GAVePed
Primo Convegno Nazionale

GAVePed
Gruppo Accessi Venosi Pediatrici

L'*educazione* e il *training* oggi in Italia e in Europa: requisiti minimi necessari per tutorare e impiantare cateteri venosi ecoguidati nel paziente pediatrico e nel neonato

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Gemelli

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Università Cattolica del Sacro Cuore

EcoTIME
Ecografia in Terapia Intensiva e Medicina dell'Emergenza


OPERATION
SILLY SKILL GAME
With SOUND FX!


L'ALLEGRO CHIRURGO
EFFETTI SONORI!

How to train?

Training in Medicine

Traditional Educational Approach (Halsted, 1892)

1) <u>KNOWLEDGE</u>

2) LEARNING BY DOING:
SKILLS (TS + nTS) + JUDGEMENT

Training in Medicine

- Knowledge → Sapere
- Skills (tech + non-tech) → Saperlo fare (come)
- Good judgement: →Sapere quando farlo

Bloom, 1956


Atul Gawande
Salvo complicazioni
Appunti di un chirurgo americano
su una scienza imperfetta
(Fusi orari)


SEEN ONE
DONE ONE
TAUGHT ONE

Training in Medicine

Laparoscopy & Endoscopy

Ultrasound-Guided Interventional

Procedures

Psychomotor Skills:
HAND-EYE COORDINATION

Ethical and Professional Issues

Moving from “learning by doing” to simulation

Training Today

- Knowledge
- Psycho-motor skills
  - Technical Skills
  - Non-technical Skills
  - Automaticity
- Good Judgement
- Communication & Teamworking

SIMULATION/CRM

Training in US-VA

- **Didactic Lectures = Knowledge**

- Laboratory Training
  - Ultrasound examination on healthy volunteers
  - Hands-on Simulation

SIMULATION

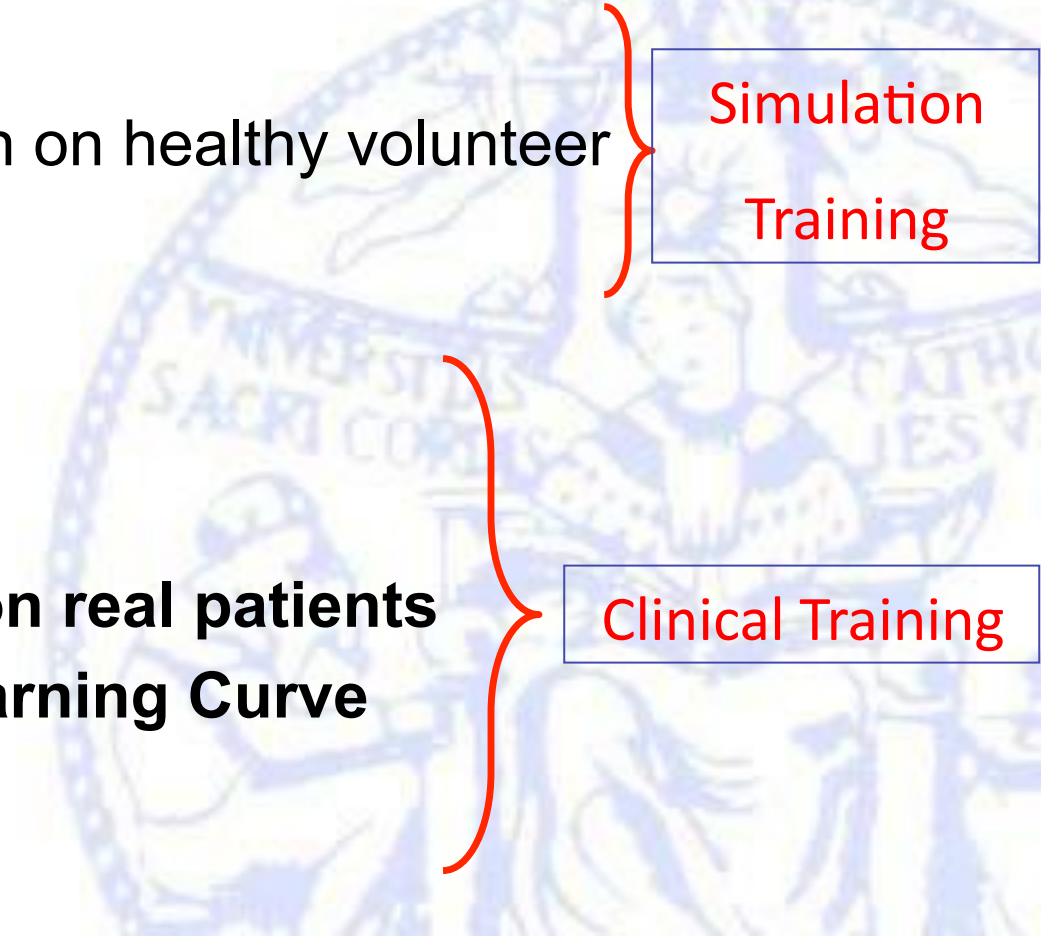
- Proctoring
  - Direct observation
  - Tutored procedures on real patients

Training in US Guided VA Today

- Didactic Lectures = Knowledge

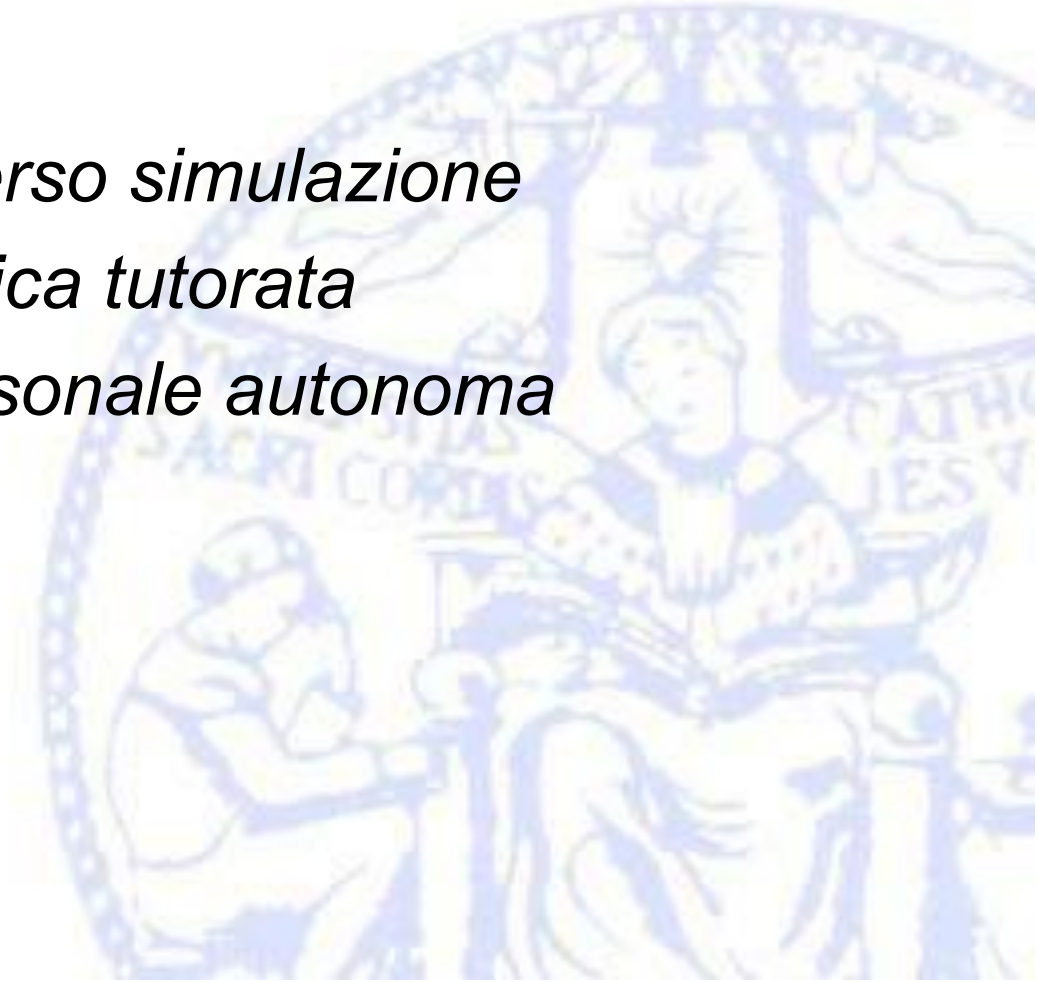
- Laboratory Training
  - Ultrasound examination on healthy volunteer
  - Hands-on Simulation

- Proctoring Phase
  - Direct observation
  - **Tutored procedures on real patients**
- **Personal 'untutored' Learning Curve**
- Final Clinical Audit



State of the art

- <u>Aspetti definiti</u>
  - *Didattica Teorica*
  - *Lab-training attraverso simulazione*
  - *Learning curve clinica tutorata*
  - *Learning curve personale autonoma*
  - *Audit clinico*



State of the art

- Molte le questioni da definire
  - *Numero di procedure (?)*
  - *% di complicanze per ciascuna tecnica?*
  - *Durata del training*
  - *Mantenimento proficiency*
  - *Caratteristiche dell'istruttore*
  - *Rilevatori istituzionali di efficacia del training: quali outcomes?*
  - *Personale dedicato al paziente pediatrico*
  - *Percorso di certificazione e accreditamento*

Training in Medicine

- Università
  - Corso di laurea
    - *Medicina e Chirurgia*
    - *Infermieristica*
- Scuole di Specializzazione
- Professionisti con consolidata esperienza lavorativa

Differenti tecniche di insegnamento

Intensive Care Med
DOI: 10.1007/s00134-012-2597-x

CONFERENCE REPORTS AND EXPERT PANEL

Massimo Lamperti
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Thierry Pirotte
Dimitrios Karakitsos
Jack Lefrant
Stephanie Doniger
Giancarlo Scoppettuolo
David Feller-Kopman
Wolfram Schummer
Roberto Biffi
Eric Duncan
Lawrence A. Melniker
Susan T. Verghese

International evidence-based recommendations on ultrasound-guided vascular access

British Journal of Anaesthesia Page 1 of 10
doi:10.1093/bja/aes499

BJA

Evidence-based consensus on the insertion of central venous access devices: definition of minimal requirements for training

N. Moureau[1], M. Lamperti[2*], L. J. Kelly[3], R. Dawson[4], M. Elbarbary[5], A. J. H. van Boxtel[6] and M. Pittiruti[7]

EUROPEAN GUIDELINES ON PERIOPERATIVE USE OF ULTRASOUND (PERSEUS): VASCULAR ACCESS

Massimo Lamperti, Daniele Guerino Biasucci, Nicola Disma, Mauro Pittiruti, Christian Breschan, Davide Vailati, Matteo Subert, Emmanuel Boselli, Vilma Traškaitė, Andrius Macas, Jean-Pierre Estebe, Regis Fuzier, and Philip Hopkins

European Society of Anaesthesiology ESA

Intensive Care Med
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International evidence-based recommendations on ultrasound-guided vascular access

WINFOCUS

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

WoCoVA
World Congress Vascular Access

Table 5 Recommendations on education, training and accreditation in ultrasound-guided vascular access

Education and training in ultrasound for vascular access placement				
Domain code	Suggested definition	Level of evidence	Degree of consensus	Strength of recommendation
DUGVA-S2A	Ultrasound-assistance should be included in the design and conduct of education and training for venous and arterial cannulation	B	Weak	Strong
DUGVA-S2B	Ultrasound guidance should be included in the design and conduct of education and training for venous and arterial cannulation	A	Perfect	Strong
DUGV3	Clinical simulation techniques should be included in the design and conduct of education and training for all forms of vascular cannulation	B	Good	Strong
DUGV3-4	Ultrasound guidance should be used for any vascular access procedure in adults as in children and neonates where the trainee has obtained appropriate competence	B	Good	Strong
Accreditation of the ultrasound vascular access skills				
DUGV1	Accreditation, credentialing or documentation of proficiency of a clinical learner in ultrasound vascular procedures should include formal education and training (clinical simulation) in an ultrasound-based curriculum	NA	Good	Strong
DUGV2-1	Accreditation, credentialing or documentation of proficiency of a clinical learner in ultrasound vascular procedures should include independent evaluation of those procedures performed in real practice by the candidate	NA	Good	Strong
DUGV4	There should be development of a consensus standard for the accreditation of training and education programs in ultrasound-guided cannulation	NA	Good	Strong

NA not applicable

Lamperti et al. ICM 2012

- *Formal education with theoretical lessons on*
  - *ultrasound physics;*
  - *ultrasound anatomy (knobology) and*
  - *hands-on-training on inanimate models could achieve standardisation across medical centres …”*

Lamperti et al. ICM 2012

- *"…**simulation** provides an optimal training milieu for the teaching and practice of ultrasound guidance by learners …*
- *Simulation models can also provide essential psychomotor feedback required for optimal learning of ultrasound-guided cannulation…*
- *importance of independent **evaluation of learner performance** before and after the teaching intervention to allow objective confirmation of whether the learner has mastered the content of the clinical course…"*

La Consensus WoCoVA

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- Rigorosamente *'Evidence-based'*
- Utilizzato il metodo GRADE-RAND raccomandato dalla Cochrane Rev. Come metodo di scelta per le consensus
- ISO e JCAHO accettano solo metodi di certificazione basati su EBM

BJA

Evidence-based consensus on the insertion of central venous access devices: definition of minimal requirements for training

Experiential learning is a model of learning, in which learning/meaning is derived from direct experience. According to Bruner,[25] professional judgement and higher level skills can be gained from repeated patient care experiences. Experiential learning can be attained in a reflective cycle such as Kolb's learning cycle.[26] This cycle applies to patient experiences by observing and reflecting, formulating abstracts and generalizations, and finally testing the implications of concepts in new situations. Theoretical perspective and empirical knowledge are gained from various disciplines including: psychology, sociology, ethics, management, education, and biological sciences.

Experiential education is a methodology where educators/mentors purposefully engage with learners in direct experience and reflection in order to increase knowledge, develop skills, and clarify values.[27] The practical application of experiential learning has to take into account the learner's previous experience, knowledge base, and theoretical preparation. Context of learning will vary, but will guide the learner from being dependent to becoming a supervised participant and then, onto supported independence.

