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First-level clinical point-of-care ultrasound: an essential tool for today's internist

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Abstract

What are the ultrasound requirements of an internist who admits patients from the emergency department, puts them to bed, treats them, examines them, and monitors them daily? Hospitalists and general practitioners require bedside ultrasound to enhance and optimize the physical examination and improve and optimize the daily monitoring of therapies. For this purpose, comprehensive training on all organs and systems (as is the case for sonographers) is not necessary. Instead, first-level training focused on specific organs and systems is required: the levels of competence of the sonographer and “bedside ultrasound clinician” are complementary and do not conflict. First-level clinical point-of-care ultrasound is much more than a technical skill: the close contact and the real-time nature of the examination facilitate a holistic dialogue with the patient, the “core business” of internal medicine.

Introduction

Bedside ultrasound refers to the practice of performing ultrasound examinations at the patient's bedside. Historically, ultrasound machines were large, cumbersome devices that were rarely transportable. However, advancements in technology have led to the development of smaller, portable machines. These modern portable devices enable bedside examinations that, with few exceptions, are technologically equivalent to those conducted with larger clinical apparatuses. The portable machine is equipped with three probes (linear, convex, and sector) capable of performing both first and second-level examinations on all organs and systems.

In Italy, basic ultrasound training is comprehensive and standardized. Various scientific societies (FADOI, SIMI, SIUMB *et al.*) offer theoretical training courses that encompass the examination of all organs and systems, each considered equally important. The subsequent required certified practical training, characterized by specific settings and activities, determines the training outcome. This training consistently produces professionals destined for outpatient diagnostic activities, with the objective of performing techniques that maximize the acquisition of information on a given organ or system.

The role of ultrasound in internal medicine

Given these premises, if we work in an internal medicine unit and are daily at the patient's bedside, the first question is: should we perform a comprehensive ultrasound on all patients admitted from the emergency department? To achieve this, we would need to train highly skilled ultrasonographers capable of optimal performance (able to sign a complete report) on the heart, chest, abdomen, soft tissues, and vessels. We believe no internal medicine unit can guarantee such a level of competence for all its members, nor should this be the training goal.

The more important question, in our opinion, should start with the internist's needs. What are the ultrasound (sonographic) requirements of an internist who admits patients from the Emergency Department, puts them to bed, treats them, examines them, and monitors them daily? Are we certain that this physician needs to have optimal organ/system competence (able to sign a complete report) on the heart, chest, abdomen, soft tissues, and vessels? We do not think so.

Ultrasound cannot be considered monolithic or all-or-nothing. As with everything, it is necessary to distinguish and classify levels of sonographic/ultrasound competence: basic levels that everyone should have, and second and, why not, third levels reserved for a few.

First-level clinical point-of-care ultrasound: a practical necessity for internists

The practical physician, as Augusto Murri would describe, referring to the hospital internist and the general practitioner, requires bedside ultrasound to i) enhance and optimize the physical examination by extracting maximum information, and ii) improve and optimize the daily monitoring of therapies.

For this purpose, comprehensive training on all organs and systems is not necessary. Instead, a first-level training focused on specific organs and systems is required. The acquisition of this first level of sonographic competence by the entire team should be the training objective of the internal medicine operational unit and its director. This foundational training does not preclude some physicians from subsequently advancing to a second or even third level of competence.

Two different roles: the sonographer vs. the bedside ultrasound clinician

Given these premises, two distinct roles emerge for professionals who utilize ultrasound:

1. The sonographer is a specialist who operates within an office setting, attending to patients referred to them on demand (cortical activity) to provide the most comprehensive report possible on a single organ.
2. The "bedside ultrasound clinician" is a physician who conducts daily (subcortical activity) visits to their patients, whether hospitalized (hospital internist) or outpatient (general practitioner/community health unit), with the objective of optimizing the physical

examination and extracting pertinent signs/information (on a limited number of items) to enhance diagnosis (*e.g.*, presence/absence of bladder distention) or to monitor therapy (*e.g.*, fluid volume assessment).

These two levels of competence are complementary and do not conflict (Figure 1).

Let's take a closer look at the advantages of First-level clinical point-of-care ultrasound (POCUS) for the internist/general practitioner.

