

PHILIPS

Ultrasound

A patient with an aortic valve vegetation



A case study by
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Philips Lumify case study

A 22 year-old female with a history of recurrent severe asthma presented to the emergency department with fever, shortness of breath, and confusion. Point-of-care ultrasound (POCUS) demonstrated findings consistent with **bilateral pulmonary edema**, a **mobile aortic valve vegetation**, and moderate **mitral regurgitation**. Later in her hospital course, a repeat POCUS exam revealed **antero-septal and apical wall motion abnormalities** likely from an embolic vegetation to the left anterior descending coronary. After Swan-Ganz catheter placement an **IVC thrombus or a vegetation developed**.





A patient with an aortic valve vegetation

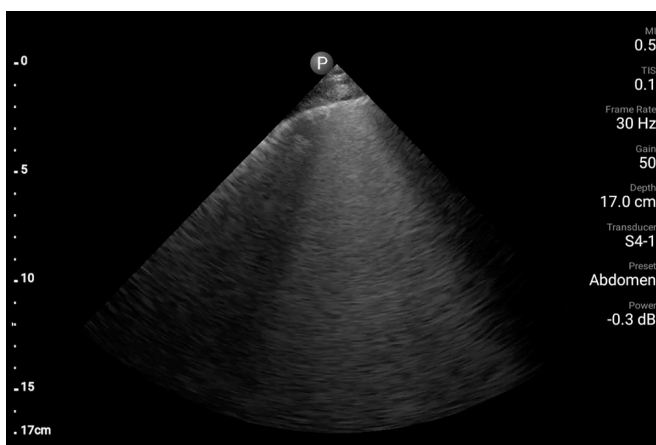
Clinical case

A 22 year-old female with a past medical history of asthma presented to the emergency department with fever, severe shortness of breath, and significant confusion/lethargy. The patient was unable to give any history. Initial concern in the emergency department was for a recurrent severe asthma exacerbation with an underlying bacterial infection vs. influenza and severe sepsis.

ECG was normal other than sinus tachycardia. There was a subtle patchy bilateral interstitial infiltrate on CXR.

The patient was admitted to the intensive care unit (ICU) and shortly thereafter developed chest pain with rapidly worsening hypoxia and respiratory failure and was urgently intubated.

POCUS of the lungs after intubation demonstrated findings consistent with bilateral pulmonary edema and pleural effusions without pneumothorax.

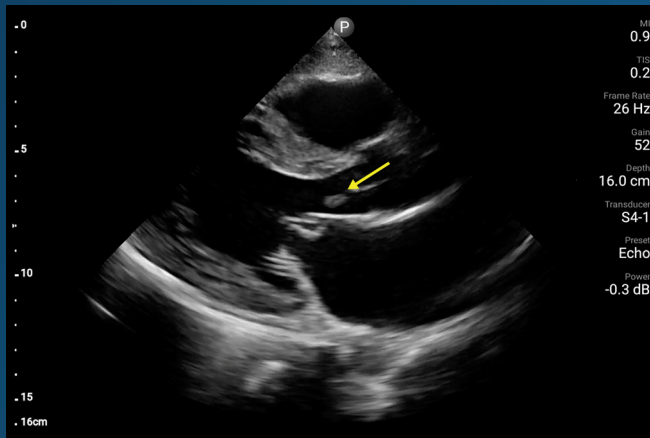


Lung – pulmonary edema



Lung – pleural effusion

POCUS of the heart demonstrated a **mobile aortic valve (AV) vegetation** and significant **mitral regurgitation**.



