

Maryland ACEP Chapter Educational Conference & Annual Meeting March 12, 2020

FACULTY: Tiffany C. Fong, MD, FACEP

PRESENTATION

HFrEF, HFpEF, what the (EF)? Point-of-Care Echo in the Evaluation of Heart Failure

DESCRIPTION

Decompensated heart failure is a commonly encountered clinical syndrome in the emergency department. Though emergency care providers have significant comfort with the diagnosis and management of patients with reduced ejection fraction, heart failure with preserved ejection fraction can be more enigmatic. This talk will provide an overview of the relevant pathophysiology, point-of-care echo findings, and management of HFrEF and HFpEF.

OBJECTIVES

- Recognize the clinical syndromes of heart failure with reduced and preserved ejection fraction (HFrEF and HFpEF).
- Describe multiple techniques to estimate ejection fraction on point-of-care echocardiography.
- Explain the basic physiology of left ventricular diastole.
- Identify key sonographic findings in HFpEF.
- Describe the management strategies for HFrEF and HFpEF.

DISCLOSURE

No significant financial relationships to disclose.



ROADMAP

- Define and recognize HF
- HFrEF vs. HFpEF
- Echo evaluation of SYSTOLIC dysfunction
- Echo evaluation of DIASTOLIC function
- Ultrasound adjuncts to heart failure
- Management and clinical integration



HFrEF and HFpEF

Have NO significant differences in their physical exam findings

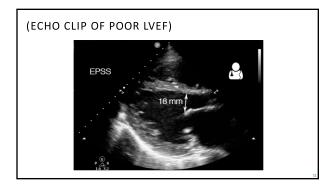
THE RATIONAL CLINICAL EXAMINATION	CLINICIAN'S CORNER	
Department H	oneic Patient in the Emergency ave Congestive Heart Failure?	
Charlie S. Wang, MD J. Mark FitzGerald, MB, DM	Context Dyspnea is a common complaint in the emergency department where phy- sicians must accurately make a rapid diagnosis.	
Michael Schulzer, MD, PhD Edwin Mak Najib T. Ayas, MD, MPH	Objective To assess the usefulness of history, symptoms, and signs along with rou- tine diagnostic studies (chest radiograph, electrocardiogram, and serum 8-type natri- uretic peptide (BNP) that differentiate heart failure from other causes of dyspnea in the emregency department.	
CLINICAL SCENARIOS	Data Sources We searched MEDLINE (1966-July 2005) and the reference lists from retrieved articles, previous reviews, and physical examination textbooks.	
Case 1 A 70-year-old woman with a history of	Study Selection We retained 22 studies of various findings for diagnosing heart failure in adult patients presenting with dyspnea to the emergency department.	
a previous myocardial infarction and heart failure presents to the emergency	Data Extraction Two authors independently abstracted data (sensitivity, specific- ity, and likelihood ratios (LRs)) and assessed methodological quality.	
department (ED) with a 2-day history of dyspnea at rest, orthopnea, and parox- ysmal nocturnal dyspnea. Physical ex- amination reveals an elevated jugular ve- nous pressure, a third heart sound (ventricular filling azlioo), bibusilar rales	Data Synthesis: Many features increased the probability of heart falser, with the best statum for each alongly bring the prevence of (1) pairs thiolog of heart falser, with the best (8-6, 8, 95%, confidence Interval (2), 41-80; (2) the symptom of paronymal non- turnal dypense (positive IR-2-6, 59%, C), 15-45; (2) the sign of the threat sound (5) patho (positive IR-2-6, 19%); (4) 9-26; (4) 9-66, 10-67; (4) 9-66; (4) 9-66, 10-67; (4) 9-66; (4) 9-66; (4) 9-66; (4) 9-66; (4) 9-66; (4) 9-66; (4) 9-66; (4) 9-66; (4) 9-66; (4) 9-66; (4) 9-66; (4) 9-66; (4) 9-66; (4) 9	