Il metodo: experential learning and education

1. Necessario un training clinico

BJA

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Situated learning is a model of learning in a community of practice where learning is derived from active or guided participation. Guided participation involves cognitive (thinking) ability, problem solving, adequate knowledge, personal skills, and appropriate attitudes and values. Students learn best when involved in genuine professional practice, supported by an experienced, capable mentor. The experienced

2. Full immersion (seguire il processo decisionale in casi concreti
3. Competenza "globale" (non solo venipuntura)

Training Strutturato

- Didattica Teorica
- Training di laboratorio
  - Volontari sani
  - Simulatori
- Training clinico e Personal Learning Curve
- Audit Clinico e Valutazione Performance

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W_R1 Didactic Educational Content	Education on anatomy and physiology is relevant to ultrasound guidance, vein assessment, and selection, and complications that may occur at any possible CVAD insertion site. Specific knowledge of vessel characteristics, skin, peripheral nervous, respiratory, and cardiac systems is included. Insertion sites for central venous access include: upper arm, chest, neck, and inguinal. Anatomy and physiology include both typical and variant presentations

- Anatomia normale e variabilità anatomica
- Principi di tecnica ecoguidata
- Algoritmi di scelta della vena
- Scelta dell'accesso venoso
- Indicazioni
- Possibili complicanze e loro riconoscimento

Anatomy

Knowledge of anatomy affects decision-making and may help to avoid insertion complications (inadvertent nerve, arterial, or lung puncture).[1] Inexperience leads to more attempts, more trauma during insertion procedures, increasing the risk of infections.[14 15 34 35] This supports the idea that more training and knowledge of relevant anatomy and physiology reduces complications during CVAD insertions.[36]

In terms of insertion site selection: the vessels, skin, and nerves systems directly impact the ability to insert and maintain a CVAD. Additional body systems include musculoskeletal, cardiac, and respiratory systems. Infection and thrombosis can both be impacted by site selection, skin integrity, and catheter–vein ratio (CVR).[8 34 37–39]

Anatomy and physiology training content:

- Vessel anatomy, location, size, and path[19 37]
- Vessel differentiation with ultrasound[8 19]
- Blood flow dynamics[8]
- Virchow's triad[8]
- Skin integrity, colonization[7]
- Peripheral nerve identification and distribution[19]
- Respiratory anatomy[8 19]
- Upper and lower extremity, axillary, neck, and chest anatomy[8 19]

W_R2 Didactic Education on Ultrasound-guided Technique	Education for using ultrasound for vein access and assessment is a component of any CVAD insertion course. Education includes: physics of ultrasound, image optimization, image analysis, anatomical assessment of both normal and variant anatomy, and simulation skills training. Landmark techniques are also components of CVAD education programmes in case circumstances arise that do not permit the use of ultrasound. Educational programmes emphasize the indisputable benefit of ultrasound for CVAD insertion

- Basi dell'ecografia per una corretta acquisizione e interpretazione dell'immagine ecografica
- Knobology
- Anatomia ecografica e variabilità anatomica
- Venipuntura 'eco-guidata'
- Uso globale dell'ecografo
- DIDATTICA TEORICA + LAB TRAINING/ SIMULAZIONE

Table 2 Recommended curriculum for ultrasound vascular assessment and intravascular placement[19]

Procedural ultrasound	Skills required
	Describe the indications and limitations when using ultrasound to assist in bedside procedures
	Define the relevant local anatomy for vascular access—central and peripheral placement
	Understand the standard protocols when using ultrasound to assist in procedures
Physics/ knobology	Skills required
	Understand the role of physics in ultrasound
	Define necessary terms: piezoelectric effect, frequency, resolution, attenuation, echogenicity, Doppler
	Understand the role of instrumentation in image acquisition
	Image mode, gain, time gain compensation, probe types
	Understand types of ultrasound artifacts and their role in image acquisition: mirroring, reverberation, shadowing, enhancement

Ecografia e Accessi Vascolari Oggi

Valutazione Ecografica Preliminare

Puntura ecoguidata

Controllo della punta

Diagnosi/Esclusione PNX/Emotorace

TEACHING PROTOCOL

Theory

ULTRASOUND ISSUES

- Basic principles of US physics
- US anatomy of the arm
- US guided vein sticking techniques
- Pitfalls of US imaging and US needle visualization
- Complications of improper US guidance and prevention of common mistakes

VASCULAR ACCESS ISSUES

- Indications for Venous Catheters insertion and criteria for a correct device selection
- Early and late complications and their prevention
- Role of US in preventing early and late complications
- International guidelines regarding device selection, insertion and management

W_R5 Education on Catheters	Topics in educational programmes include catheter: material composition, size, features, and number of lumen. Focus education on various risks vs benefits of catheter features for both short- and long-term use

- Classificazione dei cateteri
- Materiali: vantaggi e svantaggi
- Tecnologia della Power Injectability

Device selection and indications

Device characteristics and indications for use affect the selection of a CVAD and contribute to successful completion of the treatment plan. The size of a catheter influences flow which impacts the risk of vessel wall damage.[15 29 42] There is a debate over whether valved catheters impact device function and decrease overall risk to the patient. Multilumen catheters are considered higher risk for infection-related complications compared with those with fewer lumens.[8] It is incumbent on any education programme to provide current research information on CVAD design features and how these features influence risk profiles.

TEACHING PROTOCOL

4 hours of lab training

Vascular anatomy and US probe handling on healthy volunteers

Training on a home-made phantom, according to a strictly standardized step-by-step skills session protocol

W_R3 Education on Tip Placement	Education on CVAD tip placement is based on three essential features that reduce risk: high blood flow, parallel positioning to the vessel, and pulsatility of blood flow. To achieve these three ideal factors of tip location, the tip of the CVAD is at or near the cavo-atrial junction

- Corretto posizionamento della punta
- Tecniche di ‘tip location’
- Tecniche di ‘tip navigation’
- DIDATTICA TEORICA + LAB TRAINING/ SIMULAZIONE

W_R4 Infection

Education to prevent catheter-related primary bloodstream infections focus on pre, intra, and post-procedure insertion, care, and maintenance. Three main sources of infection contamination: the catheter–skin junction (extraluminal), the needleless connector and hub (intraluminal), and iatrogenic contamination. Topics to include: site selection, device selection, indications for use, maximal barrier precautions, hand washing, skin antisepsis, and the use of central line checklists are included in CVAD insertion course. Observers, empowered to stop a procedure if contaminated, are part of the implementation of the educational programme

- Prevenzione delle CR-BSI
- Pre-, Intra- & post- procedura
- DIDATTICA TEORICA + LAB TRAINING/ SIMULAZIONE


SIMULATION
CENTER
102
OFFICE

ORIGINAL INVESTIGATION

Use of Simulation-Based Education to Reduce Catheter-Related Bloodstream Infections

Arch Intern Med. 2009;169(15):1420-1423

Jeffrey H. Barsuk, MD; Elaine R. Cohen, BA; Joe Feinglass, PhD; William C. McGaghie, PhD; Diane B. Wayne, MD

- Ultrasound training on simulators
- First study ever to demonstrates positive effects of simulation training on clinical outcome

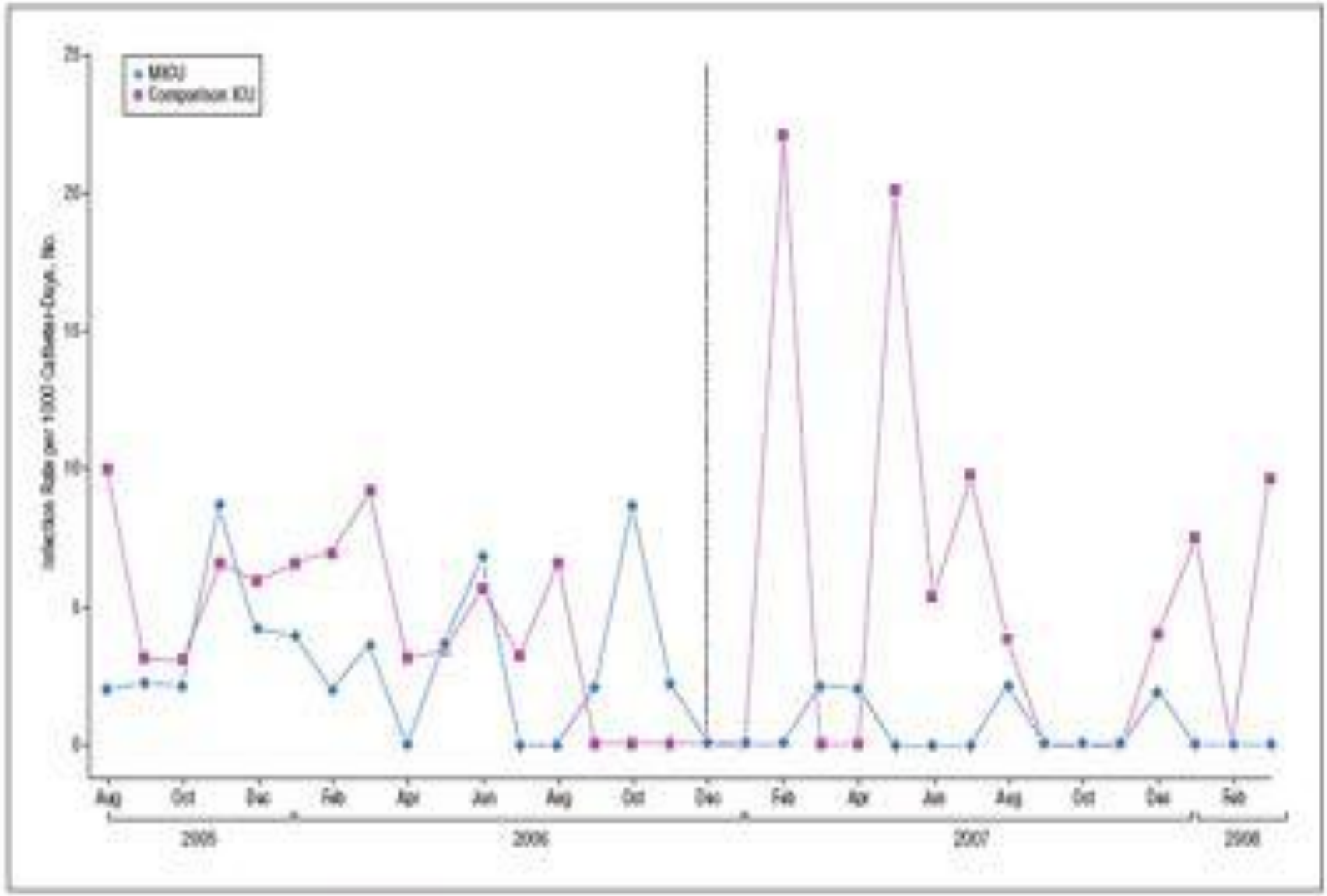


Figure 2. Monthly catheter-related bloodstream infection rates in a medical intensive care unit (MICU) and a comparison intensive care unit (ICU) before and after a simulation-based educational intervention in the MICU. The vertical line at December 2006 indicates the time that simulator-trained residents entered the MICU.

W_R6 Education on Procedure	Any central venous access educational programme includes insertion procedure for respective device placement, with both typical and variant scenarios
W_R9 Ultrasound Simulation	A simulation practice on ultrasound anatomy is included in the curriculum of CVAD placement training

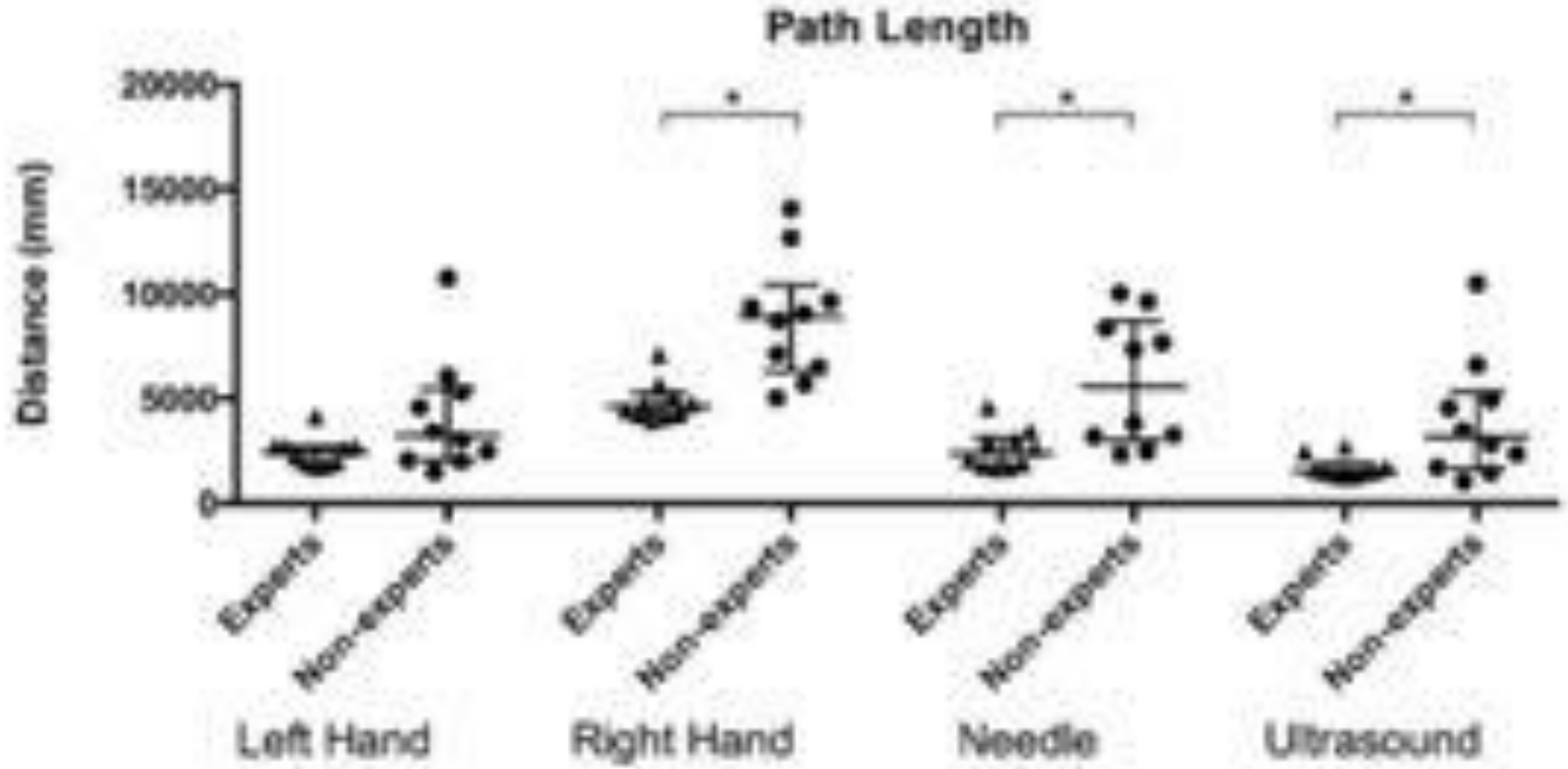
- Procedura di impianto
- Linee guida da Letteratura e procedure locali aggiornate evidence-based

Academic Emergency Medicine
Official Journal of the Society for Academic Emergency Medicine

EDUCATIONAL ADVANCE

The Development and Validation of Hand Motion Analysis to Evaluate Competency in Central Line Catheterization

