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Trends in atrial fibrillation hospitalizations in the United States: A report using data from the National Hospital Discharge Survey

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ABSTRACT

Aims: Atrial fibrillation (AF) is the most common sustained arrhythmia encountered in clinical practice. Patients presenting with AF are often admitted to hospital for rhythm or rate control, symptom management, and/or anticoagulation. We investigated temporal trends in AF hospitalizations in United States from 1996 to 2010.

Methods: Data were obtained from the National Hospital Discharge Survey (NHDS), a national probability sample survey of discharges conducted annually by National Center for Health Statistics. Because of the survey design, sampling weights were applied to the raw NHDS data to produce national estimates. Hospitalizations with a primary diagnosis of AF were identified using International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) code of 427.31. Weighted least squares regression was used to test for linear trends in the number of AF admissions, length of stay, and inpatient mortality. We further stratified AF admissions based on patients' age, gender, and race.

Results: Admissions for a primary diagnosis of AF increased from approximately 286,000 in 1996 to about 410,000 in 2010 with a significant linear trend ($\beta = 9470$ additional admissions per year, $p < 0.001$). The trend of increased AF admissions was uniform across patient sub-groups. Overall, mean length of stay for AF admissions was 3.75 days, and this remained relatively stable over time ($\beta = 0.002$ days, $p = 0.884$). Inpatient mortality was 0.96% and also remained stable over time ($\beta = 0.031\%$, $p = 0.181$).

Conclusion: Our data demonstrate an increase in the number of AF admissions but constant length of stay and mortality over time.

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1. Introduction

Atrial fibrillation (AF) is the most common sustained arrhythmia affecting about 1–2% of the general population [1]. Its prevalence in the United States (US) is projected to increase by 2.5 fold to reach about 7.5 Million by 2050, posing a public health and economic challenge [2] [3]. AF is associated with increased risk of stroke, congestive heart failure and all-cause mortality [4].

AF poses an increased economic burden on the health care system due to increasing cost of care driven in big part by

hospitalizations [5]. The annual direct cost of AF management in the US is estimated at about \$6–6.7 billion [6]. This economic burden is projected to increase further due to the increased prevalence of chronic heart diseases which usually lead to AF [7]. It is therefore important to examine the burden of inpatient care for AF patients and analyze its trends over time. To this end, we analyzed the National Hospital Discharge Survey Data (NHDS) database for temporal trends in AF hospitalizations over the past two decades.

2. Methods

Data were obtained from NHDS, an annual survey of inpatient discharges conducted by the National Center for Health Statistics since 1965. NHDS collects raw data on about 1% of hospital discharges and then weight each discharge to produce national estimates. Data collected included basic demographic variables,

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Table 1
Baseline characteristics and comorbidities by year.