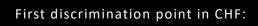
	Pooled		Summary LR (95% Cl)*	
Finding	Sensitivity	Specificity	Positive	Negative
Initial clinical judgment ^{12,31,40,86}	0.61	0.86	4.4 (1.8-10.0)	0.45 (0.28-0.73
History Heart failure ^{36,41,43,46,65,56}	0.60	0.90	5.8 (4.1-8.0)	0.45 (0.38-0.53
Myocardial infarction ^{41,43-43,48,53}	0.40	0.87	3.1 (2.0-4.9)	0.69 (0.58-0.82
Coronary artery disease ^{36,44,53,56}	0.52	0.70	1.8 (1.1-2.8)	0.68 (0.48-0.95
Dyslpidemia ⁴⁵	0.23	0.87	1.7 (0.43-6.9)	0.89 (0.69-1.1)
Diabetes mellitus ^{43-45,45,56}	0.28	0.83	1.7 (1.0-2.7)	0.86 (0.73-1.0)
Hypertension ^{38,41,43,41,48,83,36}	0.60	0.56	1.4 (1.1-1.7)	0.71 (0.55-0.93)
Smoker ⁴⁵	0.62	0.27	0.84 (0.58-1.2)	1.4 (0.58-3.6)
Chronic obstructive pulmonary disease ^{36,45,48,53}	0.34	0.57	0.81 (0.60-1.1)	1.1 (0.95-1.4)
Paroxysmal noctumal dyspnea ^{36,45,46,53,56} Orthopnea ^{36,47,43,45,46,53,56}	0.41	0.84	2.6 (1.5-4.5)	0.70 (0.54-0.91
Edema ^{36,653}	0.51	0.76	2.1 (0.92-5.0)	0.64 (0.39-1.1)
Dyspnea on exertion ^{36,48}	0.84	0.34	1.3 (1.2-1.4)	0.48 (0.35-0.67
Fatigue and weight gain ³⁶	0.31	0.70	1.0 (0.74-1.4)	0.99 (0.85-1.1)
Cough ^{96,45,45,53,56}	0.36	0.61	0.93 (0.70-1.2)	1.0 (0.87-1.3)
Physical examination Third heart sound (ventricular filing gallop) ^{36,47,43–46,46,33,36}	0.13	0.99	11 (4.9-25.0)	0.88 (0.83-0.94)
Abdominojugular reflux ³¹	0.24	0.96	6.4 (0.81-51.0)	0.79 (0.62-1.0)
Jugular venous distension ^{36,41,43,45,48,53,58}	0.39	0.92	5.1 (3.2-7.9)	0.66 (0.57-0.77)
Rales ^{38,41,43,45,48,53,50}	0.60	0.78	2.8 (1.9-4.1)	0.51 (0.37-0.70)
Any mumur ^{30,44,40,53}	0.27	0.90	2.6 (1.7-4.1)	0.81 (0.73-0.90)
Lower extremity edema ^{41,43,45,53,56}	0.50	0.78	2.3 (1.5-3.7)	0.64 (0.47-0.87)
Valsalva maneuver ³¹	0.73	0.65	2.1 (1.0-4.2)	0.41 (0.17-1.0)
Systolic blood pressure <100 mm Hg ⁴⁸	0.06	0.97	2.0 (0.60-6.6)	0.97 (0.91-1.0)
Fourth heart sound (atrial gallop) ^{36,653}	0.05	0.97	1.6 (0.47-5.5)	0.98 (0.93-1.0)
Systolic blood pressure ≥ 150 mm Hg ⁴⁸	0.28	0.73	1.0 (0.69-1.6)	0.99 (0.84-1.2)
Wheezing ^{36,47,45,48,13}	0.22	0.58	0.52 (0.38-0.71)	1.3 (1.1-1.7)
Ascites ⁴⁸	0.01	0.97	0.33 (0.04-2.9)	1.0 (0.99-1.1)

