Virtual Care Team-Guided Strategy for Therapeutic Optimization in Hospitalized Patients with Heart Failure: The IMPLEMENT-HF Study

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on behalf of the IMPLEMENT-HF Investigators

American College of Cardiology Scientific Sessions
March 6, 2023
New Orleans, LA

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Disclosures

Ankeet S. Bhatt has received research support from NHLBI, American College of Cardiology, and Bayer AG.

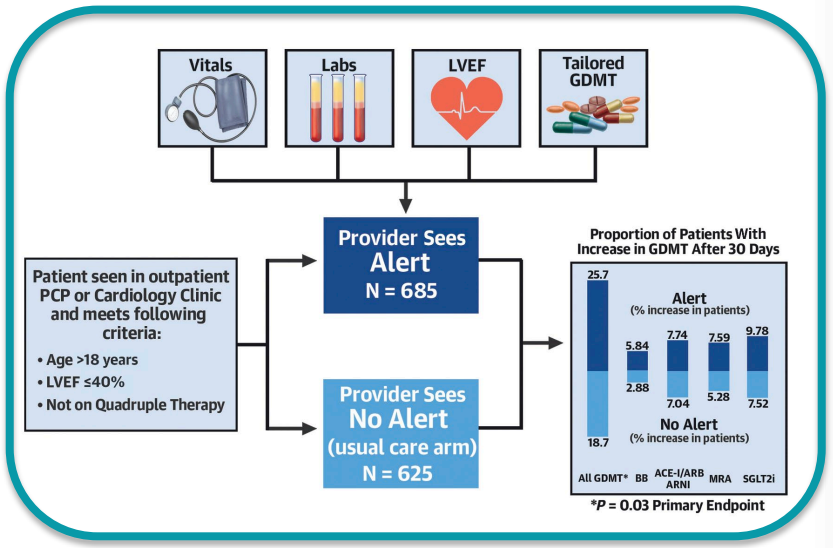
IMPLEMENT-HF was funded by the Brigham Care Redesign Incubator and Startup Program (BCRISP), Brigham and Women's Hospital.

Background and Rationale

- Despite strong evidence and endorsement by clinical practice guidelines, implementation of medical therapy for HFrEF remains incomplete.
- Hospitalization, regardless of admission indication, may represent a potentially attractive setting for therapeutic optimization.
- Prior HF implementation trials have generally excluded two populations (1) patients admitted for non-HF reasons and (1) those with *de novo* presentations of HFrEF.

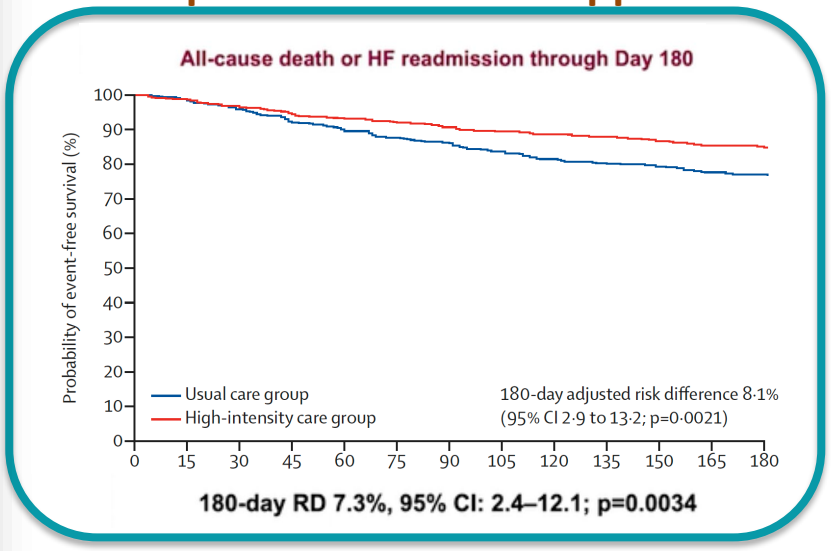
Implementation Science in Heart Failure

EHR-Based Clinical Decision Support



Highly Scalable
Modest Effect Size; ?Alert Fatigue

In-person care team support



Resource Intensive
Large Effect Size

Ghazi et. al. J Am Coll Cardiol. 2022.
Mebazza et. al. Lancet. 2022.

