

Beta Blockers Versus Calcium Channel Blockers as First-Line Therapy for the Initial Management of Rapid Ventricular Response in Patients with Atrial Fibrillation

Stephanie Lee,¹ Ori Ben-Yehuda,^{1,2} Doug Humber,^{1,3}

¹University of California San Diego Health, San Diego, USA ²Department of Medicine, University of California - San Diego, San Diego, USA. ³Skaggs School of Pharmacy and Pharmaceutical Sciences, San Diego, USA

Abstract

Atrial fibrillation (AF) is a common arrhythmia with two general treatment approaches: rate or rhythm control. Rate control in AF is achieved by decreasing AV nodal conduction velocity with beta blockade or calcium channel inhibition. Based on the result of the AFFIRM trial, beta blockers (BBs) were more commonly used, and a higher percentage of the patients achieved adequate heart rate (HR) control (< 110 bpm) compared to calcium channel blockers (CCBs). Our project aims to evaluate the use and dosing of BBs and CCBs in the Emergency Department (ED) of Jacobs Medical Center (JMC) for patients presenting in atrial fibrillation with rapid ventricular response (AF-RVR).

This retrospective chart review included adult patients who presented to the ED of JMC in AF-RVR and who received rate-controlling drugs between 01/01/2021 to 09/01/2022. The primary objective was the percentage of patients who achieved adequate rate control (HR < 110 bpm) within the first 90 minutes after drug administration. The secondary objectives included the prevalence of bradycardia (HR < 60 bpm) or hypotension (SBP < 90 mmHg) within 90 minutes of drug administration.

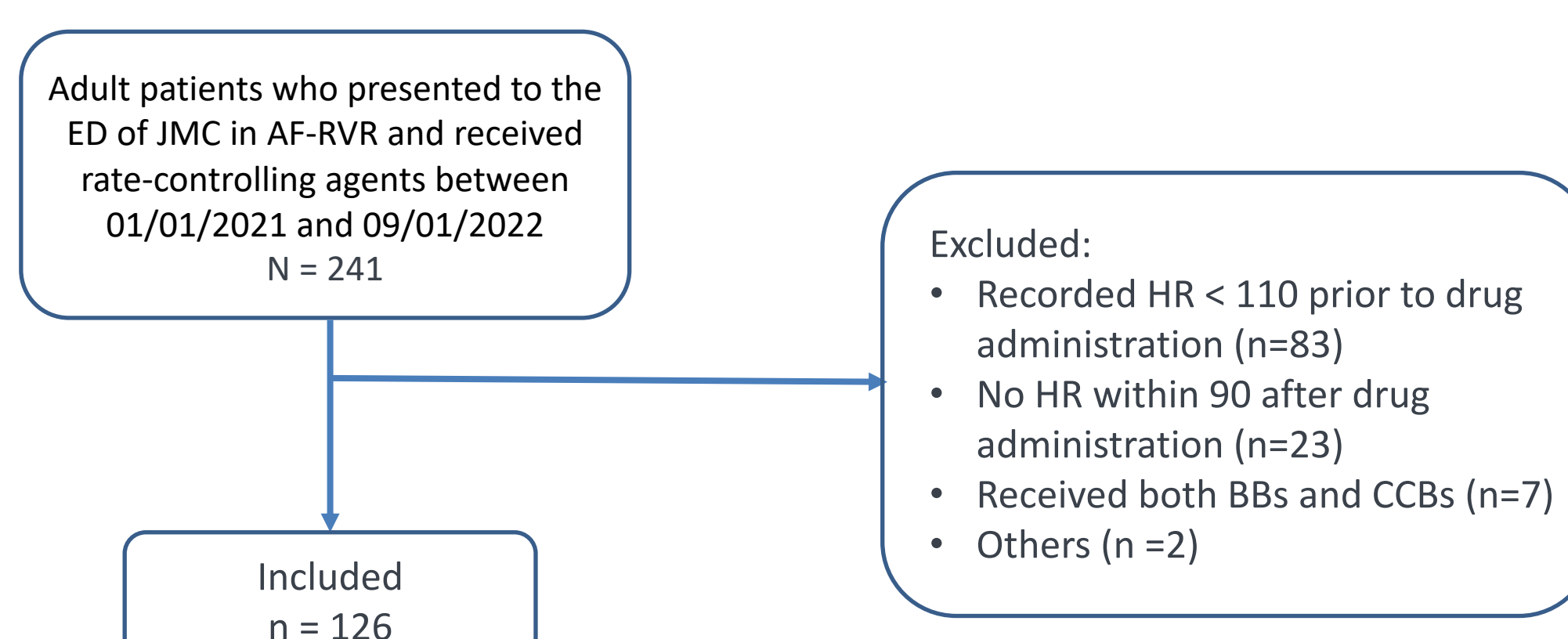
In the predefined time frame, 241 patients were identified with 133 meeting inclusion criteria. The main reason for exclusion was HR < 110 bpm prior to drug administration. Sixty percent of the study population was male with a mean age of 69 years and weight of 82.2 kg. More patients (71%) received BBs than CCBs (23%). Overall, 44.4% achieved the primary objective (50% BB vs 28% CCB, p<.05). Few experienced hypotension or bradycardia.