	1996	1997	1998	1999	2000
Age	72.7 (63.1–80.9)	73.5 (63.7–80.6)	72.4 (62.2–80.3)	72.5 (63.2–80.0)	73.2 (63.7–80.7)
Age Group					
<50	28,168 (9.8%)	29,148 (9.1%)	23,906 (7.3%)	31,010 (8.9%)	32,567 (9.1%)
50–59	26,345 (9.2%)	25,368 (7.9%)	39,109 (12.0%)	35,571 (10.2%)	33,644 (9.4%)
60–69	60,941 (21.3%)	61,158 (19.2%)	65,524 (20.0%)	64,352 (18.5%)	69,997 (19.6%)
70–79	82,309 (28.7%)	107,652 (33.7%)	103,169 (31.5%)	118,585 (34.2%)	114,401 (32.1%)
>80	88,599 (30.9%)	96,028 (30.1%)	95,454 (29.2%)	97,657 (28.1%)	106,122 (29.7%)
Gender					
Male	132,986 (46.4%)	143,436 (44.9%)	154,877 (47.3%)	150,063 (43.2%)	153,275 (43.0%)
Female	153,376 (53.6%)	175,918 (55.1%)	172,285 (52.7%)	197,112 (56.8%)	203,456 (57.0%)
Race					
White	210,621 (73.6%)	237,744 (74.4%)	242,030 (74.0%)	246,635 (71.0%)	242,741 (68.0%)
Black/African American	13,625 (4.8%)	20,366 (6.4%)	19,055 (5.8%)	22,217 (6.4%)	19,890 (5.6%)
American Indian/Alaskan Native	601 (0.2%)	1,253 (0.4%)	1,311 (0.4%)	1,226 (0.4%)	95 (0.0%)
Asian	4,188 (1.5%)	1,884 (0.6%)	3,681 (1.1%)	1,758 (0.5%)	1,854 (0.5%)
Native Hawaiian/Pacific Islander	2,827 (1.0%)	3,997 (1.3%)	4,308 (1.3%)	4,124 (1.2%)	305 (0.1%)
Other					2,253 (0.6%)
Multiple Races					220 (0.1%)
Not Stated	54,500 (19.0%)	54,110 (16.9%)	56,777 (17.4%)	71,215 (20.5%)	89,373 (25.1%)
Marriage Status					
Married	92,524 (32.3%)	102,384 (32.1%)	105,604 (32.3%)	117,315 (33.8%)	118,572 (33.2%)
Single	20,083 (7.0%)	23,549 (7.4%)	25,810 (7.9%)	19,576 (5.6%)	28,332 (7.9%)
Widowed	58,309 (20.4%)	62,217 (19.5%)	53,162 (16.2%)	62,588 (18.0%)	68,420 (19.2%)
Divorced	7,559 (2.6%)	9,887 (3.1%)	8,945 (2.7%)	11,699 (3.4%)	8,646 (2.4%)
Separated	1,136 (0.4%)	1,938 (0.6%)	1,251 (0.4%)	1,264 (0.4%)	3,735 (1.0%)
Not Stated	106,751 (37.3%)	119,379 (37.4%)	132,390 (40.5%)	134,733 (38.8%)	129,026 (36.2%)
Region					
Northeast	67,700 (23.6%)	80,080 (25.1%)	98,089 (30.0%)	96,587 (27.8%)	91,085 (25.5%)
Midwest	71,540 (25.0%)	79,176 (24.8%)	80,823 (24.7%)	88,474 (25.5%)	95,047 (26.6%)
South	102,217 (35.7%)	111,960 (35.1%)	108,629 (33.2%)	110,853 (31.9%)	125,328 (35.1%)
West	44,905 (15.7%)	48,138 (15.1%)	39,621 (12.1%)	51,261 (14.8%)	45,271 (12.7%)
Ischemic heart disease	80,039 (28.0%)	71,959 (22.5%)	88,463 (27.0%)	91,635 (26.4%)	92,326 (25.9%)
Ventricular arrhythmias	9,194 (3.2%)	10,523 (3.3%)	9,944 (3.0%)	7,669 (2.2%)	10,233 (2.9%)
Left bundle branch block	4,721 (1.6%)	3,996 (1.3%)	3,146 (1.0%)	3,426 (1.0%)	3,909 (1.1%)
Complete AV block	1,000 (0.3%)	3,776 (1.2%)	1,509 (0.5%)	935 (0.3%)	501 (0.1%)
Heart Failure	62,204 (21.7%)	67,396 (21.1%)	70,400 (21.5%)	71,955 (20.7%)	67,705 (19.0%)
Peripheral vascular disease	6,985 (2.4%)	7,574 (2.4%)	10,237 (3.1%)	10,635 (3.1%)	11,704 (3.3%)
