# Atrial Fibrillation Among the NASA Astronaut Corps

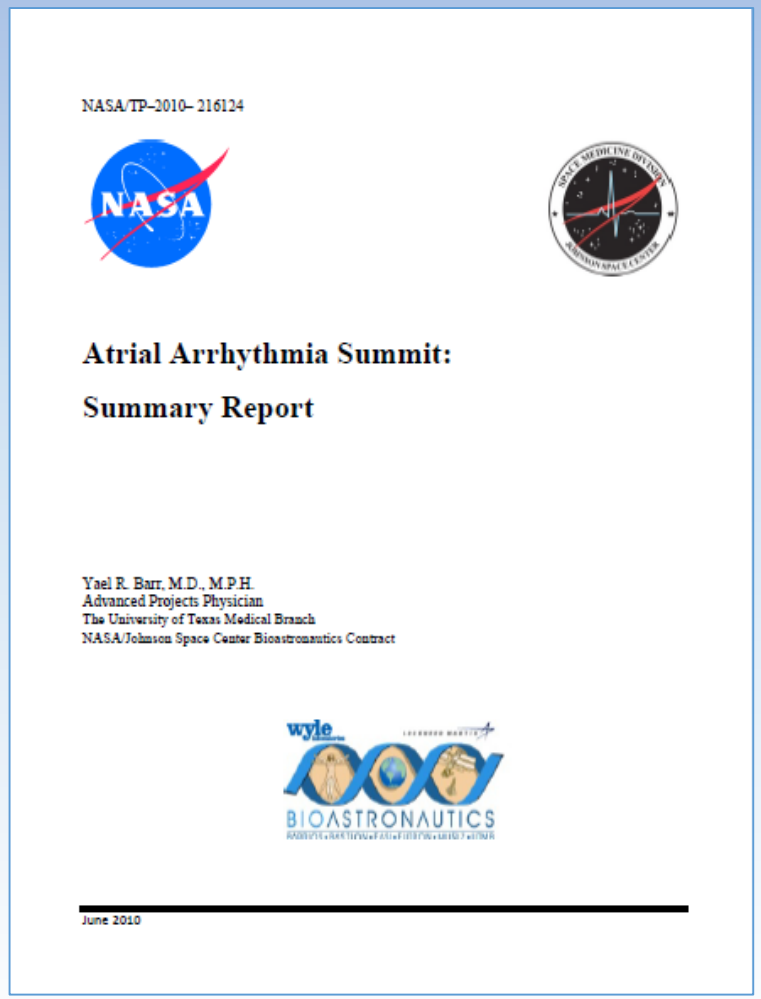
Jacqueline Charvat, PhD, Stuart Lee, PhD,
Michael Stenger, PhD, Mary Van Baalen, PhD

Lifetime Surveillance of Astronaut Health

# Overview of Atrial Fibrillation

- Atrial fibrillation (Afib) causes the upper chambers of the heart to beat irregularly (quiver), potentially leading to clotting in atria which could lodge in artery leading to the brain which can result in stroke
- Most common dysrhythmia in the US
- Risk factors
  - Increased age
  - High blood pressure
  - Heart disease
  - Increased alcohol use
  - Family history
  - Sleep apnea
  - Elite athletes