BBs were used more frequently at the JMC ED for patients who presented in AF-RVR. A higher percentage of failure to achieve target HR goal was seen with CCBs, however, the CCBs were suboptimally dosed when normalized by body weight. This study highlights the importance of appropriate CCBs dosing when treating patients presenting to the ED in AF-RVR.

Introduction

- Atrial fibrillation (AF) is a common arrhythmia with two general treatment approaches: rate or rhythm control.
- Rate control in AF is achieved by decreasing AV nodal conduction velocity with beta blockade or calcium channel inhibition.
- Based on the result of the AFFIRM trial, beta blockers (BBs) were more commonly used, and a higher percentage of the patients achieved adequate heart rate (HR) control (< 110 bpm) compared to calcium channel blockers (CCBs).
- Our project aims to evaluate the use and dosing of BBs and CCBs in the Emergency Department (ED) of Jacobs Medical Center (JMC) for patients presenting in atrial fibrillation with rapid ventricular response (AF-RVR).

Figure 1. Patient Selection Flow Chart



Materials and Methods

- Retrospective chart review included adult patients who presented to the ED of JMC in AF-RVR and who received rate-controlling drugs between 01/01/2021 to 09/01/2022
- Inclusion Criteria: treated at the ED of Jacobs Medical Center with either a BB or CCB for AF
- Exclusion Criteria: <18 years of age, experiencing incarceration, or received both BB and CCB
- Primary Objective:
 - The percentage of patients who achieved HR < 110 bpm within the first 90 minutes after drug administration
- Secondary Objective(s):
 - The percentage of patients with bradycardia (HR < 60 bpm) within 90 minutes of drug administration
 - The percentage of patients with hypotension (SBP < 90 mmHg) within 90 minutes of drug administration
- Overall decrease in heart rate by drug/route and weight-normalized dose
- Statistical analysis included chi square, student t test and descriptive statistics.

Results

- 241 patients were identified with 126 meeting inclusion criteria
- Main reason for exclusion was HR < 110 bpm prior to drug administration
- More studied patients (36.5%) were on BBs prior to admission than CCBs
- Of included, 75% received BBs and 25% received CCBs (25%)
- Overall, 44.4% achieved the primary objective (50% BB vs 28% CCB, p<.05)
- In the BB group, IV metoprolol 5 mg monotherapy was the most common (41%) agent and 47.5% of these patients achieved primary outcome
- The average dose of IV diltiazem per weight was 0.15 mg/kg

