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Epidemiology and outcome of new-onset atrial fibrillation in the medical intensive care unit☆

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ABSTRACT

Objective: To assess the incidence of new-onset atrial fibrillation (NOAF) in the medical intensive care unit setting and describe associated characteristics and implications for long-term outcomes.
Materials and Methods: A single-center, retrospective study of patients admitted to a medical intensive care unit from January 1, 2008, to December 31, 2013, was conducted. Atrial fibrillation (AF) diagnosis was categorized as NOAF or preexisting (PEAF). Intensive care unit characteristics along with in-hospital and long-term outcomes were compared.
Results: A total of 10, 836 patients were included, 582 (5%) with NOAF, 2368 (22%) with PEAF, and 7886 (73%) with non-AF. Adjusted ICU management differed ($P< .001$) between all groups (NOAF vs PEAF vs non-AF) in regard to incidence of vasopressor use, mechanical ventilation, and renal replacement therapy, occurring more frequently in NOAF. Although ICU mortality was greater for NOAF (odds ratio, 1.40; 95% confidence interval, 1.03-1.87; $P= .03$), NOAF was not predictive of in-hospital mortality after adjustment for greater disease severity. One-year survival after ICU discharge was similar for both AF groups when compared with non-AF (54%, 52%, 75%; $P< .001$, log-rank).
Conclusions: Risk factors for AF were less common in NOAF than in PEAF, yet NOAF incidence was associated with greater ICU disease severity and poorer short-term ICU outcomes. New-onset AF was not independently predictive of in-hospital mortality.

1. Introduction

Atrial fibrillation (AF) is the most common cardiac arrhythmia in both the general population and critically ill [1,2]. Population-based studies have shown an increasing prevalence of AF associated with a 2-fold risk of mortality [2]. Although it is well known that perioperative AF is a predictor of increased morbidity and mortality in patients undergoing both cardiac and noncardiac procedures [3-7], there is a paucity of data regarding new-onset AF (NOAF) in the medical intensive care unit (MICU) population. One prospective observational study in a mixed medical-cardiac ICU setting demonstrated that new-onset arrhythmias were associated with significantly longer ICU stays and trended toward higher mortality [8]. In critically ill postcardiac surgical patients, the estimated prevalence of AF was 10.5% to 31.0% [8-11].

Few studies have looked into NOAF in noncardiac, nonsurgical medical ICU populations with current assessments, giving incidences ranging from 0.9% to 15% [9,12-14]. Data related to AF in the MICU have been best described in subsets of patients with severe sepsis and septic shock [10,12,15,16] with little known about NOAF compared with preexisting AF (PEAF) [14] in this setting.

This study aims to characterize further features of NOAF occurring in the MICU including associated clinical findings and severity of acute illness. We also compared short- and long-term outcomes in NOAF vs PEAF including ICU and in-hospital mortality, and 1-year survival after ICU discharge.

2. Materials and methods

2.1. Design and setting

Mayo Clinic Institutional Review Board (IRB 14-002 734) approval was obtained. A retrospective single-center cohort study was performed at a tertiary institution (Mayo Clinic Hospital–Saint Mary's Campus, Rochester, Minn) with a 24-bed medical ICU. Our primary objective was to determine the incidence of NOAF broadly in the medical ICU

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setting and describe associated characteristics at admission. Secondary objectives included clinical aspects of care with NOAF compared with PEAF and those without diagnosed AF (non-AF). We also compared severity of illness at ICU admission, ICU and hospital length of stay (LOS), and survival up to 1 year after discharge.

2.2. Population and case definition

All adult patients 18 years and older with prior research authorization admitted to the medical ICU from January 1, 2008, to December 31, 2013, were included. Only first admission to the medical ICU during the study period was assessed in patients with multiple admissions to prevent inclusion into both cohorts if they were subsequently diagnosed with AF outside of hospitalization. Eligible patients were categorized into 3 groups: (1) NOAF, (2) PEAF, and (3) non-AF. Atrial fibrillation cases were identified using the *International Classification of Diseases, Ninth Revision* (*ICD-9*) diagnosis codes 427.31 and 427.32. Electrocardiograms associated with individual AF cases were independently reviewed to confirm diagnosis. New-onset AF was categorized if the first recorded diagnosis occurred during the medical ICU stay without previous AF documentation in the patient's electronic medical record (EMR). Preexisting AF was established by a standing *ICD-9* diagnosis code of 427.31 or 427.32 before the first MICU admission or AF documentation in the clinical EMR. All remaining patients were classified as non-AF.