David Clinkard, MSc, Matthew Holden, MSc, Tamas Ungi, MD, PhD, David Messenger, MD, FRCPC, Colleen Davison, PhD, Gabor Fichtinger, PhD, and Robert McGraw, MD, FRCPC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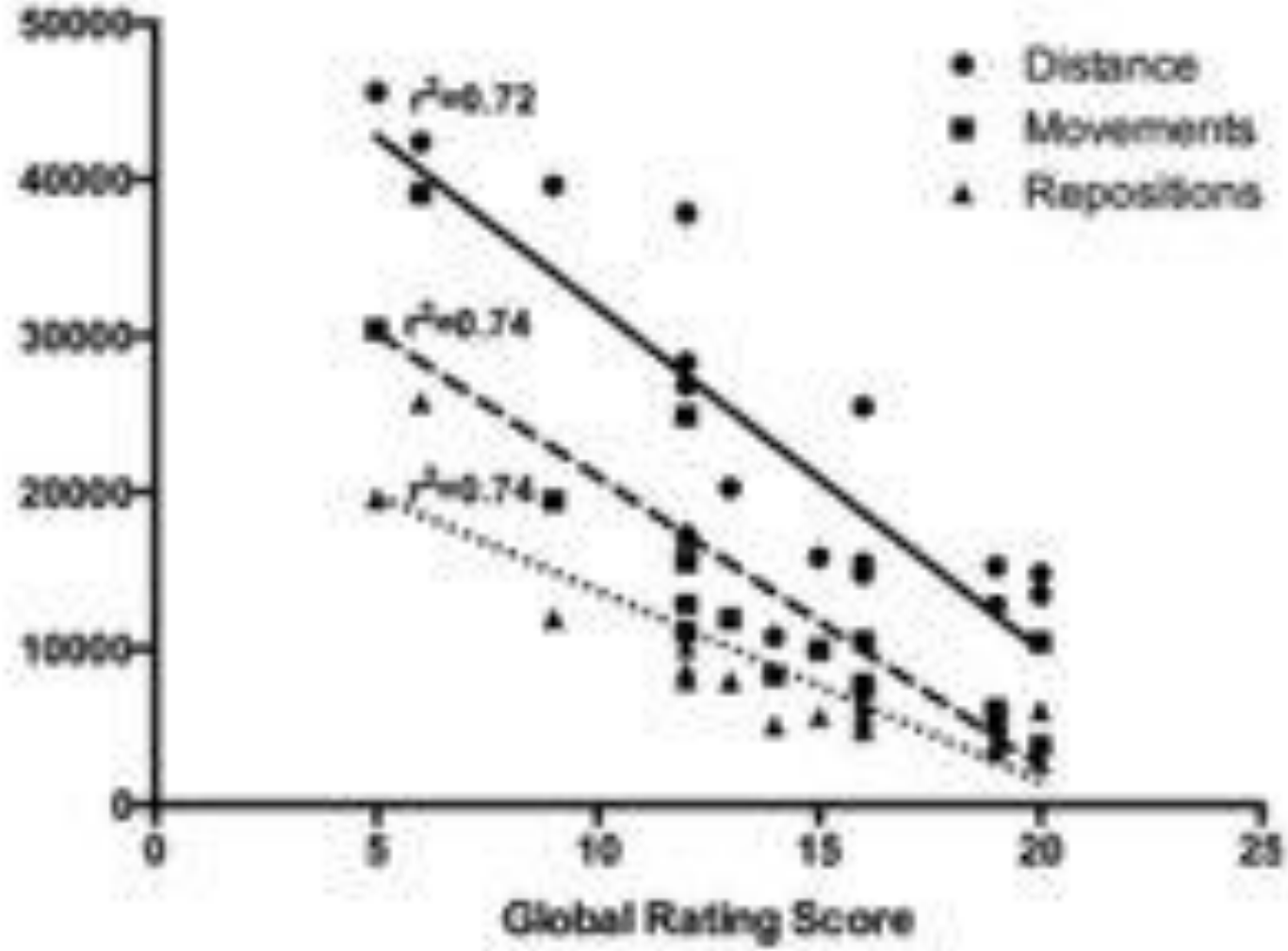
Left Hand
Right Hand
Needle
Ultrasound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Global Rating Score
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Repositions
r²=0.72
r²=0.74
r²=0.74

Targeting zero: minimizzare le complicanze associate all'impianto e alla gestione degli accessi venosi

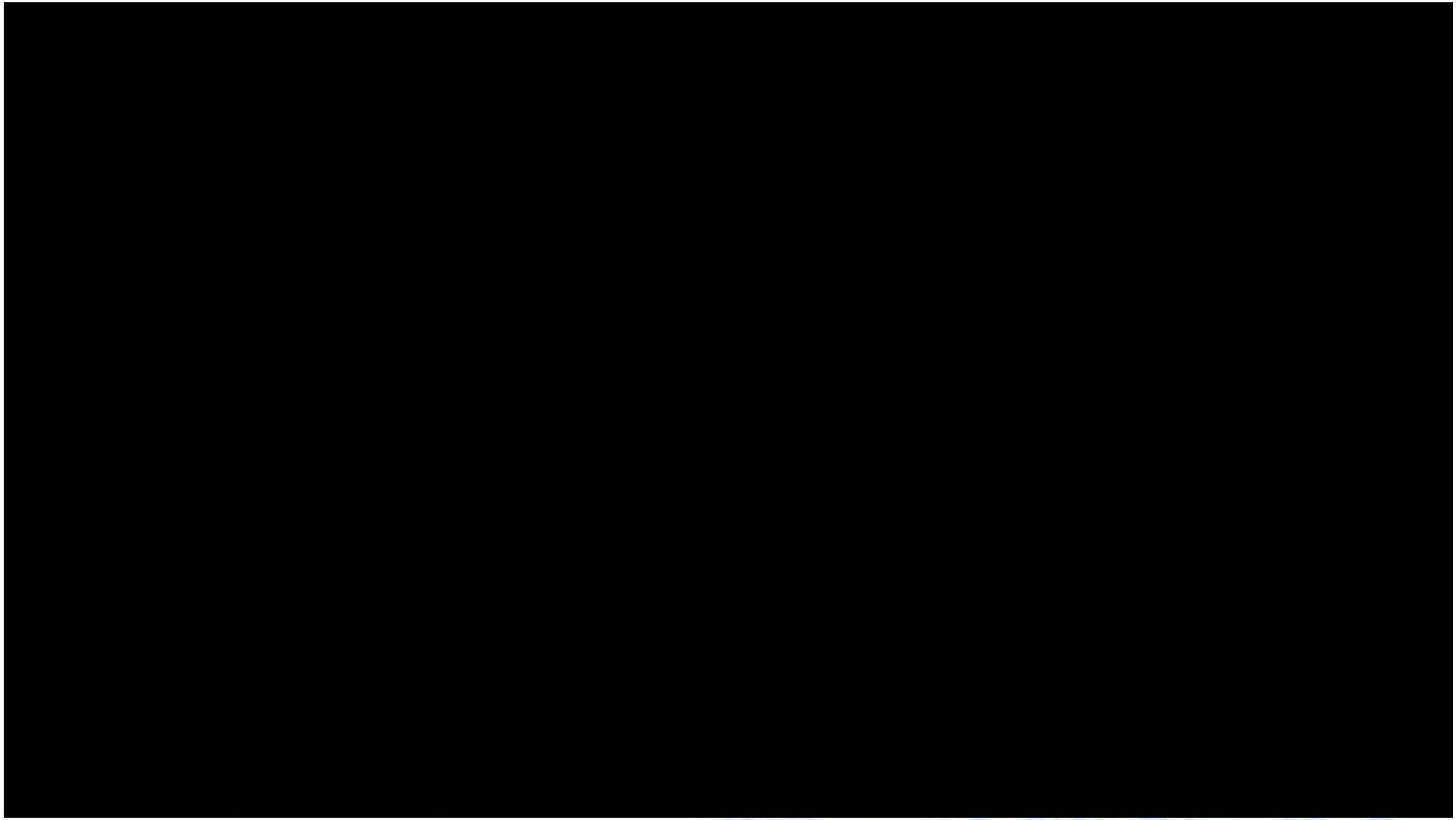
Targeting zero: how to minimize the complications associated to insertion and management of venous access devices

Human Factors

Technology

Organisation

In questo video contate quante volte I giocatori in bianco passano la palla



- 14
- 15
- 16

- 14
  - 15
- 16

Avete visto il gorilla?

Almeno la metà di voi non ha visto il gorilla

- Per chi tra voi ha notato il gorilla…
- Per chi era già a conoscenza di questo test…

Ce n’è un altro…

In questo video contate quante volte I giocatori in bianco passano la palla

Se cercate il gorilla potreste non controllare altri eventi inaspettati

- Avete visto la tenda cambiare colore?
- Avete visto 1 giocatore vestito di nero lasciare il gioco?

Simulation is the answer!

- "Improving one's susceptibility to errors by increasing one's awareness of the risk, and habitually stepping back and revise diagnoses and procedures…"

Weller JM,. Anaesthesia & Intensive Care 2008; 36: 185–9.

- "Simulation training is effective in achieving these aims!"

St Pierre M, Hofinger G, Buerschaper C. Crisis Management in Acute Care Settings: Human Factors and Team Psychology in a High Stakes Environment. Berlin: Springer, 2007; 74– 8.

"In a simulated environment, errors can be allowed to progress to teach the trainee the implications of the error and allow reactions to rectify deviations"

Ziv A ACADEMIC MEDICINE, VOL. 78, NO. 8 / AUGUST 2003

"Tell me and I forget,

Teach me and I may remember,

Involve me and I learn"

Benjamin Franklin

Lesson Learned from Flight Deck

Since the ’60s, aviation accidents dramatically decreased after the implementation of standardized training based mostly on simulation

Aviation (and nuclear) industries has developed high-fidelity simulation training programs improving the non-technical skills of teams through Crew Resource Management programs (CRM).

“It is frightening to speculate the level of mortality that might ensue if pilots received the same level of training that surgeons are currently subjected to in learning new surgical procedures”

L Tafra 2001

Simulation in Medicine

- Anaesthesiology was one of the first medical specialties to demonstrate the impact of human factors
- In the early ‘90s, David Gaba and colleagues, at Stanford University, developed the concept of Anaesthesia Crisis Resource Management (ACRM), which addressed human factors in the operating-room setting
- Since then, as the concept extended into different domains and specialties, it was called Crisis Resource Management (CRM)

Gaba D, Anesthesiology, 1992

CRM Principles

- Points regarding cognitive aspects and decision making

Know your environment

Anticipate & plan

Allocate all available informations

Prevent or manage fixation errors

Repeatedly reassess

Use cognitive aids

Cross check

Repeatedly reassess

Set priorities dynamically

Allocate attention wisely

- Points regarding Teamwork and Resource Management

Call for help early enough

Good Teamworking: membership and leadership role

Communicate effectively: closed loop communication

Distribute the workload

use all available resources

Rall & Gaba, 2010

Closed Loop Communication

- Misinterpreted communication can result in adverse events

  ✳ What is said may not be what is heard

  ✳ What is heard may not be what is understood

  ✳ What is understood may not be what is done

A case of Miscommunication

- Agitated patient, intubated
- Doctor: 'Please, give 20 Propofol'
- Nurse: 'Ok' and applying 20 ml of Propofol claims: '20 propofol are in'

Blood pressure crashes and patient goes into CA

Intention was 20 mg, not 200 mg

Simulation

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Anatomical models

There are a variety of inanimate models useful for simulating vessel anatomy visualization with ultrasound. The best simulation models should include vessels and also mimic the normal body anatomy with muscles, soft tissues, and bones. For this reason, inanimate animal models such as turkey breasts may be effective for simulation practice with ultrasound.

In the future, virtual simulators may be available for perfect hand–eye coordination of the trainee.[53–55]

Simulation Technology

Types of Simulation Technology

Mannequin-based simulators	Mannequin-based, or "high-fidelity," simulators use sophisticated computer-driven electronic and pneumatic mannequins to provide health care professionals with realistic patients that breathe, respond to drugs, talk, and have vital sign outputs into the clinical monitoring equipment in the treatment room.
Partial or complex task trainers	Provide a highly realistic yet focused experience for the learner and are designed for a specific procedure, such as central line placement, bronchoscopy, or airway management.
Screen-based computer simulators	Programs that run on personal computers or the Internet that allow learners to work through cases using clinical knowledge and critical decision-making skills.
Standardized patients	"Actors" specifically trained to present their medical histories, simulate physical symptoms, and portray emotions as specified by each case.
VR	VR is a simulated, immersive environment, created by a combination of computer based images and interface devices. A VR environment may include visual stimuli, sound, motion, and smell.

VR = virtual reality.