Table 1. Patient Demographic

Characteristics	Beta-blocker (n = 94)	Calcium channel blocker (n = 32)	P value
Sex female, n (%)	39 (41.5)	12 (37.5)	.69
Age, (mean± std), years	72.64±13	73.09±18	.42
Weight, (mean± std), kg	79.32±23	91.62±24	<.05
PMH, n (%)			
Coronary artery disease	14 (11.1)	4 (3.2)	.74
Cardiomyopathy	7 (5.6)	1 (0.8)	.39
Hypertension	50 (39.7)	17 (13.5)	.99
Valvular disease	16 (12.7)	2 (1.6)	.13
Heart failure	38 (30.2)	12 (9.5)	.77
Ischemia heart disease	4 (3.2)	2 (1.6)	.64
Atrial fibrillation	46 (36.5)	24 (19.1)	<.05
Pacemaker	4 (3.2)	1 (0.8)	.78
Admission Problems, n (%)			
Acute decompensated heart failure	6 (4.8)	2 (1.6)	.98
Sepsis	7 (5.6)	2 (1.6)	.82
Home Medication, n (%)			
Any beta blocker	46 (36.5)	7 (5.6)	<.01
Any calcium channel blocker	2 (1.6)	5 (4)	<.01
Amiodarone	4 (3.2)	1 (0.8)	.78
Digoxin	4 (3.2)	0 (0)	.24
None of the above	47 (37.3)	20 (15.9)	.22
Any oral anticoagulant	39 (31)	8 (6.35)	.09

Figure 2. Primary Outcome

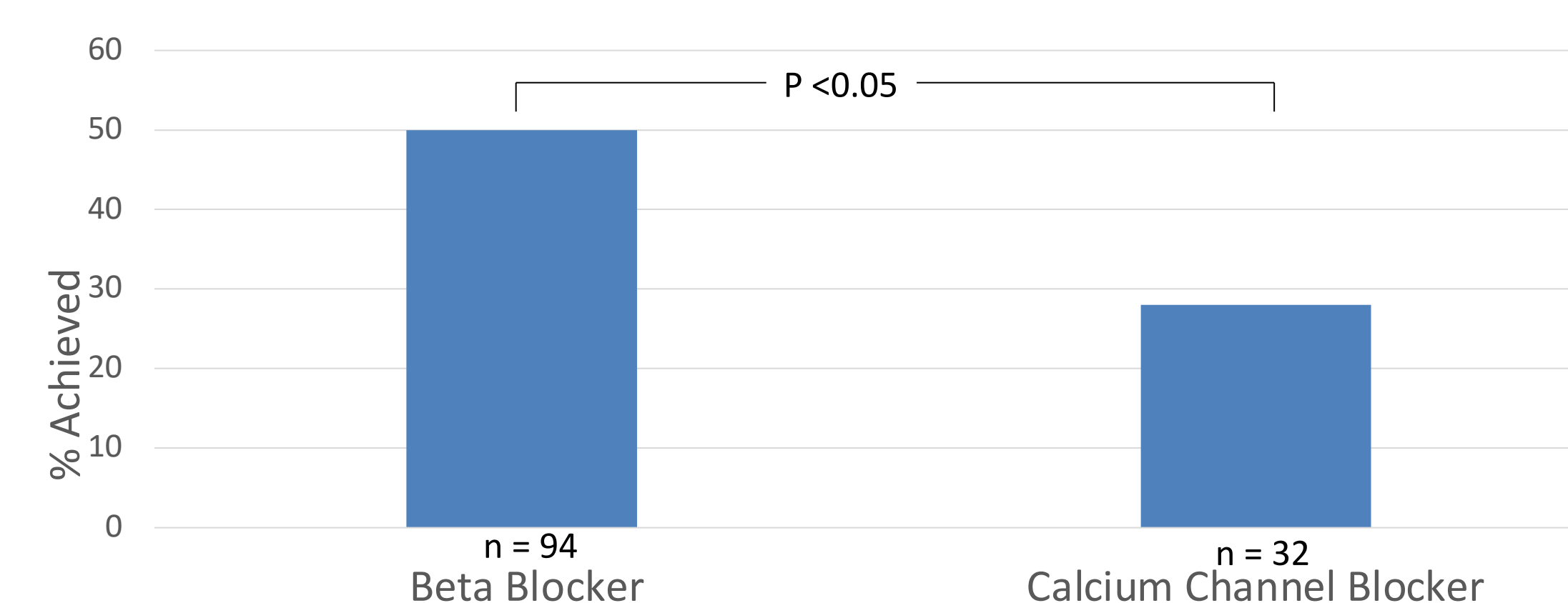


Table 2. Secondary Outcomes

	Received Beta Blocker (n = 94)	Received Calcium Channel Blocker (n = 32)	P value
SBP < 90 mmHg, n (%)	7 (7.4)	1 (3.1)	.30
HR < 60 bpm, n (%)	3 (3.2)	0 (0)	.38

