Five things to consider when your patient “stalls” in hospital

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Speaker Disclosure
Dr. Jonathan Howlett

- **Relationships with commercial interests:**
  - **Grants/Research Support:** AstraZeneca, Merck, Servier, Pfizer, Novartis, Medtronic, Bayer
  - **Speakers Bureau/Honoraria:** Bayer, Servier, Boerhinger Ingleheim, Novartix
  - **Consulting Fees:** General Electric, Government of Canad & Alberta, Novo Nordisk, AstraZeneca, Merck, Servier, Pfizer, Novartis, St Jude, Bayer
  - **Medical Advisory Board:** Cardiol

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Mrs HF

- 73 Female, ICM LVEF 34%, last hospitalized Feb ’19
- Meds: ACE, BB, diuretic, CCB, statin, ASA
- Admitted to ED with AHF
- Warm feet, alert, appropriate
- HR 54, BP 140/68, SaO2 89% R/A
- *JVP elevated*, bilateral crackles and peripheral edema
- Na 131, K 3.9, Hgb 115,
- creatinine 147, NT pro BNP 8455 pg/ml

Mrs. HF- subsequent course

- Given NTG long acting formulation, continued other meds, added amlodipine
- IV furosemide 60 mg bid with no weight loss
- Symptoms unchanged, still on supplemental O2
- Alert but cool extremities
- BP 100/80, HR 86
- Na 130, K 3.9, Creatinine increased to 200 (147)

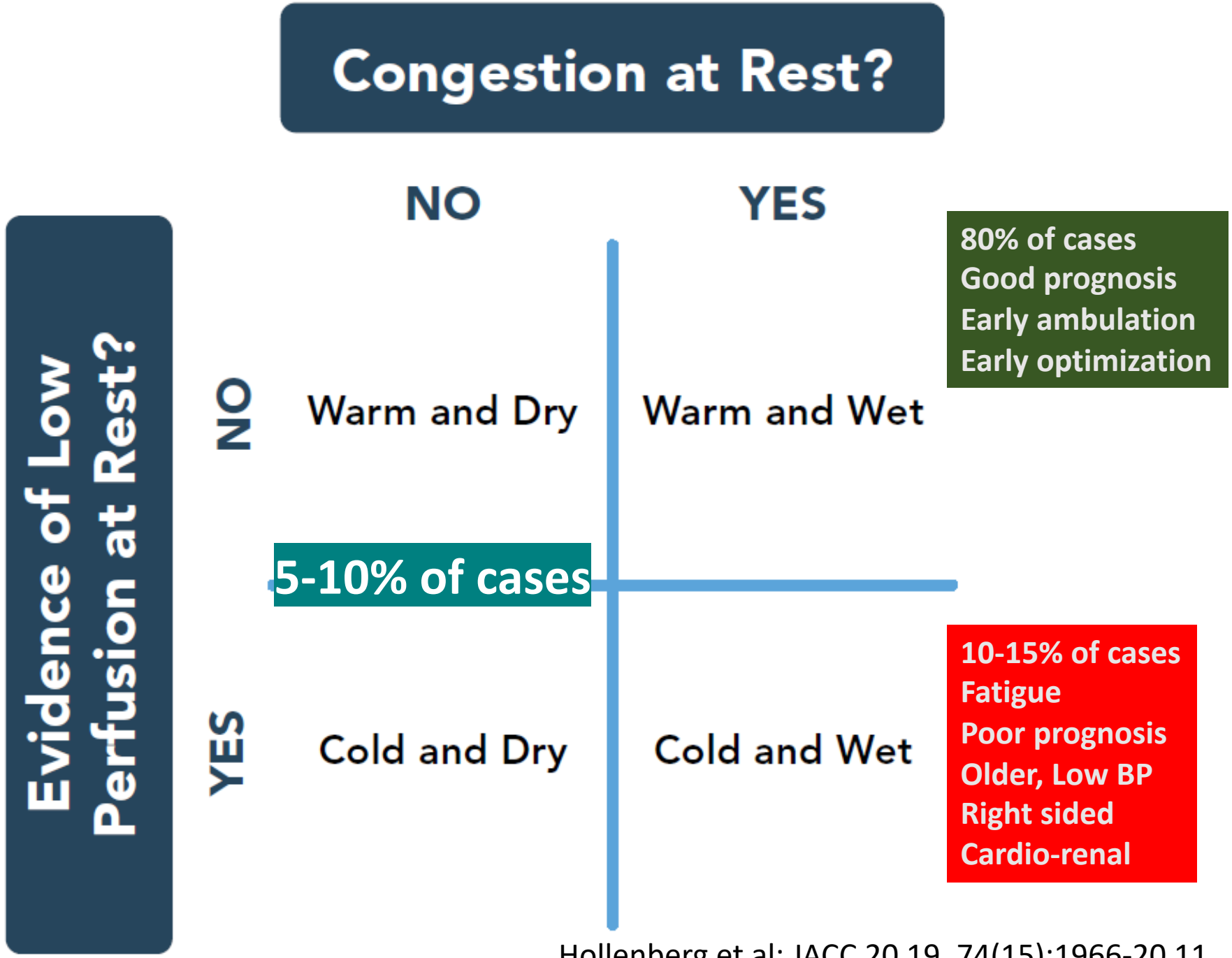
What would your next option be?

1. Intensify loop dose
2. Change furosemide to infusion at 10 mg/hour
3. Add thiazide
4. Add MRA
5. Add SGLTi

Alert but cool extremities
BP drop to 100/80, HR 86
Na 130, K 3.9, Creatinine increased to 200 (147)
On ACE, BB, Furosemide iv boluses, ntg

Five considerations:

- **Know what a ‘good’ trajectory looks like**
- Know how to use diuretic strategies
- Know the volume status, measure I/O
- Know why patients ‘stall’
- Know a few tricks

