 1.33, with cardiogenic shock: OR 2.3).

Our findings have implications for acute management and post-hospitalization follow-up of patients with new-onset AF. The majority of new-onset AF cases occur after non-cardiac surgery or among patients with infections. Thus, most hospitalized patients with new-onset AF are unlikely to be under the direct care of cardiologists or cardiac surgeons, physicians who may be most adept at treating new-onset AF. In addition, emerging evidence suggests that new-onset AF associated with acute conditions [e.g., sepsis(3)] has high rates of recurrence and adverse long-term outcomes. Improved communication of long-term AF risks between hospital and outpatient providers is warranted.

Our findings also differ from opinions expressed in recent guidelines.(1) For example, most cases of new-onset AF occurred in patients admitted with infections or in post-operative patients. Although pneumonia is explicitly identified in guidelines as a condition associated with new-onset AF, infections from other sources were similarly represented among cases of new-onset AF. Conditions such as pulmonary embolism, thyrotoxicosis, and pericarditis were rarely present among hospitalized patients with new-onset AF.

Our study was limited by the ability of *ICD-9-CM* codes to identify temporal proximity between acute diagnoses and AF, especially when multiple diagnoses occurred simultaneously. Our results may not be generalizable outside of hospitalized patients. We were unable to identify whether AF present at the time of admission was new or pre-existing, a limitation which may result in underestimates of the association between some acute conditions and new-onset AF. Furthermore, cardiac rhythm monitoring may be more likely in some clinical scenarios (e.g., after cardiac surgery), and may have influenced our results.

In conclusion, we have examined risks for new-onset AF associated with acute conditions in a representative sample of hospitalized patients. Our findings inform prior knowledge gaps regarding acute conditions associated with new-onset AF and may provide targets for improved processes of care.

## Abbreviations

| | |
|---|---|
| **AF** | atrial fibrillation |
| ***ICD-9-CM*** | *International Classification of Diseases, 9th Revision, Clinical Modification* |

## References

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## Table 1

Acute conditions associated with new-onset atrial fibrillation (AF) among hospitalized adults

| Acute Condition | Number with New-Onset AF * (Total N=22,780) | % New-Onset AF with Condition * | % Condition with New-onset AF | Multivariable † -adjusted odds ratio for new-onset AF (95% CI) |
|---|---|---|---|---|
| Non-cardiac surgery N=641,071 | 8481 | 37.2 | 1.3 | 3.08 (2.99-3.18) |
| Infection N=730,379 | 7944 | 34.9 | 1.1 | 1.54 (1.49-1.59) |
| Cardiac surgery N=23,083 | 4804 | 21.9 | 20.8 | 52.4 (50.2-54.7) |
| Myocardial infarction N=77,848 | 2234 | 9.8 | 2.9 | 1.41 (1.34-1.48) |
| Pulmonary embolism N=20,939 | 244 | 1.1 | 1.2 | 1.43 (1.26-1.63) |
| Thyrotoxicosis N=10,172 | 141 | 0.6 | 1.4 | 1.78 (1.49-2.12) |
| Myo/pericarditis N=3705 | 126 | 0.6 | 3.4 | 1.73 (1.41-2.12) |

* Individual patients may have multiple diagnoses associated with new-onset AF

† Model adjusted for age, race, sex, history of diabetes mellitus, hypertension, heart failure, chronic pulmonary disease, stroke, metastatic cancer, prior myocardial infarction, and the acute conditions infection, surgery (cardiac and non-cardiac), myocardial infarction, alcohol, pulmonary embolism, thyrotoxicosis, myo/pericarditis