McLaughlin et al., Acad Emerg Med, 2008

Phantoms

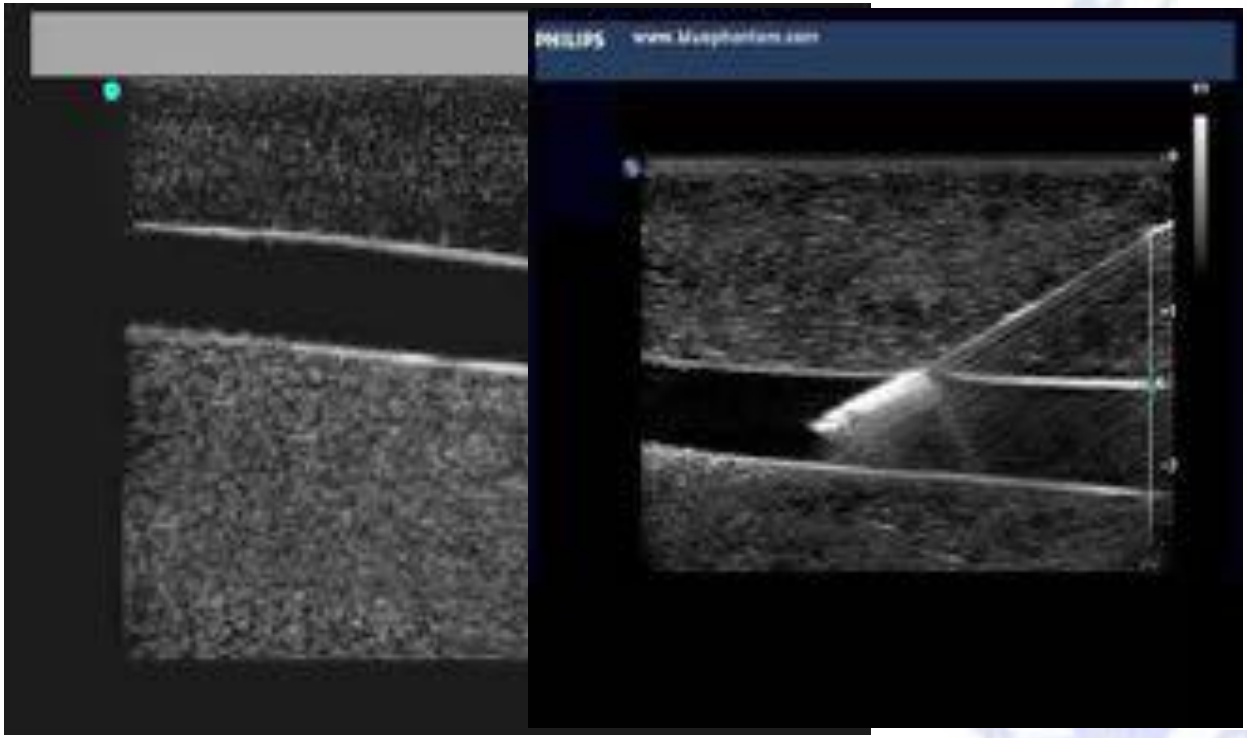
Commercial,

anatomical phantoms

Phantoms

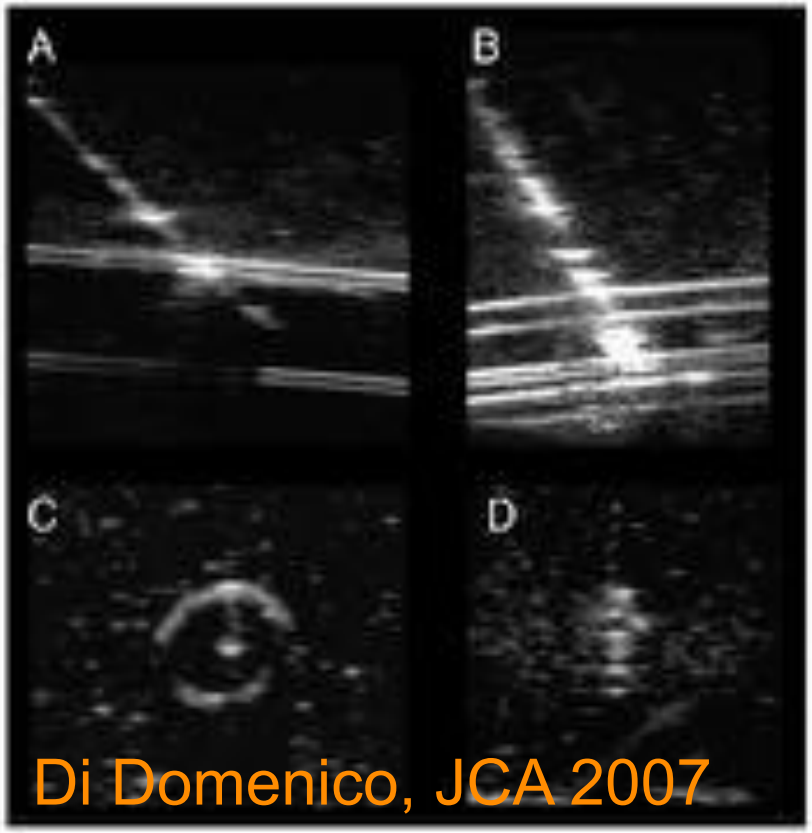
Commercial,

simplified phantoms

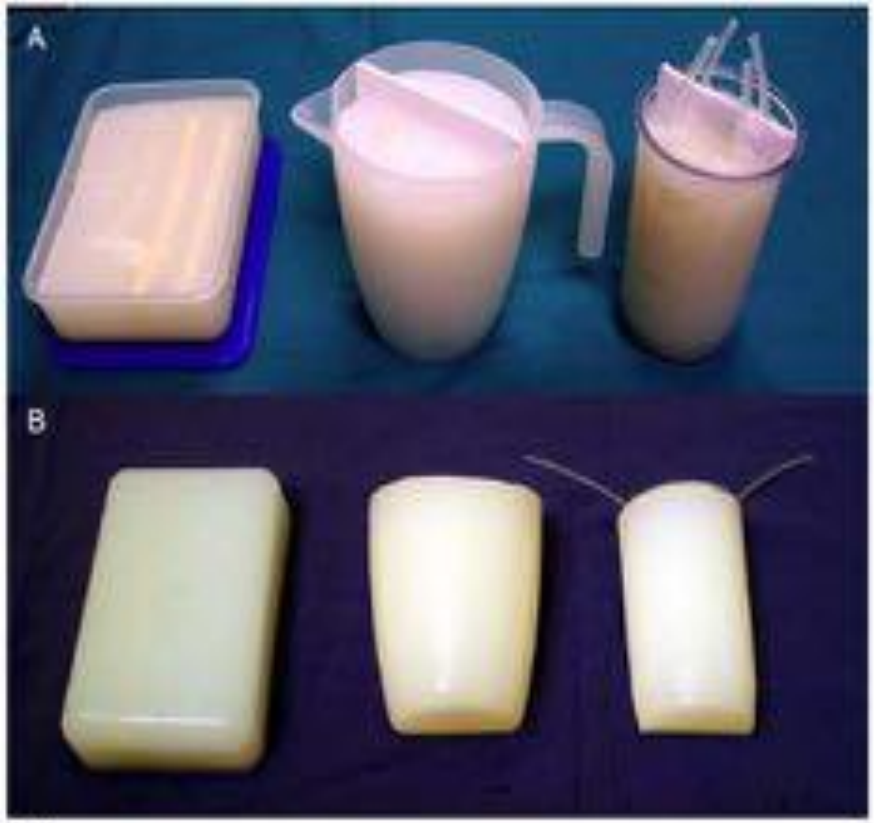


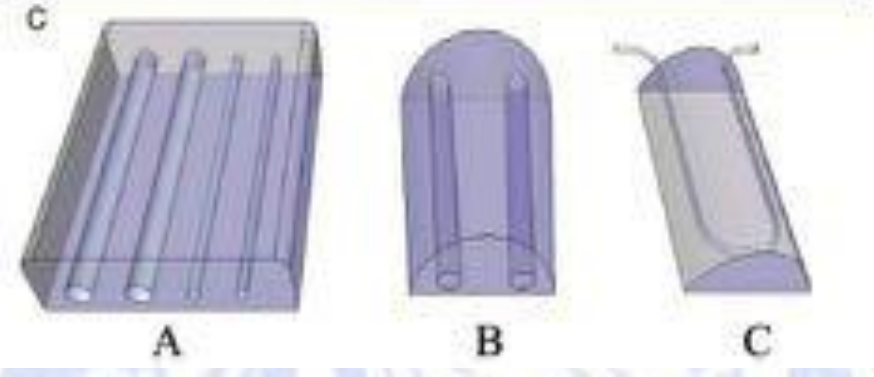
Phantoms

Home made,
simplified phantoms



Di Domenico, JCA 2007

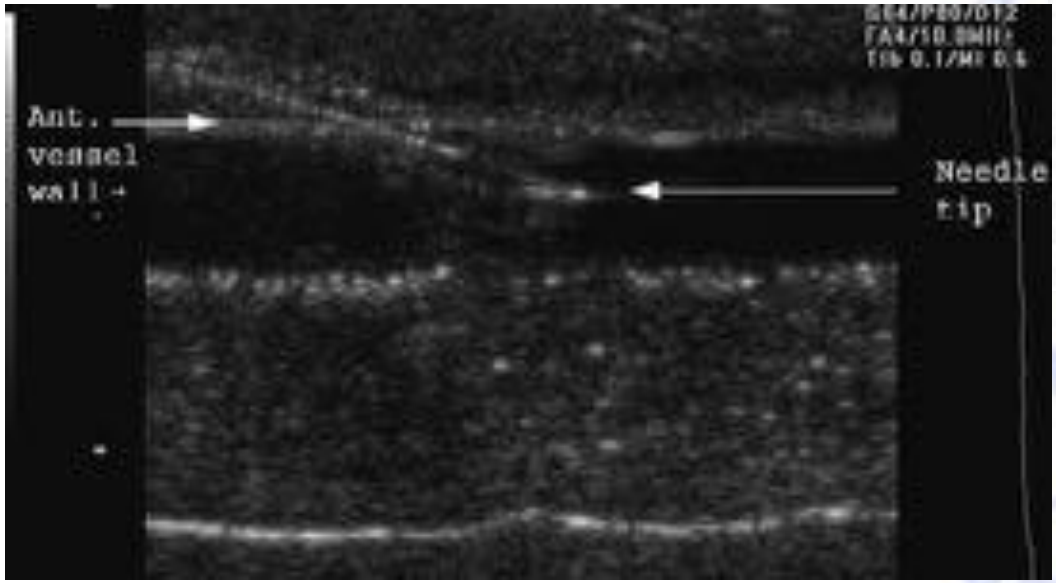


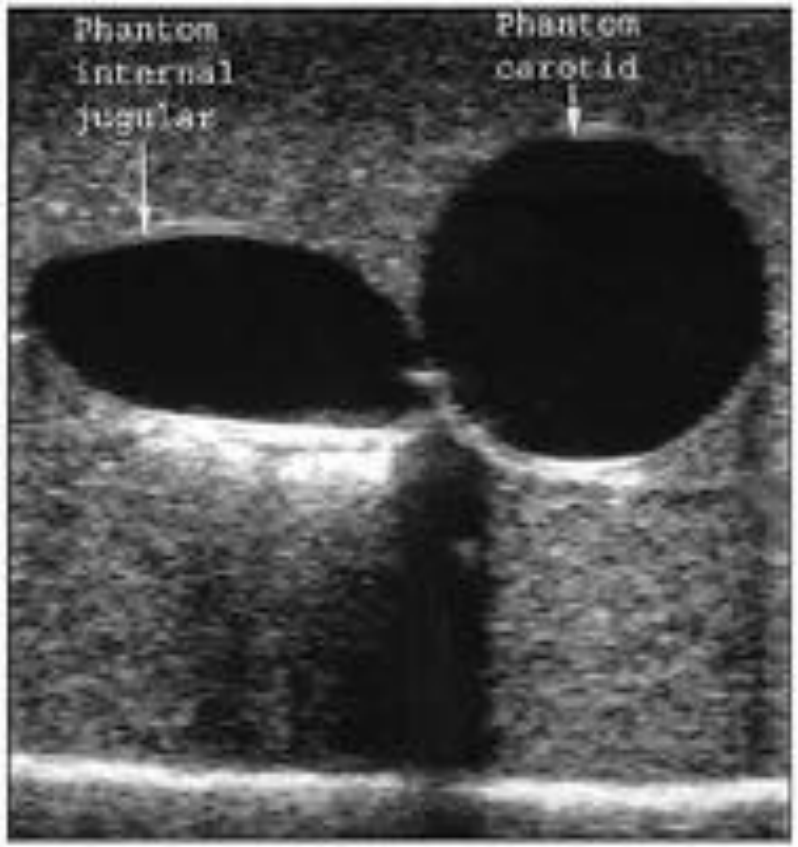


Phantoms

Home made, simplified phantoms

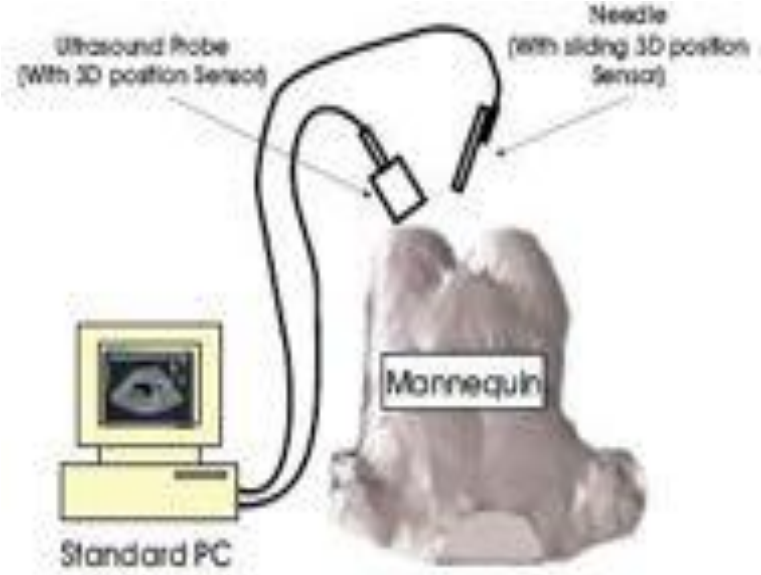
The phantom is formed using water, unflavored gelatin, sugar-free Metamucil, latex tubes and a rectangular Pyrex glass cake pan (17 × 27 × 5 cm). Preparation of the container includes cleaning the inner surface and spraying it with a small amount of a non-stick product.