# 2010 Atrial Arrhythmia Summit



NASA/TP–2010– 216124

**Atrial Arrhythmia Summit:**

**Summary Report**

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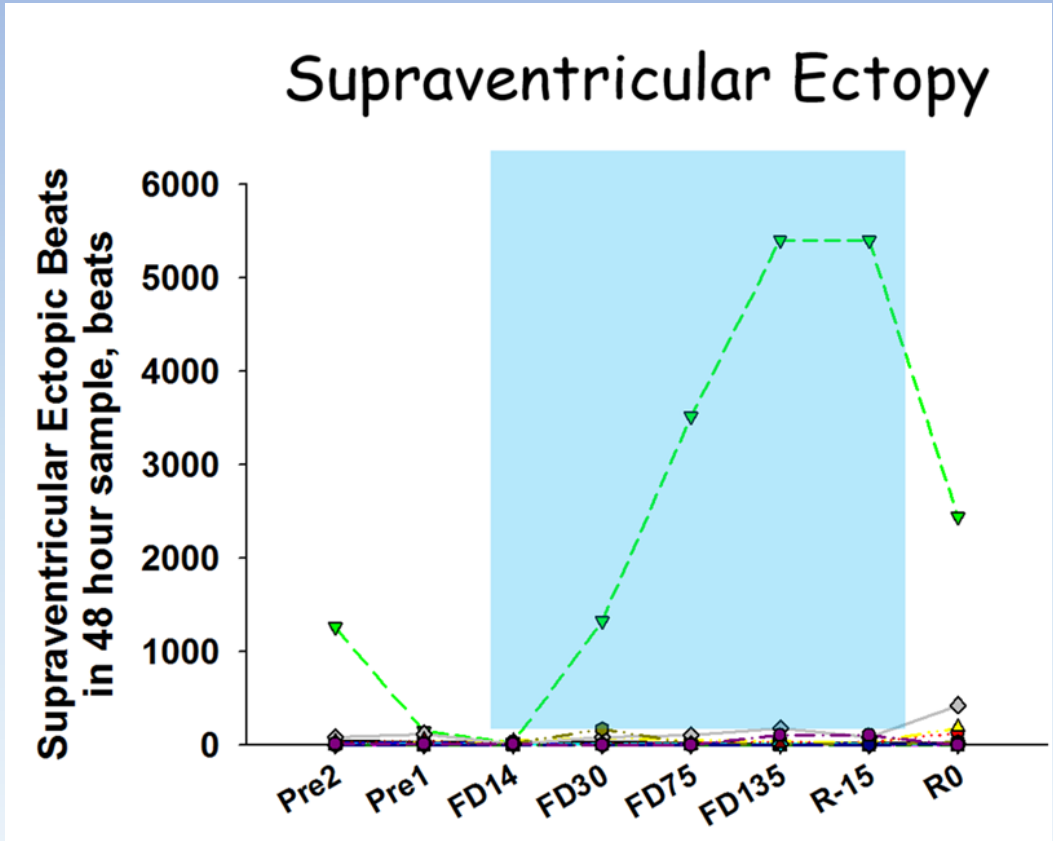
BIOASTRONAUTICS

June 2010

- 17 / 317 (5.4%) astronauts diagnosed with atrial fibrillation
- Age of presentation was lower in astronauts than in the general population (~40 vs. ~60 yrs old)
- Contributing factors:
  - Frequent and comprehensive screenings leading to high discovery rate
  - Higher levels of vagal tone associated with higher levels of aerobic exercise
- Possible risk factors during spaceflight:
  - Atrial distension due to fluid shift
  - Increase in sympathetic activation