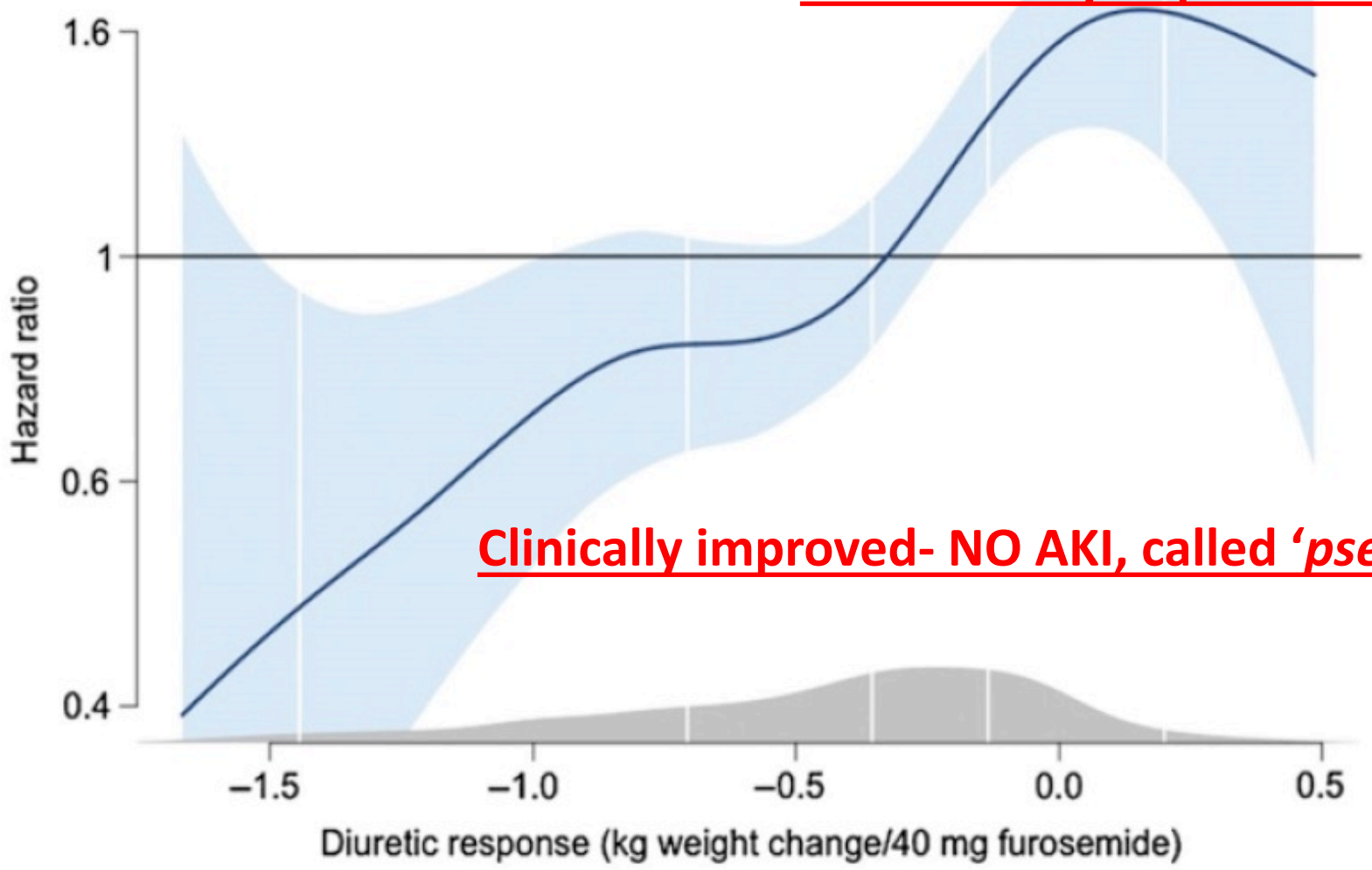


Hollenberg et al: JACC 20 19, 74(15):1966-20 11

Diuretic Response

In the setting of sCr > 27 increase umol/L from baseline

Not Clinically improved- AKI Present



Clinically improved- NO AKI, called '*pseudo WRF*'

Valente et al Eur Heart J 2014 (PROTECT)

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- **GUIDELINE TERRITORY**

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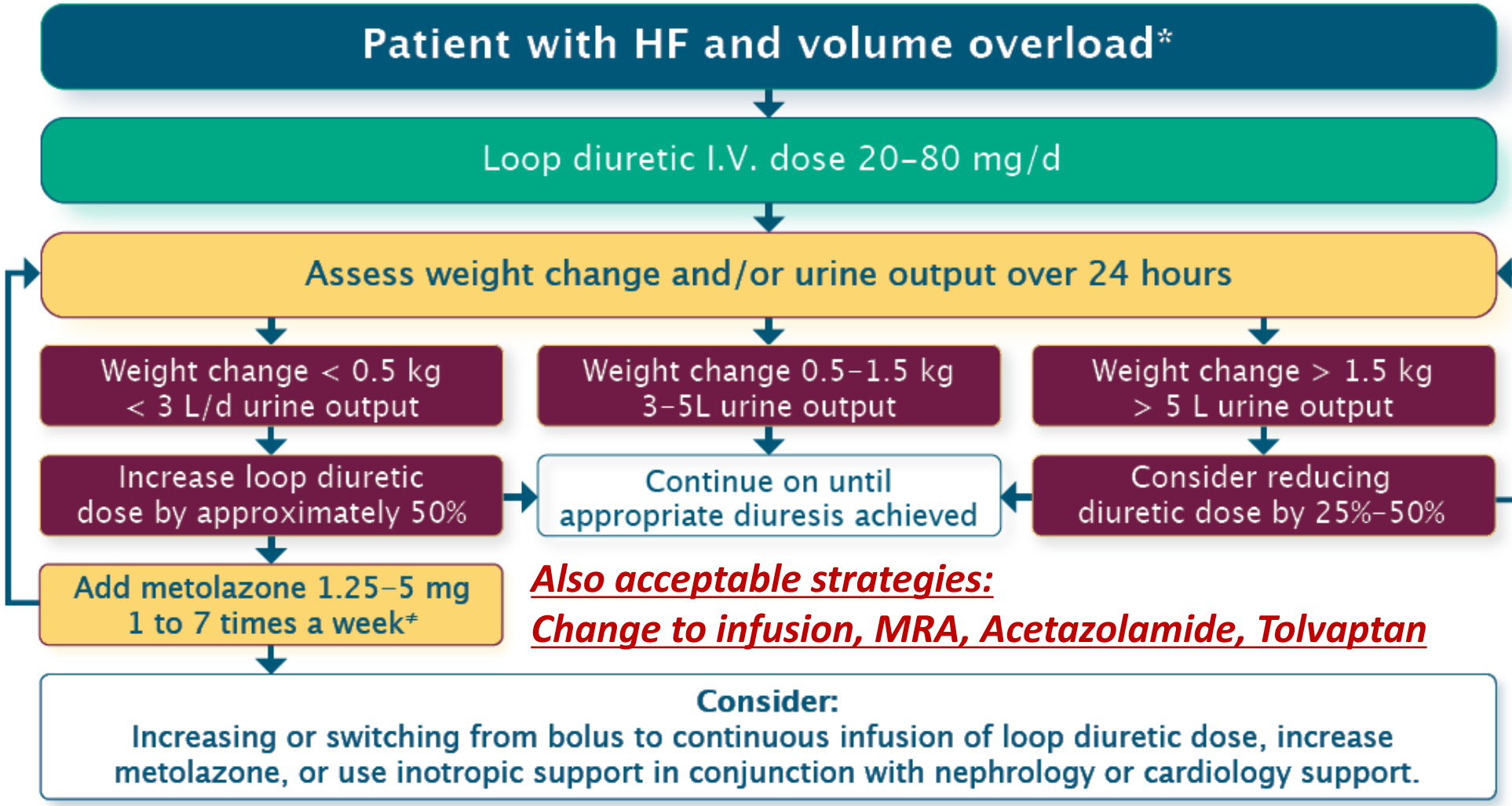
Acute Heart Failure (AHF) - Diuretic Dosing



Can check via

Also acceptable strategies:

Change to infusion, MRA, Acetazolamide, Tolvaptan

U/O > 150/hr
Urine Na> 70
For same day decisions

* **Assumes:** 1) Volume assessment with each step
2) Monitoring of electrolytes, renal function, symptoms and vital signs
3) Daily weights
4) Urine output not often accurate or obtainable

≠ Titrate progressively, according to the degree of hypervolemia, furosemide doses and creatinine/kidney function