Parasternal long-axis
(arrow = AV vegetation)



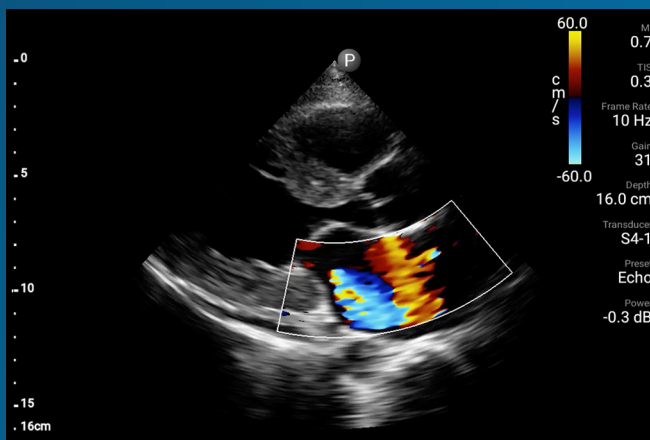
Parasternal SAX Ao



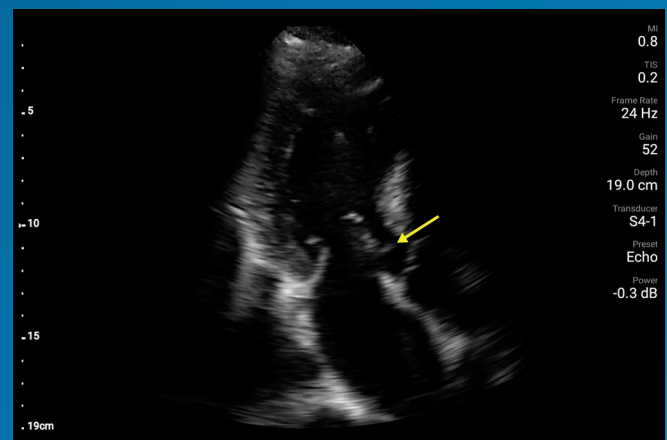
Parasternal SAX MV



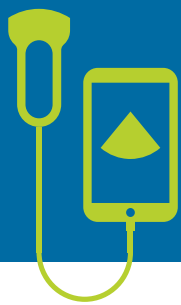
Parasternal SAX papillary muscle



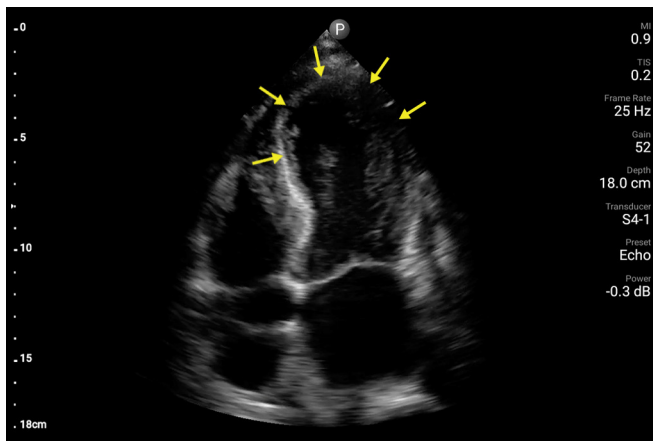
Parasternal LAX – note the mitral regurgitation in the left atrium



Apical 3-chamber (arrow = AV vegetation)



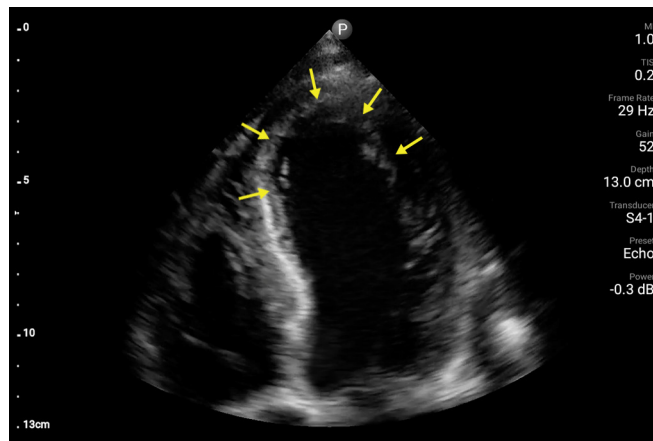
A patient with an aortic valve vegetation



Apical 4-chamber

Additionally, POCUS demonstrated antero-septal and apical wall motion abnormalities. A stat ECG showed ST segment elevation in the antero-septal leads.