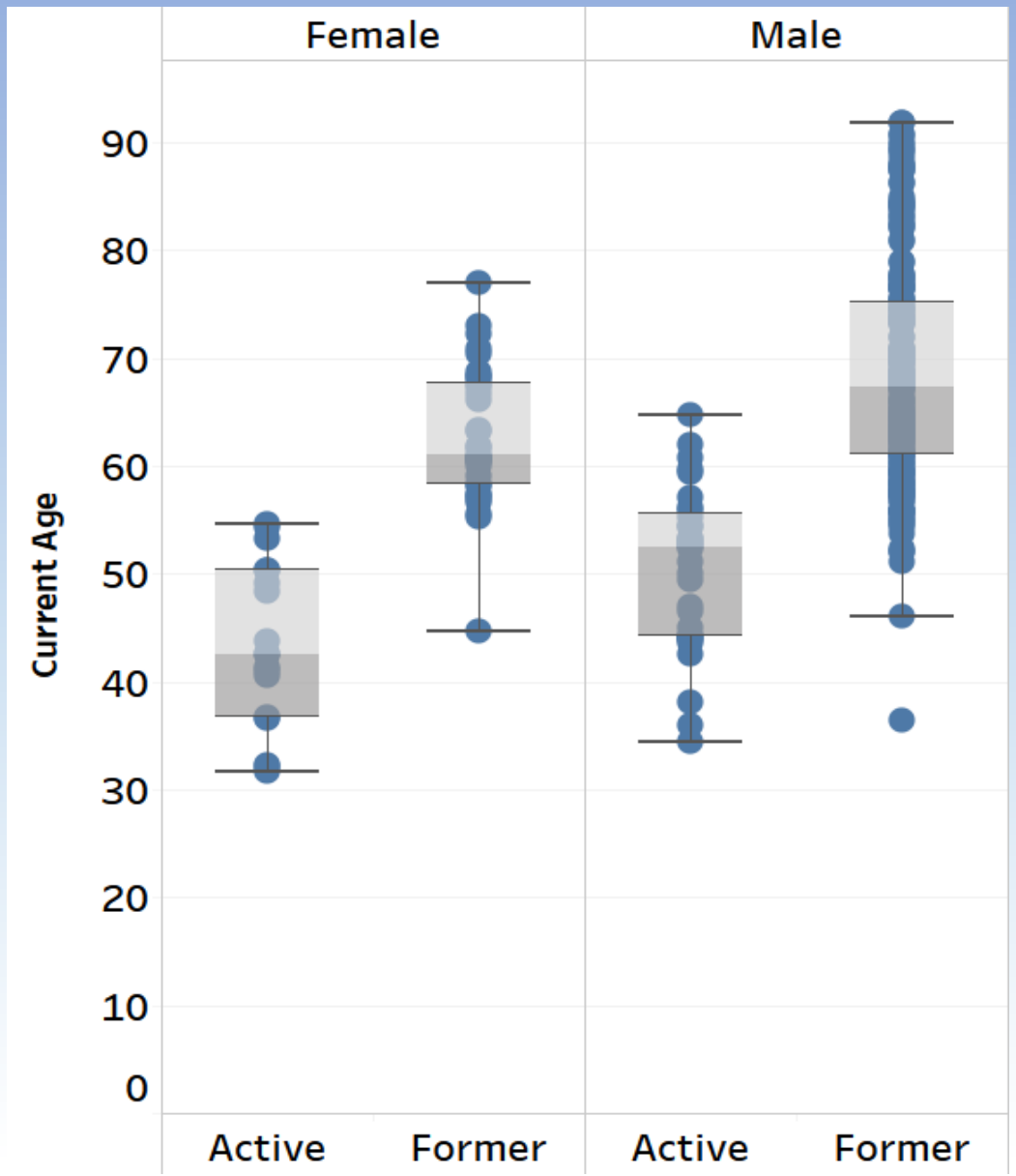
# Integrated Cardiovascular Study

## Co-PIs: Benjamin Levine, MD; Michael Bungo, MD




- No potentially lethal arrhythmias were noted.
- In one subject, there was a late-flight increase in supraventricular ectopy which did not persist post-flight (Khine et al, 2018)
- In a second subject there was increase in ventricular ectopy which occurred early in flight and persisted through the post-flight period (not shown)

# NASA Astronaut Corps: Age by Status




Data as of 1/21/2020

# Purpose and Methods




Purpose

Review of atrial fibrillation / flutter outcomes among NASA astronauts in order to provide context for the risk of atrial arrhythmias during a deep space mission.