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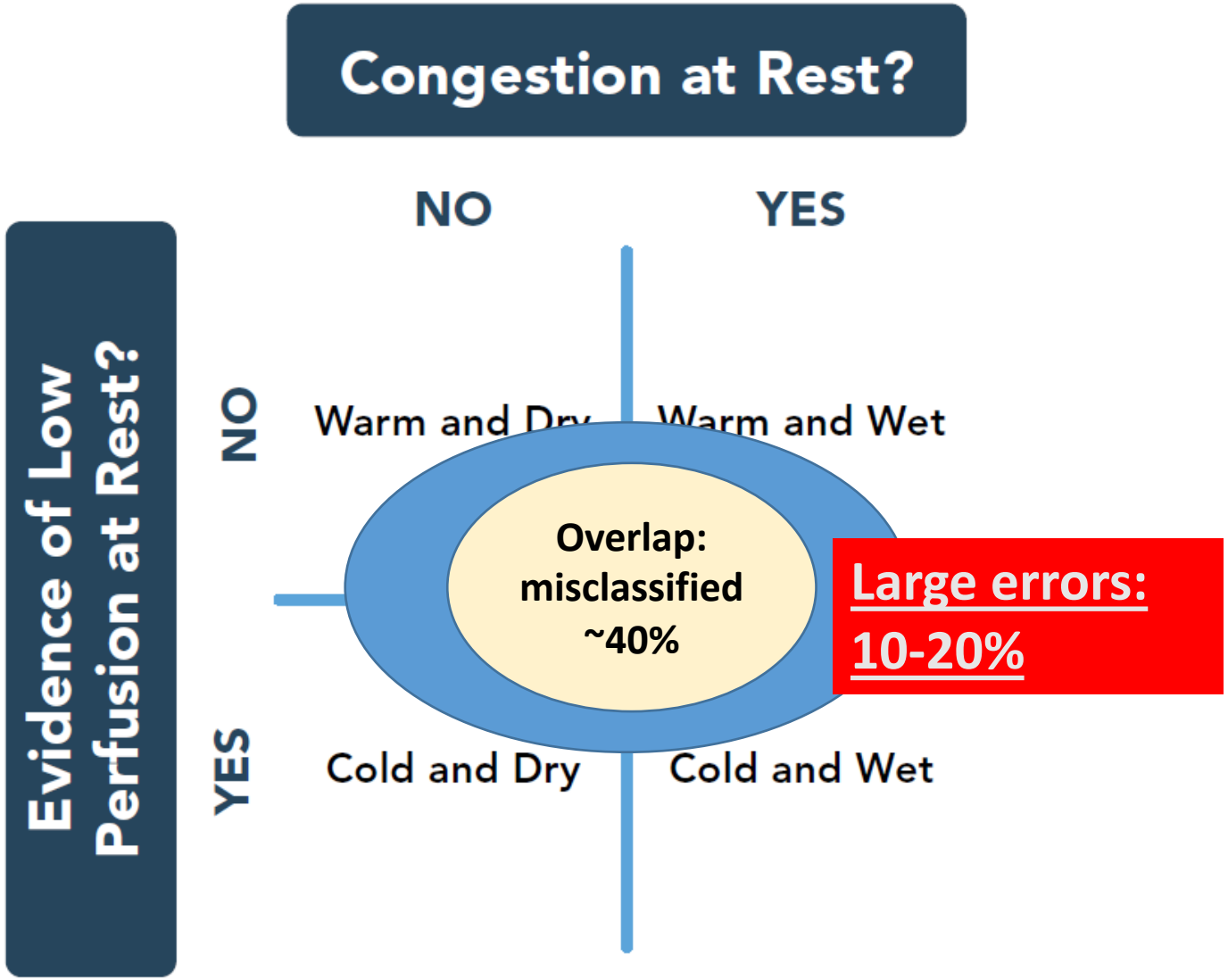
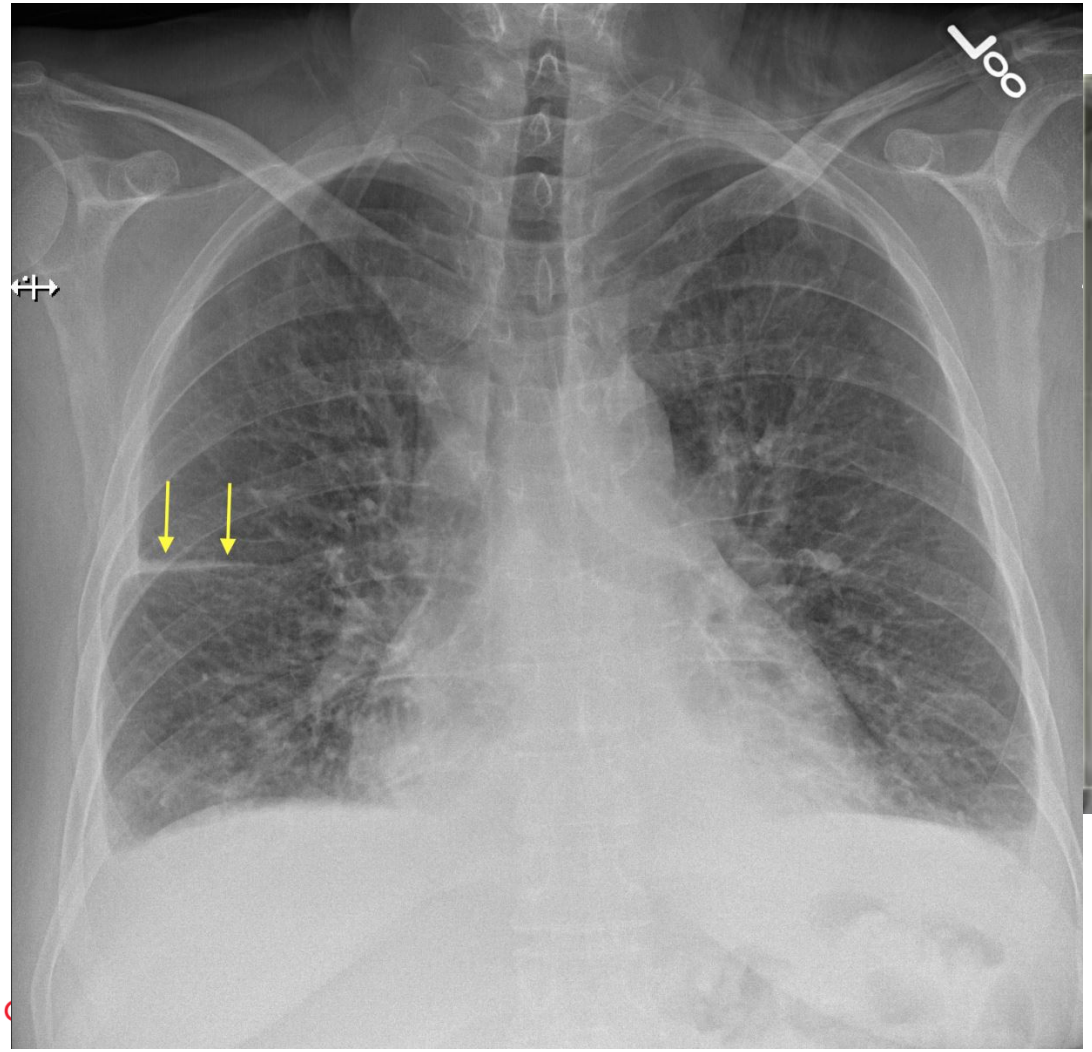
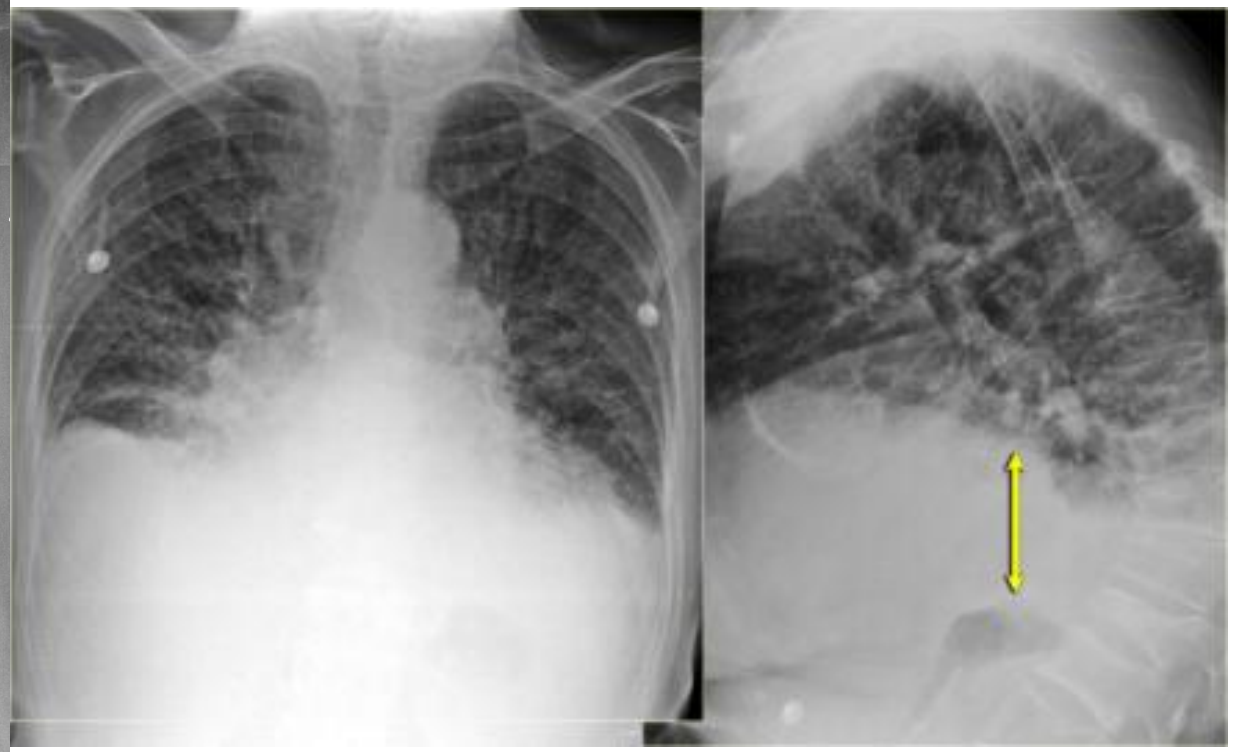


Hollenberg et al: JACC 20 19, 74(15):1966-20 11

The Chest X Ray is your friend!

