Clinical Evidence and Sources

Please visit **www.sonosite.com/improvecare/evidence** to view a complete list of sources and related links.

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5. For information on CMS' quality reporting/value based purchasing program, please see: **http://www.sonosite.com/improvecare/evidence** to view a complete list of sources and related links.
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SonoSite, Inc.
Worldwide Headquarters
21919 30th Drive SE, Bothell, WA 98021-3904
Tel: 1 (877) 560-0977 Fax: 1 (425) 951-6800
E-mail: safety@sonosite.com

SonoSite Ltd
European Headquarters
Alexander House, 40A Wilbury Way, Hitchin, Herts SG4 0AP, United Kingdom
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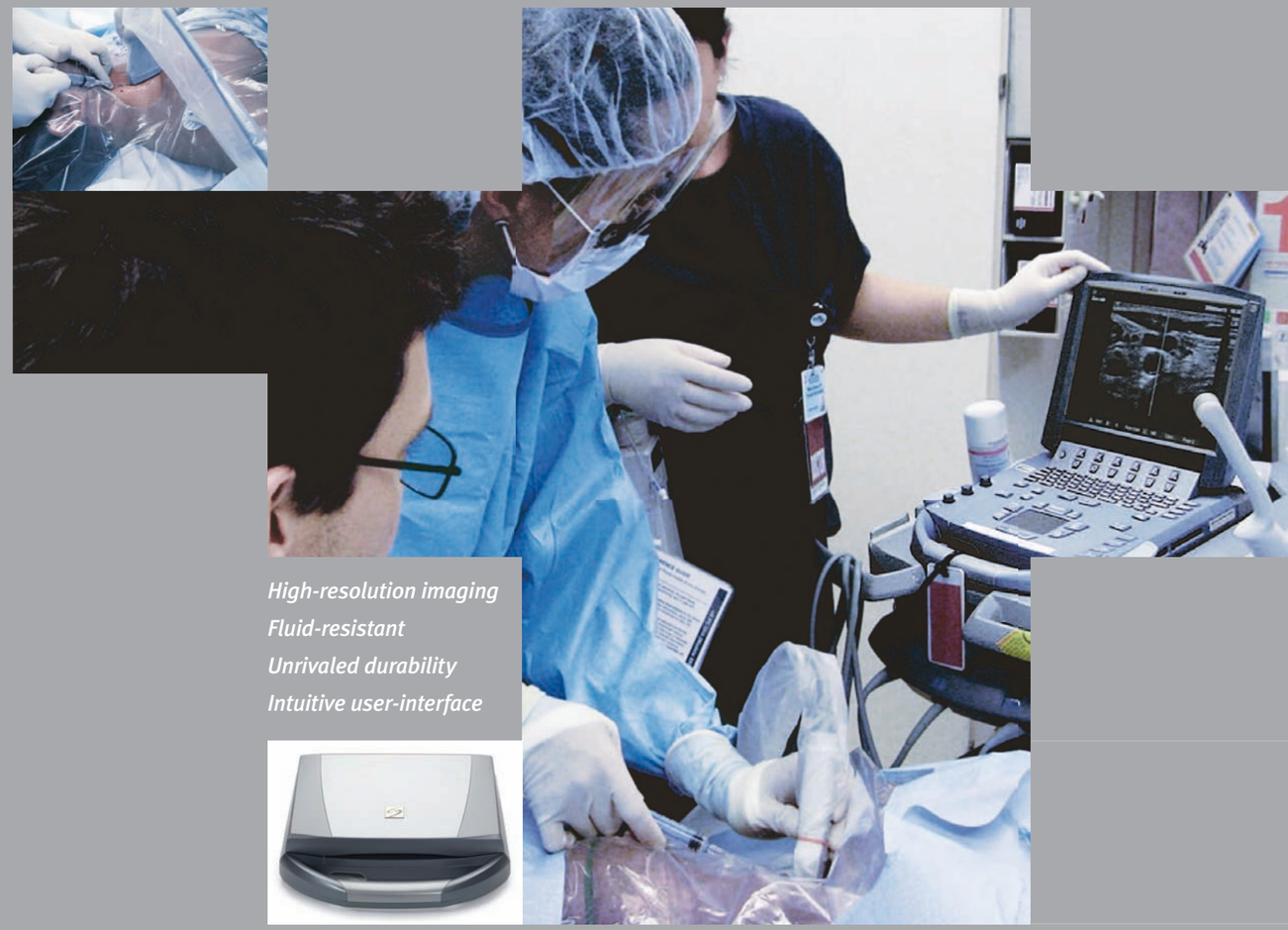

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How Often do Complications Occur?