Hypertension	95,414 (33.3%)	111,250 (34.8%)	115,031 (35.2%)	140,775 (40.5%)	139,175 (39.0%)
Chronic pulmonary diseases	36,084 (12.6%)	53,631 (16.8%)	48,156 (14.7%)	55,944 (16.1%)	51,179 (14.3%)
Diabetes	42,336 (14.8%)	49,206 (15.4%)	52,697 (16.1%)	52,284 (15.1%)	54,732 (15.3%)
Chronic kidney disease	3,564 (1.2%)	5,383 (1.7%)	4,813 (1.5%)	6,389 (1.8%)	8,196 (2.3%)
Anemia	10,488 (3.7%)	14,384 (4.5%)	16,142 (4.9%)	13,062 (3.8%)	16,618 (4.7%)
Pulmonary circulation disorders	4,782 (1.7%)	6,628 (2.1%)	6,610 (2.0%)	6,377 (1.8%)	9,044 (2.5%)
Paralysis	6,827 (2.4%)	5,957 (1.9%)	3,669 (1.1%)	3,537 (1.0%)	4,119 (1.2%)
Valvular diseases	43,549 (15.2%)	49,011 (15.3%)	55,225 (16.9%)	58,471 (16.8%)	60,485 (17.0%)
Other neurologic disorders	5,992 (2.1%)	12,481 (3.9%)	13,569 (4.1%)	10,502 (3.0%)	12,314 (3.5%)
Hypothyroidism	19,552 (6.8%)	18,621 (5.8%)	19,932 (6.1%)	26,206 (7.5%)	34,374 (9.6%)
Liver disease	1,249 (0.4%)	2,586 (0.8%)	1,023 (0.3%)	1,956 (0.6%)	1,439 (0.4%)
PUD	4,077 (1.4%)	3,627 (1.1%)	4,779 (1.5%)	4,714 (1.4%)	2,619 (0.7%)
AIDS		40 (0.0%)			122 (0.0%)
Lymphoma	1,168 (0.4%)	1,504 (0.5%)	969 (0.3%)	2,477 (0.7%)	854 (0.2%)
Metastatic cancer	945 (0.3%)	2,826 (0.9%)	5,817 (1.8%)	4,307 (1.2%)	5,670 (1.6%)
Solid tumor without mets	18,352 (6.4%)	19,885 (6.2%)	21,116 (6.5%)	20,420 (5.9%)	24,022 (6.7%)
Collagen vascular diseases	3,201 (1.1%)	6,215 (1.9%)	3,612 (1.1%)	6,427 (1.9%)	7,849 (2.2%)
Coagulopathy	2,062 (0.7%)	5,791 (1.8%)	4,387 (1.3%)	2,724 (0.8%)	6,732 (1.9%)
Obesity	7,465 (2.6%)	6,709 (2.1%)	13,359 (4.1%)	14,535 (4.2%)	11,107 (3.1%)
Weight loss	727 (0.3%)	3,442 (1.1%)	1,551 (0.5%)	1,737 (0.5%)	3,712 (1.0%)
Fluid and electrolyte disorders	23,202 (8.1%)	34,518 (10.8%)	27,156 (8.3%)	27,553 (7.9%)	32,556 (9.1%)
Alcohol abuse	4,240 (1.5%)	7,602 (2.4%)	7,446 (2.3%)	8,238 (2.4%)	5,746 (1.6%)
Drug abuse	1,407 (0.5%)	883 (0.3%)	1,359 (0.4%)	2,370 (0.7%)	737 (0.2%)
Depression	4,145 (1.4%)	3,882 (1.2%)	9,730 (3.0%)	9,428 (2.7%)	19,677 (5.5%)
Psychosis	1,712 (0.6%)	2,824 (0.9%)	2,154 (0.7%)	2,496 (0.7%)	4,302 (1.2%)
Smoking (other tobacco use)	5,157 (1.8%)	9,277 (2.9%)	13,557 (4.1%)	19,479 (5.6%)	18,153 (5.1%)
	2001	2002	2003	2004	2005
Age	72.9 (64.4–80.7)	74.0 (64.5–81.2)	73.0 (61.9–80.6)	72.9 (61.7–81.7)	73.9 (63.1–82.3)
Age Group					
<50	28,969 (7.5%)	27,895 (6.7%)	34,673 (8.1%)	37,188 (9.2%)	34,057 (8.3%)
50–59	38,505 (10.0%)	43,377 (10.4%)	51,590 (12.0%)	44,755 (11.1%)	39,057 (9.5%)
60–69	77,476 (20.1%)	68,905 (16.5%)	79,985 (18.7%)	80,072 (19.9%)	79,418 (19.3%)
70–79	122,794 (31.9%)	144,374 (34.5%)	136,604 (31.9%)	101,018 (25.1%)	117,663 (28.6%)
>80	117,265 (30.5%)	133,350 (31.9%)	125,899 (29.4%)	140,133 (34.8%)	140,865 (34.3%)

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