Quantitative advantages

It is well-established in the literature that ultrasound is significantly superior to cardiac auscultation with a stethoscope. This superiority is also evident when compared to percussion and palpation (*e.g.*, delineation of organs) or, in the musculoskeletal field, in the interpretation of the content (solid/liquid) of superficial swellings.¹

Beyond the informative data from clinical studies, it is important to note that the time required for training is vastly different. Without delving into cardiac auscultation, even the “simple” identification of a bladder globe or a moderate ascitic effusion via percussion requires years of experience, while the ultrasound finding is almost immediate with a pocket device, already set up for use.

Let us imagine a scenario where all general practitioners and hospital physicians possess these basic skills. Undoubtedly, there would be resource savings in terms of second-level examinations or consultations. The few studies available today in the literature concern emergency medicine and document a reduction in hospital stays when the POCUS approach is adopted.¹

From the emergency setting, bedside clinical ultrasound POCUS is expanding into all other specialties, including internal medicine. However, the process is still too slow, despite the evidence of the superiority of the POCUS approach.

In other words, there are the foundations for a true revolution in the clinical physician's training pathway. Even today, anatomy is still taught using cadavers, and medical semiology is still practiced exclusively with those tools (primarily the stethoscope) that, while they heralded the advent of modern medicine, now seem insufficient for optimizing the physical examination (*i.e.*, gaining more clinical information).

Certainly, the stethoscope should not be discarded and replaced by POCUS. What is needed is an intelligent integration, identifying basic ultrasound competency levels (held by all) and advanced levels (held by a few). POCUS would allow for the dynamic teaching of anatomy in the living; POCUS-oriented semiology and medical clinics would be able to train far more competent clinicians. All this is possible thanks to the further miniaturization of devices (pocket ultrasound/smartphone devices, the true ultrasound stethoscope), which, as documented in the literature since at least 2014, are entirely equivalent to cart-based machines regarding the competencies required for bedside clinical ultrasound (Table 1).² The topic is vast and complex, but it is unavoidable, especially since, even today, the prices of smartphone ultrasounds, while high, are not prohibitive, and in a few years, it will be the patients themselves who will be asking doctors about POCUS.

Qualitative advantages

POCUS is not merely a technique; it holds significant importance, particularly for the internist. Modern medicine, especially community medicine, demands efficiency, which is both reasonable and understandable. However, the current emphasis on efficiency often leads to the industrialization of medicine, severely compromising and alienating the doctor-patient relationship. According to bioethicist Giovanni Maio, three aspects are particularly critical in this shift toward efficiency: i) the elimination of patience; ii) the devaluation of experience; iii) the denial of the necessity for a clinical relationship between doctor and patient.

POCUS clearly counters these trends:

1. POCUS is a repeatable examination, ensuring it is not neglected due to time constraints, which is a significant advantage.
2. POCUS, like all methods, requires standardization through defined scans or execution protocols. However, due to its real-time nature, the aspect of operator dependence and individuality cannot be entirely eliminated. This is particularly evident in the speed and, potentially, the elegance of image acquisition. Consequently, there will always be individual and unique operators with varying levels of skill and experience.
3. Most importantly, during POCUS, the doctor and patient are in close contact, eliminating the distance that patients often detest (e.g., during a computed tomography or magnetic resonance imaging scan). This close contact, combined with the real-time nature of the examination, facilitates a dialogue with the patient about their illness and experience, which other diagnostic techniques, due to their static and spatially distant characteristics, do not allow. This is particularly evident during an ultrasound of a pregnant woman, where the doctor and patient “talk” to the baby. This possibility of dialogue exists in every context where POCUS is employed, especially with smartphone ultrasounds. The degree of experience, sensitivity, empathy, and communication skills of the individual doctor will make the difference in achieving the goal of dialoguing with the patient. POCUS should not be reduced to a mere exercise in diagnostic technique.

“I believe that a good physician is someone who can combine objectivity with humanity,” says Giovanni Maio, defining POCUS as a form of dialogue within the scope of Medicine as a “holistic understanding of the human being”.³ What better portrait for the internist and internal medicine?

