CORSO DI ECOGRAFIA AL LETTO DEL MALATO

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Fondazione IRCCS Cà Granda, Ospedale Maggiore Policlinico, Milano

Ecografia bedside: definizione, strumenti e percorso formativo

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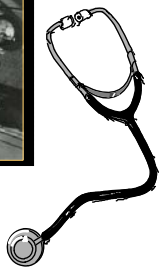
Ecografia: *evoluzione nel tempo*

da tecnica di imaging a strumento di semeiotica



Esame obiettivo:
Ispezione
Palpazione
Percussione
Auscultazione

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IM - REVIEW

Clinical applications of bedside ultrasonography in internal and emergency medicine

Vincenzo Arienti · Valeria Camaggi

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Abstract Ultrasonography (US) is an invaluable tool in the management of many types of patients in Internal Medicine and Emergency Departments, as it provides rapid, detailed information regarding abdominal organs and the cardiovascular system, and facilitates the assessment and safe drainage of pleural or intra-abdominal fluid and placement of central venous catheters. Bedside US is a common practice in Emergency Departments, Internal Medicine Departments and Intensive Care Units. US performed by clinicians is an excellent risk reducing tool, shortening the time to definitive therapy, and decreasing the assessment and safe drainage of pleural or intra-abdominal fluid and placement of central venous catheters.

It is clearly recognized that ultrasound technologies are not exclusive to radiologists or cardiologists, but can be performed and interpreted by other clinicians. The utility and safety of bedside US performed by clinicians has been fully demonstrated in Emergency Departments (ED) and Intensive Care Units (ICU) [1–4]. In the ED, US allows rapid diagnostic assessment of the patient, and supports the physician in the decision-making process; in ICU, bedside US can provide detailed information about the cardiovas-

REVIEW ARTICLE

N Engl J Med 2011;364:749-57.

CURRENT CONCEPTS

Point-of-Care Ultrasonography

Christopher L. Moore, M.D., and Joshua A. Copel, M.D.

ULTRASONOGRAPHY IS A SAFE AND EFFECTIVE FORM OF IMAGING THAT has been used by physicians for more than half a century to aid in diagnosis and guide procedures. Over the past two decades, ultrasound equipment has become more compact, higher quality, and less expensive, which has facilitated the growth of point-of-care ultrasonography — that is, ultrasonography performed and interpreted by the clinician at the bedside. In 2004, a conference on compact ultrasonography hosted by the American Institute of Ultrasound in Medicine (AIUM) concluded that "the concept of an 'ultrasound stethoscope' is rapidly moving from the theoretical to reality." This conference included representatives from 19 medical organizations; in November 2010, the AIUM hosted a similar forum attended by 45 organizations.[1-3] Some medical schools are now beginning to provide their students with hand-carried ultrasound equipment for use during clinical rotations.[4]

Although ionizing radiation from computed tomographic (CT) scanning is increasingly recognized as a potentially major cause of cancer, ultrasonography has been used in obstetrics for decades, with no epidemiologic evidence of harmful effects at normal diagnostic levels.[5,6] However, ultrasonography is a user-dependent technology, and as usage spreads, there is a need to ensure competence, define the benefits of appropriate use, and limit unnecessary imaging and its consequences.[7-10] This article provides an overview of the history and current status of compact,

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HTA ORIGINAL

Bedside Ultrasonography (US), Echoscopy and US Point of Care as a new kind of stethoscope for Internal Medicine Departments: the training program of the Italian Internal Medicine Society (SIMI)

Vincenzo Arienti · Rosella Di Giulio · Chiara Cogliati · Esterita Accogli · Leonardo Aluigi · Gino Roberto Corazza · Ultrasound SIMI Study Group

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Ultrasonografia

definizione valida per tutti i tipi di apparecchi

- Tecnica diagnostica che utilizza le riflessioni subite da un fascio di ultrasuoni nell'attraversare i tessuti biologici
- Essa permette di esplorare i parenchimi ed i tessuti molli del corpo umano
- Essa risponde a tutti i requisiti ideali di un metodo diagnostico
  - Applicabilità in tutti i pazienti
  - Indipendenza dalla funzione degli organi
  - Non invasività e buona tollerabilità
  - Elevata accuratezza diagnostica
  - Basso costo

