

EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER
DEPARTMENT OF EMERGENCY MEDICINE



Care Warriors

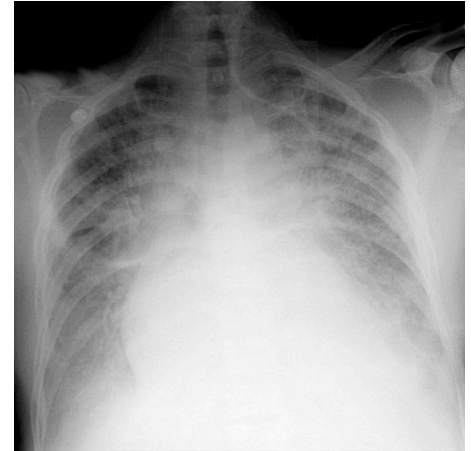
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Vol 3 | Issue 61

Acute Decompensated Heart Failure

A 34-year-old female with a past medical history significant for morbid obesity with BMI 68, congestive heart failure with AICD, type 2 diabetes mellitus, hypertension, and obstructive sleep apnea presents to the emergency department with a 12-hour history of shortness of breath that is present at rest. She denies any chest pain. Initial vital signs are as follows: Temp 98.0, HR 105, RR 24, BP 169/98, O2 sat 90% on 2LNC. On physical exam, the patient is in respiratory distress with rales at bilateral lung bases. ABG showed pH 7.31, CO2 49, O2 74 and bicarb of 25 on 2L nasal cannula. Initial lab studies show BNP 1108, trop 0.06, glucose 275. Chest X-ray was significant for cardiomegaly and increased interstitial markings suggestive of pulmonary edema. EKG showed normal sinus rhythm with possible left atrial enlargement, without ischemic changes. What is the next step in management?

- A. Rapid Sequence Intubation and mechanical ventilation**
- B. NIPPV (BiPAP), Nitroglycerin IV, Lasix IV**
- C. Venti-mask, Nesiritide IV, Lasix IV**
- D. Consult Cardiology**



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Above picture is pulmonary edema secondary to severe decompensation of heart failure.
Note the enlarged cardiac silhouette, alveolar edema and haziness of the vascular margins.

EM Case of the Week is a weekly "pop quiz" for ED staff.

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

BROWARD HEALTH MEDICAL CENTER

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Warriors

The correct answer is B. Early use of non-invasive positive pressure ventilation (such as BiPAP or CPAP) has been shown to improve outcomes in patients with cardiogenic pulmonary edema. Vasodilators are very effective in acute heart failure in regards to reducing preload and afterload. Loop diuretics should be employed in the emergency setting as an adjunct to vasodilator therapy.

Background

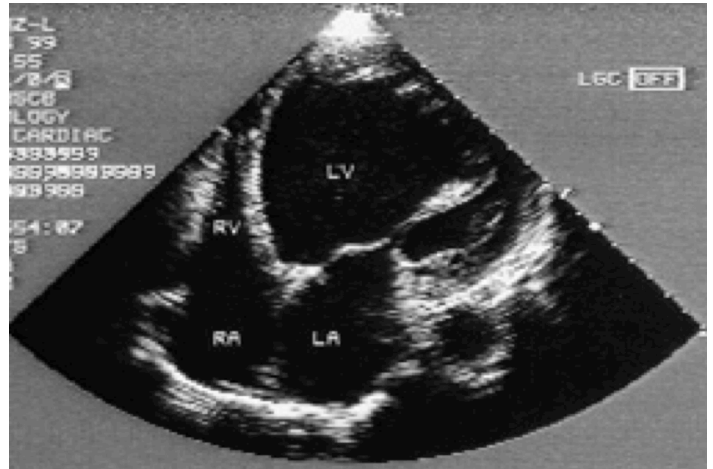
Heart failure is a clinical syndrome in which there is inadequate pumping of the heart resulting in inadequate systemic perfusion in relation to metabolic demand. About 5 million people in the US have been diagnosed with heart failure. 8 per 1000 people between the ages of 50 and 59 have heart failure in the US.