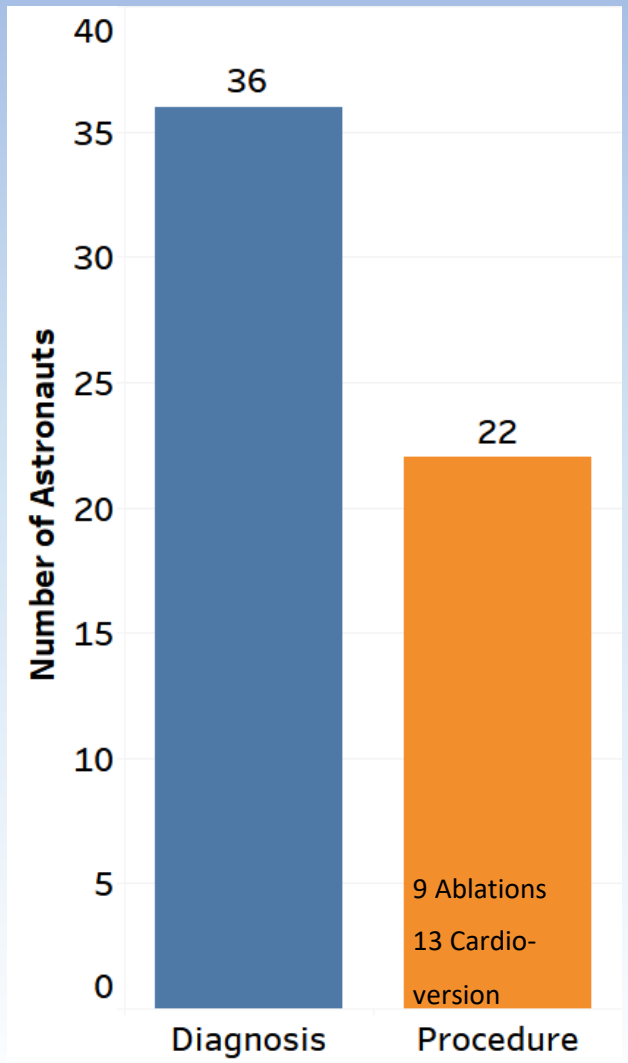
Methods

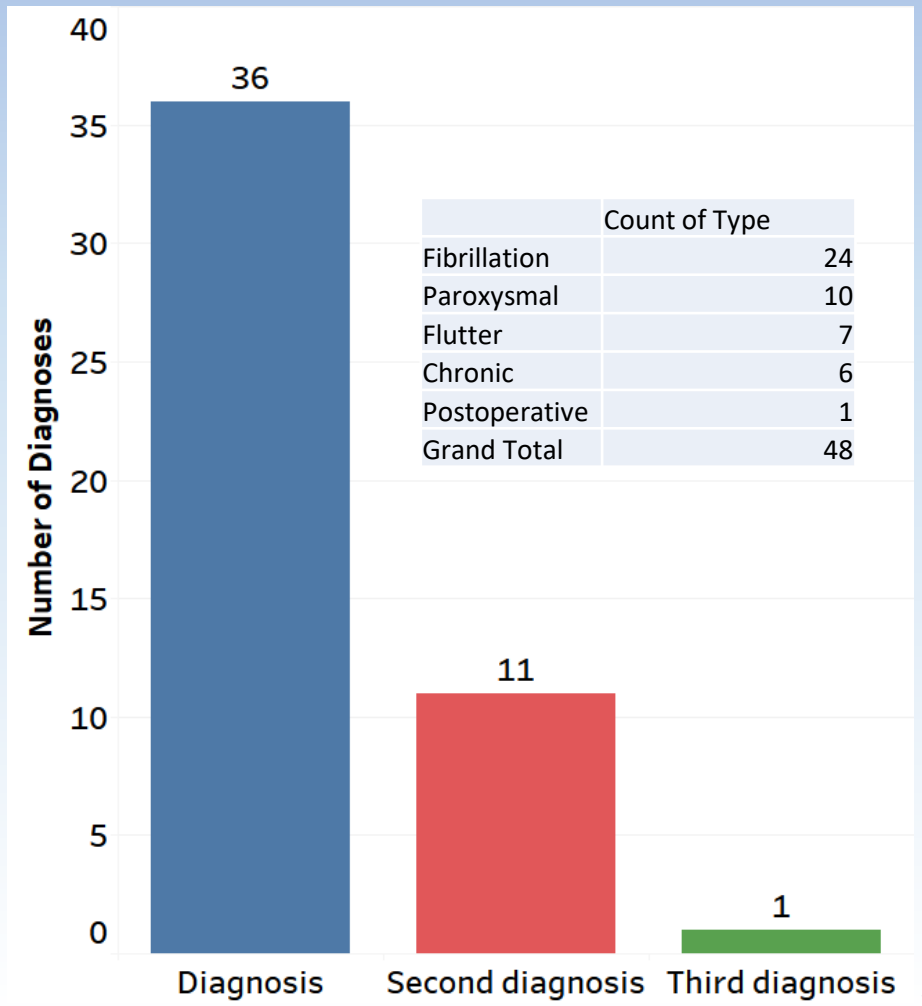
Astronaut medical data available in NASA systems as of June 2019 were queried for ICD codes and keywords related to:

- Atrial fibrillation or flutter (excluding postoperative)
- Ablation or cardioversion procedures

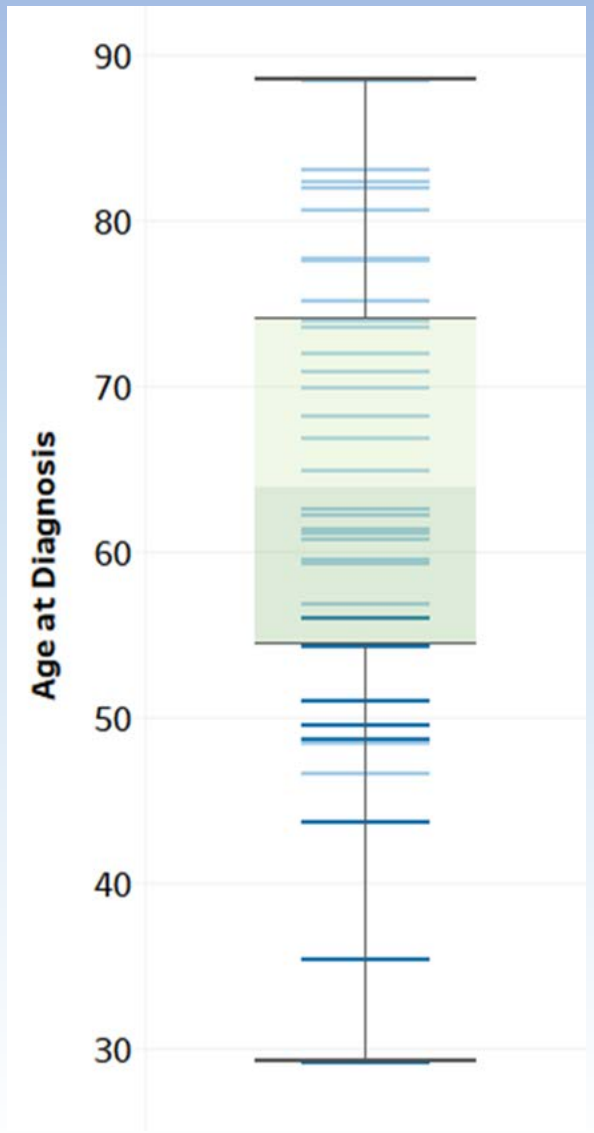
Compared prevalence of atrial fibrillation or flutter outcomes to European study