Finding	Pooled		Summary LR (95% CI)*		
	Sensitivity	Specificity	Positive	Negative	
Chest radiograph Pulmonary venous congestion ^{36,41,45,68} †	0.54	0.96	12.0 (6.8-21.0)	0.48 (0.28-0.83)	
Interstitial edema ^{41,53}	0.34	0.97	12.0 (5.2-27.0)	0.68 (0.54-0.85)	
Alveolar edema ⁴¹	0.06	0.99	6.0 (2.2-16.0)	0.95 (0.93-0.97)	
Cardiomegaly ^{36,41,43-45,48}	0.74	0.78	3.3 (2.4-4.7)	0.33 (0.23-0.48)	
Pleural effusion(s) ^{26,41}	0.26	0.92	3.2 (2.4-4.3)	0.81 (0.77-0.85)	
Any edema ^{43,44}	0.70	0.77	3.1 (0.60-16.0)	0.38 (0.11-1.3)	
Pneumonia ⁴¹	0.04	0.92	0.50 (0.29-0.87)	1.0 (1.0-1.1)	
Hyperinflation ⁴¹	0.03	0.92	0.38 (0.20-0.69)	1.1 (1.0-1.1)	
Electrocardiogram Atrial fibrillation ^{36,43,44,48,56}	0.26	0.93	3.8 (1.7-8.8)	0.79 (0.65-0.96)	
New T-wave changes ³⁶	0.24	0.92	3.0 (1.7-5.3)	0.83 (0.74-0.92)	
Any abnormal finding ^{41,53}	0.50	0.78	2.2 (1.6-3.1)	0.64 (0.47-0.88)	
ST elevation ^{38,48}	0.05	0.97	1.8 (0.80-4.0)	0.98 (0.94-1.0)	
ST depression ^{36,48}	0.11	0.94	1.7 (0.97-2.9)	0.95 (0.90-1.0)	

	Pooled		Summary LR (95% CI)	
	Sensitivity	Specificity	Positive	Negative
Clinical judgment or BNP ≥100 pg/mL ^{40*}	0.94	0.70	3.1 (2.8-3.5)	0.09 (0.06-0.1
BNP alone, pg/mL ≥250 ^{36,43,55}	0.89	0.81	4.6 (2.6-8.0)	0.14 (0.06-0.33
≥200 ^{36,42-44,46,54,55}	0.92	0.75	3.7 (2.6-5.4)	0.11 (0.07-0.18
≥150 ^{39,43,44,48,54-56}	0.89	0.71	3.1 (2.1-4.5)	0.15 (0.11-0.2
≥100 ^{36,39,42-44,47,48,54-56}	0.93	0.66	2.7 (2.0-3.9)	0.11 (0.07-0.16
≥80 ^{39,43,47,48}	0.96	0.71	3.3 (1.8-6.3)	0.06 (0.03-0.13
≥50 ^{39,44,54}	0.97	0.44	1.7 (1.2-2.6)	0.06 (0.03-0.12

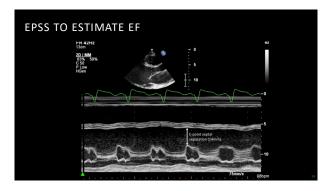






Determine **preserved vs. reduced** ejection fraction







Reduced (HFrEF): **EF <40%**

Gray-zone: EF 40-50%

Preserved (HFpEF): **EF>50%**





WHY DOES DIASTOLIC DYSFUNCTION MATTER?

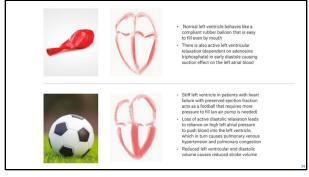


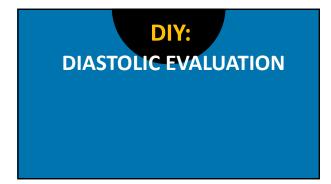
HFpEF

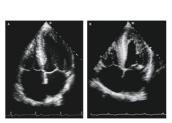
Lower mortality rate than HFrEF (3 vs 4%)

but similar or higher morbidity (ICU, hospital LOS)









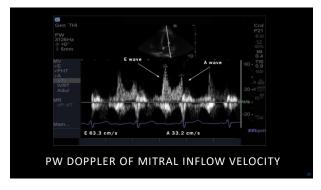
HFpEF diagnosis requires a normal EF (>50%)