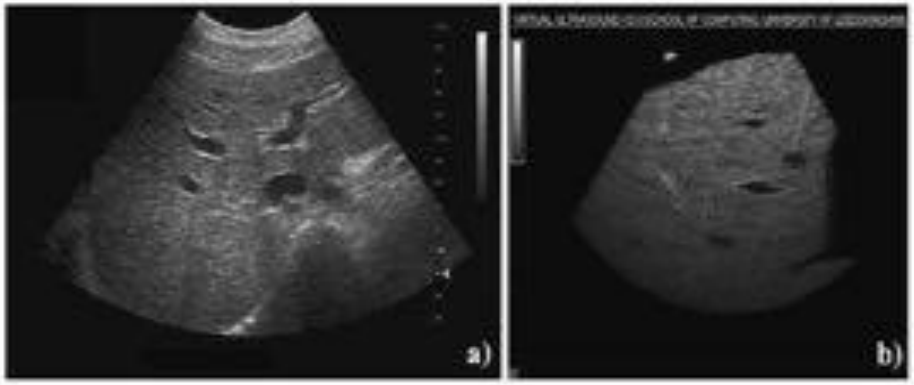


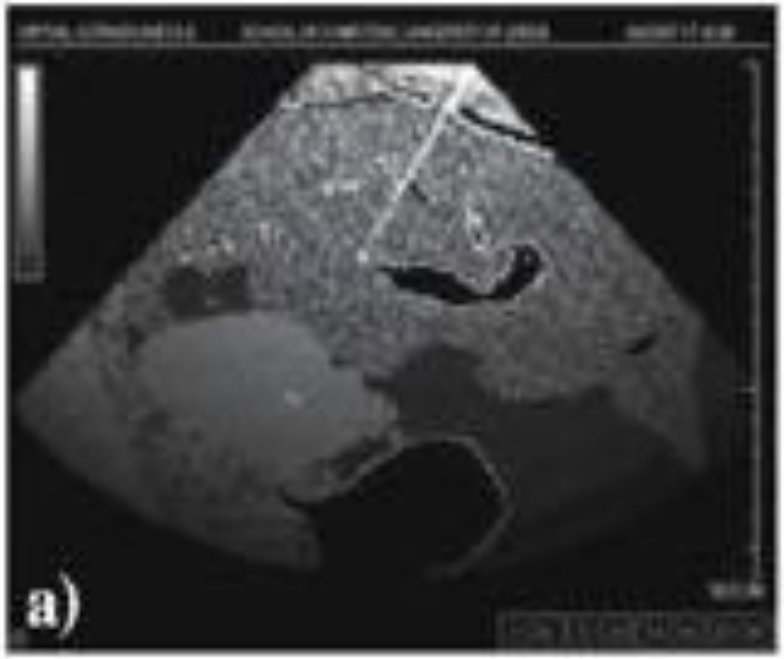


Kendall, CJEM 2007

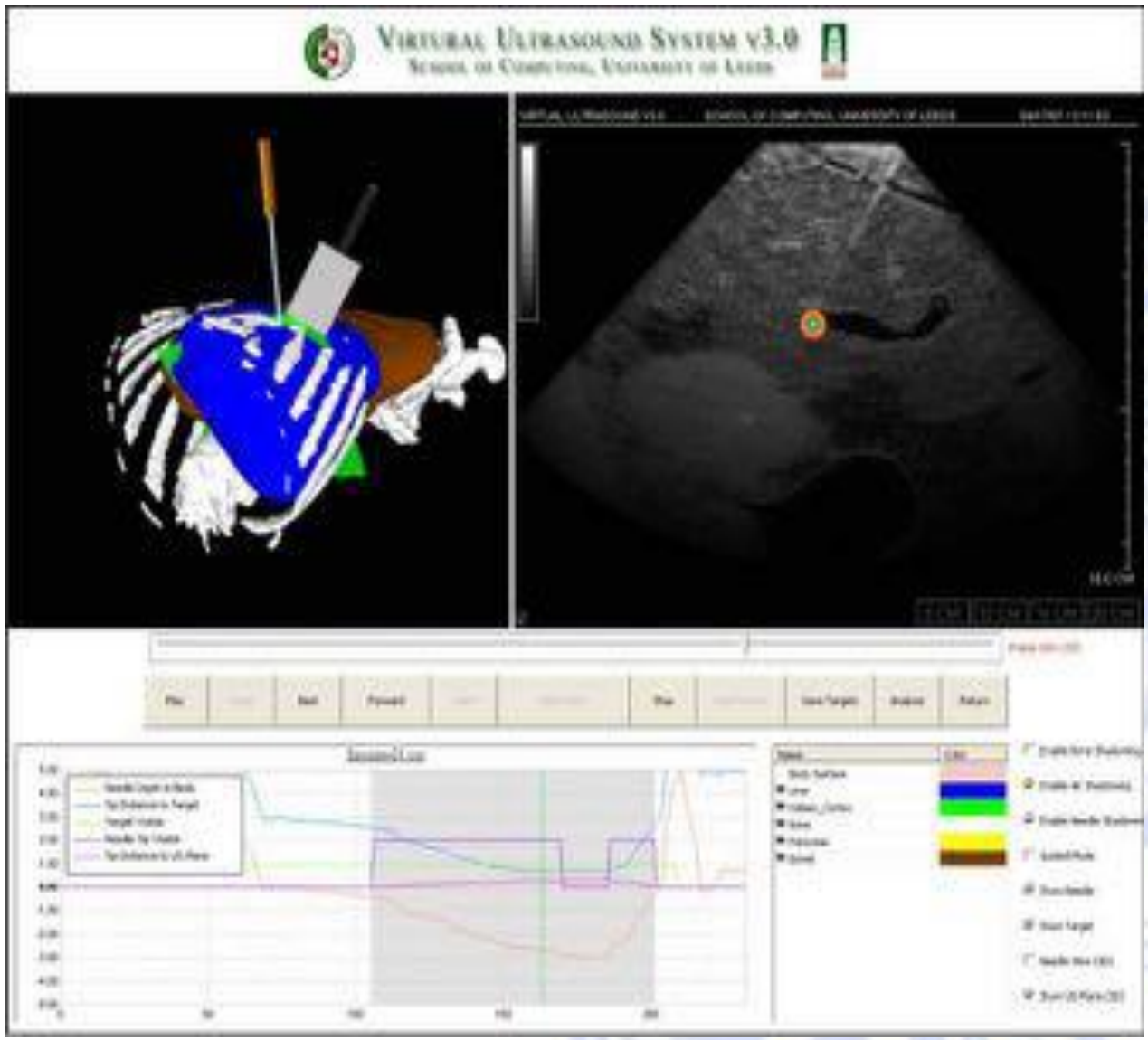
Computer-based simulators







Computer-based simulators



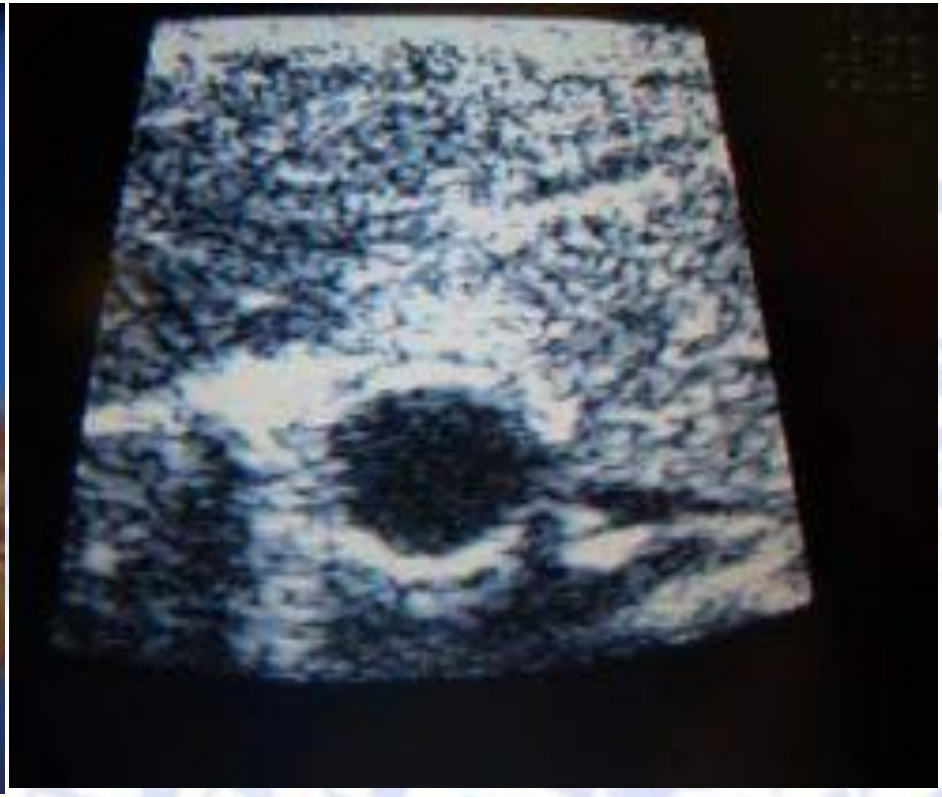
Phantoms

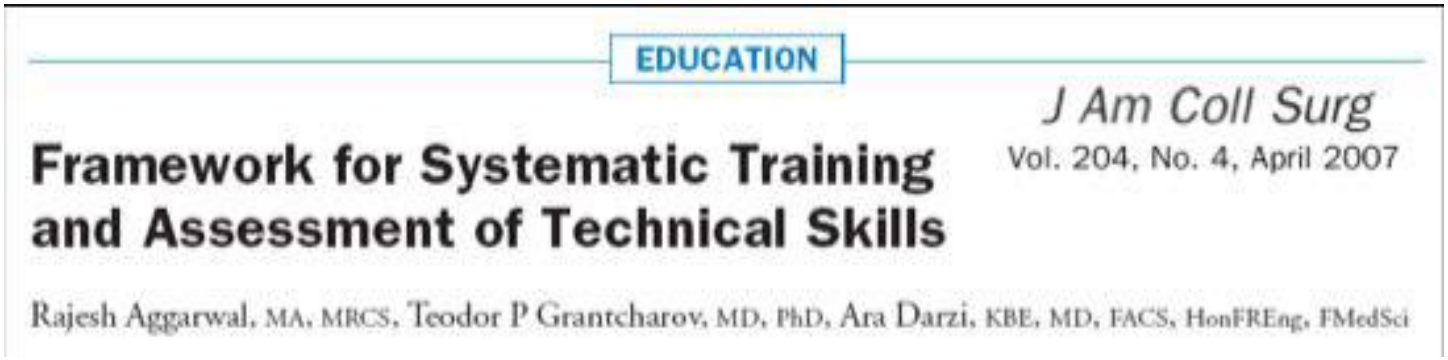
Home made, simplified phantoms

Chantler, Anaesthesia 2004

Phantoms

Pittiruti, AVA 2005





EDUCATION

J Am Coll Surg
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Framework for Systematic Training and Assessment of Technical Skills

Rajesh Aggarwal, MA, MRCS, Teodor P Grantcharov, MD, PhD, Ara Darzi, KBE, MD, FACS, HonFREng, FMedSci

- Somministrare da 6 a 12 tasks di difficoltà crescente
- Passare all'esercizio successivo solo dopo completamento soddisfacente del precedente
- Progressione fino a "ricostruire" l'intera procedura (CONTESTUALIZZAZIONE)
- Misurazione della performance
- Feedback e debriefing

The Seven Steps Protocol

PHASE 1 – ULTRASOUND IMAGING

- Step 1: probe orientation
- Step 2: hand stabilization + static and dynamic evaluation of the vein (short axis scan)
- Step 3: shift to long axis scan of the vein

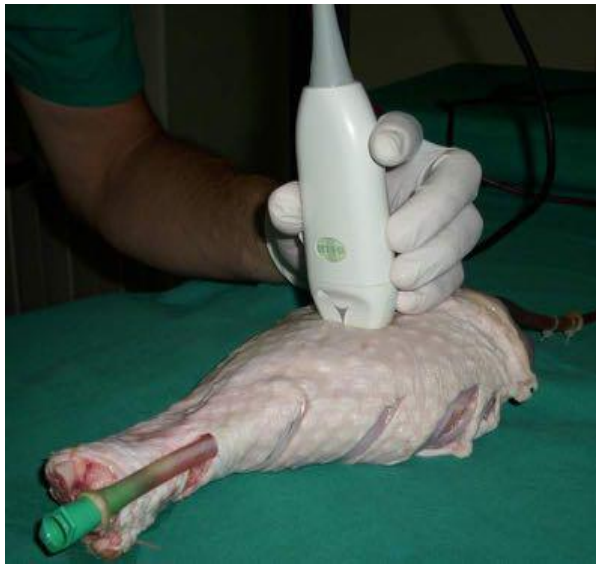
PHASE 2 – US GUIDED NEEDLE MANIPULATION

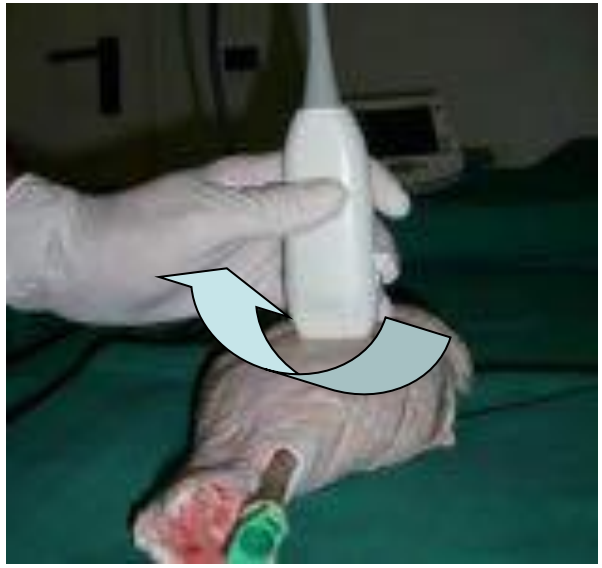
- Step 4: static visualization of the needle and its tip
- Step 5: dynamic visualization of the needle and its tip without venous target
- Step 6: techniques of US guided venipuncture

PHASE 3 – CATHETER INTRODUCTION

- Step 7: complete simulation of field preparation, catheter introduction, securement and medication + US visualization of catheter within the lumen

STEP 1 – Probe orientation





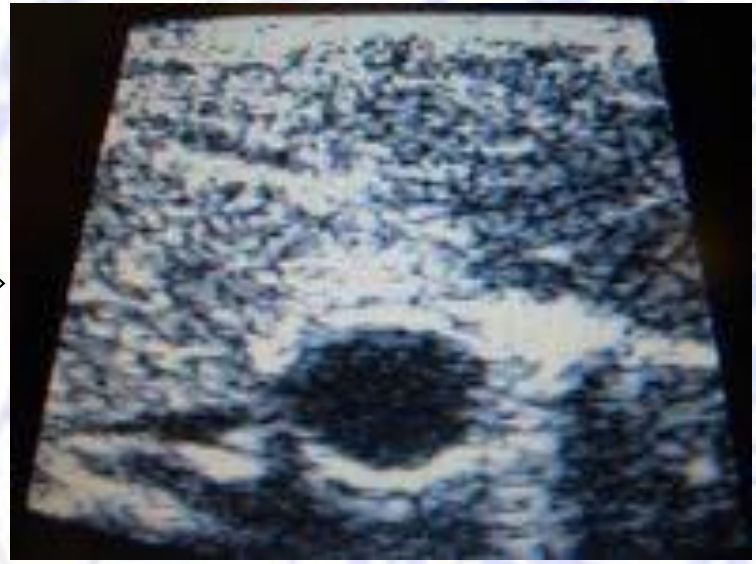
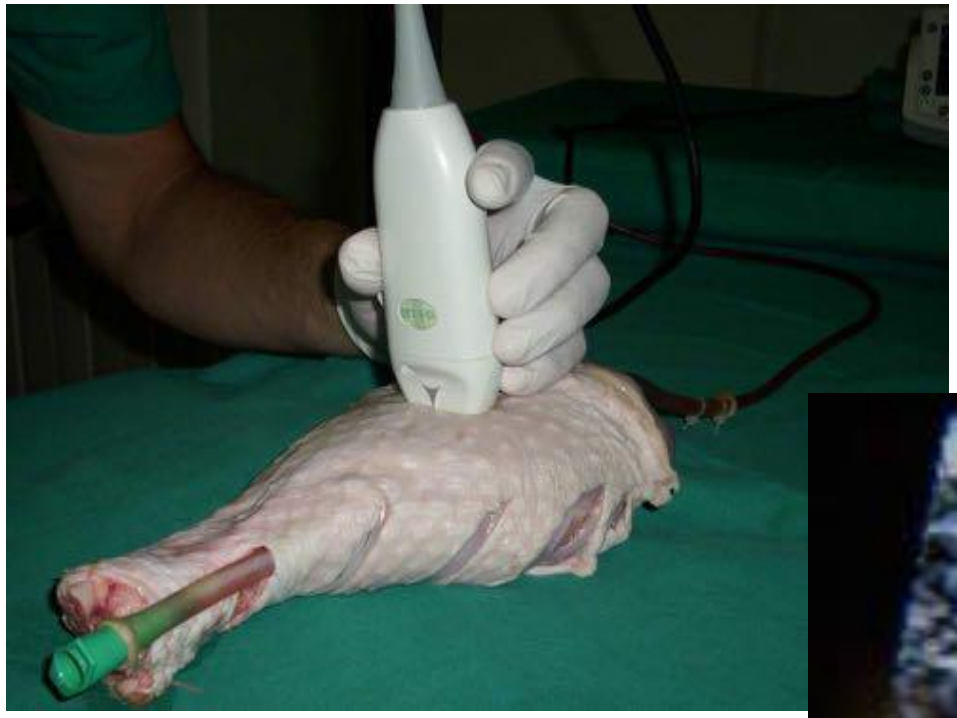