The aortic valve vegetation and wall motion abnormalities were confirmed by a stat formal echocardiogram done in the ICU while the cath lab was being activated at 2 AM. Her ST elevation MI was felt to be related to a likely embolic vegetation to the left anterior descending (LAD) coronary artery. She underwent an emergent LAD thrombectomy in the cath lab with placement of a balloon pump and Swan-Ganz catheter.



Apical 4-chamber – LV zoomed

Upon removal of these devices, POCUS incidentally visualized findings consistent with either a mobile thrombus or an additional vegetation in the inferior vena cava (IVC).

Multiple blood cultures from the patient grew *Staphylococcus aureus* on hospital day two.



Subcostal view of the IVC (arrows = either a mobile thrombus or vegetation)



Videos

Click here to watch the video online or go to www.philips.com/CCEMeducation

Parasternal long-axis.
Note the AV vegetation and mitral regurgitation.

Click here to watch the video online or go to www.philips.com/CCEMeducation

Parasternal short-axis.
Note the AV vegetation in the AO view.

Click here to watch the video online or go to www.philips.com/CCEMeducation

Apical 4-chamber: after patient developed chest pain.
Note the antero-septal and apical wall motion abnormalities.

Click here to watch the video online or go to www.philips.com/CCEMeducation

Subcostal view of the IVC acquired in the cath lab.
Note the mobile thrombus or vegetation.



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Clinical impact

The immediate availability of POCUS in the intensive care unit can quickly *narrow* a differential diagnosis. A very common example of this benefit is the impact of performing cardiac and pulmonary ultrasound in patients presenting with undifferentiated shortness of breath ^{1,2}.

In addition, as demonstrated in this case, POCUS can *expand* the differential to include diagnoses not originally included such as pulmonary edema, mitral regurgitation, and endocarditis in a young female with presumed asthma. Using POCUS the triage and time-to-appropriate treatment (such as time to initiation of antibiotics, cath lab activation, formal echocardiogram, etc.) can be improved.

Similarly, the patient with undifferentiated hypotension can be quickly triaged with a focused cardiopulmonary POCUS exam. In this patient on the ventilator with endocarditis, the differential for acute hypotension is broad. The acute decrease in left ventricular regional systolic function not only narrows the differential, but adds an unlikely diagnosis that may not have been in the forefront of the physician's mind (acute embolic myocardial infarction).



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Conclusion

The spectrum of cardiac POCUS extends from basic identification of pericardial fluid and gross overall LV systolic function^{3, 4}, to more advanced color Doppler assessment of valves and regional wall motion abnormalities. With rigorous training and an integrated environment of POCUS and formal echocardiography, both basic and advanced POCUS applications can significantly expedite and improve the quality and efficiency of care for patients.

References

1. Lichtenstein DA, Meziere GA. Relevance of lung ultrasound in the diagnosis of acute respiratory failure: the BLUE protocol. *CHEST* 2008; 134, 117-125.
 2. Volpicelli G, Elbarbary M, Blaivas M et al. International evidence-based recommendations for point-of-care lung ultrasound. *Intensive Care Med* 2012; 38, 577-591.
 3. Johnson BK, Tierney DM, Rosborough TK, Harris KM, Newell MC. Internal medicine point-of-care ultrasound assessment of left ventricular function correlates with formal echocardiography. *J Clin Ultrasound* 2016; 44, 92-99.
 4. Spencer KT, Kimura BJ, Korcarz CE, Pellikka PA, Rahko PS, Siegel RJ. Focused cardiac ultrasound: recommendations from the American Society of Echocardiography. *J Am Soc Echocardiogr* 2013; 26, 567-581.
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