2.3. Data collection

Data were abstracted from the EMR using the ICU Data Mart and Mayo Data Discovery Query Builder. Patient demographics, comorbidities, CHADS2 score, and Acute Physiology and Chronic Health Evaluation III (APACHE III) score were obtained on admission. Assessed comorbidities included diabetes, hypertension, congestive heart failure, coronary artery disease, prior stroke or transient ischemic attack (TIA), and obstructive sleep apnea (OSA). Clinical outcomes and management focused on need for organ support were defined by vasopressor use, renal replacement therapy (RRT), and mechanical ventilation. Intensive care unit and hospital LOS as well as mortality as dichotomous outcomes were compared, with time to survival assessed after date of discharge up to 1 year.

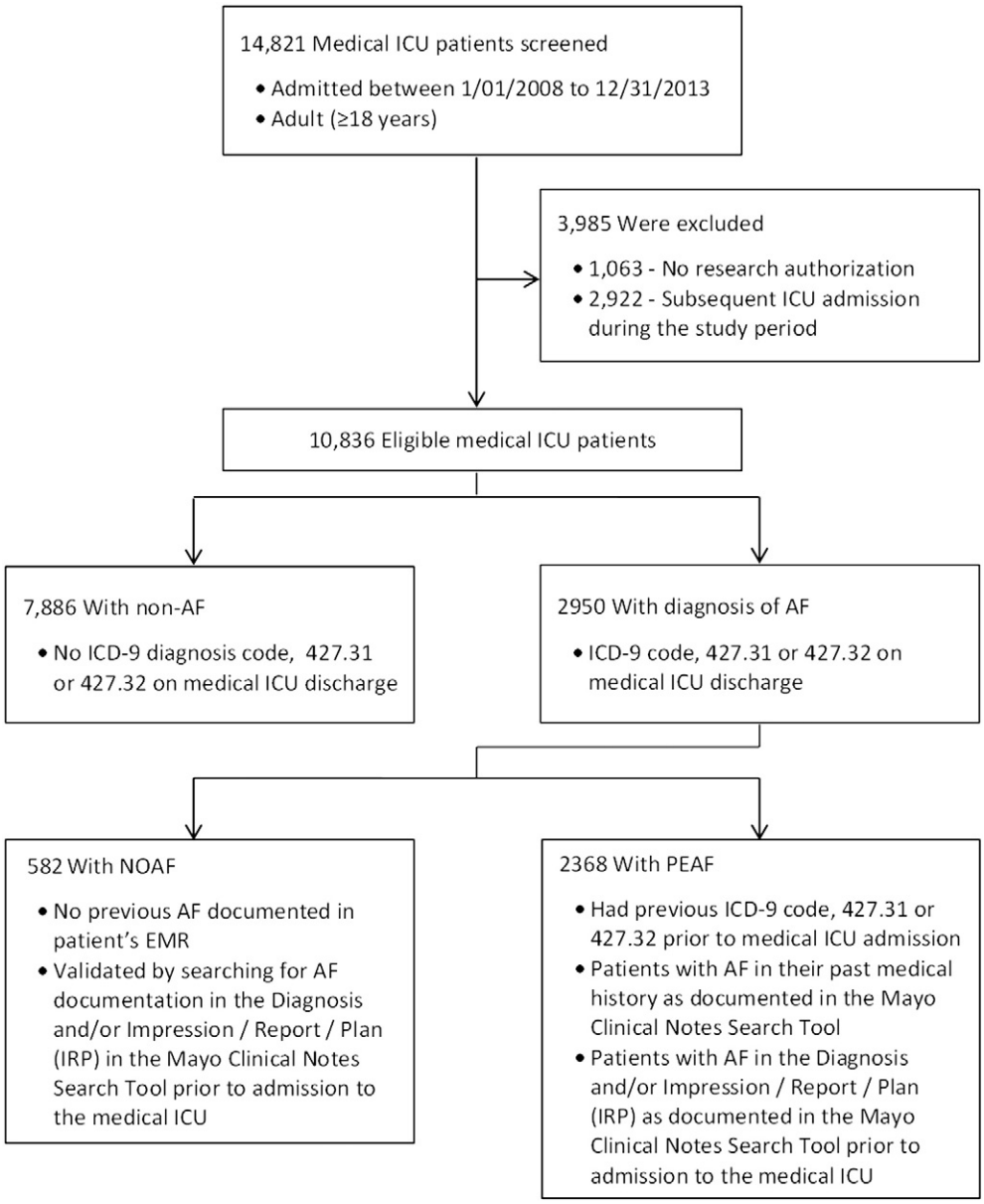

Fig. 1. Study flowchart.