In the current issue of JASE, Singh et al. discuss the American Society of Echocardiography Remote Echocardiography With Web-Based Assessments for Referrals at a Distance (ASE-REWARD) study, a unique and humanitarian project that highlights the ability of point-of-care handheld ultrasound and Web-based remote interpretation to enhance the cardiovascular care provided to a large rural population in northern India attending a meditation retreat. This report raises many interesting points.

Clearly, advances in miniaturization have allowed the development of outstanding handheld portable ultrasound units, such as the Vscan (GE Healthcare, Milwaukee, WI). These in turn allow caregivers (physicians, sonographers, nurses, etc.) to bring high-quality diagnostic imaging to patients, no matter where in the world patients are located. This clearly makes echocardiography unique and in stark contrast to other noninvasive imaging modalities, such as cardiac magnetic resonance imaging, computed tomography, positron emission tomography, and even radionuclide imaging. Hence, echocardiography really defines being able to deliver care anywhere.

Advances in Web-based transmission of images allowed Singh et al. to upload diagnostic ultrasound images securely (with no violations of the Health Insurance Portability and Accountability Act) and seamlessly (through commercially available software provided by Core Sound Imaging, Inc., Raleigh, NC, and GE Healthcare) to a cloud-based Web Server (Studycast; Core Sound Imaging, Inc.). These images were then transmitted via the internet for remote interpretation by 75 experienced echocardiographers. Not only did this occur seamlessly, but remarkably, the median time for interpretation—with the interpreting physicians distributed throughout the world—was 11 hours 44 min. This time is as fast as achieved in some echocardiography labs located in the United States.

A team of nine outstanding and highly motivated sonographers imaged 1,023 individuals over a 2-day period. Not only is this a remarkable feat, but these sonographers also provided qualitative diagnostic interpretations, which were later compared with the interpretations of the remote echocardiography readers. It is important to appreciate that a very systematic approach to obtaining the images was undertaken, so that each study followed a set protocol. Remarkably, 1,021 of the 1,023 studies were adequate for interpretation. The facts that on average, each sonographer did approximately 56 to 57 studies a day, that these studies were technically very good, and that the sonographers then provided on-site qualitative interpretations speak strongly about the expertise of sonographers and highlight their value as colleagues in the field of echocardiography.

The sonographers were asked to identify abnormal findings if present and to classify them into three categories, showing mild, moderate, or severe abnormalities (examples of left ventricular [LV] size, LV wall thickness, LV function, right ventricular size and function, valvular abnormalities, pericardial abnormalities, and various congenital abnormalities). The sonographers were also asked to estimate LV ejection fraction (LVEF) visually and to classify it as mildly depressed (45%-54%), moderately depressed (30%-44%), or severely depressed (≤30%), as well as to detect the presence of segmental wall motion abnormalities. Their findings were then compared with those of the remote interpreting physicians, and concordance and discordance among the findings were analyzed. Interestingly, and not surprisingly, the largest discrepancy pertained to visual estimations of LV systolic function, as well as the degree of LV hypertrophy. Although the sonographers and interpreting physicians were all very experienced, the presence of a discordant opinion on the visual estimation of LVEF is not surprising. In fact, it is often the case in many echocardiographic settings, at least in this country, and is one of the major criticisms of echocardiography: namely, that different interpreters give different ejection fractions when viewing the same images on a given patient. This finding in the current study, as well as the fact that we see the same variability in our daily practice, highlights the need for quantitative assessment of global and regional LV function. Although experienced echocardiographers (and sonographers) can learn over time to estimate LVEF accurately, echocardiography needs a more quantitative analytic method for documenting chamber volumes as well as global and regional LV function. It is possible that advances in digital technology may bring these capabilities, which are currently available on larger echocardiographic instruments, to the smaller, handheld portable units. But this discordant finding does highlight the fact that all of us, when performing and interpreting echocardiographic evaluations of LV global and regional function, must base our findings on obtaining multiple views from which to assess global and regional LV function and must also correlate our findings with those obtained using other techniques, so that we can enhance accuracy.

