



# Marathon Running Does Not Cause Atrial Fibrillation

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## Abstract

**Background:** Atrial fibrillation/flutter (AF) is associated with poorer outcomes and quality of life than sinus rhythm<sup>1-5</sup>. Recent research has reported an increased incidence of AF in endurance exercisers such as marathoners<sup>6-13</sup> in spite of an improved cardiovascular outcome with exercise<sup>13-25</sup>.

**Objective:** In this study, we aimed to compare the incidence of AF in marathon runners versus the general population.

**Methods:** This was a historical prospective case-control study. Cases were local marathoners who ran the local Med City Marathon between May 2000 and May 2015. A local control population was selected over a similar time frame from a cohort of patients who had stress testing at Mayo Integrated Stress Center. Both groups were prospectively followed until the end of January 2016 for occurrence of incident AF. We used Cox proportional hazards regression to determine the effect of marathon running on AF incidence, while including women and controlling for confounding factors including Functional Aerobic Capacity (FAC) from the exercise test. We also used a low-risk, asymptomatic population (absence of diabetes, hypertension, hyperlipidemia, smoking, cardiovascular disease, and sleep apnea) for an additional sensitivity analysis in which to compare incidence of AF.

**Results:** There were 370 marathoners (mean age 38.1±10.6, 37% female) and 14,073 controls (mean age 53.0±13.5, 36.9% female). Over a median follow up of 14 (8-17) years, the incidence of AF was 1.89% and 12.34% in marathoners and controls, respectively. On proportional regression modeling, after adjusting for age, sex, body mass index, diabetes, hypertension, current smoking status, chronic kidney disease, coronary artery disease, valvular heart disease, sleep apnea, and use of beta blockers, marathoners' risk of AF was not increased [HR 1.27 (0.60-2.68, p=0.53)]. Sensitivity analysis with low-risk controls (n=4,371) showed that marathon running was still not a significant risk factor for development of AF [HR 1.44 (0.68-3.10, p=0.34)].

**Conclusions:** While many previous papers have reported an increased risk of AF with endurance exercise, they were often not well controlled for confounding factors, had small populations, and did not include women who have a lower AF risk. Based on our data, marathon running presents no increased risk of atrial fibrillation

## Objectives

Objectives were:

- Find the incidence of atrial fibrillation in the general population in recent years at Mayo Clinic
- Find the incidence of atrial fibrillation in Mayo Clinic patients who have completed at least one Med City Marathon between 2000 and 2016
- Compare the incidence of atrial fibrillation between the general population and marathon runners

## Methods

This was a prospective case-control study of Med City marathon runners (Rochester, Minnesota) who completed the marathon between May 2000 and 2016 and who were also Mayo patients who consented for their data to be used in research. Marathoners were found through records from the local newspaper. We then matched these names to Mayo patients and confirmed the correct identity using a Mayo-specific computer program, Advanced Cohort Explorer to ensure they were marathon runners. These patients were followed up prospectively for a mean of 7 years.

Controls were chosen from a database of patients that have had cardiopulmonary exercise testing at Mayo Clinic.

We first compared the incidence of AF in the marathoners to the general population using simple descriptive statistics and Student's t-test. Next, we used Cox proportional hazard regression to adjust for confounding factors identified on univariate regression. Using this model, we adjusted for age, BMI, female sex, diabetes, hypertension, current smoking status, chronic kidney disease, coronary artery disease, valvular heart disease, sleep apnea, functional aerobic capacity, and beta blocker use.

For additional sensitivity, we also compared the marathoners to a low-risk population (absence of diabetes, hypertension, hyperlipidemia, smoking, cardiovascular disease, and sleep apnea), using Student's t-test.

## Discussion

• Several recent papers have reported an increased incidence of AF with endurance exercise, such as marathon running. However, there are some methodological problems with these papers, including low numbers, exclusion of women (who have a lower risk of atrial fibrillation), and control groups with lower incidence of atrial fibrillation than would be otherwise expected.

• It should be considered whether endurance athletes notice symptoms more frequently due to pulse checks

• Athletes may notice symptoms of atrial fibrillation more, as a common symptom is exercise intolerance. Symptoms may also only be noticed at the extreme end of physical activity

• Compared to healthy non-athlete controls, athletes may be more likely to get routine physical examinations

## Conclusions

• Marathon running is not associated with AF development when compared to general population incidence, even when controlled for confounders

• Marathon running is still not significantly associated with AF incidence when compared to a healthy low-risk population

• The rate of atrial fibrillation in marathon runners is very low compared to non-marathon runners undergoing stress testing