# Atrial Fibrillation / Flutter Diagnosis Among NASA Astronauts

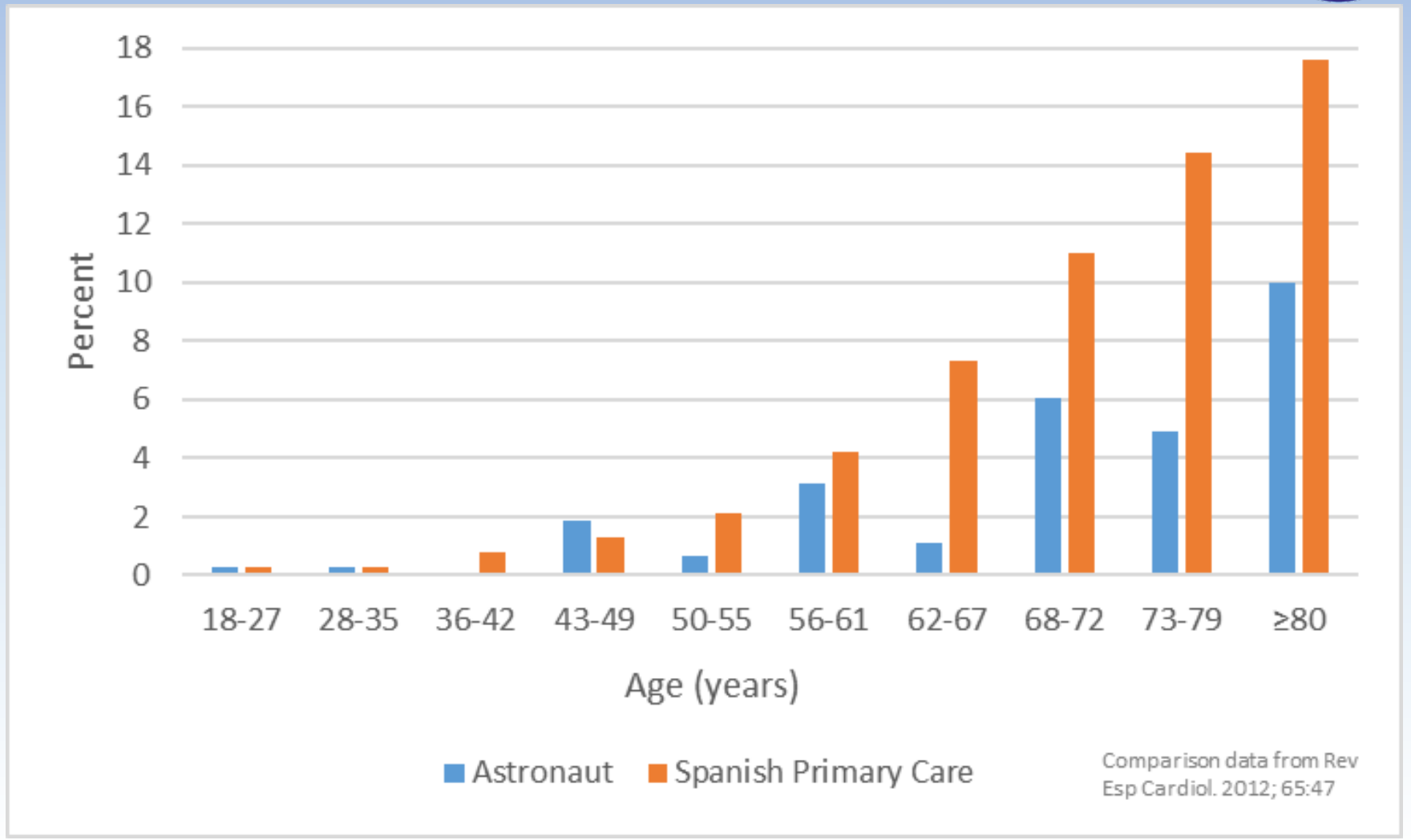


# Age at Diagnosis



# Prevalence of Atrial Fibrillation by Age at Diagnosis (n=36)



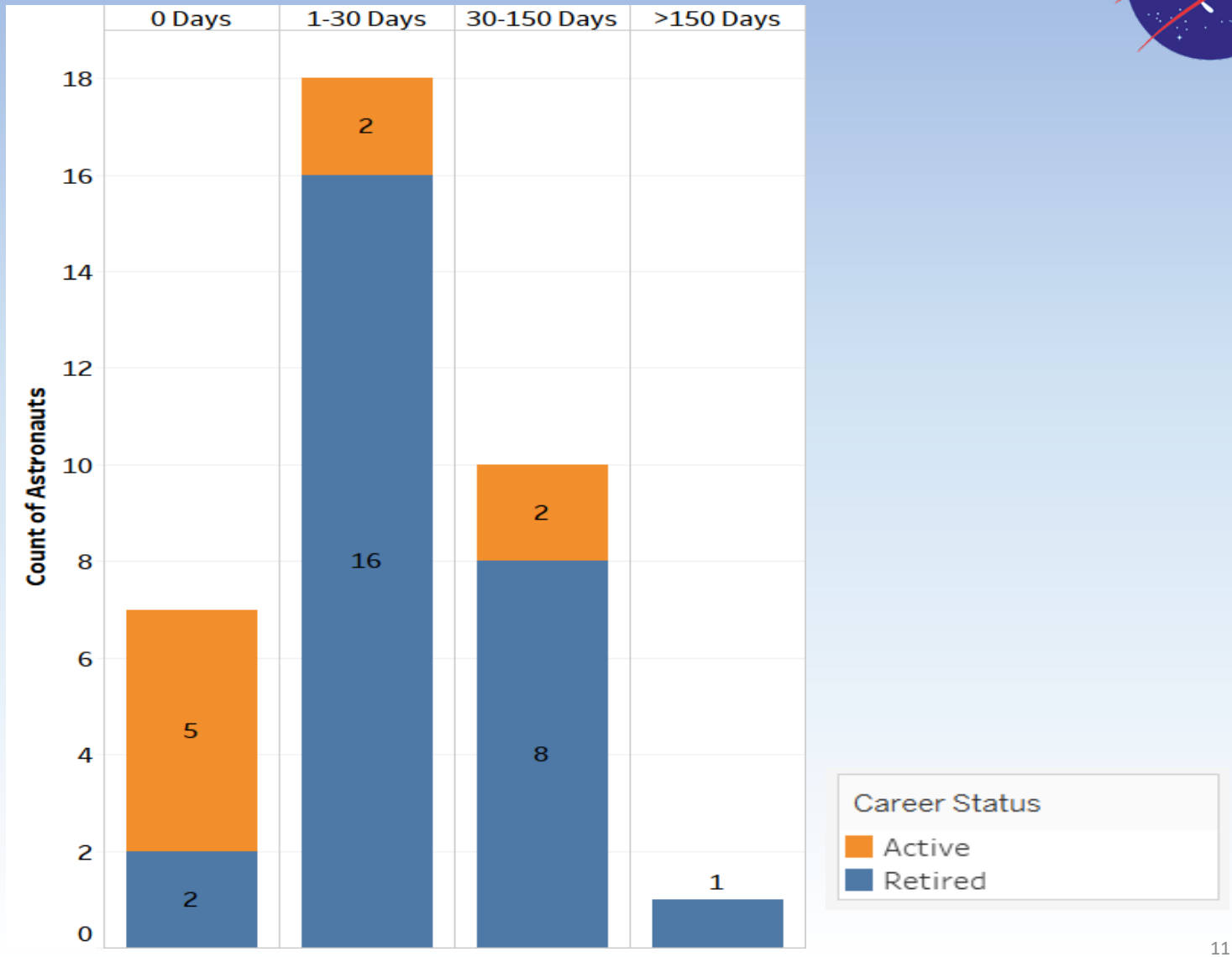
# Atrial Fibrillation / Flutter Diagnosis Among NASA Astronauts

9 crewmembers (25% of cases) were diagnosed during their active career

- 3 did not fly a mission following their diagnosis
- 6 flew a mission after the diagnosis
  - 5 diagnosed before any flight
  - 1 diagnosed between missions
- Of the 6 that flew:
  - 3 had an ablation
  - 1 had a cardioversion procedure

3 of 36 crewmembers were diagnosed within 3 years following a mission

# Total Days in Orbit prior to Diagnosis



# Recurrences

11 of 36 astronauts had an atrial fibrillation recurrence documented

- 1 was active at time of original and recurrent diagnosis (did not fly)
- 10 were retired at time of original and recurrent diagnoses
- One with a 3rd diagnosis

2 of 11 who had a recurrence also had a 2nd procedure

- Both incident case and recurrence occurred following retirement
- One ablation case had a repeat approx. 3 years following first
- One cardioversion case had a repeat approx. 5 years following first

# Summary

Atrial fibrillation/flutter is observed in NASA astronauts with an increasing prevalence with aging

- Comparison to available data suggests no greater prevalence than in general population
- Working to compare astronauts to other healthy cohorts and examine contributions of other risk factors

Atrial fibrillation / flutter has not been diagnosed among NASA astronauts while in space

- Currently there is no evidence that the length or number of spaceflight exposures increases the risk of atrial fibrillation/flutter
- More evidence is needed to understand the complex interplay of aging and spaceflight especially with respect to proposed three year exploration missions

# Study Team




Lifetime Surveillance of Astronaut Health

- Jacqueline Charvat, PhD
- Mary Van Baalen, PhD




JSC Cardiovascular and Vision Laboratory

- Stuart M.C. Lee, PhD
- Michael B. Stenger, PhD

# Questions?