Discussion

Heart failure can be classified into low output failure and high output failure, based on the cardiac output. Low output failure can be caused by impaired cardiac contractility, such as ischemia/infarction, acute mitral or aortic regurgitation, myocarditis, cardiomyopathy, drugs, sepsis, and infiltrative diseases. Low output failure can also be caused by excessive afterload from hypertension, aortic stenosis, pulmonary HTN, or from impaired filling due to constrictive pericarditis or diastolic dysfunction. High output heart failure occurs when there is an increase in cardiac output to supply an increased demand, but this increase in CO is inadequate. This type is commonly seen in anemia, pregnancy, hyperthyroidism, and Paget's disease.

Diagnostic tests

- History and physical examination, chest radiography, 12-lead ECG, cardiac troponin testing (I or T), electrolytes, and a complete blood cell count are important initial clinical tools.
- B-type natriuretic peptide is commonly utilized when there is clinical uncertainty. A BNP level <100pg/dL is less likely to be associated with acute heart failure. A BNP level >500 pg/dL is likely to be correlated with an acute heart failure syndrome.



- While echocardiogram is usually performed as an inpatient study, it is very useful in the emergency setting to establish the diagnosis of heart failure. Above is an echocardiographic image of a congested left ventricle.

Treatment

- Management in the emergency room involves prompt airway assessment and pulse oximetry to ensure adequate oxygenation. The use of positive pressure ventilation such as CPAP or BiPAP has been shown to improve oxygenation and decrease ventricular afterload by increasing intrathoracic pressure. 5-10mmHg of positive pressure ventilation may reduce the need for intubation in acute heart failure syndromes with severe dyspnea.
- Vasodilator therapy can be very useful in decreasing preload and afterload forces, which contribute to the symptoms of acute heart failure. According to ACEP, nitrates should be administered for these patients. Treatment with IV nitroglycerin has been shown to reduce inpatient mortality. Nesiritide has no benefit over nitrates. ACE inhibitors may also be useful, but there is some risk of hypotension in patients with acute heart failure syndromes with the first dose.

For a list of educational lectures, grand rounds, workshops, and didactics please visit BrowardER.com and **click** on the **"Conference"** link.

All are welcome to attend!

- The use of loop diuretics has been standard in the emergency department treatment of heart failure, when used in conjunction with vasodilator therapy. 2013 ACCF/AHA guidelines recommend early diuretic therapy in the ED, which has been shown to improve outcomes.

TABLE 1: INTRAVENOUS VASODILATORS FOR ACUTE DECOMPENSATED HEART FAILURE

Recommended Use	Agent	Effect on Preload	Effect on Afterload	Considerations	Monitoring
Adjunct to diuretics in patients with rapid improvement in congestive symptoms in patients with adequate blood pressure	Nitroglycerin	Decrease	Minimal*	Tachyphylaxis can occur	Blood pressure Adverse effects (eg, headache)
	Nitroprusside	Decrease	Decrease	Thiocyanate accumulation with high doses or renal dysfunction	Blood pressure Thiocyanate toxicity (rare)
	Nesiritide	Decrease	Decrease	Longer half-life than nitroglycerin or nitroprusside, risk of sustained hypotension	Blood pressure Renal function

*Nitroglycerin can lower afterload at high doses.
Adapted from references 4 and 5.

- The majority of patients who present to the ED with heart failure are admitted. Patients with significant dyspnea and elevated blood pressure have the poorest short-term outcomes. Several variables and biomarkers, such as renal failure, hyponatremia, increased BNP levels, elevated troponins and high or low blood pressure, have been identified as predictors of adverse events and outcomes. Short ED stays or observation may be an alternative to admission in patients without high-risk features. Further studies to identify low risk features of acute HF may reduce hospital admissions in the future.

Take Home Points

- Assess ABCs promptly
- Obtain CXR, ECG, Appropriate labs
- BNP should be employed to help establish diagnosis
- Bedside echocardiogram if cardiac/valvular function is unknown
- Use NIPPV as indicated
- Early use of diuretics and vasodilators
- Closely monitor volume status and urine output



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ABOUT THE AUTHOR

This month's case was written by Dean Kalam. Dean is a 4th year medical student from NSU-COM. He did his emergency medicine rotation at Broward Health North in March 2017. Dean plans on pursuing a career in Internal Medicine.

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