Figure 3. Average Heart Rate Decrease vs IV metoprolol tartrate

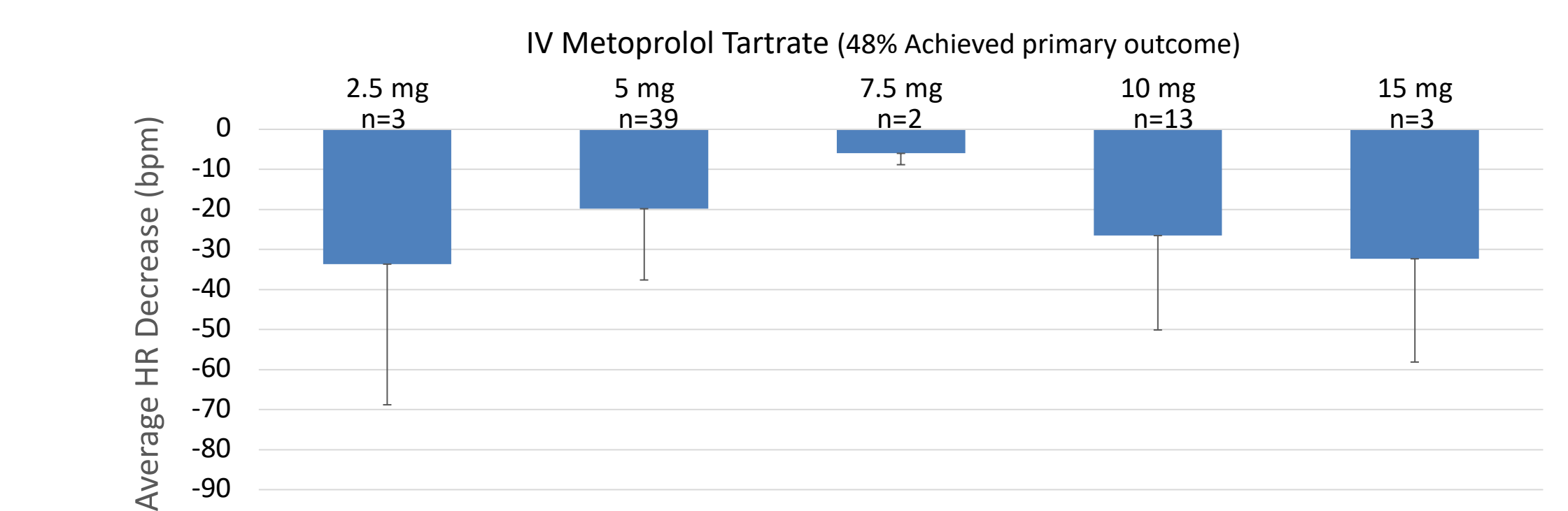
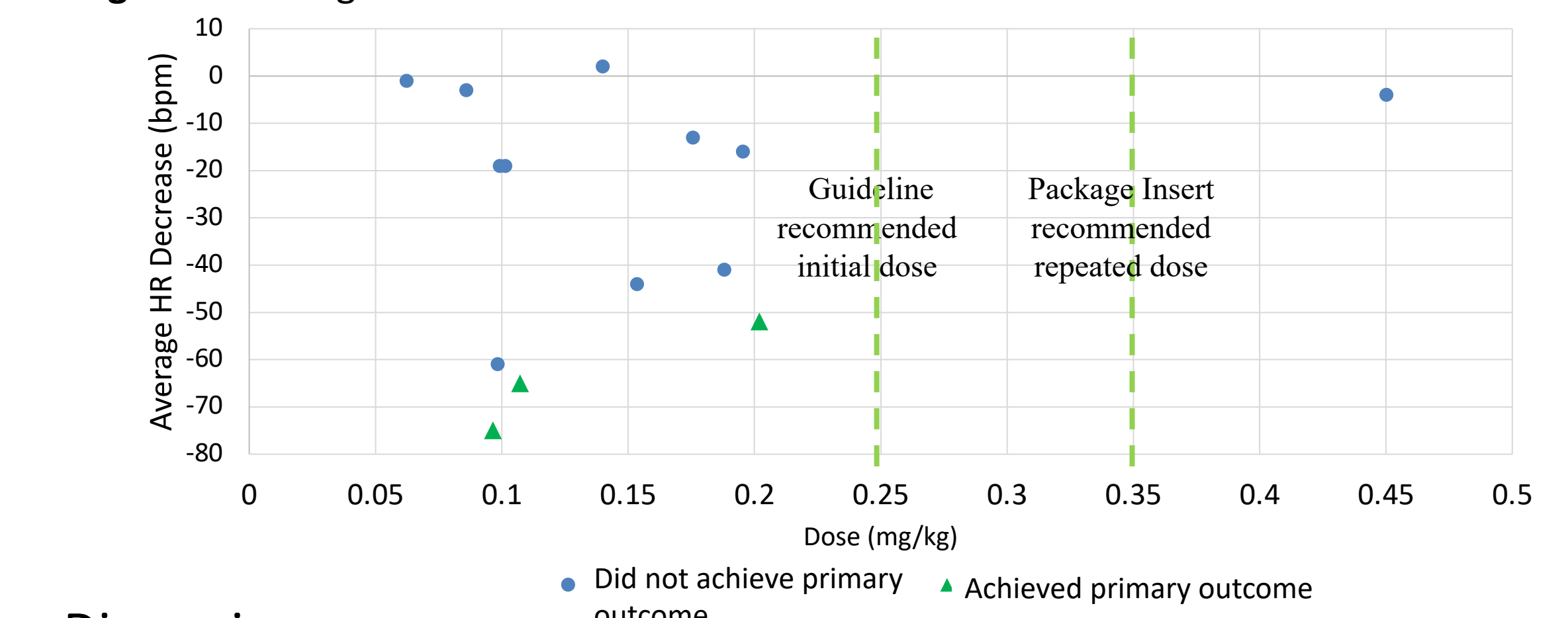


