Symptom-Based Ultrasonography

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KEYWORDS

• Ultrasonography • Symptom-based • Emergency department • Point of care

KEY POINTS

- Point-of-care (POC) ultrasonography can be used to rapidly aid in working up patients presenting with chest pain, dyspnea, and abdominal pain.
- To evaluate patients with chest pain or dyspnea, the clinician sonologist should scan the heart, pleura, lung bases, and inferior vena cava.
- POC ultrasonography can assist with unstable patients with chest pain or dyspnea by evaluating for pericardial tamponade, evidence of right ventricular strain/massive pulmonary embolism, tension pneumothorax, aortic dissection, and acute severe mitral regurgitation in the setting of ST-elevation myocardial infarction (suggestive of acute papillary muscle rupture).
- Unstable trauma patients with chest pain or dyspnea can be examined for hemopericardium, hemothorax, and tension pneumothorax.
- Patients with unstable vital signs and abdominal pain can be rapidly evaluated by examining the Morrison pouch to look for presence of free fluid/intraperitoneal bleeding, and other life-threatening conditions as directed by history, physical examination, and clinical context.

Videos showing heart with large pericardial effusion and tamponade physiology, McConnell's Sign with RV strain, thrombus in RA/RV, severe mitral regurgitation with color doppler imaging, pleural effusion, severely reduced LV systolic function, inferior wall motion hypokinesia, calcified aortic valve and absence of pleural sliding accompany this article at http://www.ultrasound.theclinics.com/

INTRODUCTION

The use of point-of-care (POC) ultrasonography as a rapid assessment tool has been adopted in emergency departments (EDs), inpatient units, critical care bays, and outpatient settings. Ultrasonography has numerous advantages: it is noninvasive, portable, does not carry the risk of ionizing radiation, and can be performed rapidly at a patient's bedside. In this article, algorithms are proposed for a symptom-based approach to the use of ultrasonography in the evaluation of patients presenting with dyspnea, chest pain, and abdominal pain.

CHEST PAIN AND DYSPNEA SYMPTOM COMPLEX

Undifferentiated chest pain and dyspnea are common complaints in emergency medicine, and patients frequently present with both symptoms. Emergency physicians often perform a battery of tests to help differentiate the varied causes of chest pain or dyspnea and rule out life-threatening causes. Often, these patients are admitted for further workup.

Dyspnea and chest pain are in the top 5 complaints of patients presenting to the ED.[1] However,

Funding Sources: None.
Conflicts of Interest: None.
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Ultrasound Clin 9 (2014) 227–246
http://dx.doi.org/10.1016/j.cult.2014.01.003
1556-858X/14/$ – see front matter

the diagnostic differential for each is complex and often cumbersome to investigate.[2] In addition, the patient history may be misleading. POC ultrasonography may guide the clinical investigation and facilitate bedside diagnosis of emergent conditions. Chest pain and dyspnea may be provoked by both acute and chronic diseases. Although it may not be possible to diagnose every cause in the ED, the role of the emergency physician is to diagnose conditions that may be life-threatening if missed. Although additional tests may be required to confirm certain diagnoses, the portability, clinical applicability, and simplicity make POC ultrasonography an indispensable bedside tool for rapidly ruling in critical diagnoses.

POC ultrasonography can help to reduce the time to diagnosis and disposition in certain situations. There is considerable overlap between evaluating chest pain and dyspnea, because they share some of the same pathologic conditions. Our proposed unified algorithm when evaluating patients with a chief complaint of chest pain or dyspnea with POC ultrasonography is shown in **Fig. 1**.

The approach to assessment for patients with dyspnea in the ED has already been published using the RADiUS (rapid assessment of dyspnea with ultrasonography) approach outlined by Manson and Hafez.[3] We propose extending that approach to patients with chest pain as well. Using the RADiUS approach, one can sequentially look at the heart, pleura/lungs, and the inferior vena cava (IVC) in these patients to obtain clinically relevant information on patients. Look at the heart through 3 windows if possible (subcostal, parasternal long/short axis, and apical 4-chamber [A4C]) to maximize the information you can gather. Next, examine the lungs by looking at the pleura line, dividing each lung into 4 quadrants. After that examination, move the transducer to the supradiaphragmatic window to look for pleural effusions (similar to FAST [focused assessment with sonography for trauma] examination). Examine the IVC for caliber and variability with respiration.

CHEST PAIN AND DYSPNEA IN THE HEMODYNAMICALLY UNSTABLE PATIENT

Patients with hemodynamic instability presenting with chief complaints of chest pain or dyspnea represent unique challenges. They require concurrent resuscitation and stabilization, while a diagnostic workup is performed. The history may be limited because of the patient's clinical status, physical examination has limited usefulness, and ancillary tests can take time to perform and can put the patient at risk, because they require the patient to be sent out of the ED for further testing.

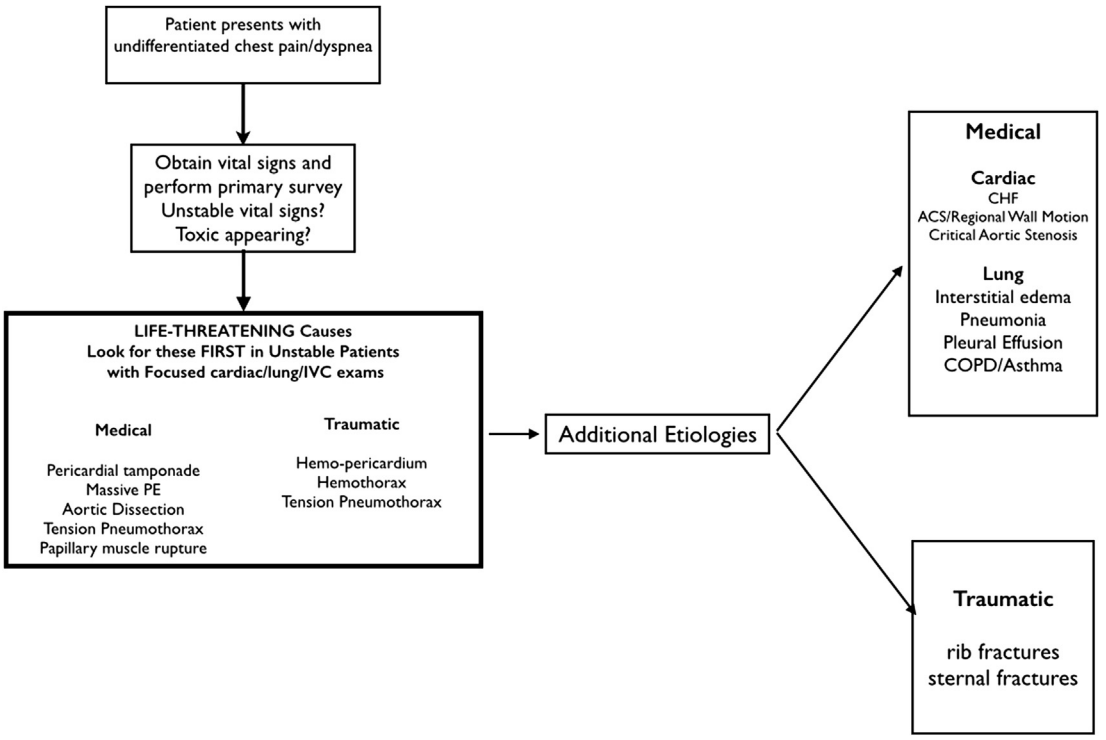

Fig. 1. Algorithmic POC ultrasonography approach to the patient with chest pain or dyspnea.