Ecografia bedside

definizione

Esame ecografico eseguito dal clinico al letto del malato mediante ecografi di piccole dimensioni, portatili o carrellabili

Personal computer size device

"Echoscopy" and "Point of Care US"

definizione

La recente introduzione di apparecchiature miniaturizzate ha reso necessaria una ulteriore differenziazione in:

1) bedside US di 1° livello, eseguita con strumenti tascabili "Echoscopy" (ES)

Pocket size device

2) bedside US di 2° livello "Point of Care US" (POCUS) eseguita con strumenti di maggiori dimensioni tipo tablet o personal computer

Tablet size device

Bedside Ultrasonography (US), Echoscopy and US Point of Care as a new kind of stethoscope for Internal Medicine Departments: the training program of the Italian Internal Medicine Society (SIMI)

Ultrasound SIMI Study Group

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Ecografia bedside: gli apparecchi

- Eterogeneità
- Carrellati o portatili
- Prezzo

- Sonde
- Pannello di controllo
- Monitor (CRT,LCD)

Ecografia bedside: le sonde

Convex (2,5 – 7 MHz)

Lineare (8-17 Mhz)

- Molteplici
- 10-60 tipi

Endocavitaria (3-8 MHz)

Settoriale (1-6 MHz)

Uso comune:

- Convesse
- Lineari
- Endocavitarie
- Settoriali

Forma e frequenze differenti = diverse applicazioni

Sonda convex

Convex (2,5 – 7 MHz)

- Frequenza medio bassa
- Buona penetrazione tissutale
- Largo impiego

Organi esplorabili:

- Addominali (Fegato, Reni, Aorta ...)
- Toracici (Polmone, Cuore FAST)

Studio delle strutture poste in profondità

Sonda lineare

Lineare (8-17 Mhz)

- Frequenza alta
- Scarsa penetrazione tissutale
- Buona risoluzione

Organi esplorabili:

- Collo (tiroide, vasi epiaortici)
- Arti (cute, muscolo-scheletrico, vasi)
- Addome (intestino), Torace (polmone)

Studio delle strutture poste in superficie

Fisica degli US

formazione dell'immagine

Trasduttore (lamina piezoelettrica che emette e rileva gli US)