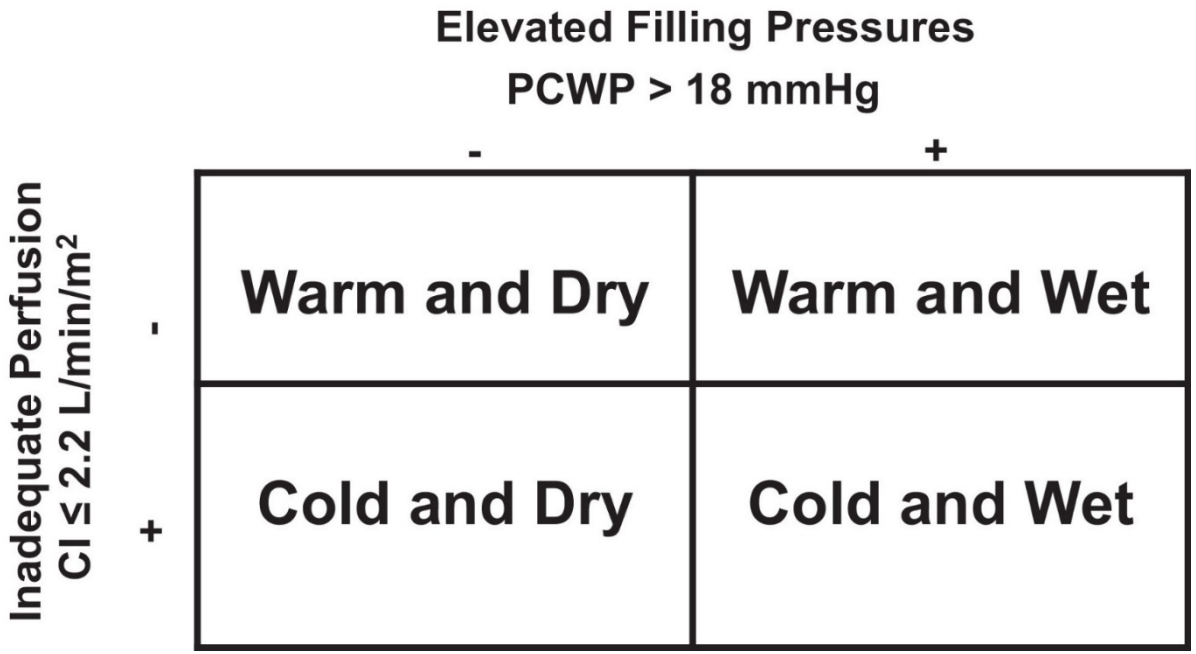




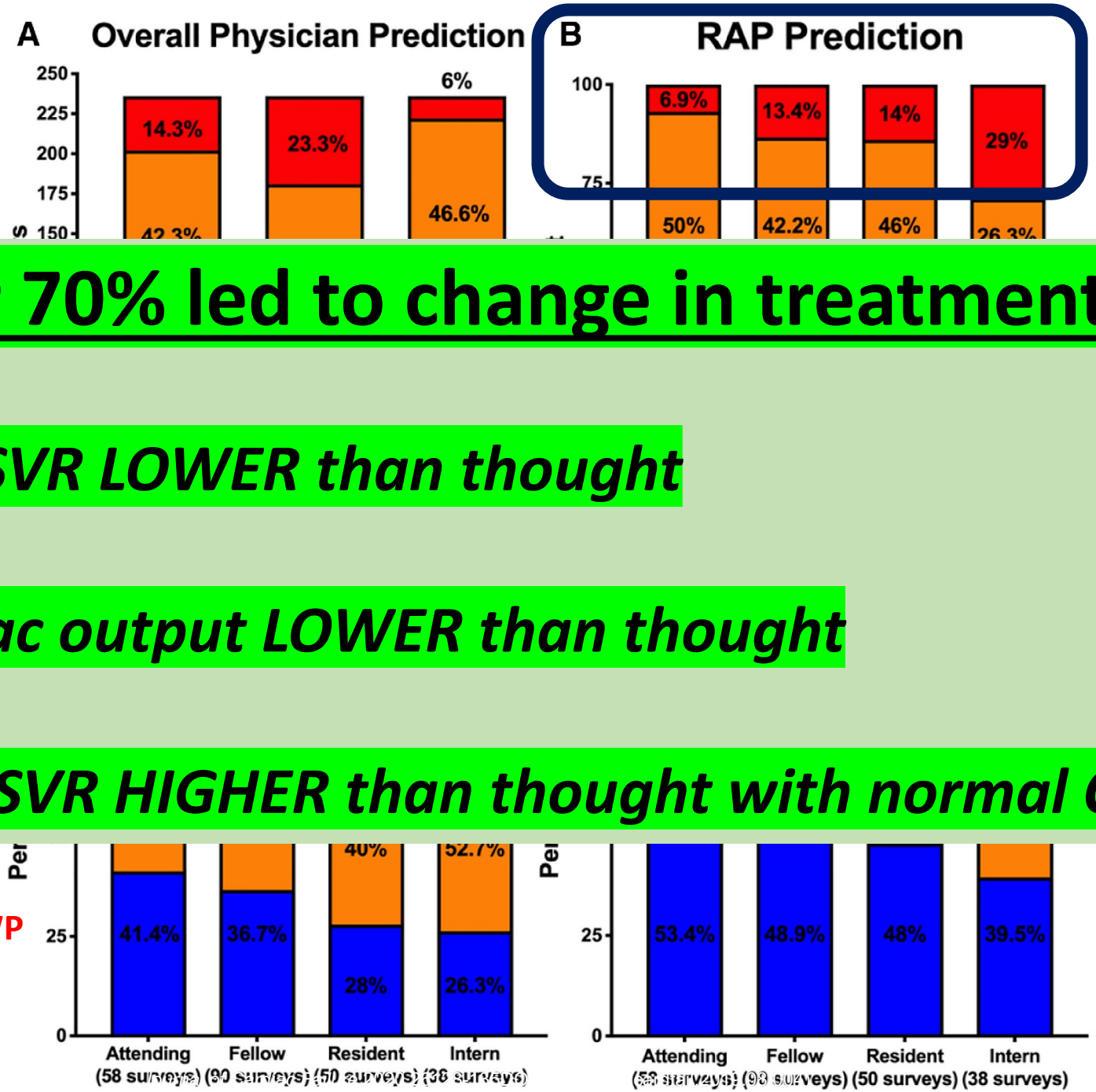
Discordance Between Clinical Assessment and Invasive Hemodynamics in Patients With Advanced Heart Failure

- 218 cases, clinical assessment, then RHC within 6-12 hours
- Compared to RHC results by category

Right atrial pressure (mmHg)	Pulmonary wedge pressure (mmHg)	Cardiac index (CI)
< 6	7-12	< 1.5
6-12	13-18	1.5- 2.2
12-18	19-24	> 202
>18	>24	



Narang et al, Journal of Cardiac Failure 2020;26(2) DOI: 10.1016/j.cardfail.2019.08.004