In this regard, we would like to share a patient testimony presented by a representative of *Cittadinanza Attiva* at the FADOI Regional Congress on February 16, 2024: “...Yesterday I decided to go to the CAU, the new Assistance and Urgency Center at the Health House in Bologna-Navile, established to remove white and green codes from the regular Emergency Room. I was welcomed by well-trained, kind, and attentive staff, and I was fortunate to encounter a doctor who had graduated relatively recently but was already capable of conducting herself like a veteran. She listened to me carefully, did not underestimate any of my statements, and focused on fitting them into an overall picture that made sense; she understood well that I wasn’t there to waste her time. Additionally, she was technologically advanced: she performed a quick ultrasound of my right kidney and surroundings using an accessory connected to her cell phone, allowing her to observe in real-time if there were any problems. This led me to two considerations: first, when I experience a symptom, I am overly sensitive, and if it measures one millimeter, I perceive it as a meter. The second is that I am fortunate: the CAU-Navile had just been inaugurated two days earlier, and I was among the first to use the service. Speaking with the doctor, she explained to me that when therapy is changed, there needs to be a period when the “old” drug is no longer taken and the new one is not yet taken. “Yes,” I commented, “a ‘wash-out’ period is necessary to avoid the overlapping effects of the two drugs and prevent conflict.” I returned home after the appropriate explanations, reassured and in a better mood. It was an interesting experience from which I learned a lot.”

The young doctor certainly has “an extra gear” in terms of empathy and communication and should be commended for that. At the same time, it seems quite evident how POCUS with a smartphone ultrasound greatly facilitated and catalyzed the doctor-patient relationship, bringing mutual satisfaction to both parties. This can be said regardless of the clinical findings (fortunately benign in this case): we would like this to be the main take-home message for the internist.

Conclusions

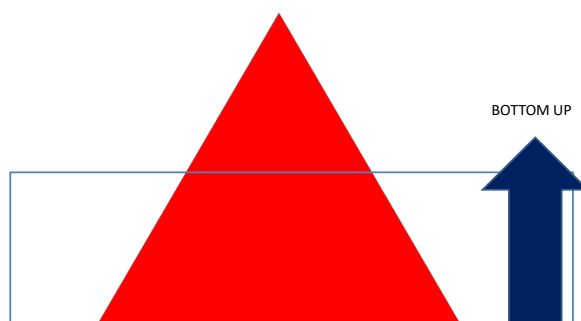
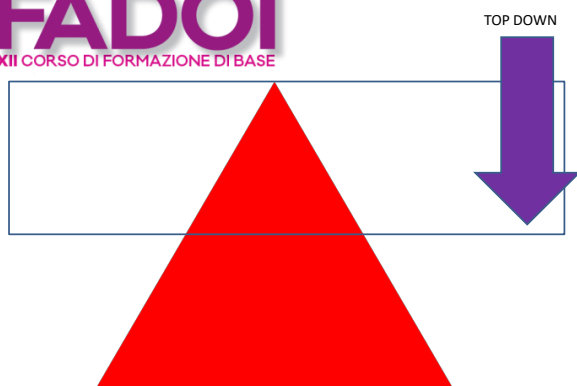
Considering that since 2014 it has been established that the performance of smartphone ultrasounds for the limited items of POCUS is entirely comparable to modern cart-based machines, we can assert that internists have at their disposal a tool that should be a distinctive feature of their practice and the visibility of internal medicine as effective and efficient, portable and always available, and

capable of establishing a friendly and empathetic relationship, in perfect harmony with the expectations of 21st-century patients.

A recent position paper by the European Federation of Internal Medicine defines POCUS core competencies and clinical settings for internists in a symptom-based approach, addressing training requirements and providing a framework for training programs at a national level. The FADOI Ultrasonography Department has developed a dedicated training course specifically for hospitalists and general practitioners.⁴

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GLOBAL ULTRASONOGRAPHY	FIRST-LEVEL CLINICAL POCUS
Comprehensive	Selective (few items)
Diagnostic	Semiologic
Report	Finding
Quantitative/qualitative	Semi-quantitative (yes/no)
Few dedicated physicians in the operational unit	All physicians in the operational unit
Extensive training +++++	Moderate training +++
Cortical	Subcortical

Figure 1. Ultrasound levels of competence for the internist. POCUS, point-of-care ultrasound.

Table 1. Correct use of pocket ultrasound devices.

Pocket ultrasound/smartphone devices: appropriateness	
Pleural, pericardial, peritoneal effusions	yes/no
Wet/dry lung	yes/no
Dilated heart ventricles	yes/no
Severe cardiac systolic dysfunction	yes/no
Collapsible inferior vena cava	yes/no
Palpable/ suspected abdominal mass	yes/no
Hydrops of the gallbladder	yes/no
Hydronephrosis	yes/no
Intestinal and biliary obstruction	yes/no
Abdominal aortic aneurysm	yes/no
Bladder outlet obstruction	yes/no
Thoracentesis/paracentesis (US-assisted)	
Catheter into the bladder (nursing staff)	yes/no