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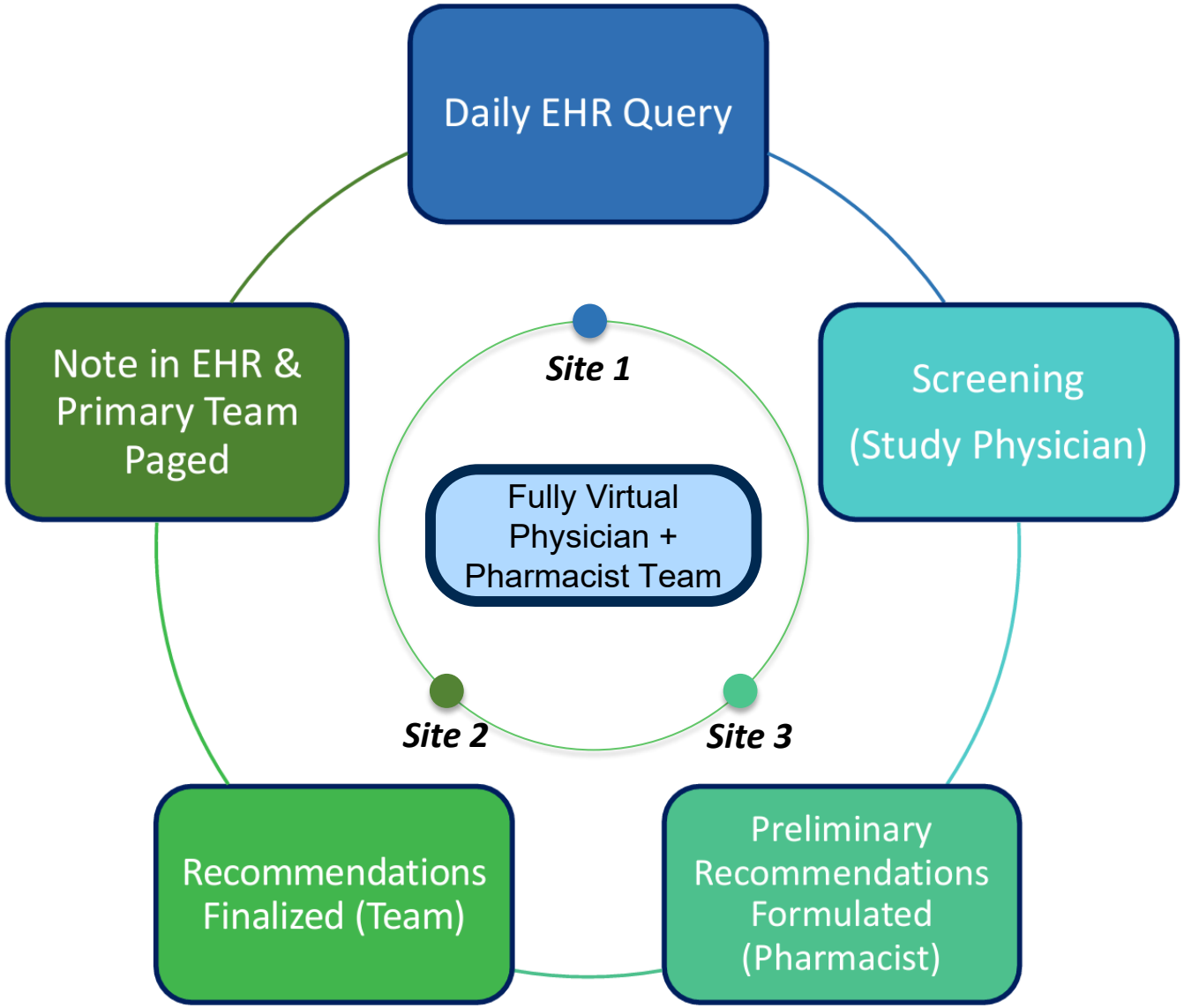
IMPLEMENT-HF: Virtual Care Team Guided Strategy



Facilitate **combination disease-modifying HF therapy:**

- Evidence-based βeta-Blocker
- ARNI > ACEI or ARB
- MRA
- SGLT2i

Up-titrate to target doses

IMPLEMENT-HF Pilot Feasibility Study

ESC European Society of Cardiology

Virtual optimization of guideline-directed medical therapy in hospitalized patients with heart failure with reduced ejection fraction: the IMPLEMENT-HF pilot study

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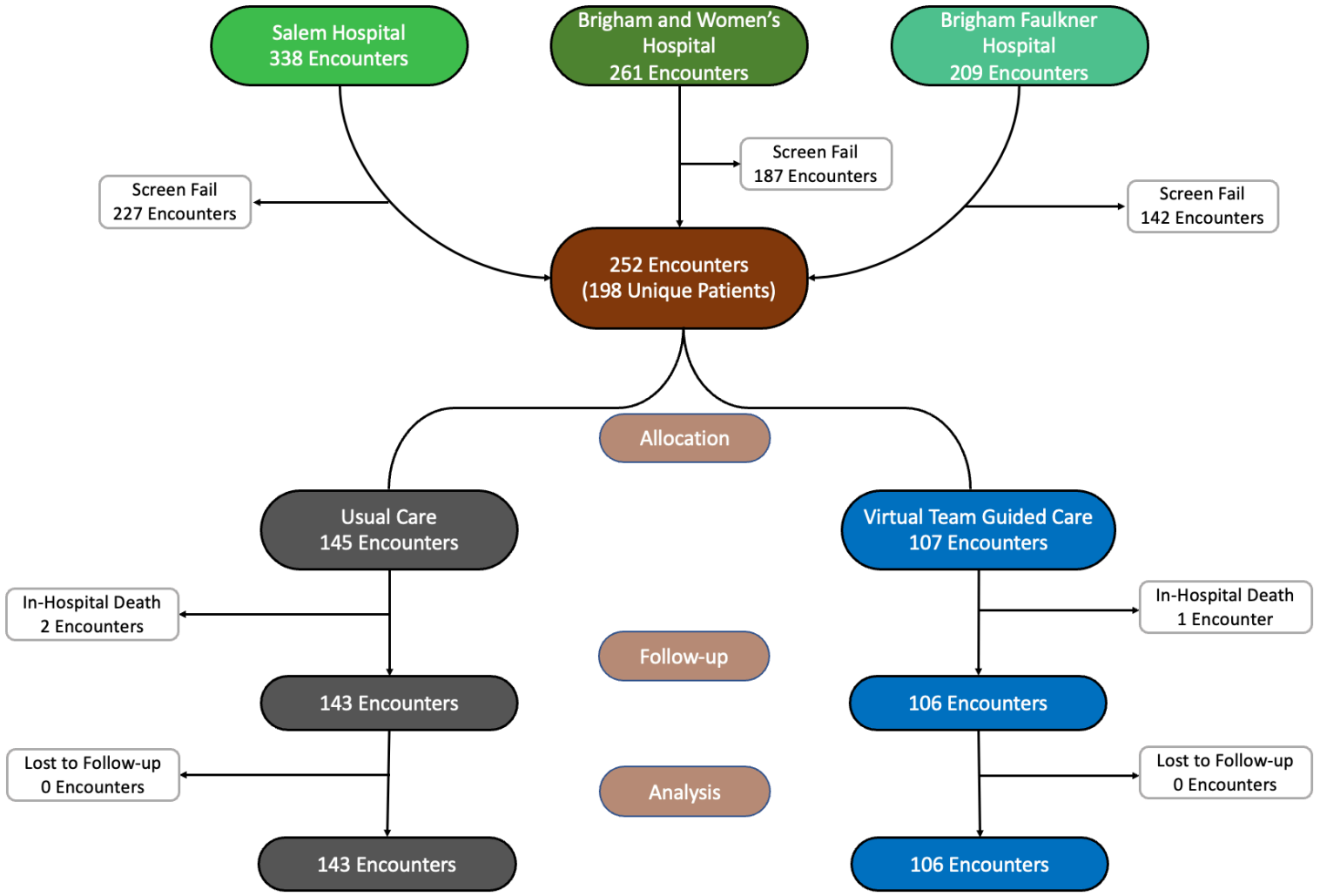
Bhatt AS, Varshney AS et. al. Eur J Heart Failure. 2021.