Central Venous Catheter Complications

- Unsuccessful insertion. The Agency for Healthcare Research & Quality (AHRQ) reports that unsuccessful insertion of central venous catheters (CVCs) occur in up to 20% of all cases.[1]
- Total complications. The rate of major and minor CVC complications is up to 10%. These complications are: [1]
  - Arterial puncture
  - Hematoma
  - Pneumothorax
  - Hemothorax
  - Chylothorax
  - Brachial plexus injury
  - Arrhythmias
  - Air embolus, catheter malposition
  - Catheter knotting

Iatrogenic Pneumothorax (IP)

- MedPAR data from the Centers for Medicare and Medicaid Services (CMS) indicates that IP was reported in 2.31 per 1,000 discharges in 2007.[2]
- As many as 18% of thoracentesis are complicated by pneumothorax.[3]

What is the Cost of Complications?

Iatrogenic Pneumothorax

- AHRQ reports iatrogenic pneumothorax is associated with an increased length of stay of 4-7 days.[4]
  – The attributable cost per incident is $17,000 – $45,000.
- Under Medicare's Reporting Hospital Quality Data for Annual Payment Update (RHQDAPU) program, facilities must report rates of iatrogenic pneumothorax to receive the full market basket update; these data will be public beginning in 2010.[5]

What is the Cost of Medical Malpractice Associated with Complications?

An analysis of claims related to injury resulting from central venous catheter placement (part of the American Society of Anesthesiology Closed Claims Project) reveals that "claims related to central catheters had a high severity of patient injury" and resulted in the following payments:[6]

Type of Complication	Median Payment	Range of Payment
Wire/Catheter embolus	$39,725	$654 – $132,500
Cardiac tamponade	$160,245	$34,499 – $6,912,000
Carotid artery puncture/cannulation	$40,870	$12,975 – $527,000
Hemothorax	$297,000	$17,850 – $1,435,293
Pneumothorax	$143,250	$1,280 – $208,750
Miscellaneous vessel injury	$184,625	$1,000 – $1,717,775
All central catheter claims	$105,500	$654 – $6,912,000

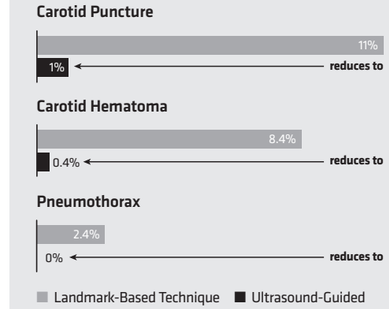
Data in 1999 dollars; claims against anesthesiologists since 1970.

Ultrasound Guidance Reduces These Risks and Improves the Quality of Care

Central Venous Catheters

The AHRQ recommends ultrasound guidance for all central venous cannulation.

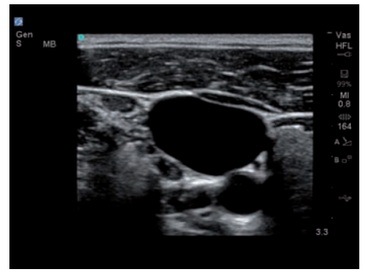
- Reduces placement failures and complications during attempted placements with a relative risk reduction of 78%.[7]
- In 900 critical care patients, ultrasound guidance of internal jugular vein catheterization reduced complications dramatically as seen to the right.[8]
- Carotid puncture was reduced from 8.3% to 1.7%.[9]
- Reduces the number of venipuncture attempts prior to successful placement.[7]
  – Avoids patient anxiety and discomfort from multiple attempts.
  – Speeds the care process during an emergency.
- Reliable detection of the guidewire with ultrasound guidance during CVC placement provides an additional measure of safety.[10]



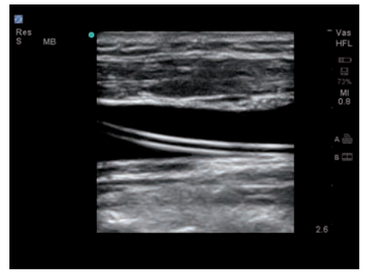
Thoracentesis & Paracentesis

The American Board of Internal Medicine strongly recommends proficiency in use of ultrasound to guide thoracentesis for certification in the subspecialty of critical care medicine.[11]

- Reduces the rate of pneumothorax resulting from thoracentesis to 3% or lower (vs. 18% without ultrasound).[3]
- Ultrasongraphy is advantageous over standard chest radiography and CT because of the absence of radiation.[12]
- 95% of patients with ascites were successfully aspirated using emergency center ultrasound technique versus 61% using the traditional technique.[13]



Transverse View Internal Jugular Vein



Sagittal View Internal Jugular Vein with Catheter in Lumen

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