Hand-Carried Ultrasound Devices

Research reveals HCU devices benefit medical students in cardiac diagnoses

Using hand-carried ultrasound (HCU) devices in conjunction with traditional teaching techniques improves medical school students' ability to make correct diagnoses in cardiac cases, according to a recent study from the University of Chicago. The study's authors argue that handheld ultrasound training should be added to every medical school's physical examination (PE) curriculum. The study was presented at last month's scientific sessions at the American Society of Echocardiography annual meeting in Toronto.

Jeanne M. DeCara, MD, assistant professor of medicine at the University of Chicago Hospital and lead author of the study, says the study came as a result of an evolving body of literature noting the decline in physician skill with regard to the physical examination — in particular, the cardiac examination.

"[This decline] has been going on over the last two decades," DeCara says, "and it occurs on all levels of training — from cardiologists to medical students. The consequence of this is that physicians now are relying heavily on technology to make their diagnoses."

DeCara sees the problem originating at the medical school level. "Currently, the physical exam is taught in the second year of medical school, and that's at a time when the students are not typically exposed to patients," she says. "They learn how to listen to the heart almost in isolation. They have a few practice patients and a physical exam course that lasts for a given amount of time, but it's not something they do repeatedly throughout their second year of medical school."

THE NEXT GENERATION

The older generation of physicians didn't have the technology that is available today to make a diagnosis, says DeCara. They depended more on the physical examination. "The physicians got very sophisticated at the art of listening to patients," she says "and they would impart that knowledge onto their students."

DeCara notes that in the past, patients had longer hospital stays, physicians had more time to make their rounds and usually were required to make a diagnosis and triage the patient largely on the basis of the physical examination. "The tradition of medicine was to use the stethoscope," she says.

Percent of Correct Diagnosis

The average percentage of findings identified by students from patients examined (mean±8%)

Prior to training	38%
Post phase 1 training	40%
Post phase 2 training, without HCU	46.6%
Post phase 2 training, with HCU	59.3%

But as the older generation retires, the responsibility to teach medical students falls on the next generation of physicians — one that grew up with technology. "[Younger physicians are] not quite as sophisticated with the stethoscope as the more senior physicians were in the past," DeCara says. And with time always a factor, she believes today's students are not getting the bedside training that was once the norm.

DeCara says University of Chicago students and residents rotating on the hospital ward are frequently brought to the echocardiography laboratory after rounds to see their echocardiograms. "It becomes more tangible to them if they see somebody with an enlarged heart," she says. "It leaves a lasting impression on them."

She says, ideally, a physician would want to listen to a patient and then do an echo at the bedside. Until recently, the problem has been that echo machines, although portable, are cumbersome and not practical to image every patient at their bedside after an examination. But with the hand-carried devices — which usually weigh between five and seven pounds — convenience is not an issue.

For the premise of their study, the researchers asked three questions:

- Is it feasible to teach medical students how to perform ultrasound exams?
- Assuming it can be done, does it add any incremental value to their ability to listen to the patient with their stethoscope?

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— *Jeanne M. DeCara, MD*

- How much better would diagnosis from medical students be if they used a hand-carried ultrasound device over the stethoscope?

For the study itself, they selected 10 fourth-year medical students enrolled in a four-week medical elective course on cardiac examination offered as part of the curriculum at the University of Chicago Medical School.

The course included two training phases. The first phase was a 10-day review of cardiac anatomy, pathophysiology and auscultatory findings, using traditional teaching methods consisting of lectures and CD-ROMs. This was followed by an additional 10-day individualized and supervised instruction on the use of HCU, limited to the short axis and apical four-chamber views, during which the students used echocardiographic findings to confirm or revise their preliminary auscultatory diagnoses on patients referred to the echocardiography lab.

DISSECTING THE RESULTS

To assess the results of these training phases, each student examined 12 patients with known cardiac disease at three different times: on the first day of the course, after the review of their conventional training and again after 10 days' HCU training. During the last examination, students first auscultated and submitted diagnoses. They then performed HCU exams and modified their diagnoses if necessary. Analysis of variance was used to compare the percentage of correct diagnoses at each examination.

Most students' errors were attributed to missed findings rather than misdiagnosis. Compared to the students' baseline skills, HCU resulted in more accurate bedside diagnoses.

On the students' first patient interaction (prior to any physical exam review or HCU training), only 38 percent of the findings were correctly identified. After review of their conventional training, that percentage increased only slightly to 40 percent. On the final examination, the diagnoses by ausculation without use of the HCU produced a 46.6 percent accuracy rate, while the diagnoses that immediately following the HCU produced a 59.3 percent accuracy rate.

"Our conclusion is that it is feasible to teach medical students a limited ultrasound exam," says DeCara. "It significantly improves upon the performance level that students currently attain by the end of medical school."

From their data, the researchers suggest that HCU devices can serve as teaching aids for auscultatory instruction and as powerful diagnostic tools for less experienced physicians. They recommend their inclusion in the medical school PE curriculum.

"In the end, this really affects patient care," DeCara says. "If you can make a correct diagnosis at the [patient's] bedside, then I think that, ultimately, the patient gets triaged quicker and further evaluation and treatment can be appropriately chosen."

DeCara and her colleagues believe it's important to make sure the foundation that students get in their second, third and fourth years of medical school is strong because, eventually, these students are going to be teaching the next generation of physicians.

— *Tom Schaffner*