Design of the IMPLEMENT-HF Pivotal Study



Effectiveness Outcomes:

- Composite In-hospital GDMT Optimization Score
- Proportion of encounters with HF therapy intensification

CEC Adjudicated Safety Outcomes:

- Acute kidney Injury
- Hyperkalemia
- Bradycardia
- Hypotension

Inclusion & Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Age ≥ 18 years	Received care in an intensive care unit
LVEF ≤ 40% assessed in preceding 12 months	Admission to a same-day procedural or surgical service
Admitted to a participating facility on a non-intensive care unit medical or surgical service	Inotropic or mechanical circulatory support use
	Acute coronary syndrome, percutaneous cardiac procedure, stroke, or major cardiovascular vascular surgery within 30 days
	Systolic blood pressure < 90 mmHg in the preceding 24 hours
	Severe valvular disease or ≥moderate RV dysfunction on most recent TTE
	Pulmonary hypertension on disease specific therapies
	Congenital heart disease
	Amyloid heart disease
	Hypertrophic or restrictive cardiomyopathy
	Bacteremia or suspected bacteremia
	History of or listed for any solid organ transplant
	Admission for bone marrow transplant or chemotherapy administration
	Receiving hospice care or comfort-measures only
	Admission for COVID-19
	Pregnant or nursing women
	Physician discretion

Select Baseline Characteristics

	Virtual Care Team Strategy n=107	Usual Care n=145
Demographics		
Age (years)	70 ± 12	69 ± 15
Women	35%	33%
Race		
White	78%	71%
Black	13%	15%
Other	9%	14%
Hispanic ethnicity	17%	18%
Primary language		
English	87%	85%
Spanish	14%	11%
Other	0%	4%
Primary admission diagnosis of heart failure	25%	24%
De-novo presentation of HF	22%	18%
Left ventricular ejection fraction (%)	33 ± 9	32 ± 9
Coronary artery disease	48%	49%
Cancer	17%	17%
Diabetes mellitus	47%	39%
Admission Vital Signs and Laboratory Measures		
Systolic blood pressure (mmHg)	134 ± 29	132 ± 25
Heart rate (bpm)	88 ± 21	89 ± 23
Sodium (mEq/L)	138 ± 4	137 ± 4
Potassium (mEq/L)	4.2 ± 0.6	4.3 ± 0.7
eGFR (mL/min/1.73m^2)	61 ± 31	62 ± 32

Primary Endpoint

In-hospital GDMT Optimization Score:

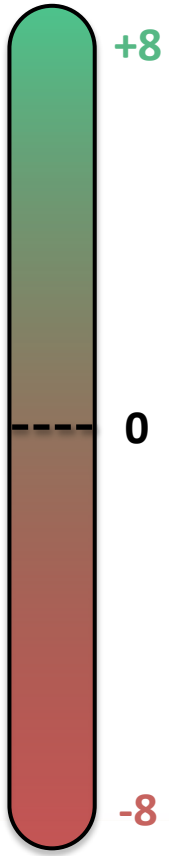
+2 for new initiations

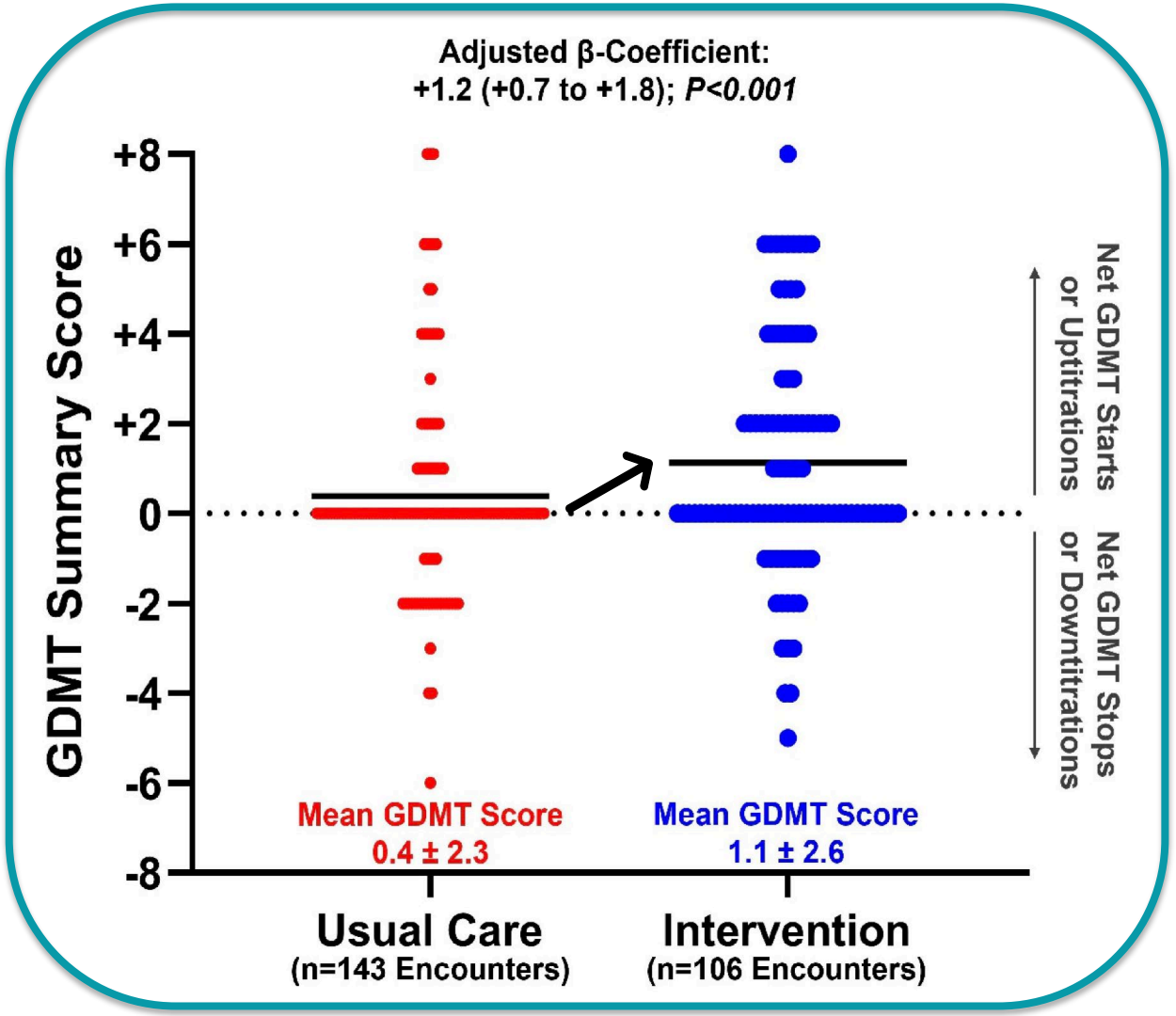
+1 for dose ↑↑

-1 for dose ↓↓

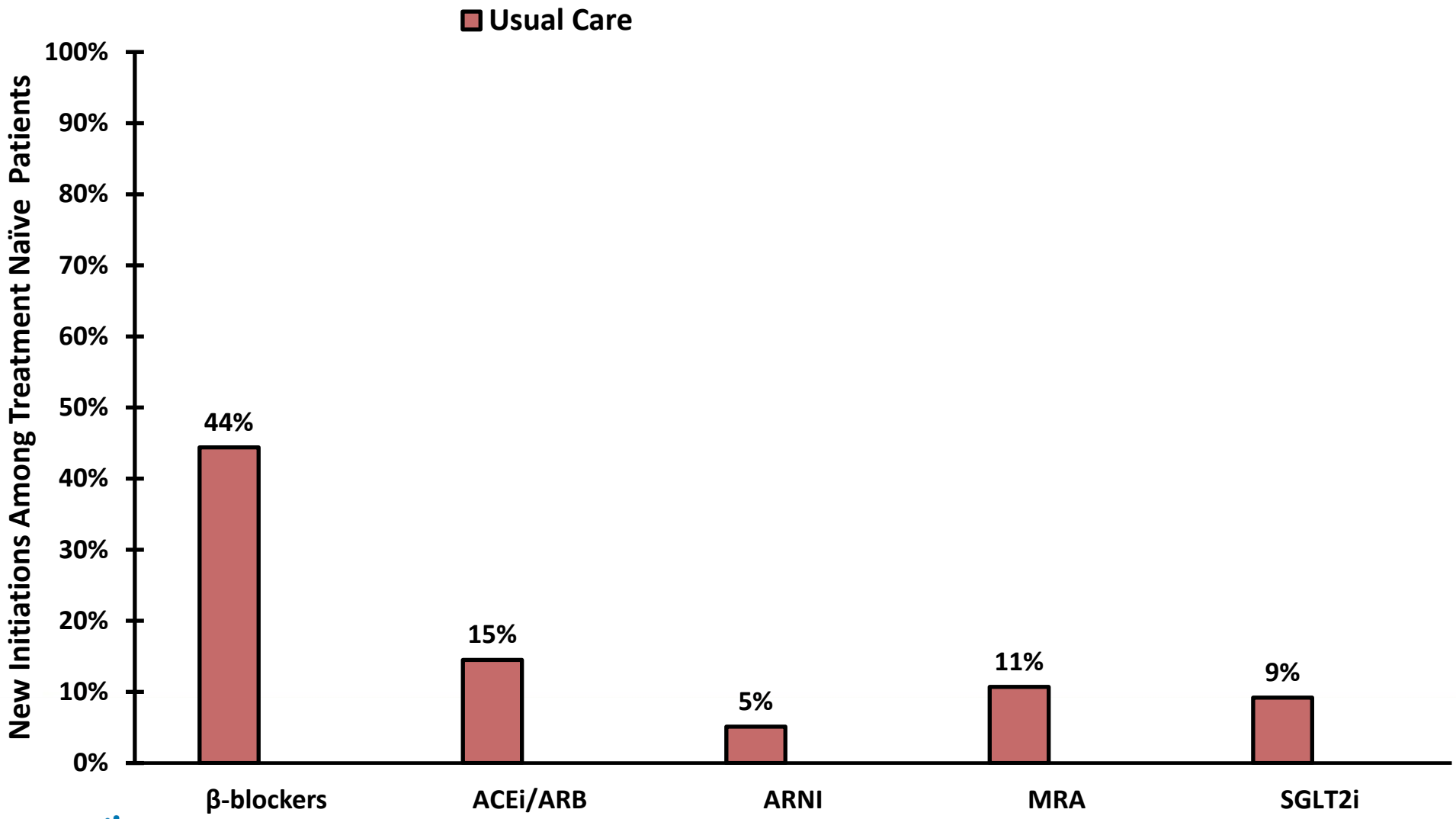
-2 for new discontinuations

Assessed by comparing prior to admission and discharge medication regimens

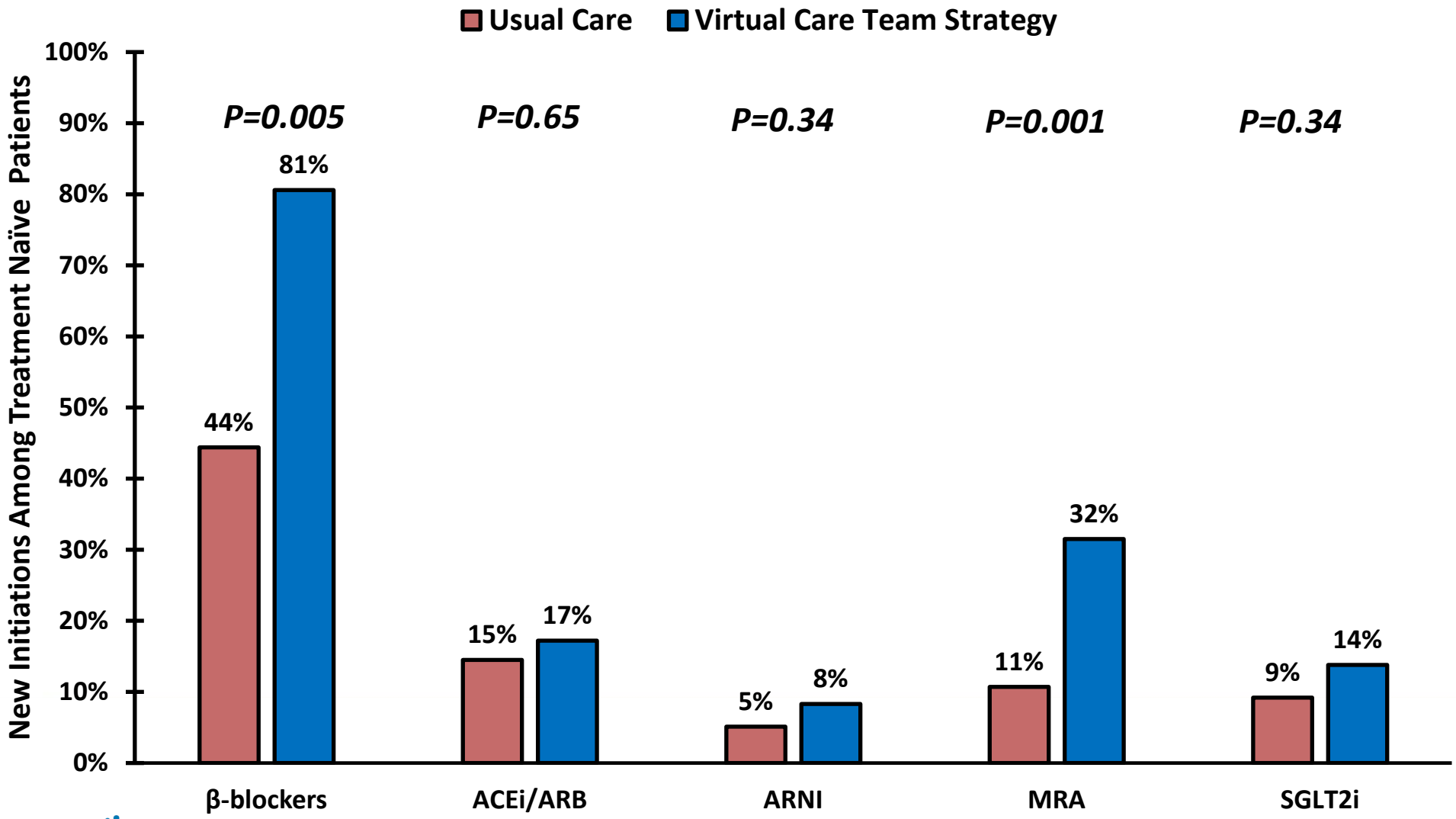




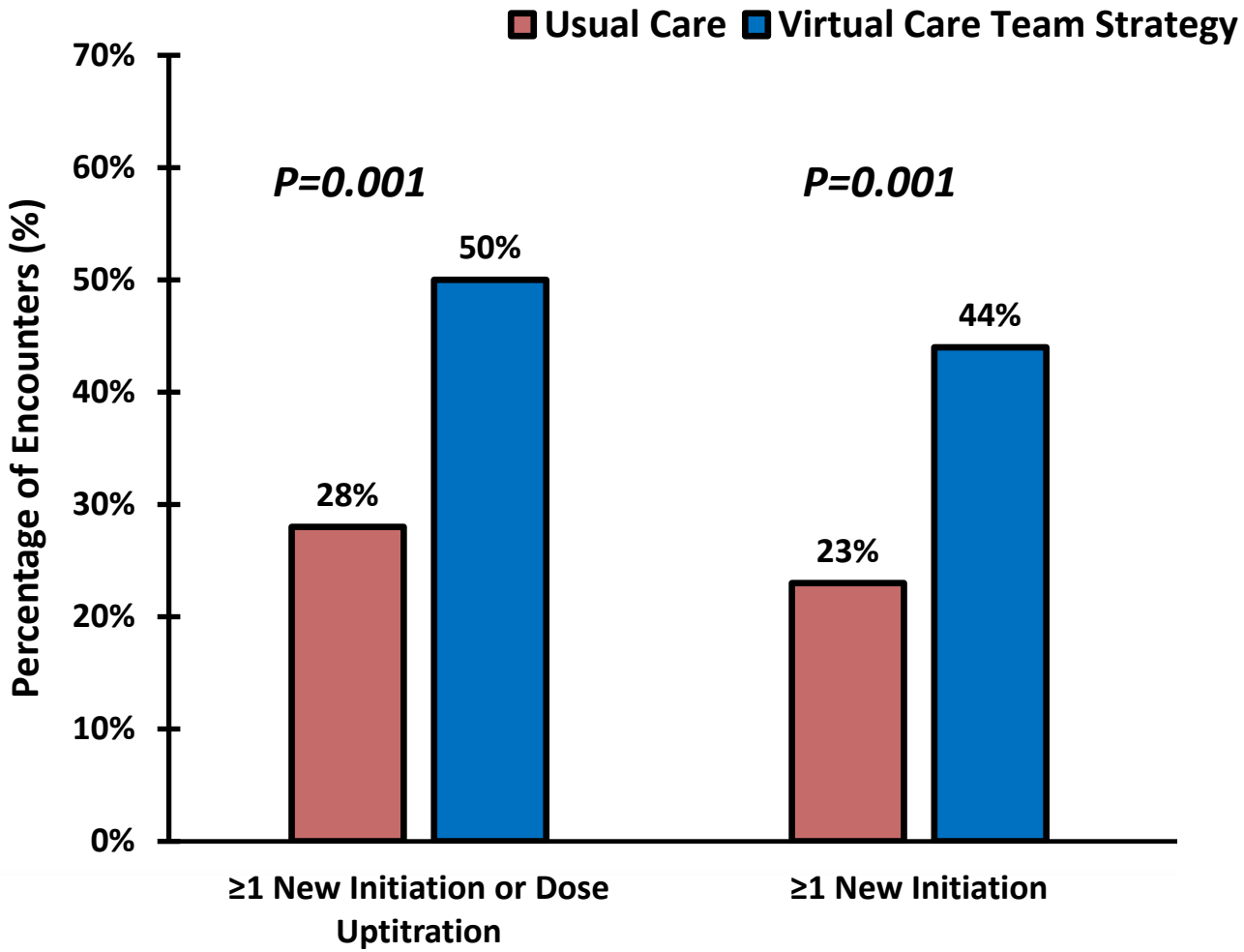
Secondary Outcomes



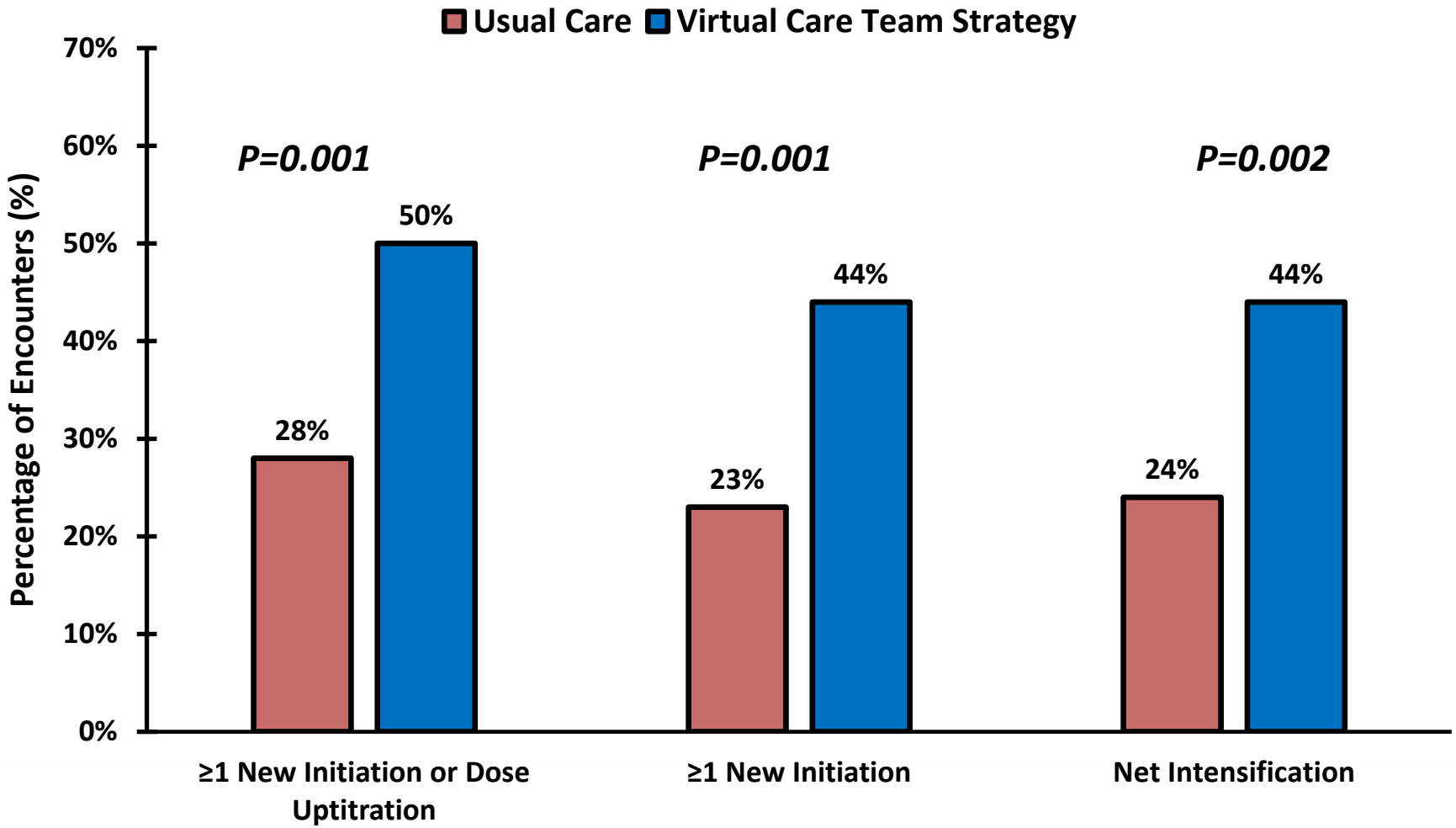
Secondary Outcomes



Secondary Outcomes

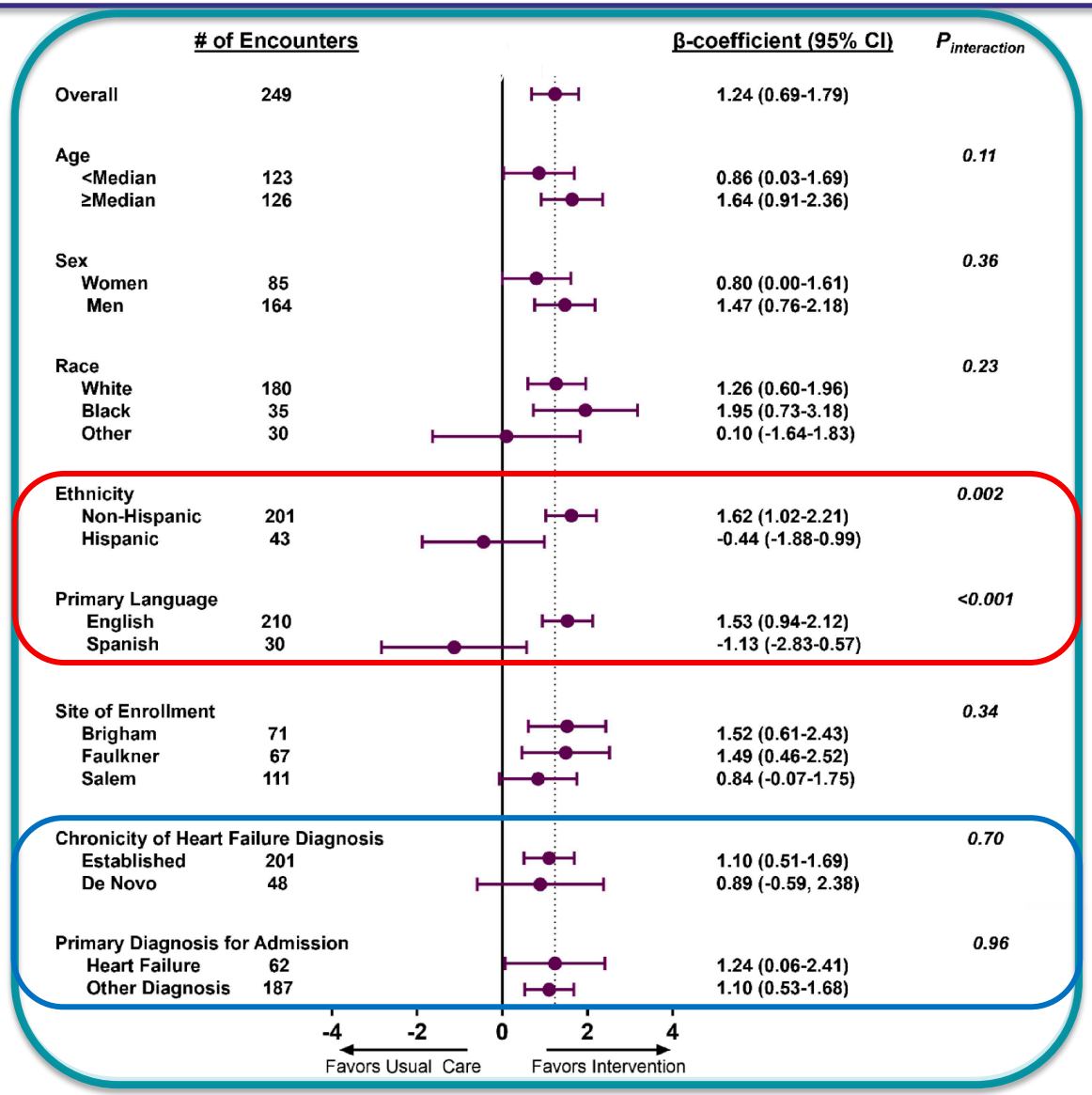


Secondary Outcomes



Number Needed to Intervene: ~5 Encounters

