Netherlands
The Journal of Medicine

SPECIAL REPORT

Binary ultrasonography for the internist: yes or no, that's the question!

F.H. Bosch[1]*, J.C. ter Maaten[2], A.B.M.Geers[3], R.O.B. Gans[4]

[1]Department of Internal Medicine, Rijnstate Hospital, Arnhem, the Netherlands, [2]Department of Acute Internal Medicine, Academic Medical Hospital, Groningen, the Netherlands, [3]Department of Internal Medicine, Antonius Hospital, Nieuwegein, the Netherlands, [4]Department of Internal Medicine, Academic Medical Hospital, Groningen, the Netherlands, *corresponding author: fhbosch@rijnstate.nl

ABSTRACT

The authors discuss the pros and cons with regard to ultrasound for the internist. They state that ultrasonography is seldom used by internists and they suggest several reasons for this. After a brief review of the literature they conclude that using ultrasound would probably benefit patients and would lead to a more rapid diagnosis and an increase in safety while performing invasive diagnostic and therapeutic interventions. The authors suggest that internists use ultrasound in a different way compared with radiologists, cardiologists, etc. They introduce the term binary ultrasound: ultrasound should be used to answer clinical questions with a yes or a no.

KEYWORDS

Ultrasonography, diagnosis, intervention

INTRODUCTION

In the last few years there have been many discussions about implementing ultrasonography for the internist. Up to now, no clear decision has been taken. In this article we will ponder about the reasons for this hesitation and suggest a new role for ultrasound in internal medicine: binary ultrasound.

THE CURRENT SITUATION

Up to now, there is no training curriculum in ultrasound for internists in the Netherlands. This is in contrast to many countries around us where ultrasonography is often performed by internists. Many specialists in the Netherlands have adopted ultrasonography in their daily practice. Urologists, gynaecologists, cardiologists and pulmonologists rely on their echographic skills for analysing the anatomy and functionality of the organs that they are studying. We see that ultrasonography is beginning to enter the field of some subspecialities of internal medicine with great hesitation: endocrinologists are echoing the thyroid, vascular internists measure the carotid artery intima media thickness with the aid of ultrasound, intensivists use ultrasound for determining cardiac output and filling status.

So what are the reasons that internists have not accepted ultrasound as an integral part of their examinations? There have been no investigations into this issue, but we will try to find an answer and suggest new avenues to explore.

Firstly, there is probably a misunderstanding about what ultrasonography means for the internist. It goes without saying that radiologists will always be better at performing an ultrasound of the liver, the kidneys or other internal organs, and that cardiologists will always outperform us in investigations of the heart, etc. We suggest that ultrasound for the internist should be limited to answering simple questions with a 'yes' or a 'no'. We coin the term binary ultrasound.

From the literature it appears that answering clinical questions with a yes or a no is a viable way of thinking; emergency ultrasound was approximately 86% sensitive and 98% specific to detect abdominal fluid and 96% sensitive and 100% specific to detect pleural fluid.[1] The overall sensitivity and specificity for detecting hydronephrosis in patients with a renal colic amounted to 87% and 82%, respectively.[2] Assessment of the diameter of the inferior vena cava, and its variations during respiration,

correlate with central venous pressures that were measured invasively.[3,4] A short training session in emergency ultrasound appeared accurate to detect abscess formation in the presence of a soft tissue infection,[5] and bedside soft tissue ultrasound altered the management in 56% in patients with cellulitis.[6]

Some of the questions that can be answered with a yes or a no are:

- Is there free fluid in the abdomen?
- Is there a postrenal obstruction?
- Is there pleural fluid?
- Is there a pericardial effusion?
- Is there intravascular volume depletion?
- Is there abscess formation in the presence of a soft tissue infection?

Of course, an internist with the aid of ultrasound cannot answer all clinical questions with a yes or a no: 'Is the bile duct dilated?' for instance is a far more difficult question to answer.

There may be doubts about the reliability of the above-mentioned application of ultrasonography or whether these skills can only be learned after an extensive training program. The American College of Emergency Physicians has described precise pathways for training in core applications of emergency ultrasound, including the evidence for these core applications. It appears that a limited number of examinations is enough to reliably perform several of the core applications. Based on a long experience in core emergency ultrasound training, the American College of Emergency Physicians recommends that a trainee should obtain at least 25 documented and reviewed cases in each of the core applications with a range of 25-50 cases, whereas a minimum number of ten examinations are recommended for an ultrasound-guided procedure examination. So, binary ultrasound can be learned within a limited timeframe.[7]

DIAGNOSING COMMON INTERNAL MEDICAL PROBLEMS

Ultrasonography has a central role in diagnosing many major problems. For instance, in hypotension, ultrasonography is very helpful in determining cardiac filling status, rightward deviation of the intraventricular septum, tamponade, and free fluid in the pleural space or abdominal cavity. These diagnoses can be determined with good reliability by asking questions that can be answered with a simple yes or no (e.g. is there any pericardial fluid?) after which more dedicated investigations can be ordered. Ultrasound is also very good in determining filling status through determining whether the inferior caval vein is dilated.[3]

The diagnostic value of immediate goal-directed ultrasound to identify causes of nontraumatic, undifferentiated hypotension in the emergency department has been shown by Jones *et al*.[8] They found this protocol resulted in fewer viable diagnostic aetiologies and a more accurate physician impression of the final diagnosis within 15 minutes after presentation.

Unknown to many, ultrasound of the lungs is also able to determine whether the lungs are ventilated through visualisation of the pleura.[9]

PERFORMING INVASIVE PROCEDURES

Ultrasonography is becoming an indispensible tool in invasive procedures. There is accumulating evidence that ultrasonographic guidance improves patient safety and procedural success.[10] For instance, it has been shown in the literature that internal jugular cannulation for the placement of haemodialysis catheters is safer with ultrasonography.[11] In addition to this: one of us failed 14 times in 155 catheterisations of the internal jugular vein and hit an artery seven times. Furthermore there were four localised haematomas.[12]

Ultrasonography in diagnosing and treating pleural effusions is very valuable and saves a lot of x-rays.[13] Ultrasound guidance improved the success rate of paracentesis and identified a number of patients in whom the procedure could not be performed. A short training program was sufficient to learn to use ultrasound in these instances.[14]

We would like to propose that the time that internists perform procedures blindly is slowly coming to an end.

THE FUTURE

We suggest that internists will have to learn what we coin as a new term: binary ultrasonography. Internists can use ultrasonography to answer clinical questions with a yes or a no to improve their diagnostic skills in addition to their other skills. Furthermore, internists will use ultrasonography as an aid in performing invasive procedures.

We propose that ultrasonography for the internist becomes so important that it will be performed in many instances before the results of laboratory investigations become available. This will be especially the case in treating the acutely ill medical patient; many protocols will in the future have a new structure: 1. History; 2. Physical examination; 3. Ultrasonography; 4. Lab results; 5. Additional investigations. This will lead to better patient care.

These principles have consequences. Firstly, the basics of ultrasonography will have to be taught in the beginning of the training of the internists and, secondly, ultrasound competencies have to be described for every aspect of the training of the internist and implemented in the training when appropriate.

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