Over 70% led to change in treatment strategy:

erience matters

PVR/SVR LOWER than thought

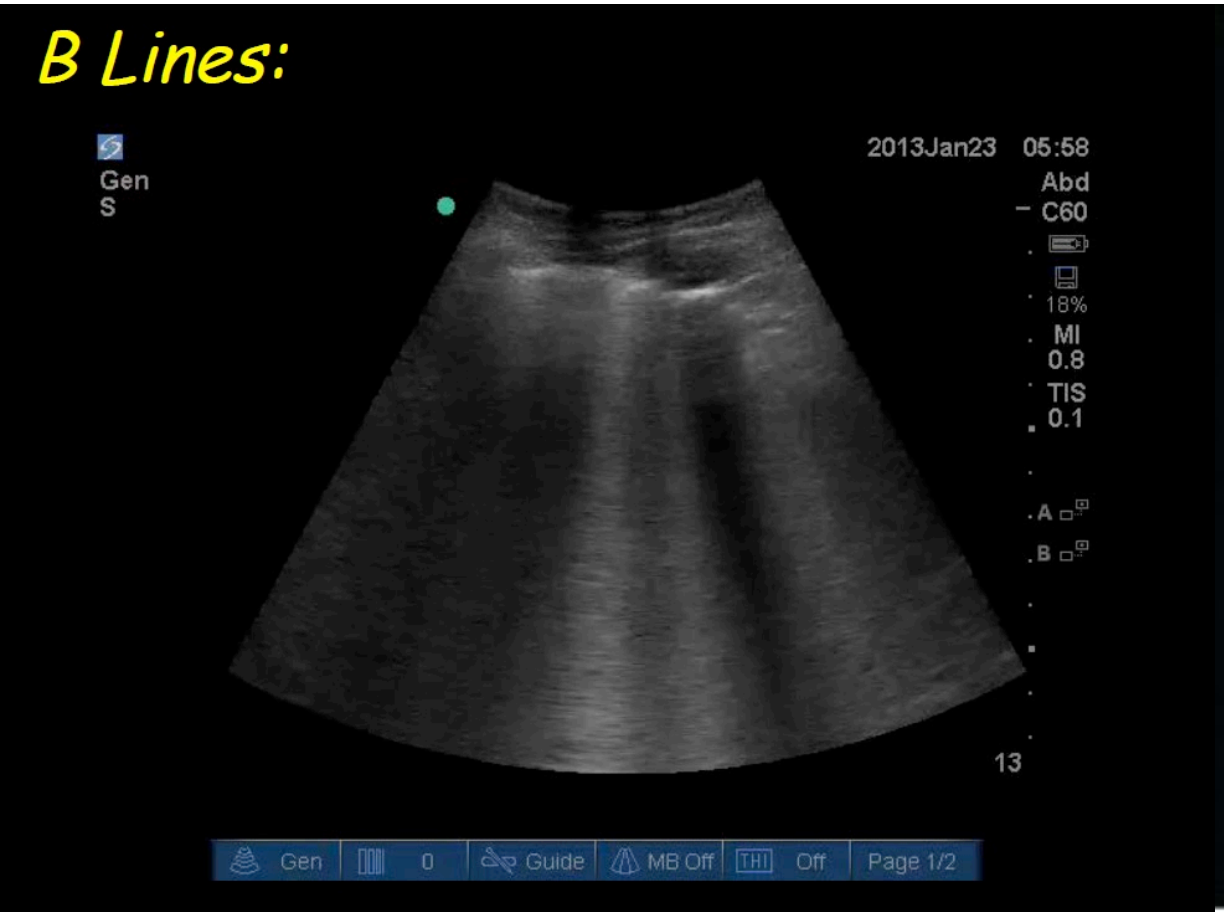
Cardiac output LOWER than thought

PVR/ SVR HIGHER than thought with normal CO

Especially for PWP

Narang et al, Journal of Cardiac Failure 2020;26(2) DOI: 10.1016/j.cardfail.2019.08.004

POCUS for assessment of fluid status



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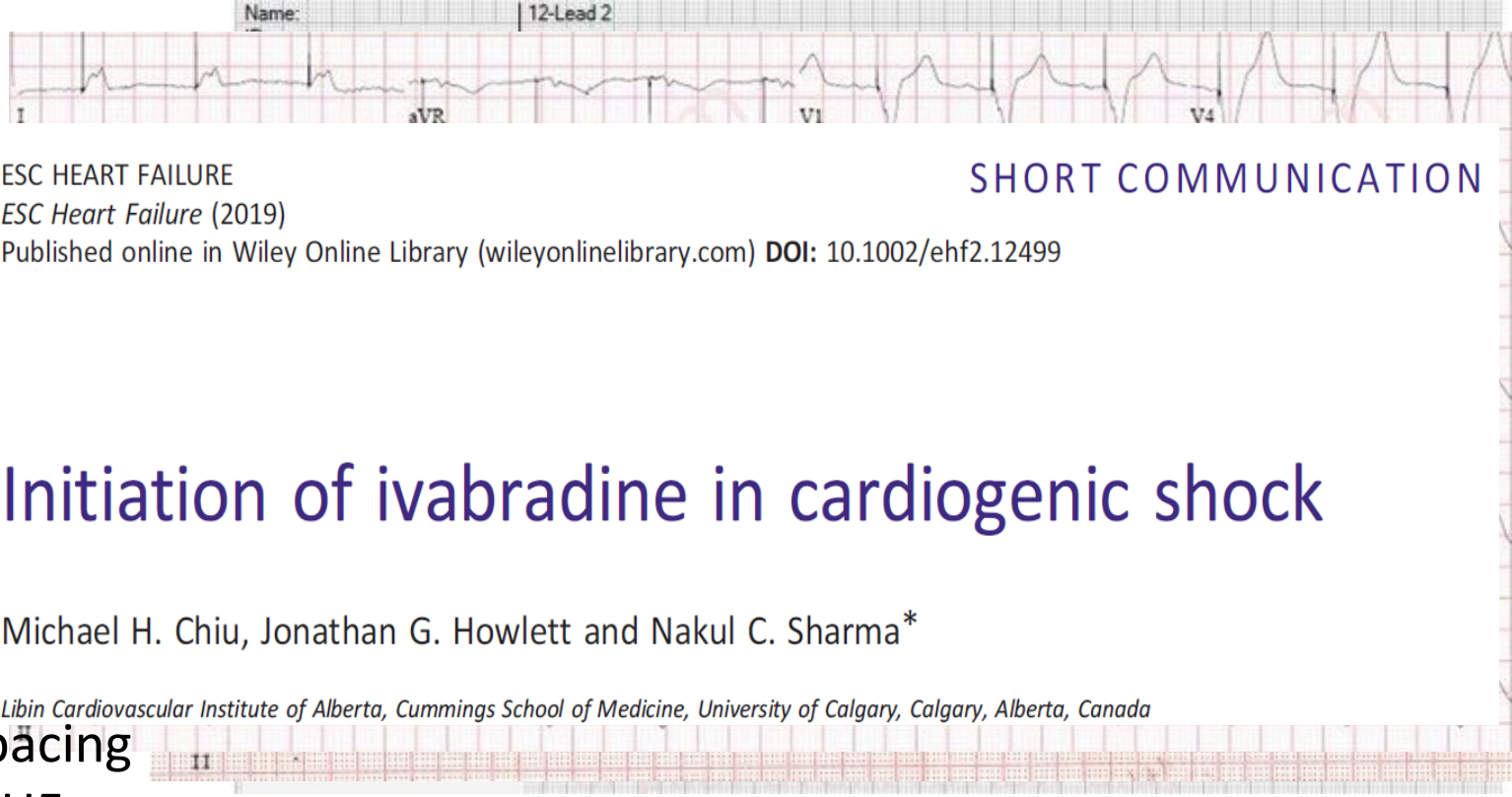
Failure to Diurese: Common ‘Cardiorenal’ Reasons

- Inadequate diuresis is COMMON
- Low Cardiac output state
  - With or without volume depletion
- Advanced renal disease
- Symptomatic Hypotension
- Atypical/ Right Sided Heart Failure
- Unrecognized Non Adherence

Specific Hemodynamic Considerations

(not including inadequate diuresis)



ESC HEART FAILURE
ESC Heart Failure (2019)
Published online in Wiley Online Library (wileyonlinelibrary.com) **DOI:** 10.1002/ehf2.12499

SHORT COMMUNICATION

Initiation of ivabradine in cardiogenic shock

Michael H. Chiu, Jonathan G. Howlett and Nakul C. Sharma*

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- Rhythm:
  - Control HR if too high
  - Reduce BB if rate low, especially if pacing
  - Consider DCCV for AF associated WHF
  - Consider CRT if wide complex QRS
  - Consider PVC suppression if frequent PVCs
- You May need to reduce GDMT drugs, esp RAASi and BB medications
  - Perfusion pressure is necessary for diuresis
- Rarely
  - Pericardial constriction

