



Bedside Ultrasonography: 6 Success Factors for Implementation



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Nidhi Nikhani, MD, shares 6 steps to implement ultrasonography in critical care, based on implementing ultrasound-guided central venous catheterisation (CVC) at Banner Health.

1. Define clinical challenges to be solved by implementing bedside ultrasound

[Banner Health](#) faced the challenge of placing peripherally inserted central catheter (PICC) lines. When a nurse needed to place a PICC line in a patient with difficult vascular access, she borrowed a bedside ultrasound machine from the radiology department and successfully inserted the line. This success motivated other clinicians to adopt this approach.

2. Examine the scientific evidence and safety benefits of bedside ultrasound

Ultrasound-guided placement of central lines is recommended as a preferred evidence-based safety practice in guidelines. Procedural complications are common and expensive medical errors. Iatrogenic pneumothorax (the accidental puncture and collapse of the patient's lung during medical treatment) is one of the most expensive. A randomised trial of ultrasound-guided CVC reduced rates of pneumothorax and hemothorax to zero, and reduced or eliminated all other complications (Fragrou et al. 2011).

3. Identify an ultrasound champion and launch a bedside ultrasound training programme

- Physician leadership will accelerate adoption of bedside ultrasound.
- A training programme is essential, and can include both simulation and hands-on training.
- Partner with your ultrasound provider, who may be able to help with organising training events.
- Train-the-trainer: The initial trainees can train others once they are proficient.

4. Use clinical teams and CVC safety bundles that include ultrasound guidance

Banner established dedicated vascular-access teams comprised of respiratory therapists and nurses, available around-the-clock to perform ultrasound-guided line insertions. To reduce central-line associated bloodstream infections (CLASBIs), our health system uses a six-point safety bundle:

1. Hand hygiene
2. Maximal barrier precautions
3. Chlorhexidine skin antisepsis
4. Optimal catheter site selection
5. Daily review of CVC line necessity, with prompt removal of unneeded lines
6. Ultrasound-guided line placement

5. Expand use of bedside ultrasound to new applications, such as bedside echocardiography

Due to the need to capture and interpret cardiovascular ultrasound images at any hour of the day or night to guide treatment in real time, Banner implemented a bedside echo programme. Respiratory therapists were trained to acquire high-quality bedside ultrasound images to transmit to tele-intensivists remotely. All iCare intensivists were trained in interpreting echo images in real time and using the findings to assess the fluid and cardiovascular status of patients suffering from CHF, shock, or other conditions.

The Surviving Sepsis campaign's bundle of care practices for patients with severe sepsis or septic shock recommends bedside cardiovascular ultrasound as one of the recommended methods for evaluating volume status and tissue perfusion, with the scan to be performed within six hours of clinical presentation. Bedside echo has been shown to:

- Improve diagnostic accuracy.

- Reduced time delays for procedures.
- Superior accuracy in evaluating fluid status in heart failure patients, compared to physical examination techniques
- Reduced cost for procedures.
- Support for use of ultrasound as the 'third eye' to help the intensivist manage patients.
- Assessment of shock to determine hemodynamic status, fluid resuscitation and interventions.

6. Track ultrasound outcomes and learn from success

A key success factor is engagement of physicians through educating them about the safety benefits of ultrasound guidance, including confidence that the needle is inserted correctly with a high degree of first-pass success.

With ultrasound at the bedside, and the clinical information it provides, physicians are ideally equipped to rapidly help the sickest patients achieve optimal outcomes.

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