Primary Endpoint across Subgroups of Interest



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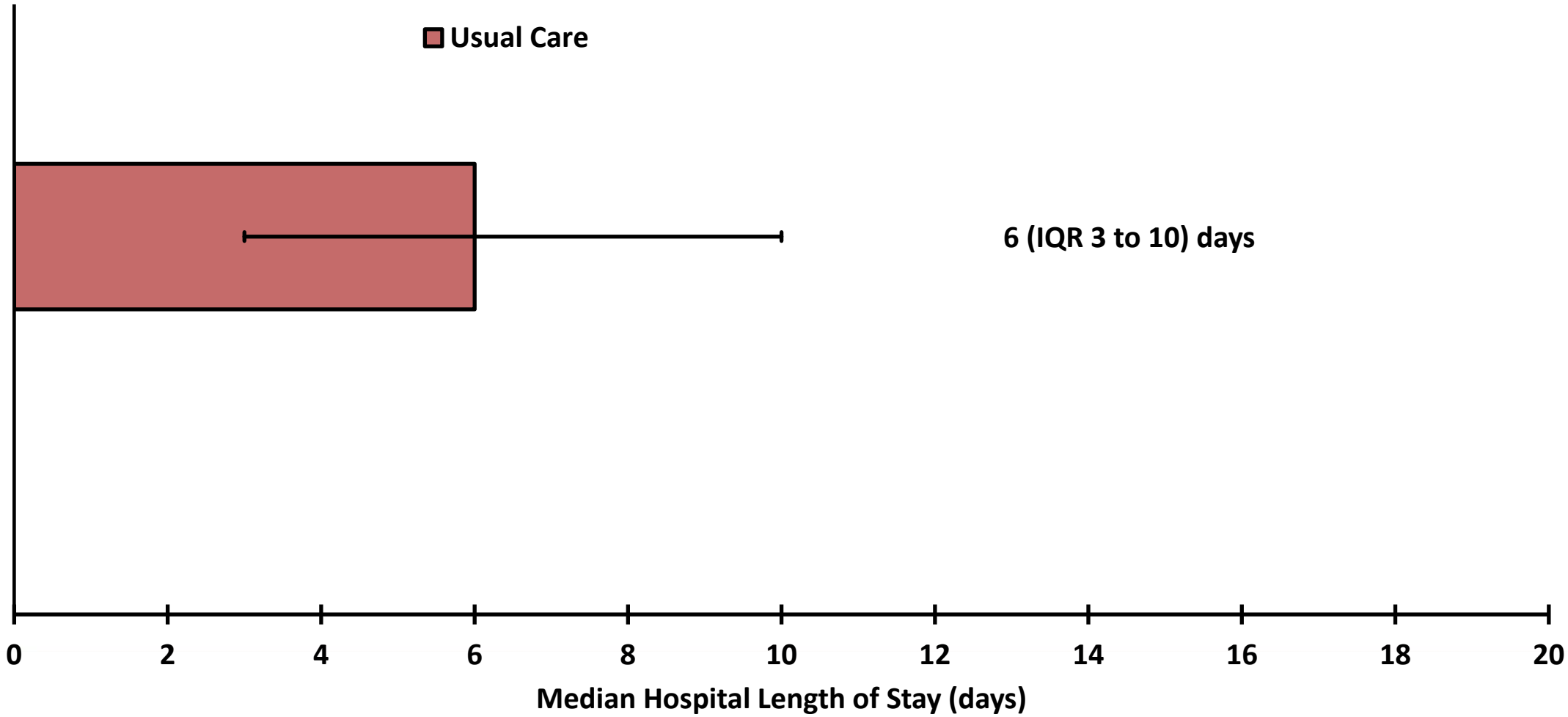
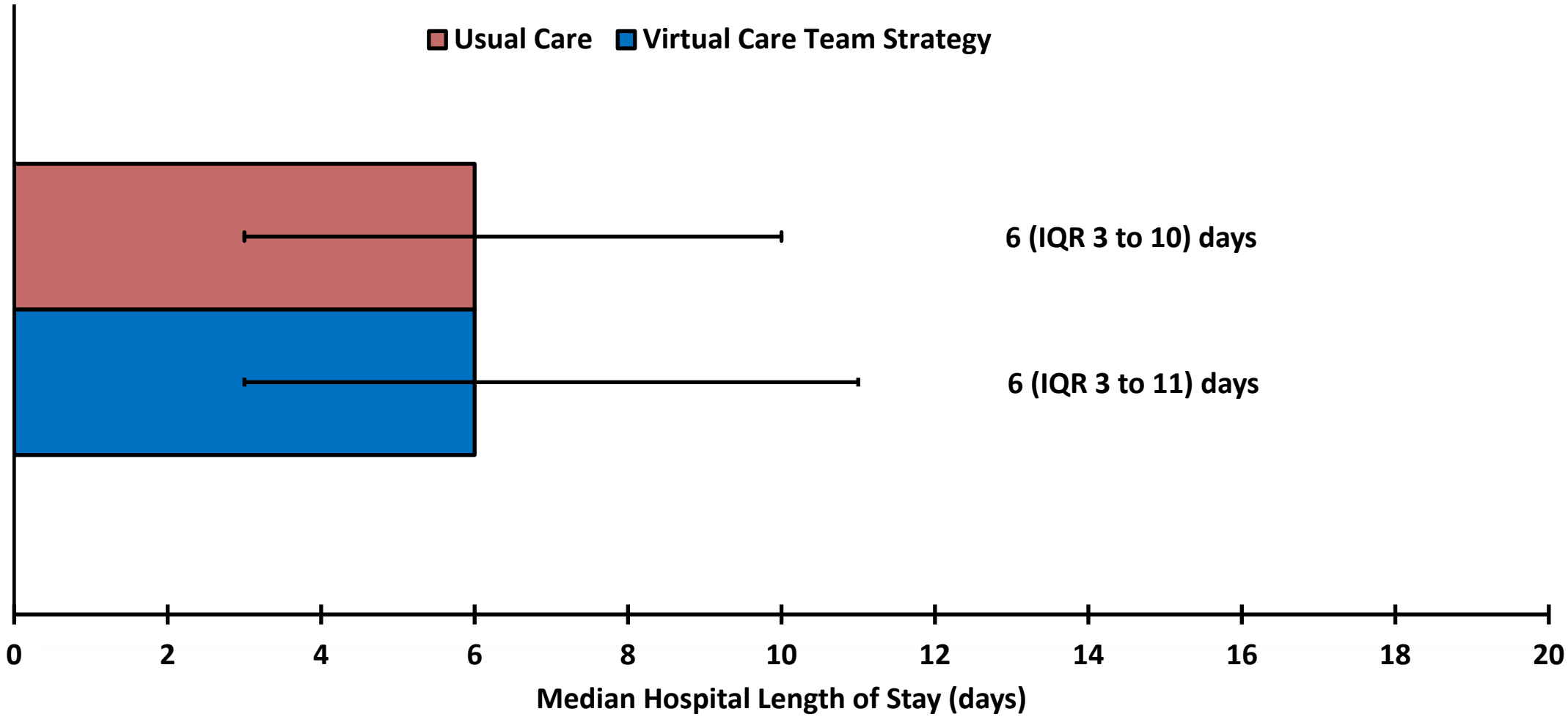
In-Hospital Adverse Events (CEC Adjudicated)

	Virtual Care Team Strategy n=107	Usual Care n=145	P-Value
Any Adverse Event	23 (21.5%)	40 (27.6%)	0.30
Hypotension	12 (11.2%)	24 (16.6%)	0.28
3 consecutive SBP <90mmHg	12 (11.2%)	23 (15.9%)	0.36
Vasopressor/ICU requirement for hypotension	2 (1.9 %)	7 (4.8 %)	0.31
Hyperkalemia	8 (7.5 %)	18 (12.4%)	0.22
Serum K^+ > 5.5mmol/L	6 (5.6 %)	18 (12.4%)	0.08