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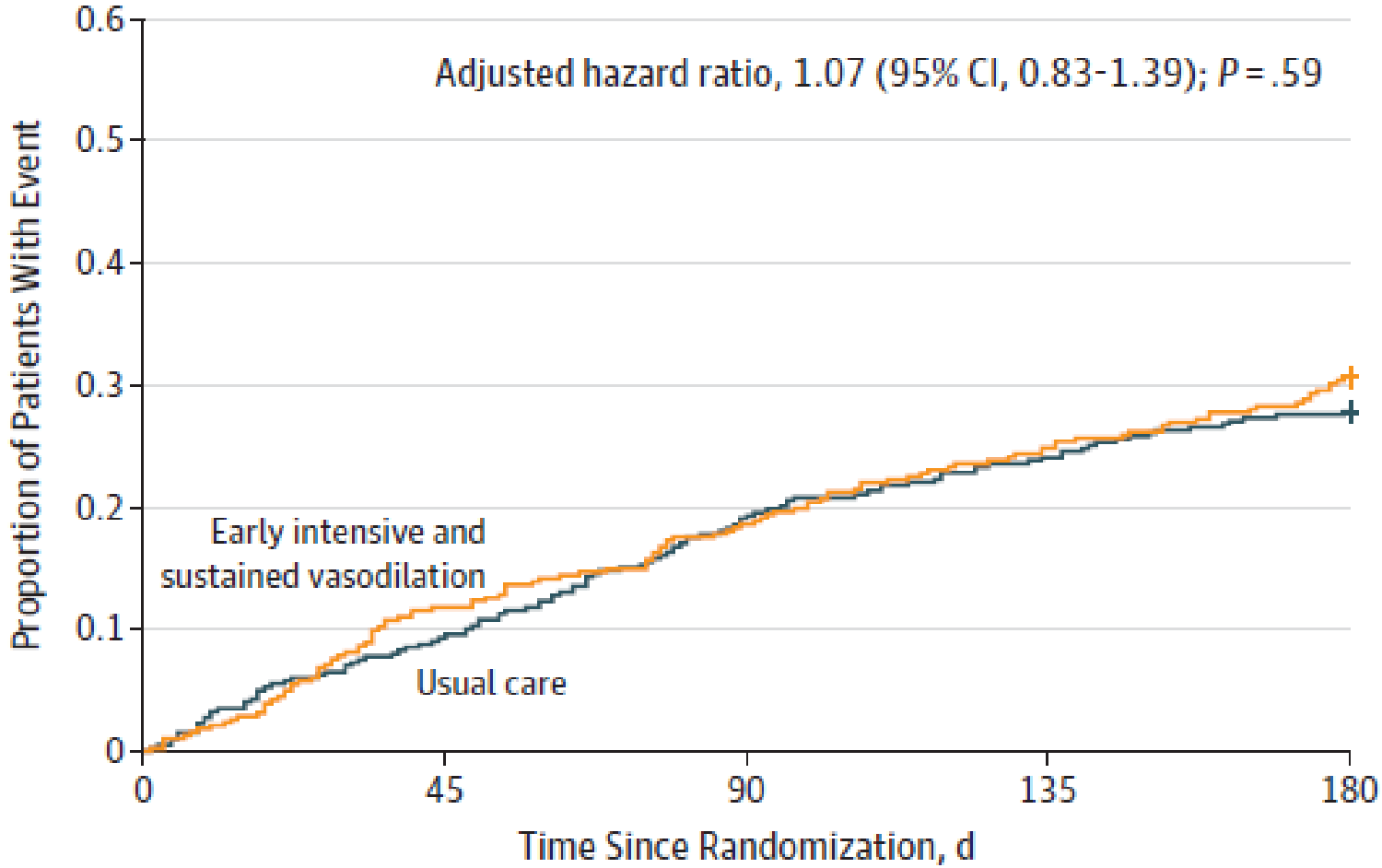
GALACTIC – AHF: Within 180 Days Among Patients Treated With



No. at risk					
Early intensive and sustained vasodilation	382	337	311	287	265
Usual care	399	361	322	303	288

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Kozhuharov et al. JAMA. 2019;322(23):2292-2302. doi:10.1001/jama.2019.18598, Packer *N Engl J Med*. 2017;376(20):1956-1964. Metra *N Engl J Med*. 2019;381(8):716-726., O'Connor, *N Engl J Med*. 2011;365(1):32-43.

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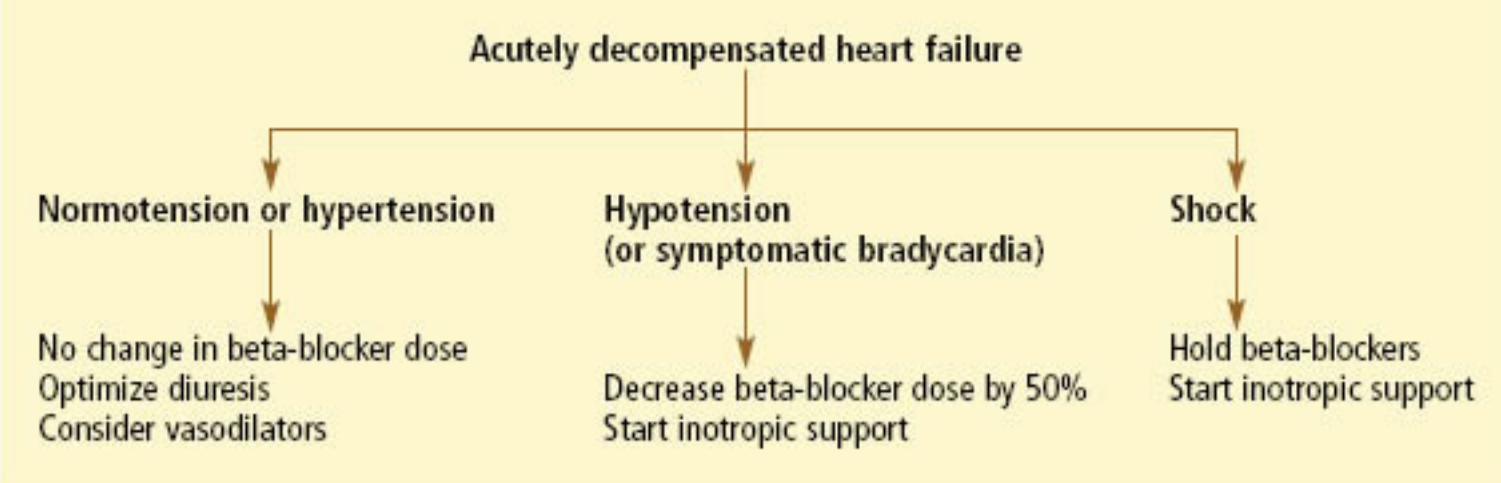
Positive inotropic agents ‘

-’*cold and wet’ patients*



Vasodilator	Bolus	Infusion rate
Dobutamine[a]	No	2–20 μg/kg/min (beta+)
Dopamine	No	3–5 μg/kg/min; inotropic (beta+)
		>5 μg/kg/min: (beta+), vasopressor (alpha+)
Milrinone[a,b]	25–75 μg/kg over 10–20 min	0.375–0.75 μg/kg/min
Enoximone[a]	0.5–1.0 mg/kg over 5–10 min	5–20 μg/kg/min
Levosimendan[a]	12 μg/kg over 10 min (optional) [c]	0.1 μg/kg/min, which can be decreased to 0.05 or increased to 0.2 μg/kg/min
Norepinephrine	No	0.2–1.0 μg/kg/min
Epinephrine	Bolus: 1 mg can be given i.v. during resuscitation, repeated every 3–5 min	0.05–0.5 μg/kg/min