Of the 1,021 interpretable studies, 16.7% were felt to have major abnormalities. The authors classified major abnormalities as any valvular regurgitation of greater than moderate degree, any valve stenosis, any congenital heart abnormality, any LV systolic dysfunction with an ejection fraction <55%, or any wall motion abnormalities and/or the presence of moderate LV hypertrophy. LV systolic dysfunction (45.9%) was the most frequent major abnormality found, followed by valvular abnormalities (32.9%) and congenital abnormalities (13.5%). Although one could argue with classifying some of these abnormalities as major (specifically, having a single regional wall motion abnormality or an LVEF <55%), the authors felt that classifying these findings as major meant that they would warrant further evaluation and workup. In fact, in their study, approximately 80% of the individuals who were found to have major abnormalities by echocardiographic evaluation were found on subsequent telephone follow-up to be compliant with initial recommendations for further workup. Hence, not only did the handheld ultrasound detect abnormalities that warranted further workup, but further workup did in fact occur. In this way, the team of sonographers and physicians was able to...
accomplish the goal of bringing top-notch cardiovascular diagnostic imaging to a large, rural population to facilitate access to cardiovascular care.

The beauty of echocardiography, when done well, is that it allows the assessment of not only valvular anatomy but also chamber size, wall thickness, and chamber function, as well as the ability to evaluate the great vessels and the pericardial space. Although the handheld Vscan does not provide spectral Doppler, which would be needed for accurate evaluation of stenotic valvular lesions (this was provided, when necessary, by further scanning with the Vivid i or Vivid q system [GE Healthcare], the laptop portable systems also available on site), the criterion that the investigators used to detect major abnormalities of valvular structures is important to note. This criterion is the same one that any echocardiographer should use when trying to determine the severity of a valvular lesion. The authors looked for the presence of valvular calcification and abnormalities of the valvular motion, and the effect of the valvular lesion on chamber sizes (left atrium and left ventricle), as well as LV wall thickness, among other findings. In other words, as was done in this study, an interpreting physician or sonographer should not rely solely on Doppler findings in valvular lesions to evaluate their severity but also look at the effect of those lesions on global cardiac chamber size and function.

The emergence of outstanding handheld portable echocardiographic instruments, such as the Vscan, does allow many physicians and sonographers to use them as point-of-care devices. The study of Singh et al. clearly shows that when done by experienced sonographers and experienced interpreters, high-quality care can be brought to a needy population, anywhere in the world. But, as pointed out by Dr. William Zoghbi, the current president of the American College of Cardiology and a past president of the American Society of Echocardiography, advances in the miniaturization of ultrasound do carry the risk for misuse of this technology. This misuse could, in and of itself, not only lead to improper diagnosis but also result in improper management of patients. To this point, Singh et al. highlight the fact that the European Association of Echocardiography has recently published a position paper that mandates specific training and certification for all users of such handheld technology, except for those cardiologists who are certified for transthoracic echocardiography. So, as Dr. Zoghbi and many others have pointed out, advances in ultrasound technology must be matched with the motivation to deliver quality and expertise on the basis of adequate training, so that our patients are given the highest level of care.

THE NEW BLACK BAG: ARROWSMITH

In 1969, each member of my Emory Medical School graduating class (72 individuals) was given a doctor’s black bag—at the time, the symbol of a physician—as a graduating gift. The gifts were provided by a large pharmaceutical company, something that would obviously be impossible in today’s environment. I still possess this black bag, although I must admit that I stopped using it sometime during my residency. I dare say that very few physicians today either have a black bag (outside of neurologists, who find it convenient to carry all of their magic tools) or would even know what to put in one. Now, although one might argue that the new iPad mini might be the black bag of the future, I would suggest that technology such as the Vscan could represent the “new” black bag, as it allows health care providers to bring diagnostic skills and capabilities to patients, no matter where they are. Using such a tool, a physician can again make “house calls.”