Serum K^+ > 6.0mmol/L	--	6 (4.1%)	0.04
Acute potassium lowering therapy	6 (5.6%)	6 (4.1%)	0.77
Acute kidney injury	5 (4.7%)	3 (2.1%)	0.29
Doubling of admission sCr	5 (4.7 %)	1 (0.7 %)	0.09
New kidney replacement therapy	--	2 (1.4 %)	0.51
Bradycardia	0 (0.0 %)	0 (0.0 %)	--
3 consecutive HR ≤40bpm	--	--	--
Temporary or permanent pacing	--	--	--
Acute heart rate therapy	--	--	--
In Hospital Death	1 (0.9 %)	2 (1.4 %)	--

Hospital Length of Stay



Hospital Length of Stay



Limitations

- The primary endpoint was an in-hospital implementation outcome; the impact of a virtual care team guided strategy on medication durability and clinical outcomes requires further study.
- Contamination of the intervention at the provider level is possible.
- The trial was conducted within diverse care entities a single healthcare delivery system; external validation is needed to establish generalizability.

Conclusions

- A virtual care team-guided strategy improved GDMT in hospitalized HFrEF patients across multiple hospitals in an integrated healthcare system.
- Benefits were consistent across most subgroups, including hospitalizations for non-HF indications and *de-novo* HF presentations.
  - We observed an important treatment interaction in which Hispanic & predominantly Spanish-speaking patients derived less benefit.
- A virtual care team guided strategy was safe, with no excess in adverse events.
- The beneficial effects did not come at the expense of increased hospital LOS.

Virtual care teams represent an effective, scalable, & safe approach to HFrEF therapeutic optimization.

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Simultaneously Published in JACC

www.jacc.org

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