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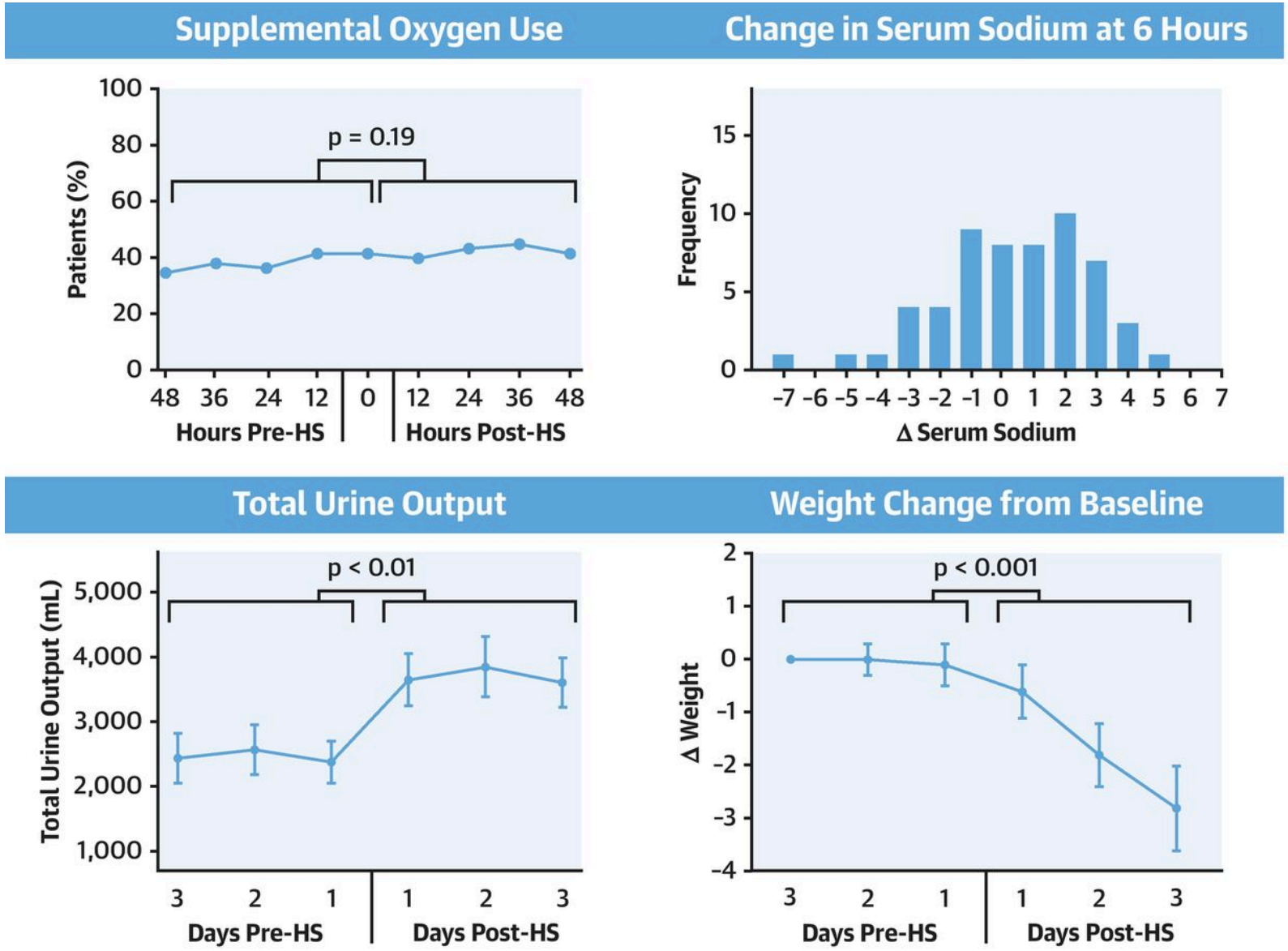
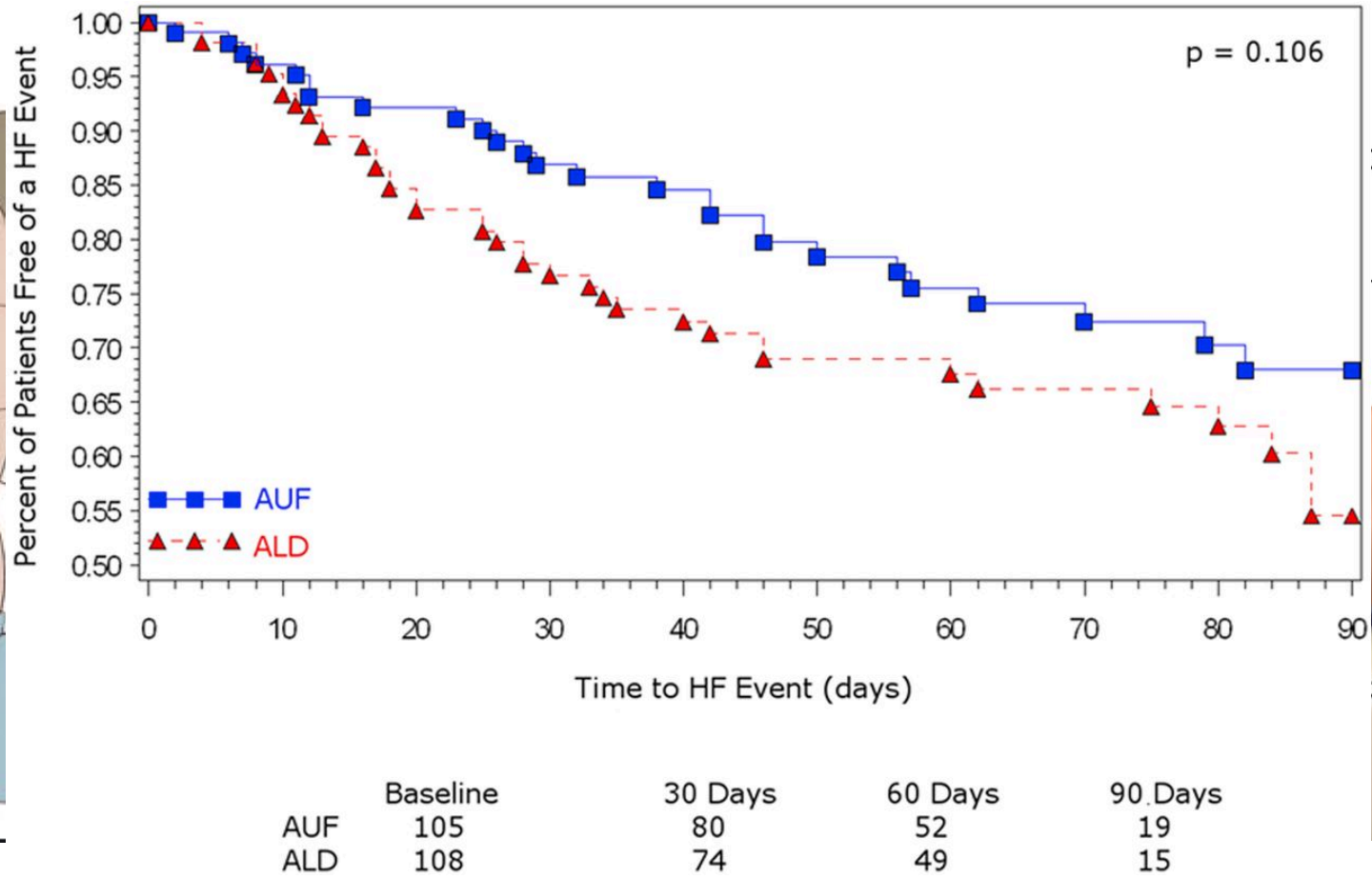
Use of hypertonic saline facilitated diuresis

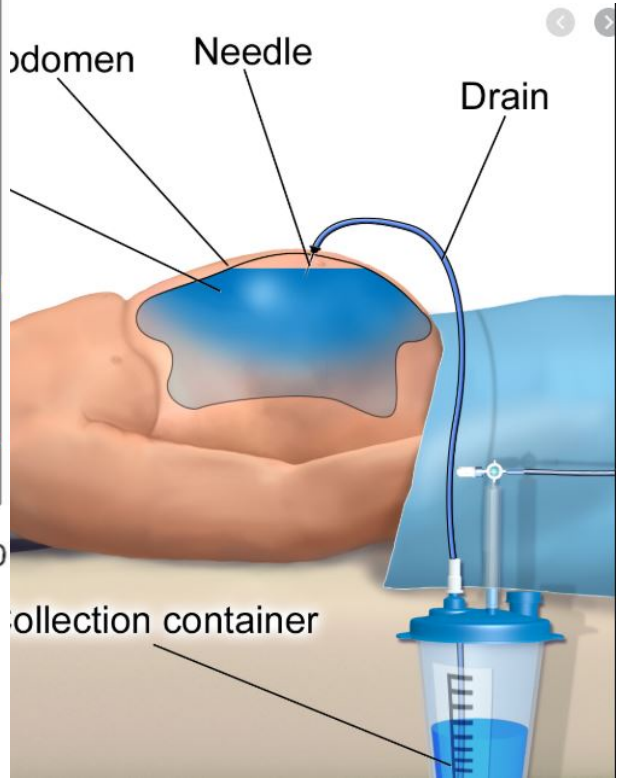


Griffin, M. et al. J Am Coll Cardiol HF. 2020;8(3):199-208.

