US Guided Management of Undifferentiated Dyspneic Patient in the ED

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Intro: Undifferentiated dyspnea can be a complicated presentation muddled by patient comorbidities and similar symptomology shared among etiologies. Some studies have shown increased mortality and length of stay in the hospital when incorrectly initially diagnosed in the ED. US has been shown more effective at differentiating these causes and improves diagnostic accuracy. This study will implement US exam upon initial exam of patient and chart time to diagnosis/treatment, length of stay in ED, length of stay in hospital admissions versus discharge rates, and 30 day mortality. ADHF and COPD/asthma patient differentiation will be the focus.

Methods: Prospective cohort study of more than 18 years that present with the primary complaint of dyspnea with more than one complicating comorbid condition. Initial exam by physician will be accompanied by cardiothoracic US previously verified.

Results: Study powered by previous year average of time to diagnosis of institution. Patient characteristics, distribution by diagnostic category, and characteristics found on US in correlation with diagnosis will be included for multivariate analysis.

Conclusions: We expect to see a significant difference in our time to diagnosis/treatment and mortality rate.
INTRODUCTION

According to the CDC, dyspnea was cited as the primary chief complaint of 2.4% of all visits to the ED in 2016 making it the 7th leading cause of visits countrywide. The undifferentiated dyspneic patient often has multiple morbidities and possible etiologies for this symptom making them especially difficult to diagnose and initiate proper treatment. In the case of the more severe ARF, one study showed a double in mortality if inappropriately diagnosed initially in the ED in hospital. Two very prevalent diagnoses that often present with dyspnea and coexist in our particular population are COPD/asthma and AHF. Current diagnostic accuracy with pro-BNP and chest x-ray has been found to only be around 81% for AHF while LUS and clinical exam showed an accuracy of 90% for AHF in one study and 95% for COPD/asthma. A recent RCT performed in Europe also saw LUS/clinical exam outperform pro-BNP and x-ray in diagnosing HF exacerbations. This makes US not only a viable option for diagnosing the undifferentiated dyspneic patient but the option affording more certainty in diagnostic accuracy. Previous studies have looked at the feasibility of using US to diagnose and treat the undifferentiated patient with remarkably positive results. In this study, we will institute US exam upon initial examination of the patient while looking at the time to diagnosis and treatment versus those predicated on chest x-ray and pro-BNP. As overcrowding and boarding are becoming more problematic in U.S. EDs, reducing overall time spent on these measures and length of stay in the ED/hospital can be of personal and financial benefit to the patient and institution. Other end points recorded will be admissions versus discharge rate and 30 day mortality.
METHODS

- Prospective cohort study to prove reduction rate of time to diagnosis and treatment with cardiothoracic ultrasound of patient’s with undifferentiated dyspnea most likely from COPD/HF.

- Patient Selection: Patients aged 18 or older presenting with dyspnea as primary complaint with concomitant COPD/asthma and CHF in history as possible etiology. Undifferentiated in this study is defined as multiple competing diagnoses without concrete evidence on EKG or via clinical exam.

- Exclusion Criteria: Known etiology, HF exacerbated by non-medication compliance, COPD with known treatment noncompliance, Dialysis dependent patients with electrolyte aberrations, 2 or more admissions within the last 2 weeks for same symptomology. Those patients that leave AMA.

- Clinical Evaluation: All patients underwent the usual standard of care including triage diagnostic testing, history, and physical prior to ultrasound examination.

- US: Modified cardiothoracic protocol (LuCUS) demonstrated in earlier paper including LV systolic function, RV enlargement, pericardial effusion, IVC diameter and collapsibility, and lung patterns (ie A-lines, decreased lung sliding, B-lines)
- N to power study to be determined by primary outcome of time to diagnosis and time to treatment of COPD/HF in the ED of the institution prior to implementing intervention. The hope of this study is that trends in analyzed primary outcome of time to diagnosis shows a significant decrease along with time to treatment and admission rates.
• Analysis will provide evidence of significant or nonsignificant changes in end points that will further direct study. The hope is to find the addition of this intervention streamlines patient care and allows for more rapid evaluation, treatment, and change to needed level of care. Additionally, a reduction in admissions to the hospital would provide further incentive to incorporating a protocol based on these findings. Finally, a reduction in mortality is expected from prior studies and quantifying this effect in response to time may allow for further implications in the prehospital realm.
If significant changes are shown in primary end points we recommend making this a triage protocol on the undifferentiated dyspneic patient.

Furthermore, training of ancillary staff, especially those in triage and prehospital positions would be indicated and based on our end points, savings versus training expenditures can be quantified.

Additional ultrasound units should be purchased and mobile units for those EMS providers with training on trucks. These mobile units may be passed around and are on a secure database, so pictures may be transmitted for further validation of interpretation.
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