Image specularity after 180° probe rotation

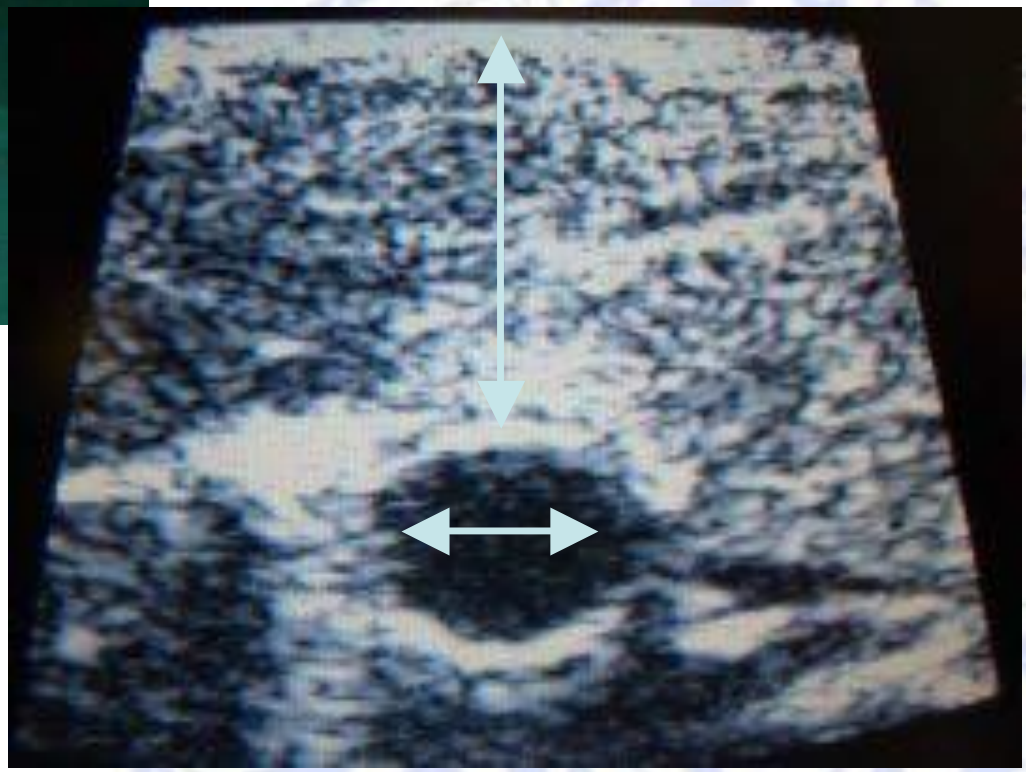
STEP 2a – Hand stabilization

The ulnar hand margin lies on the phantom surface to avoid probe slipping

STEP 2b – Static evaluation



Vein diameter and depth

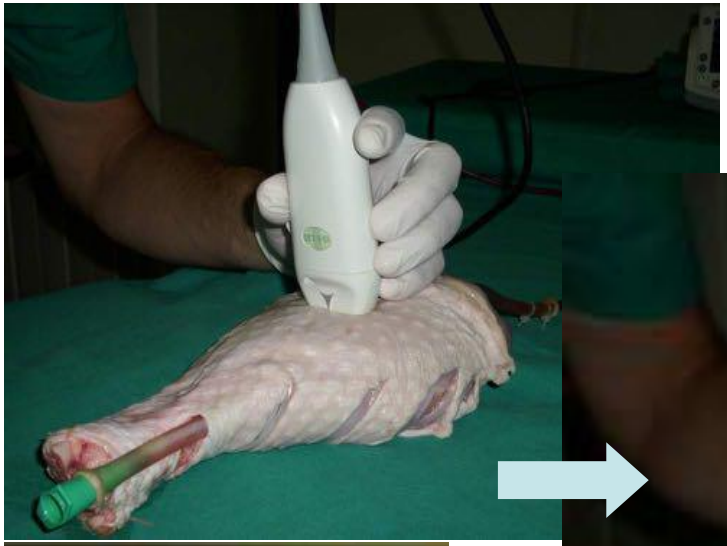


STEP 2c – Dynamic evaluation

Vein compressibility

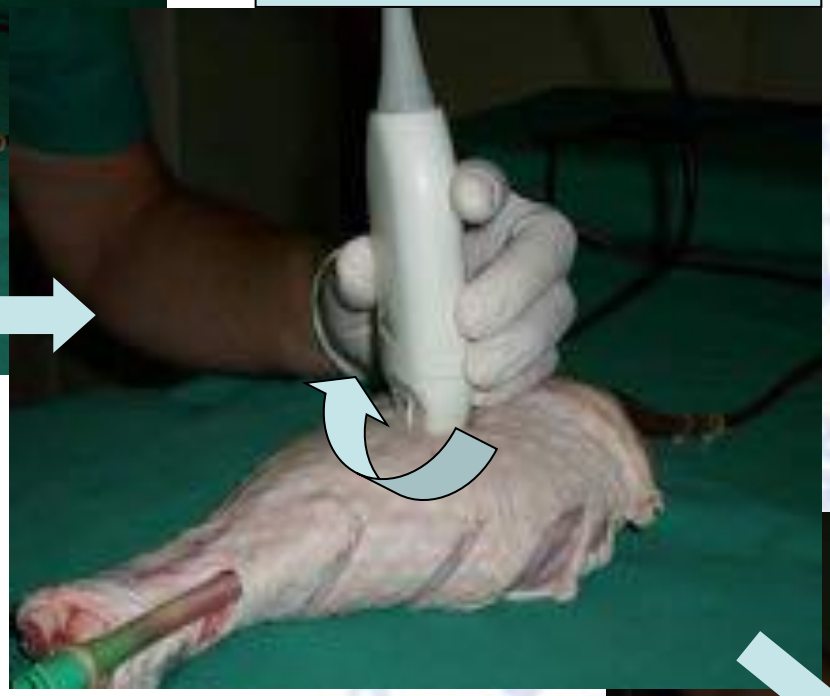
Probe sliding to evaluate any change in venous depth and course

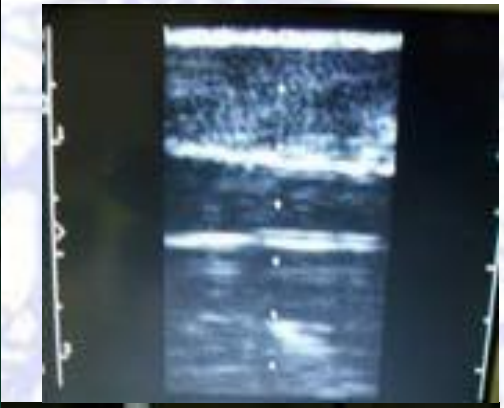
STEP 3 – Shift to long axis



1) The ”short axis” vein image is centered in the screen …

2) …90° clockwise probe rotation …





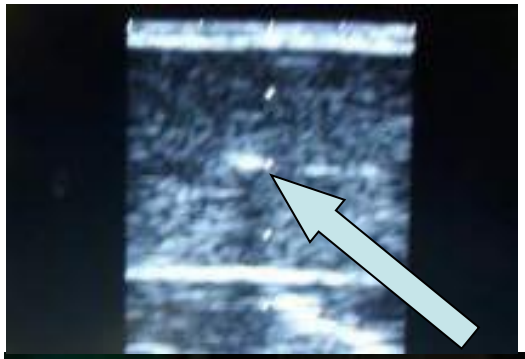
3) … until a longitudinal view of the vein is reached

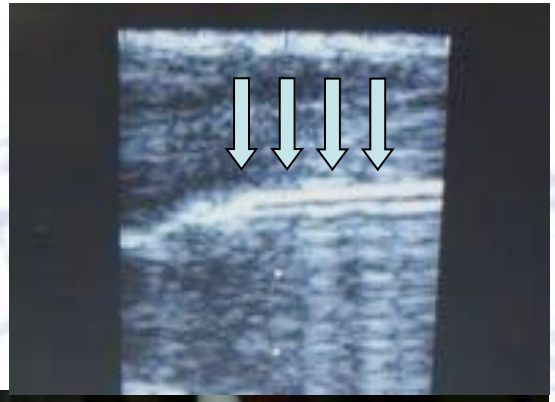
STEP 4 – Static needle/tip visualization

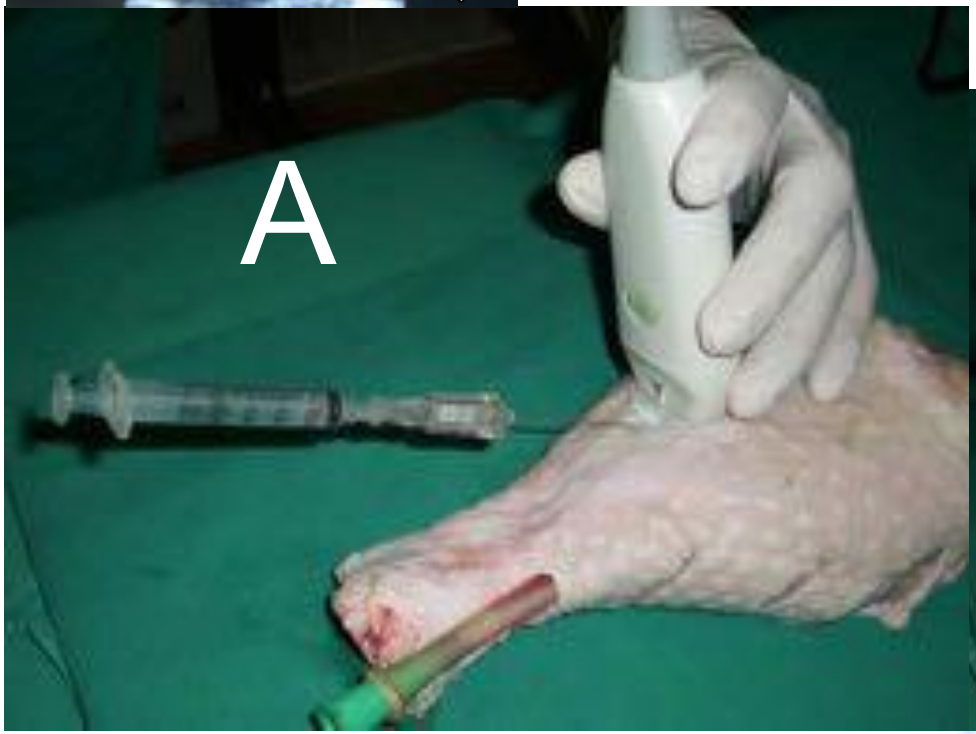
The trainee scans the phantom's soft tissue looking for the needle (no needle manipulations in this step):

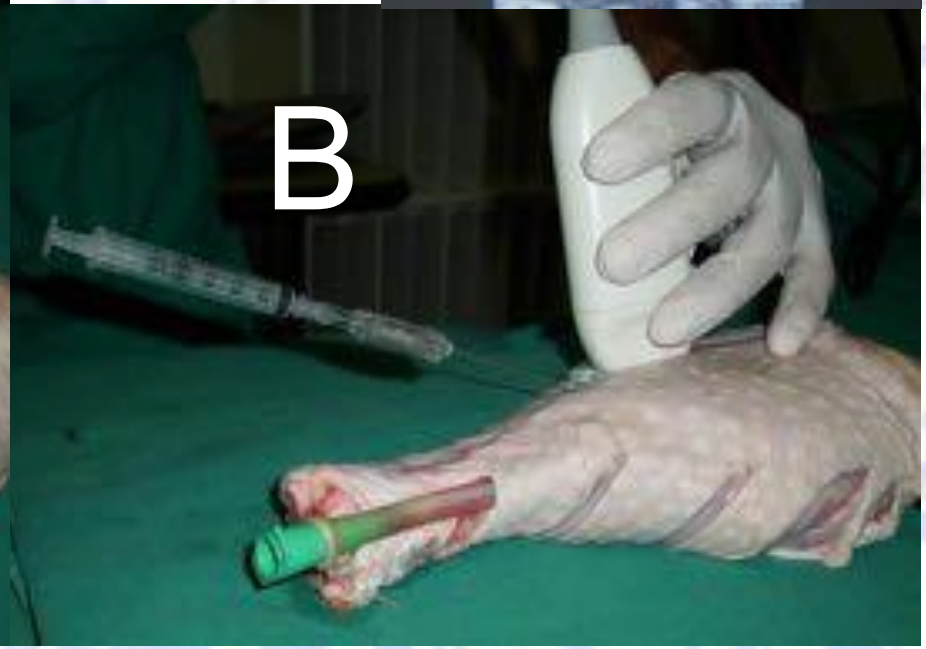
A) out of plane

B) in plane





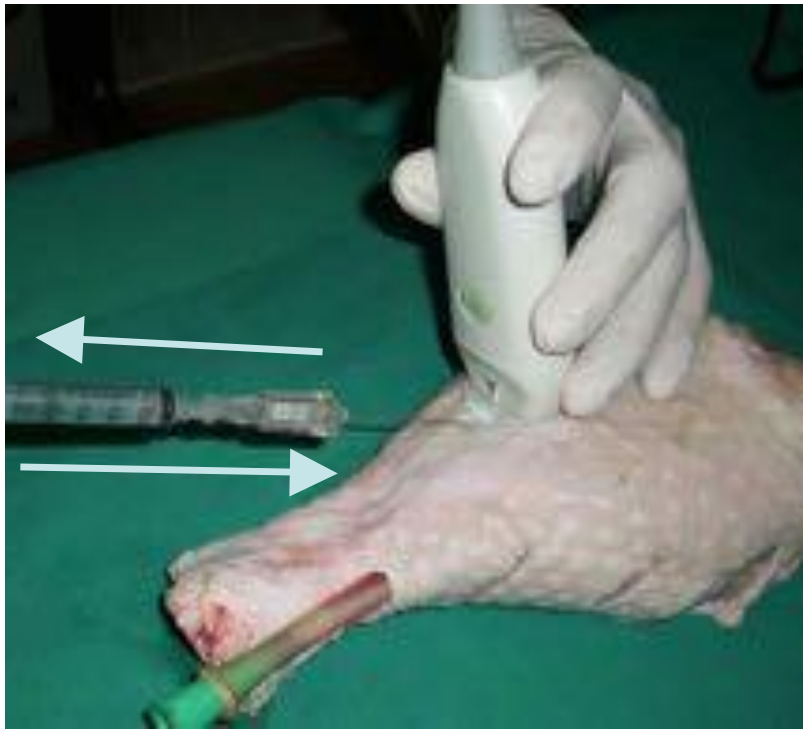




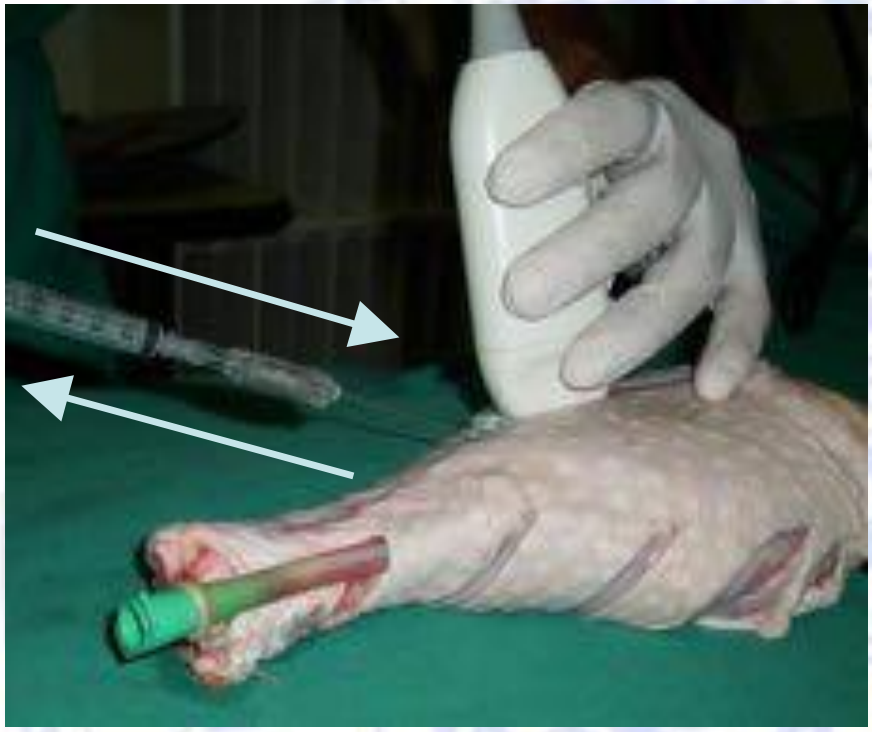
STEP 5 – Dynamic needle/tip visualization