Alternanza di fasi di trasmissione e ricezione degli US

Rappresentazione monodimensionale o A-Mode

Rappresentazione bidimensionale o B-Mode

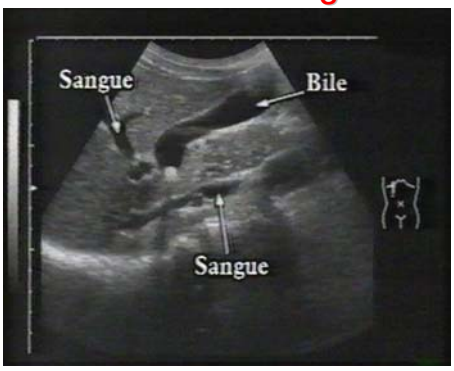
Semeiotica US

l'immagine come è rappresentata

Strutture iperecogene

ad alto grado di luminosità

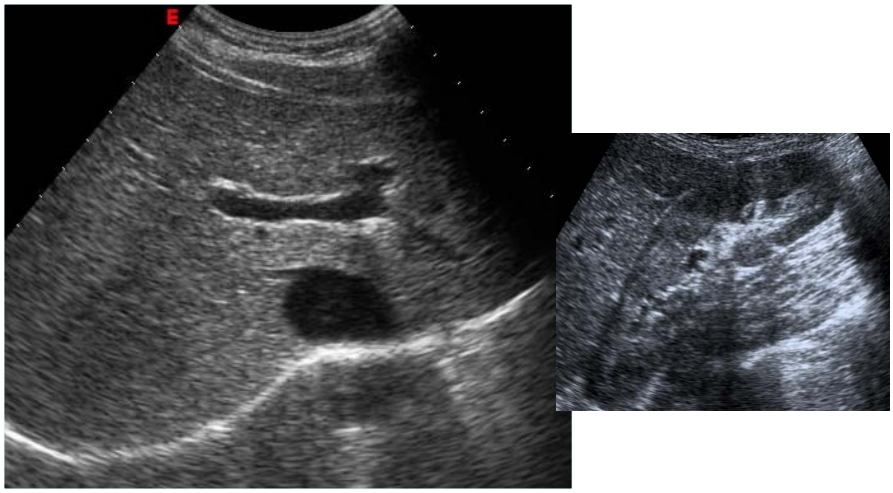
Strutture anecogene



prive di echi

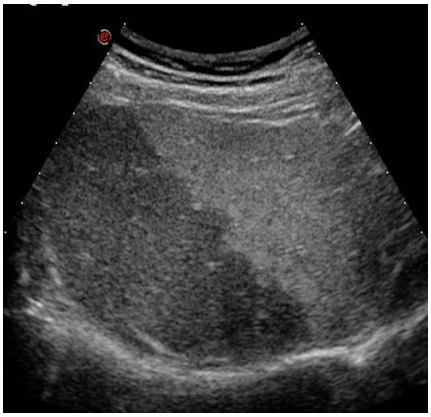
Semeiotica e semantica US

parenchima epatico normale



Semeiotica e semantica US

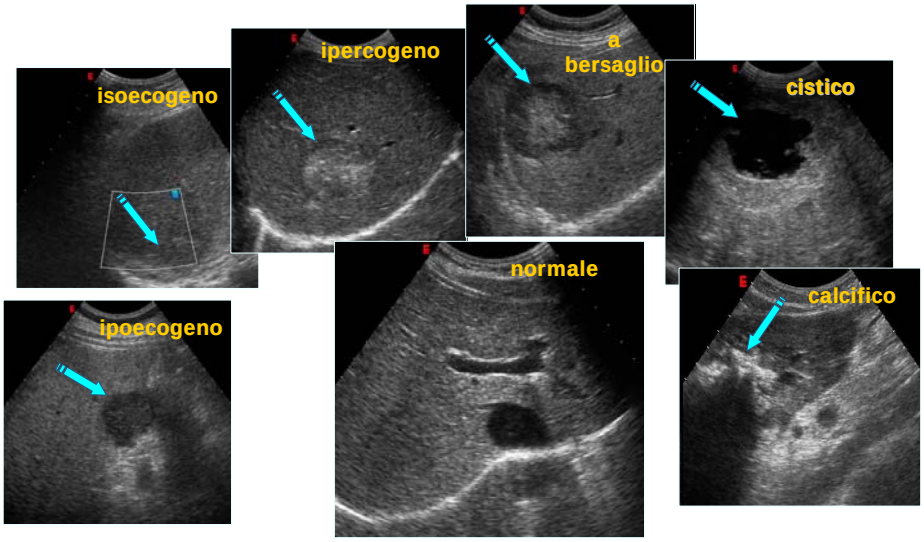
epatopatie diffuse



“bright liver pattern” “coarse liver pattern”

Semeiotica e semantica US

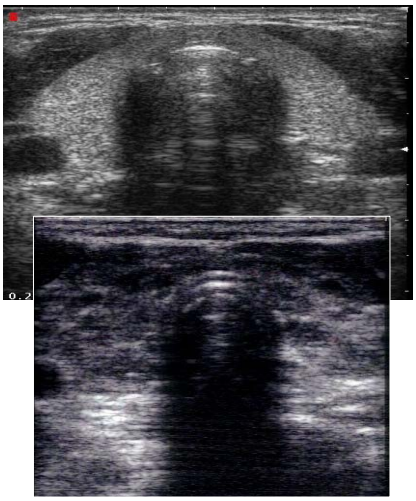
lesioni focali epatiche



Semeiotica e semantica US

extraepatica

Pancreas



Tiroide

“Echoscopy” and “Point of Care US”

(ruolo e percorso formativo)