Alternative diuretic aids: Not for routine use

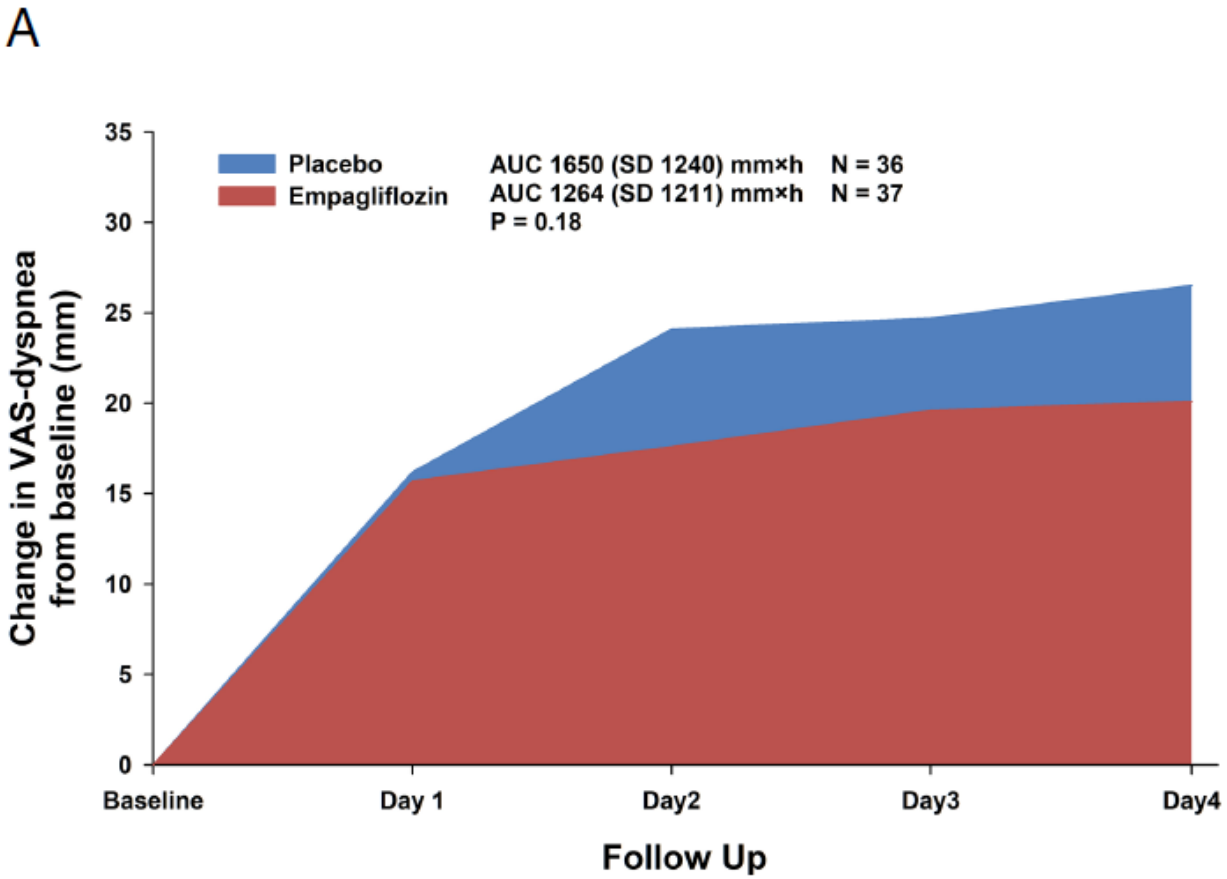


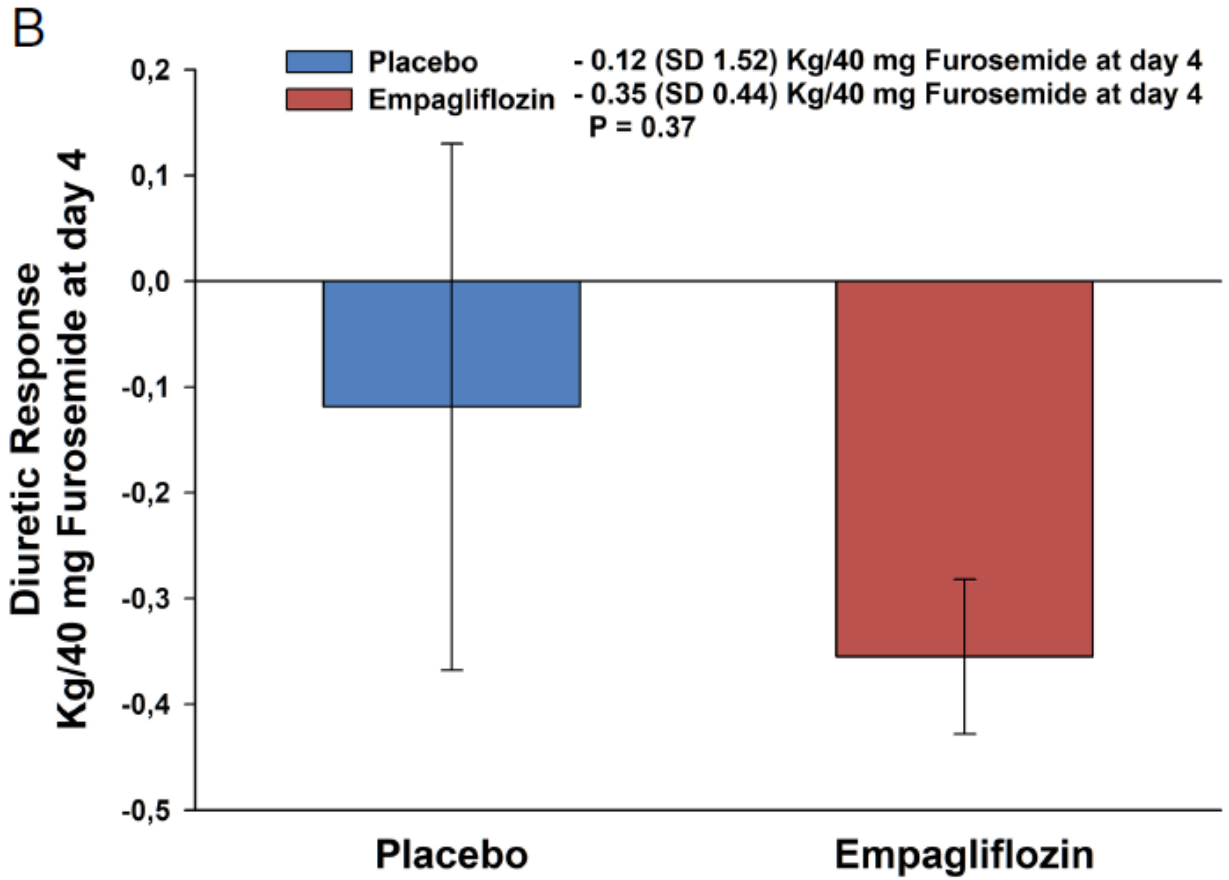
	Baseline	30 Days	60 Days	90 Days
AUF	105	80	52	19
ALD	108	74	49	15



JACC Heart Fail. 2016 Feb;4(2):95-105. doi: 10.1016/j.jchf.2015.08.005. Epub 2015 Oct 2

SGLTi- promising therapy for AHF





European Journal of Heart Failure (2020)
doi:10.1002/ejhf.1713

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