The trainee manipulates the needle (introduction and extraction) within the phantom soft tissue under close US guidance.
NO ATTENTION TO VENOUS TARGET IN THIS STEP

A) out of plane



B) in plane

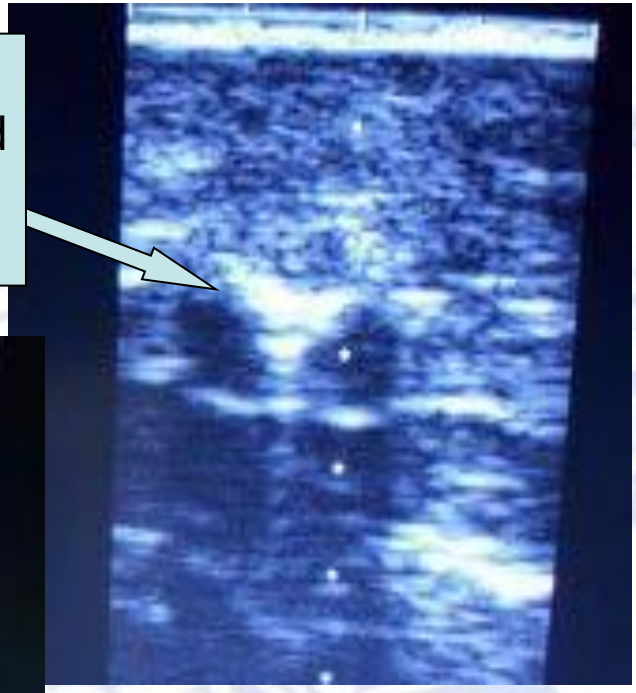


Close attention to visualization of needle tip during probe movements is required

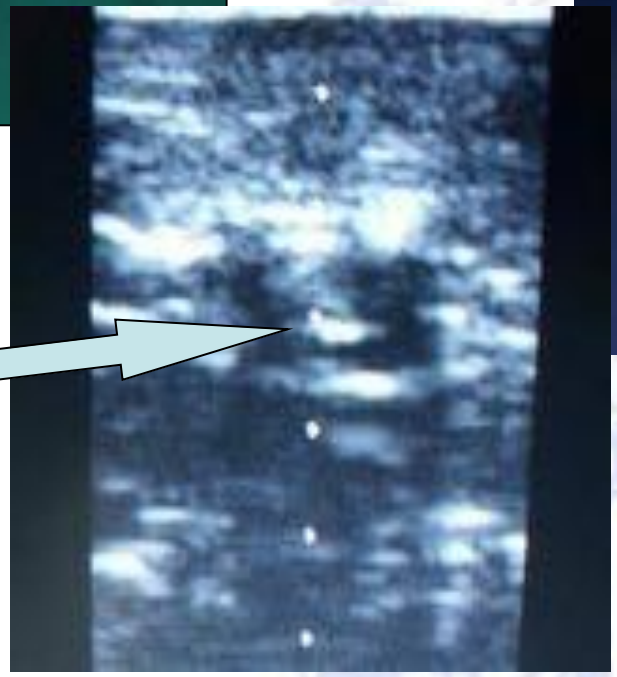
STEP 6a – US guided venipuncture

SHORT AXIS
+
OUT OF PLANE

Vein wall introflection and needle tip visualization

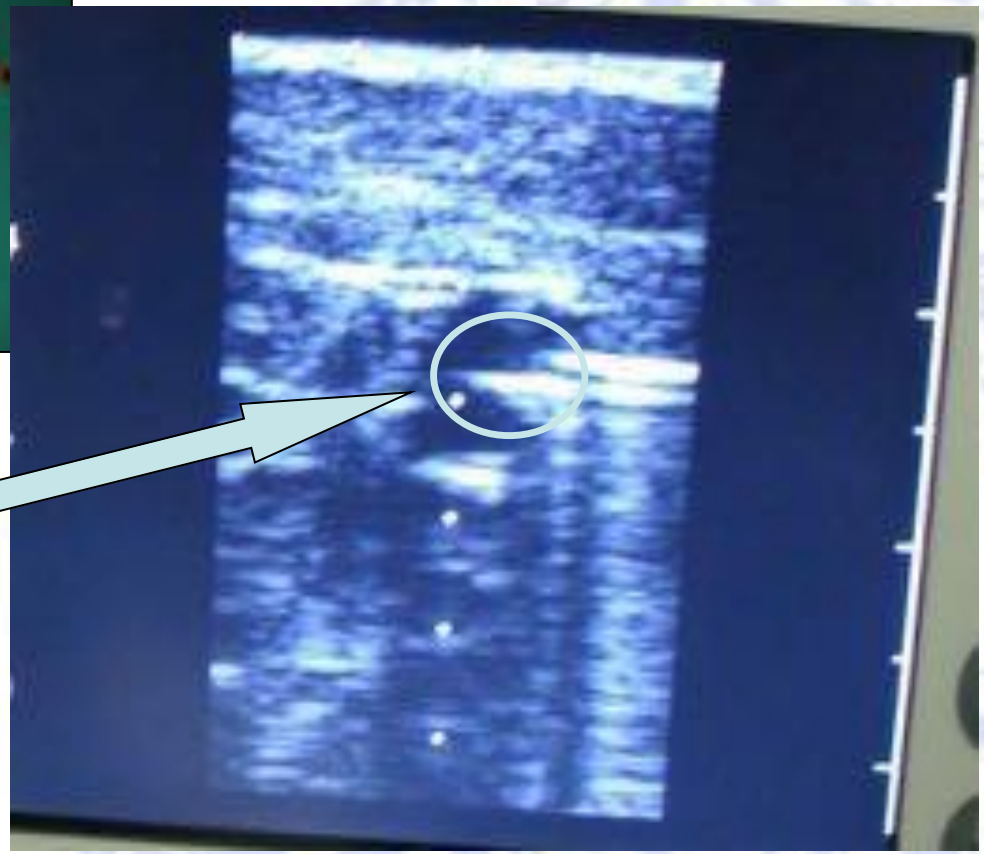


Correct visualization of needle tip within the vessel lumen



STEP 6b – US guided venipuncture

SHORT AXIS
+
IN PLANE

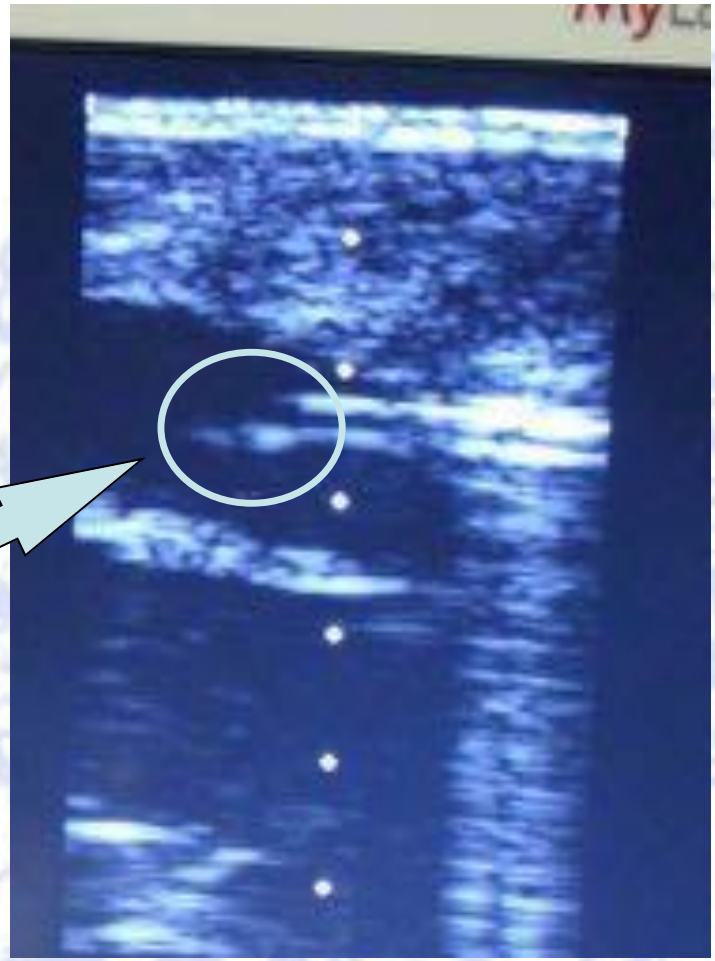


Correct visualization of needle tip within the vessel lumen

Note the bevel image

STEP 6c – US guided venipuncture

LONG AXIS
+
IN PLANE



Correct visualization of needle tip within the vessel lumen

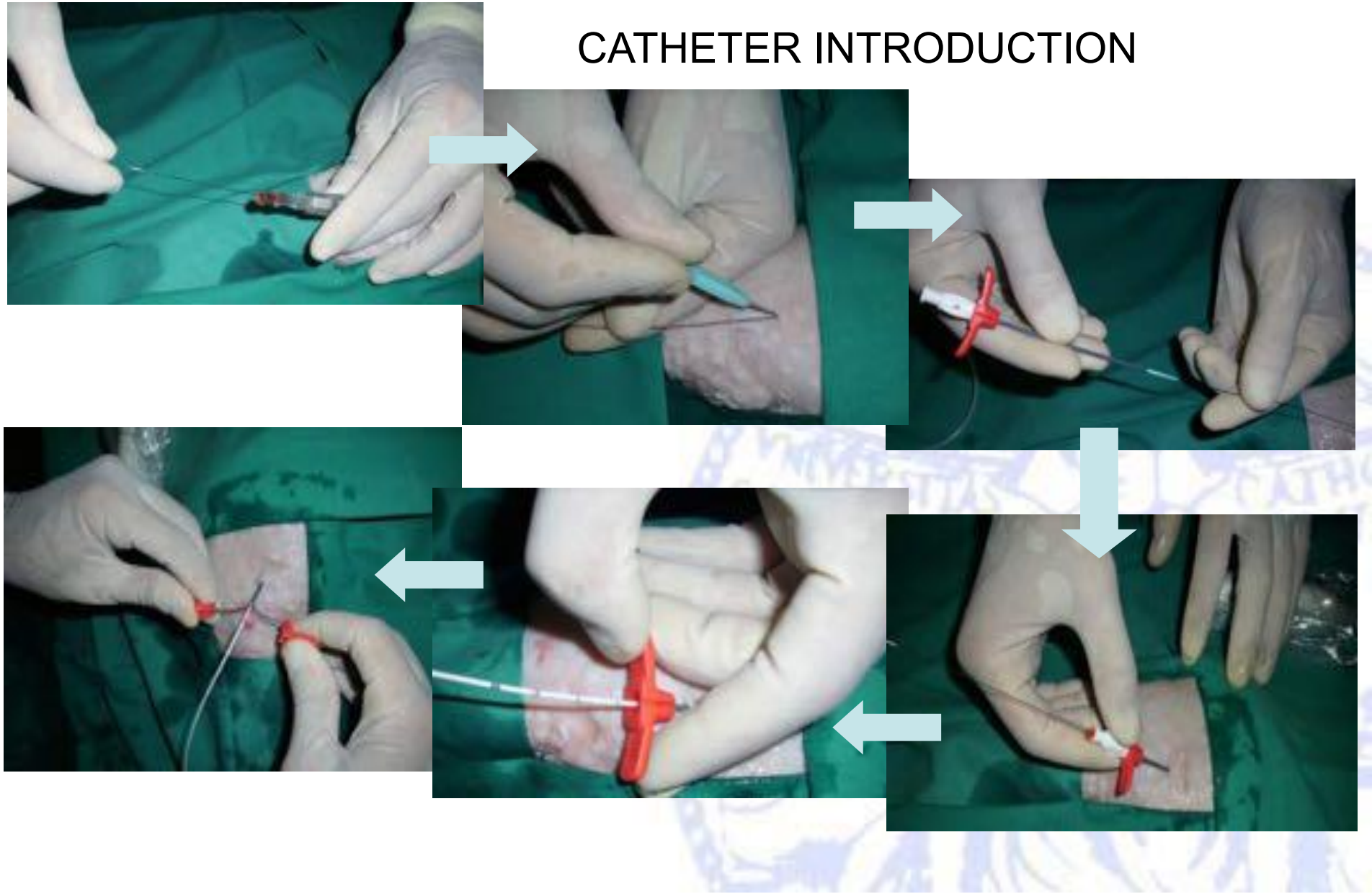
Note the bevel image

STEP 7 – Procedure simulation

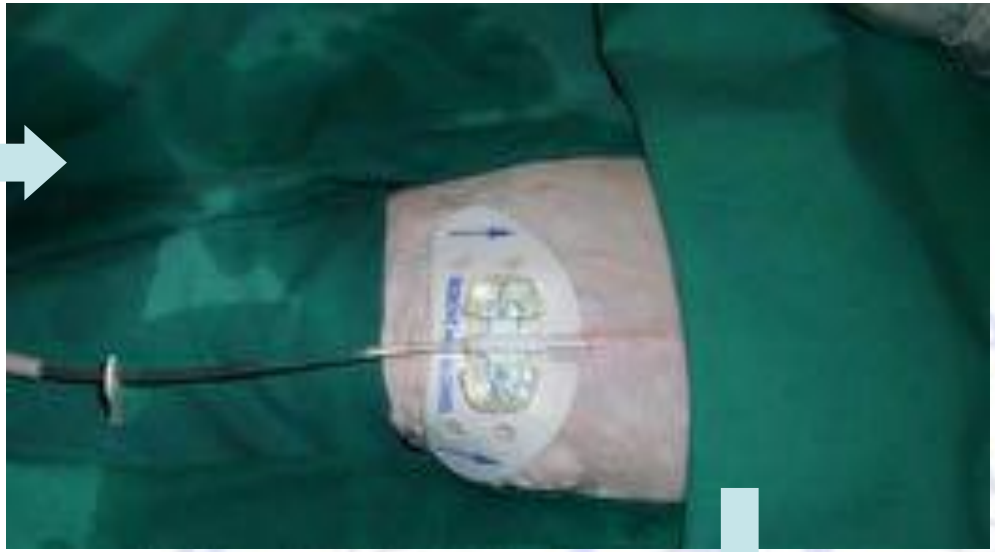
… AND LET'S GO !!!