This mental image of the physician carrying a black bag to make a house call brings me to the outstanding (and Pulitzer Prize—winning) book Arrowsmith, written by Sinclair Lewis in 1925. Lewis’s grandfather and father were physicians, so he had been around physicians all his life. The hero of the book, Martin Arrowsmith, grows up in a small midwestern town in the late 1890s and becomes, at the age of 14, a helper to the local physician, Doc Vickerson. It is Doc Vickerson who gives young Arrowsmith a magnifying glass to “start his training.” Literary critics suggest that the magnifying glass should represent the curiosity and ability to see clearly that a physician should have. I might postulate that handheld ultrasound instruments, such as those used in the ASE-REWARD study, could represent the magnifying glass of the future, in that such instruments allow the caregivers to keenly observe (diagnostic capabilities) what cardiac conditions their patients could present with, no matter the location or setting. Hence, handheld ultrasound instruments, such as the Vscan, may well represent the black bag and the diagnostic magnifying glass that physicians of old carried on house calls.

Young Martin goes on to medical school and comes under the influence of a brilliant, eccentric professor by the name of Max Gottlieb, who stimulates his not only interest in medical sciences but also his desire to help and heal. He does go on to practice in a small midwestern town but is drawn back to a prestigious New York research institute to carry out his first love: the work of a valued scientific investigator.

In the 1920s, this country was undergoing an economic boom, and medicine had become a business (sound familiar?) full of commercialism, overutilization of technology, emphasis on the financial aspects of the practice of medicine, and professional competition among medical institutions and individuals, many seeking notoriety and public recognition. Young Arrowsmith is turned off by this institutional and individual pressure, jealousy, and competition and goes off to pursue his dream as a scientist in rural Vermont, where he believes that his knowledge can be used to heal individuals.

So what does the ASE-REWARD project have to do with Arrowsmith?

Clearly, this project shows that tremendous humanitarian value and care can be provided when not only individual health care providers (sonographers, local and interpreting physicians) but also professional societies (the American Society of Echocardiography) and, very importantly, industry partners (such as GE Healthcare) come together to reach out to the underserved and provide care with compassion. Nothing about this project centered on institutional or corporate searching for notoriety or recognition, and none of the individuals who gave their time and energy were seeking personal or public gain. This project shows that the proper use of technology, coupled with a desire to bring care to those in need, can do exactly that. The many individuals involved, the American Society of Echocardiography, and the great corporate partners are to be lauded for their cooperative and giving spirit.

GIVING

One of the major messages of the report by Singh et al. (and, I hope, this editorial) is the concept that individuals, professional societies, and corporations gave of themselves in an altruistic and humanitarian way. Giving of oneself is, after all, one of the keys to not only improving the lot of those around us but also bringing worth to our profession and happiness to the individual givers. Although many of us cannot or may not be able to give of ourselves in distant
locations, such as India, South America, and Asia, we can certainly take the message and example of the ASE—REW ARD study to our local underserved communities. Think what would happen if individuals reached out to the underserved in their inner-city areas to provide outstanding care using devices such as the Vscan or other portable ultrasound machines, to aid in detecting major cardiac abnormalities, or even minor abnormalities, that could undergo intervention at a time when treatment might not only improve the health of the individual patient but also lessen the downstream burden of major illnesses on society.

Many examples already exist. Here, in my hometown of Atlanta, the HEAL Center, supported in part by our organization, the Piedmont Heart Institute, has volunteer physicians and sonographers using portable ultrasound to help serve inner-city patients and thereby improve their care in our own community.

**TAKE-HOME MESSAGES**

The study of Singh et al.\(^1\) emphasizes that tremendous advances in miniaturization and digital technology allow handheld ultrasound, coupled with secure Web-based transmission and interpretation of images, to provide diagnostic capabilities to patients at the “bedside.” It also shows the tremendous cooperative spirit among individual care providers (sonographers and remote readers), corporations, and even professional societies to bring care and modern expertise to those in need.

And finally, it demonstrates the importance of giving that we can consider applying to those in our own communities.

**REFERENCES**