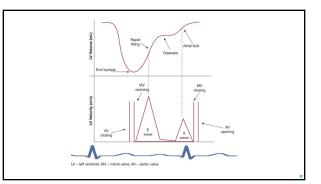
May also see:

- Non-dilated LV with concentric remodeling
- LV hypertrophy
- LA enlargement

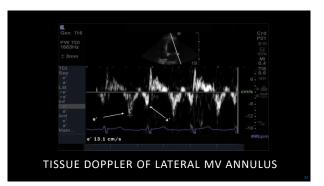
KEY: Identify 个LA pressure

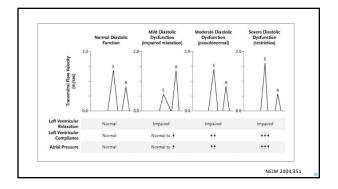


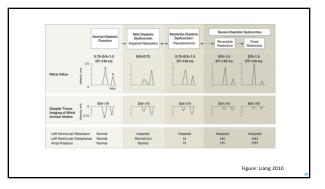


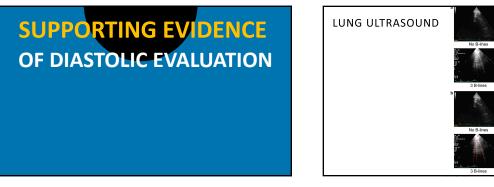


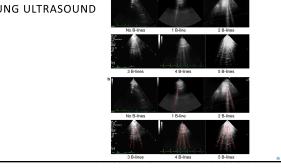


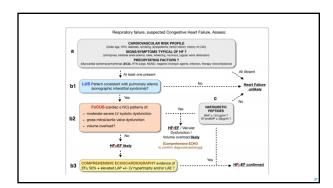












*EVOLVING THOUGHT:

HFPEF IS NOT SIMPLY DIASTOLIC DYSFUNCTION



Table 2. Management Principles	for Patients with Diastolic Heart Failure.		
Goal	Tre atment*	Daily Dose of Medication?	
Reduce the congestive state	Salt restriction Diuretics ACE inhibitors Angiotensin II-receptor blockers	-2 g of sodium per day Furosemide, 10-120 mg Hydrochlorothiaside, 12:5-23 mg Evalupe?, 2:5-40 mg Usinope?, 10-40 mg Candesarta, 4-32 mg Losarta, 2:5-100 mg	
Maintain atrial contraction and prevent tachycardia	Cardioversion of atrial forillation Sequential advieventicular pacing Beta-blockers Calcium channel blockers Radiorequercy ablation modification of atrioverbicular node and pacing	Atenolol, 12.5–300 mg Metoporolol, 25–100 mg Verapami, 120–360 mg Diltiazen, 129–540 mg	
Treat and prevent myocardial ischemia	Nitrates Beta-blockers Calcium channel blockers Coronary-artery bypass surgery, percutane- ous cononary intervention	Isosorbide divitrate, 30–310 mg Isosorbide mosonitrate, 30–90 mg Anenolel, 12–3–100 mg Metoprolol, 25–300 mg Difuzzen, 128–540 mg Veragamil, 128–540 mg	
Control hypertension	Anthyportensive agents	Chlorabildone, 12.3–25 mg hydrochlorabildon, 22.3–10 mg Aneroida, 12.5–100 mg Aneroida, 12.5–100 mg Antopolab, 12.5–200 mg Enalgerk, 2.3–40 mg Enalgerk, 2.3–40 mg Candesartan, 4–32 mg Losartan, 9–100 mg	
M	easures with Theoretical Benefit in Diastolic He	eart Failure	
Promote regression of hypertro- phy and prevent myocardial fibrosis		Enalspril, 2.5-40 mg Lisinopril, 10-40 mg Ramipril, 5-20 mg Captopril, 25-150 mg	
	Angiotensin receptor blockers Spironolactone	Candesartan, 4-32 mg Losartan, 50-100 mg 25-75 mg	NEJM 200

CORRECT DX DECONGEST CONTROL HTN CONTROL AFIB

PUTTING IT TOGETHER

(Clinical Case)

SUMMARY