Figure 4. Average Heart Rate Decrease vs IV diltiazem



Discussion

- BBs were used more frequently in the ED at JMC for AF-RVR
- Less % of CCBs achieved target HR goal compared to BB
- Most IV diltiazem doses (mg/kg) were below PI and 2014 ASC/AHA/HRS guideline recommendations
- Electronic prescribing of IV diltiazem defaults to mg instead of mg/kg
- Limitation
 - Chart review study and many excluded due to lack of HR documentation within 90 min
 - Patients received both BB and CCB were excluded; less external validity
 - Temporal relationship between home dose BB and CCB were not evaluated in this study

Conclusion

- BBs are used more frequently than CCBs at JMC ED to treat AF-RVR
- Patients who received BBs are more likely to achieve adequate heart rate decrease compared to CCBs at the current prescribed doses
- Importance to educate providers on the appropriate diltiazem weight-based dosing when treating AF-RVR
- Future direction to explore efficacy in combination of BB and CCB, mg/kg prescribing option for IV diltiazem, and re-evaluate effectiveness in future years

References

[1.] Falk RH. Atrial fibrillation. N Engl J Med [Internet]. 2001;344(14):1067–78. Available from: <http://dx.doi.org/10.1056/NEJM200104053441407>

[2.] Fuster V, Rydén LE, Asinger RW, Cannom DS, Crijns HJ, Frye RL, et al. ACC/AHA/ESC guidelines for the management of patients with atrial fibrillation: executive summary. A Report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines and Policy Conferences [Committee to Develop Guidelines for the Management of Patients With Atrial Fibrillation]: developed in Collaboration With the North American Society of Pacing and Electrophysiology. J Am Coll Cardiol [Internet]. 2001;38(4):1231–66. Available from: [http://dx.doi.org/10.1016/s0735-1097\(01\)01587-x](http://dx.doi.org/10.1016/s0735-1097(01)01587-x)

[3.] Van Gelder IC, Crijns HJ, Tieleman RG, Brügemann J, De Kam PJ, Gosselink AT, et al. Chronic atrial fibrillation. Success of serial cardioversion therapy and safety of oral anticoagulation. Arch Intern Med [Internet]. 1996;156(22):2585–92. Available from: <http://dx.doi.org/10.1001/archinte.156.22.2585>