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## Figure 1

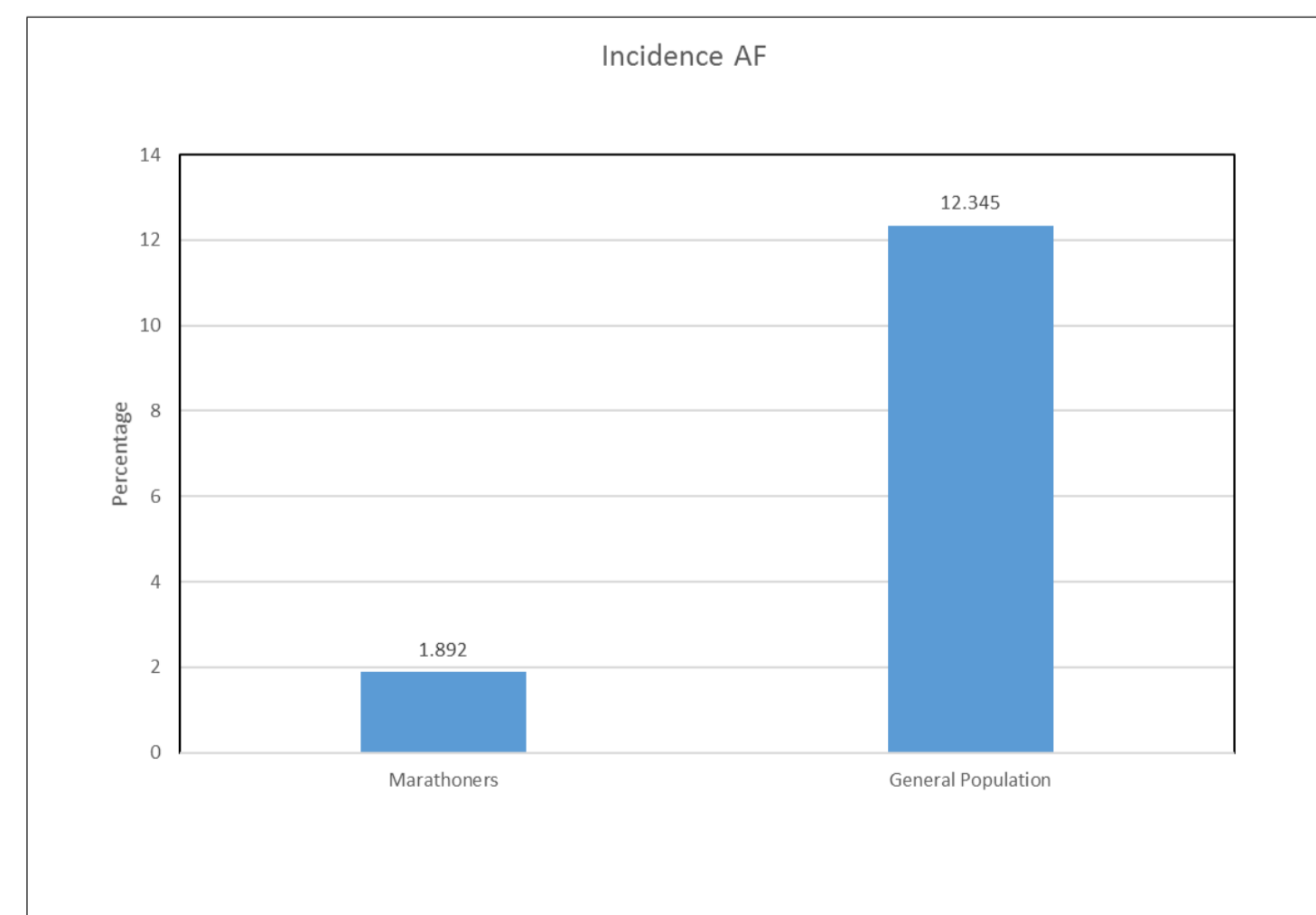


Figure 1 shows the incidence in terms of percentage of marathoners versus general controls who developed atrial fibrillation.

## Results

• Only 7 of 370 marathon runners developed AF. Of these, only 1 was lone AF. Other cases had other co-morbidities that explained AF, including Grave's disease, mitral regurgitation, and holiday heart syndrome.

• In the controls group, 12.34% had incident atrial fibrillation (1631/13,212), p<0.0001 for a difference with marathoners

• Once controlling for confounders against a standard population, marathon running was not significantly associated with development of AF [HR=1.27 (0.60-2.680), p=0.53].

• Sensitivity analysis with low-risk controls (n=4,371) showed that marathon running was still not a significant risk factor for development of AF [HR 1.44 (0.68-3.10, p=0.34)].

Table 1: Co-Morbidities in the 7 Marathoners who Developed Atrial Fibrillation

Marathon Runner	Co-Morbidities
1	Previous MI with aneurysm formation, further PCI, hyperlipidemia
2	Grave's disease-associated atrial fibrillation
3	Sleep apnea, diabetes, cryptogenic stroke
4	Hyperlipidemia, diabetes
5	Holiday heart and excess caffeine use, both of which brought on his AF episodes
6	Hypertension, alcoholism, mitral regurgitation and a vena cava teratoma
7	Lone AF