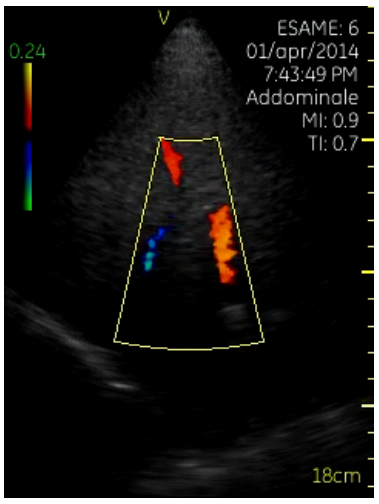
Ecoscopy

(diagnostic power and use)

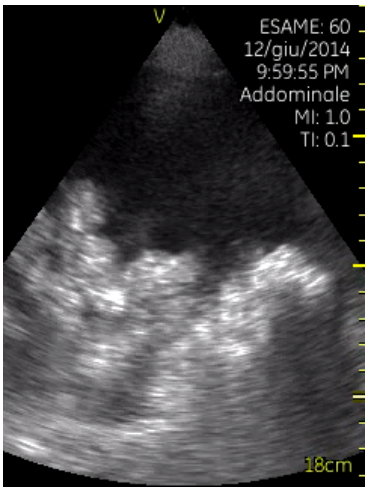
- Pleural, pericardial, peritoneal effusions (p/a, extent)
- Wet or dry lung (p/a)
- Dilated heart ventricles (p/a)
- Severe cardiac systolic dysfunction (p/a)
- Collapsible inferior vena cava (p/a)
- Palpable or suspected abdominal mass (p/a, solid vs liquid)
- Atrophy or megaly of abdominal viscera (p/a)
- Hydrops of the gallbladder (p/a, large stones)
- Hydronephrosis (p/a)
- Intestinal and biliary obstruction (p/a)
- Abdominal aortic aneurysm (p/a)
- Bladder outlet obstruction (p/a)
- Thoracentesis, paracentesis US-assisted
- Catheter into the bladder (*) (p/a)

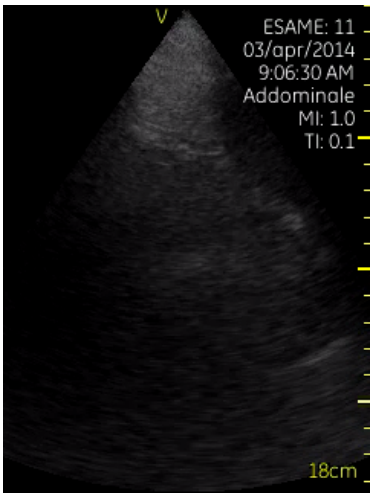
p/a: presence vs. absence
**: also performed by the nursing staff*

Ecoscopy



Ecoscopy





Point of Care US

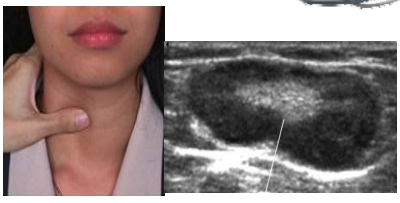
(diagnostic power and use)

1st module: Fundamentals in US

- Fundamentals of clinical bedside US examen
- Bedside US devices machines
- Indications to referral to second opinion or expert levels:
  - Fundamental US
  - Contrast Enhancement US (CEUS)
  - Interventional US

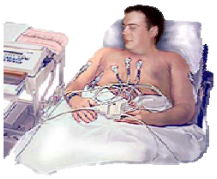
2nd module: Patients with neck nodules

- The nodule of the neck: clinical approach
- Normal US findings
- Salivary gland disease
- The thyroid nodule
- Superficial lymphadenopathy



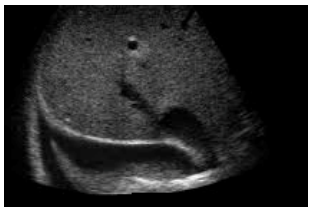
Point of Care US

(diagnostic power and use)



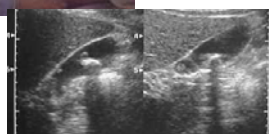
3rd module: Patient with cardio-respiratory pathology

- Dyspnoea: clinical approach
- Normal US findings
- Pleural and pericardial effusion
- Interstitial pathology, pleural or pulmonary consolidations, PNX
- Dimensions of cardiac chambers
- Normokinesis, hypokinesis, hyperkinesia: inspective EF
- Severe valvulopaty
- Inferior vena cava
- US-guided thoracentesis