STEP 7 – Procedure simulation

CATHETER INTRODUCTION

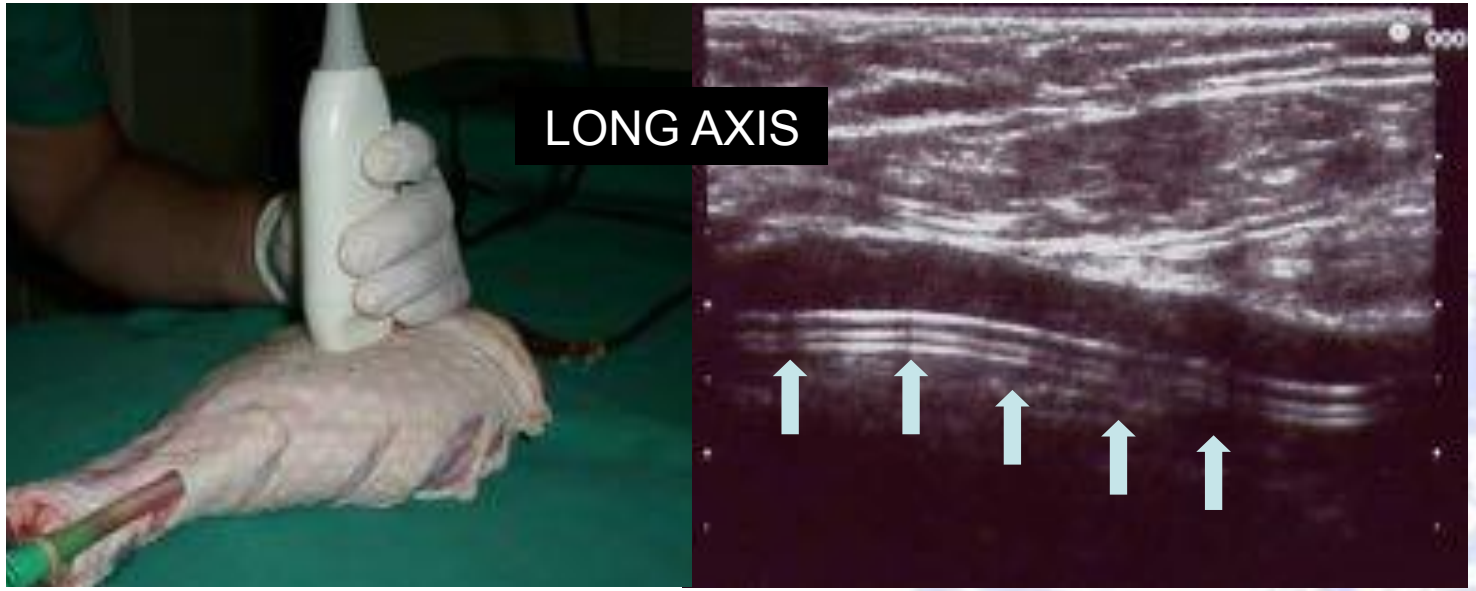


STEP 7 – Procedure simulation

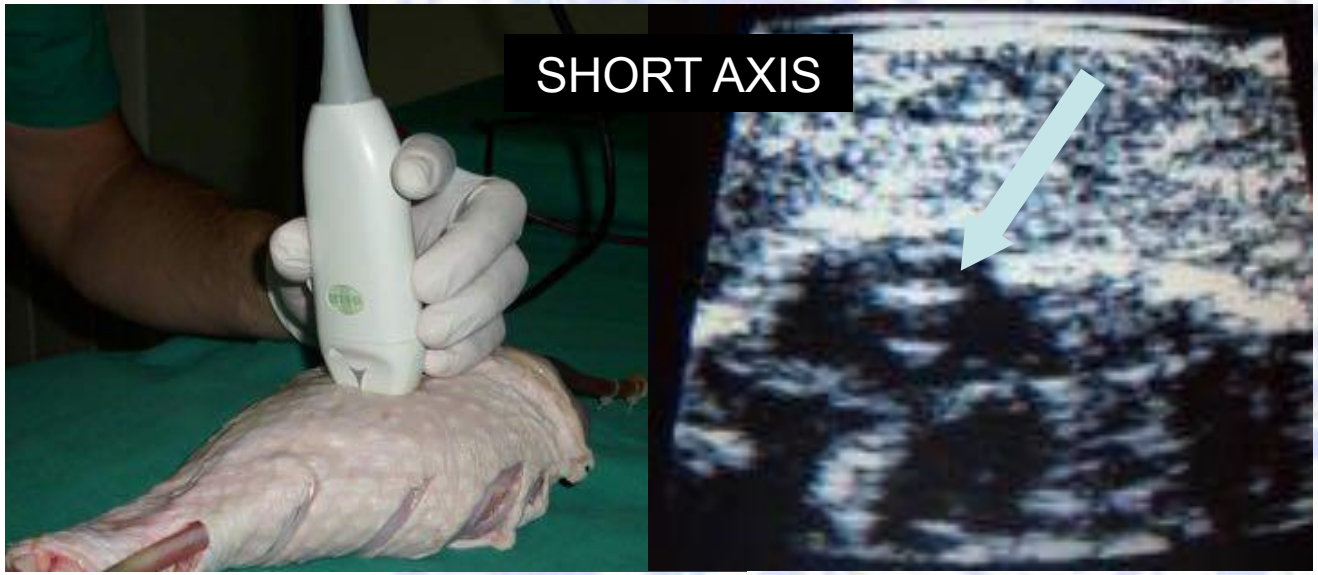


CATHETER SECUREMENT
AND MEDICATION

STEP 7 – Procedure simulation



CATHETER VISUALIZATION WITHIN THE VESSEL LUMEN



Valutazione e Audit

- Test scritto per valutazione basi cognitive
  MINIMUM PASSING SCORE (70% di almeno 100 domande)
- Test su simulatore
- Valutazione di una procedura completa su paziente
  CHECKLIST VS GLOBAL RATING SCALES

process includes the completion of a written test assessing the practitioner's cognitive level of the procedure. This written exam should be in conjunction with a visual exam to test the knowledge of normal vs abnormal vessels, and a skills test using simulation to test the practitioner's ability to perform the procedure to a satisfactory standard. The practitioner would then undertake observed procedures under the direct supervision of an experienced practitioner.

The two main approaches to rating technical performance are global rating scales and checklists. The goal of checklists is to guide behaviour by confirming routine. It has been argued that the global rating scales (Likert type scales) do not address procedural shortcomings. Global rating scales of competence have evolved[84] and a validated 24-item checklist using the Angoff method has been created to assess the competence of residents in CVAD insertion.[85] Because CVAD insertion is sequential and predictable, assessment of the procedure can be performed using a checklist, as each component of the skill can be assessed. Formal evaluation of competence is performed using instruments such as the Ottawa Global Rating Scale (GRS) and the Ottawa Crisis Resource Management (CRS) checklist which both demonstrate effectiveness in multiple domains.[86]

Objective grading and proficiency

The application of the learning curve concept to CVAD placement means the reduction, by 50%, of major complications during the learning process. With the landmark technique, the suggested minimal CVAD placements required to achieve minimal experience was >50 insertions.[56] With ultrasound guidance, it has been suggested[11 12] that CVAD-skilled trainees require less training than novices but have more problems with hand–eye coordination.[2 3 57–60] There is no common training guideline on ultrasound training.[11 61] This Consensus Task Force recommends 6–8 h of didactic education, 4 h hands-on training on inanimate models, then 6 h hands-on training on normal human volunteers for detection of normal ultrasound anatomy. This training should be followed by supervised ultrasound cannulations, coaching the trainee during the procedure in order to achieve the required minimal skill competence with the lowest rate of complications.[62]

- 6-8 ore teoria
- 4 ore lab simulation (modalità non specificata)
- 6 ore human US anatomy
- Supervised US cannulations

Nessun "numero minimo"

Teaching CVAD insertion with children and neonates

It is necessary to have minimal cannulation of 70 central vein punctures per year in order to maintain the skills and the competence in these patients.[91] Ultrasound guidance enhances first-time success and time to cannulation in small infants, but requires supervised training to gain proficiency. It has been demonstrated to take 15 supervised, ultrasound-guided cannulations to reach proficiency with small infants.[91]

Teaching CVAD insertion with children and neonates

Minimal training is also required for peripheral vein cannulation in paediatric patients.[92] Nurses and physicians should be trained in paediatric-specific i.v. procedures during their academic/employment training period. Even so, additional factors noted in the literature were better indicators of success, such as difficulty and cooperativeness of the child.[93] In cases of difficult peripheral vein access, ultrasound guidance may not always be useful because simple compression of the probe over the skin may cause collapse of superficial veins, necessitating the use of a very lightweight probe for these patients. In this case, near-infrared technology has increased success rates of peripheral vein catheterizations.[94 95]

W_R16 Education for Children and Neonates	CVAD education with neonates and children includes: specific aspects of teaching and training with vascular access device insertion, insertion with and without ultrasound, near-infrared technology, and other technology aids for insertion	B	Perfect consensus, strong

Debriefing

After participating in a case (simulated or not), debriefing allows clinicians to reflect

Goals of Debriefing: to help trainees understand, analyze, and synthetize what they thought, felt, and did during the simulation to improve future performance in similar situations.

Moving from ‘Shame & Blame’ culture to debriefing with Good Judgement

- Judgmental Debriefing or “Shame-&-Blame”
- Non-Judgmental Debriefing or “Socratic”
- Debriefing with Good Judgment or “Reflective Practice”

Shame & Blame

- Truth is in the possession of the instructor
- Error is in the hands of the trainee
- humiliation
- dampened motivation
- reluctance to raise questions about areas of confusion
- exit of talented trainees from the specialty

“Socratic”

- Allow to deliver critical messages avoiding negative emotions
- Kind way to lead trainees to critical insight that the instructor is reluctant to state explicitly
- Non-blaming approach
- Same assumption with the ‘Shame&Blame’: ‘I’m right, You’re wrong’

Reflective Debriefing

1 – observation/description: the teacher observes and describes trainee's action
2 – comment/opinion: the teacher offers his/her idea about that
3 – mental model disclaimer: the teacher shows his/her interest (curiosity) to discover the mental model that framed student's action.

Reflective debriefing increases the chances that the student will be able to accept teacher's feedback without being defensive and feeling psychologically safe

Valutazione e Audit

training to achieve competence.[7] Defining a competent practitioner in objective terms is a difficult task. Competence is often determined after a pre-determined number of procedures being performed or after a subjective assessment by a proctor who is deemed to be competent.[67 82] This approach is often criticized however, as it relies on general agreement to determine the number of procedures necessary to gain competence. Other authors suggest an alternative, more objective method of training programme.[83] This assessment

Competenza = numero procedure ?

NO !!!

Controversie: numeri

- Learning curve: quante procedure?
  - GIPE → 50 in 6 mesi (20 in 3 mesi)
- Learning curve: durata?
  - GIPE → da 3 a 6 mesi
- Audit: entro quanto tempo?
  - GIPE → entro 6-9 mesi
- Mantenimento della proficiency: quante procedure/anno?

Peripheral Intravenous Access Using Ultrasound Guidance: Defining the Learning Curve

Mark J. Ault, MD

Table 1. **Proficiency Score Definitions**

Proficiency score	Criteria
0	Unable to locate a suitable vessel
1	Suitable vessel located but vessel not accessed by trainee but ultimately accessed by supervisor
2	Suitable vessel located but vessel not accessed by trainee and ultimately not accessed by supervisor
3	Suitable vessel located but 3 attempts at 1 or 2 sites required
4	2 attempts at 1 or 2 sites required
5	1 successful attempt required

Peripheral Intravenous Access Using Ultrasound Guidance: Defining the Learning Curve

Mark J. Ault, MD

Audit
Cosa? Quando?

- Rilevazione del successo clinico del training ricevuto
- Effettuato da parte di un tutor esperto a distanza di un certo periodo di tempo dalla fine del corso di addestramento
- Tale intervallo di tempo è ancora oggetto di controversie: alcuni autori sostengono l'utilità di un audit clinico dopo 3 mesi altri addirittura ad un anno di distanza dal termine del training.

Audit
Cosa? Come?

- Discussione della performance del discente a distanza di tempo
- Si discutono: *(a)complicanze, (b)fallimenti, (c)numero di tentativi, (d)numero di successi*
- Sarebbe utile che ciascun operatore in formazione sottoponesse al suo tutor una documentazione iconografica accurata in modo da poter ricevere un feedback produttivo in questa fase di debriefing

Central Venous Catheter Insertion: Global Rating Scale

Operator: _____ Date ___/___/____ Supervisor _____

Scale: Level 0: Not completed

Level 1: Novice: Uses 'rules' to perform a ridged text book procedure. Requires lots of practice.

Level 2: Advanced beginner: Requires direction with many questions. Requires further practice.

Level 3: Competent but lacks self direction and is inflexible with performance.

Level 4: Proficient: Sees the situation as a whole. Performance guided by knowledge and expertise.

Adapted from Gentile JE (2012) Applying the Novice-to-Expert Model to Infusion Nursing. Journ Infus Nurs 35(2):103-107 and Benner P (1984) Novice to expert: Excellence and Power in Clinical Practice. Menlo Park. Addison – Wesley

Performance Criteria	Level	Comments and Case Difficulty
1. Demonstrates effective ultrasound use for sizing of vessels and depth determination for establishing needle angle with gel, aseptic management of probe and ergonomic positioning of clinician and patient		
2. Identify relevant veins and arteries: internal and external jugular veins / carotid artery. Subclavian vein / artery, brachial vein, basilic vein, cephalic vein		
3. Differentiate veins from arteries based on anatomic position, compressibility, respirophasic changes, views via in-plane and out-of-plane orientation, can identify vascular thrombosis by visualisation or by compression		
4. Prepares patient's skin effectively and establishes and manages a sterile field during the procedure including maximum sterile barriers and ultrasound sterile cover		
5. Demonstrates knowledge of the effects of patient positioning on anatomical topography depending on type of placement: Trendelenburg, head rotation		
6. Demonstrates a skilful and accurate ultrasound guided venous puncture, management of supplies and sterile catheter preparation consistent with manufacturer instructions		
7. Demonstrates a good understanding of the steps leading to a successful CVC placement including: Guidewire manipulation, tunnelling (if necessary), dilator and peel away sheath use		
8. Appropriately secures the CVC post insertion, completes confirmation of tip, cleans probe and unit after use		

Case Difficulty

Extremely easy	Fairly easy	Average	Fairly difficult	Very challenging
1	2	3	4	5

Declaration

Box 2: Satisfactory Standard

Grade 5 or 4 across all domains with the following provisos: No Level 1's or 2's. Please initial relevant box below

Standard Achieved ☐ Standard **not** achieved ☐

Failure to achieve the standard by the participant requires a repeat of the supervised insertion until the standard/Competency is achieved

Please also complete the expert global evaluation below – this will be used to validate the process, and will not be used in assessing the candidates.

Confidential: Expert Global Evaluation - Overall judgement

In order to help with setting standards and validating the process, please give your expert global assessment ***independent*** of the above grading – in other words, do you personally judge that the operator is a competent independent operator. Please check one of the two boxes below:

The candidate: is competent in inserting CVC's independently ☐

is **not** competent to independently insert CVC's ☐

I CERTIFY THAT THE OPERATOR/PERFORMER _____

Medical Registration/License Number _____

Meets the criteria outlined in box 2 YES ☐ NO ☐

Trainer/Superviser/Instructor

- Trainer certificato
- Motivazione
- Proficiency del trainer: casistica elevata, bassa ‘morbidity’
- Membro di IV team
- Sua precisa responsabilità deve essere quella di promuovere una cultura nella prevenzione delle CR-BSI

‘Primum, non nocere...’
Simulation: an Ethical Imperative!

- Proper development of SIMULATION TRAINING is an ethical imperative
- Improving TECHNICAL & NON-TECHNICAL SKILLS, simulation-based education has the potential role:
    - to decrease the numbers and effects of medical errors,
    - to facilitate open exchange in training situations,
    - to enhance patient safety,

Adopting simulation as a standard of training and certification in medical education, health systems will be more accountable and ethical.

Thanks a lot