Point of Care US

(diagnostic power and use)



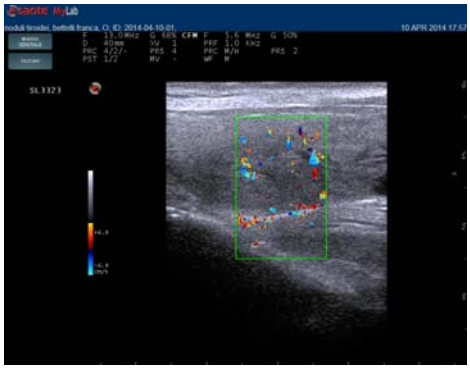
4th module: Patients with abdominal diseases

- Acute abdomen: clinical approach
- Normal US findings
- Ascites and abdominal masses
- Focal parenchymal lesions ([2 cm)
- Jaundice, cholelithiasis, cholecystitis, cholangitis
- Renal failure, hydronephrosis, renal stones
- Abdominal aortic aneurysm (surgery or follow-up?)
- Bowel obstruction, appendicitis, diverticulitis, IBD and tumours
- US-guided paracentesis

5th module: Patients with limb edema

- "Swollen" leg: clinical approach
- Normal US findings
- Deep venous thrombosis (DVT

Point of care US



Gozzo multinodulare

Tumore di Klansky

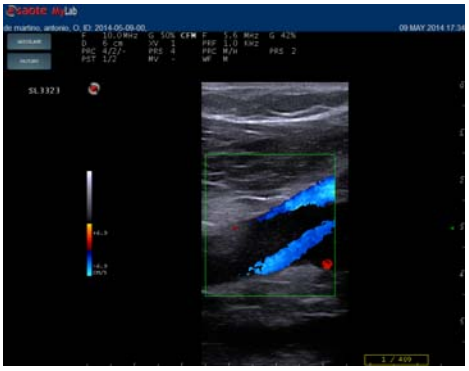
Point of care US

Colecistite acuta

Pancreatite acuta

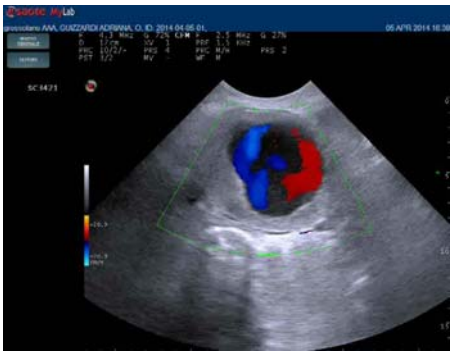
Point of care US

Trauma splenico



TVP

Point of care US



Aneurisma AA

Master SIMI in Eco Bedside

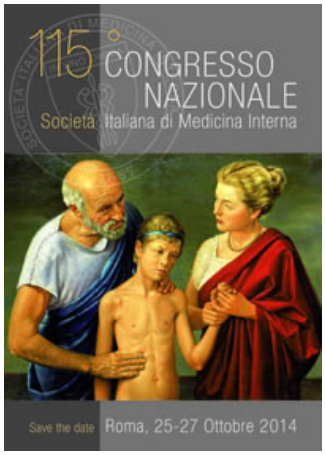
Master in Ecoscopy

The SIMI certificate of competence of first level of bedside US is achieved by means of participation in:
1) theory bedside US course held every year in the SIMI National Congress
2) theory and practical bedside US stage of one week in a SIMI School, according to the educational program of Ecoscopy

Master in Point of Care US

The SIMI certificate of competence of second level of bedside US is achieved by means of :
1) acquisition of the certificate of Master SIMI in Ecoscopy
2) participation in one theory bedside US course in a SIMI Naz School
3) practical bedside US stage of two weeks in a SIMI Naz School, according to the educational program of Point of care US

Minimaster SIMI di Ecografia Bedside di I livello



Corso di Ecografia Bedside: l'ecoscopia, ovvero il fonendoscopio ad ultrasuoni
(semeiotica ecoscopica normale e patologica in Medicina Interna)

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