



# *Trends-in-Medicine*

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## *Quick Pulse*

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### **Trends-in-Medicine**

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### **BUSINESS SOUND FOR ULTRASOUND**

Ultrasound continues to be an expanding, high growth business, and the growth of computerized tomography (CT) scanning and magnetic resonance (MR) imaging does not appear to be marginalizing ultrasound. However, the ultrasound market is dividing into two segments – lower-end screening tools and higher-end diagnostics. Senior officials at each of the major companies involved in ultrasound were interviewed about the outlook for ultrasound technology.

### **THE PLAYERS**

The top three ultrasound manufacturers worldwide are Philips Medical Systems, GE Healthcare, and Siemens Medical Solutions, but the field continues to attract new companies, from small firms to large ones such as Toshiba America Medical Systems. GE's Americas marketing manager for ultrasound, Gitte Andreasen, said, "Our competitors are Siemens and Philips. Toshiba is in there, too, but mainly GE, Siemens, and Philips own the market." A GE scientist said, "Our main competitors are Philips and Siemens. Our 4-D Voluson product really caught people off-guard, and they're having a hard time catching up to that. There was a real battle in cardiology and on the laptop front." Jim Brown, director of clinical and technical marketing at Philips, said, "If you look at the three major players, they are Philips, GE, and Siemens, and then you have more of the minor players, which include Toshiba, Aloka, and Hitachi." Even a Toshiba official said, "In terms of market share, it's Philips, GE, and Siemens, but nothing that they are doing is different from us; we're all doing the same thing."

Yet, there are some serious smaller competitors, such as SonoSite, which was first-to-market in laptop ultrasound. A GE source said, "That was a year-long head start. Now, there are competitors (to SonoSite), but SonoSite, which is independent, was still first-to-market...Hologic can be more nimble than GE, and GE can't respond as quickly." A Philips source said, "SonoSite is the biggest competitor in portables, but the question is whether SonoSite will be here in five years...We have raw data, and we can manipulate it, re-annotate it. SonoSite can't do that...(Also,) compatibility with other systems is very important. SonoSite is okay with DICOM but has problems with PACS."

A Siemens official said, "I think there are a few strong players who are making significant advances which will enable ultrasound to grow. Siemens and the competition are collectively trying to transform the industry of ultrasound and are investing in R&D. And Siemens takes the approach that we are trendsetters in solutions-oriented systems – whether ultrasound alone or multi-modalities. The key take-away is our investment in R&D and clinical workflow and making sure customers and patients benefit...Big players in ultrasound are like any industry; they try to do what is best for the industry and have friendly competition."

### THE PLAYING FIELD

The major manufacturers all remain committed to ultrasound, and it is viewed by each of these companies as an important part of their portfolio.

- **GENERAL ELECTRIC HEALTHCARE.** Marketing manager for ultrasound Andreasen said, "Ultrasound is still one of the biggest businesses within GE, so it's not going away." A scientist at GE said, "Ultrasound is a good business. It's growing quite a bit. For GE, it has been a great growth engine. GE got in it kind of late, buying its way in about 10 years ago, but it is now one of the market leaders...The primary driver of GE Healthcare is ultrasound. That is the place where we're seeing 10% growth. Ultrasound brought in more than \$1 billion in revenue to GE last fiscal year. It was a fantastic year, but who cares when it's a \$150 billion company? If you took the clinical systems division with ultrasound public, it would be No. 450 on the Fortune 500 list."
- **SIEMENS MEDICAL SYSTEMS.** Arnd Kaldowski, ultrasound division vice president, said, "The market is growing significantly worldwide. All areas are growing."
- **PHILIPS MEDICAL SYSTEMS.** Marketing director Brown said, "For Philips, ultrasound is a high growth business that is expanding and that we're investing in. It's a business that is very important to Philips Medical Systems and Philips Electronics. We don't view it as something that is latent and we're just trying to get as much as we can out of it. It's an important growth modality for us, and it's starting to play an increasing role in many areas of healthcare. One of our primary goals is to inject ultrasound into the entire healthcare cycle, whether for screening, diagnostics, therapeutics, or follow-up after therapy. So we're continuing to innovate and expand our product portfolio to meet all of these niches as best we can."
- **TOSHIBA AMERICA MEDICAL SYSTEMS.** Gordon Parhar, director of Toshiba America Medical Systems' ultrasound business unit, said, "It's definitely not a special niche, and we would like it to be a cash cow but right now it's not...It's a billion dollar market in the U.S., a very healthy market, and a market projected to grow from 2%-6% next year."

### THE BUSINESS OUTLOOK

The outlook definitely is for ultrasound to continue to grow, both as a market and as a business focus. A GE scientist said, "Ultrasound has a lot of different uses, from cardiovascular uses like the ability to monitor the flow of blood in vessels to obstetrics, where you can look at babies and figure out growth. The use in arthritis is probably underdeveloped because ultrasound does a very good job of assessing inflammation and swelling. It is used much more in Europe for that. Then, there is imaging of joints to look, in a quick way, to see if you need

a more advanced tool look." A Siemens source said ultrasound use is growing as it is integrated into cath labs and surgical suites. He said, "It has expanded to the cath lab as a PACS and workflow tool. Reporting is not just imaging. Cath and echo labs have realized this by now, and this will expand further...This underlies a broader reach to more modalities and a product family."

GE has a formulaic approach to this and its other businesses. A GE scientist explained, "The GE equation is simple: base cost cannot grow more than half the base revenue and GE expects 10% growth per year. It's a very basic equation...GE is not giving up on ultrasound. They bought Voluson, Krespa, and Lunar, but they took the products those companies made and made them better."

### COMMODITY OR INNOVATOR?

Most sources believe that the two segments – lower-end screening and high-end diagnostics – will continue to prosper. GE and Siemens have bets in both areas, Toshiba described ultrasound as moving more quickly toward screening, and Philips doesn't think ultrasound is shifting into a screening tool.

There appear to be two types of customers. GE's Andreasen said, "First, there are customers/physicians who use ultrasound because it is easy to use for quick screening, to say if something is wrong or not. Second, it's for specialists who need high-end equipment with a lot of specialty features that are used for diagnostics...If ultrasound turned into a screening tool, you would use it to establish if a patient is sick or if something is wrong – that's screening. Then, you would need to move to something more specialized, and that can still be ultrasound at a different level, so there are kind of two levels of ultrasound." A Philips source said, "Whether ultrasound becomes a screening tool depends on the application, but, yes, it is moving that way, from primary care to internal medicine. It is a great screening tool. It is very inexpensive and can be done on the spot."

Is ultrasound getting commoditized? At the low end, as a screening device, probably yes. Ultrasound devices are getting smaller and cheaper. GE, for example, is taking some of its ultrasound technology and packaging it in a form that may become more of a commodity. A GE scientist said, "GE continues to innovate, but GE provides a perspective of taking the same technology and packaging it in something that does become more of a commodity...The devices are smaller and cheaper, so probably yes, it is becoming a commodity."

Imagine an ultrasound device the size of an iPod. That's what GE's Andreasen is predicting. She said, "Ultrasound is a commodity – at least into the segment that we communicate with, sell into, and are educating. For radiologists and OB/GYNs it is definitely a must-have...I believe that for the next two or three years, ultrasound will be for diagnostic

purposes. Down the road, physicians believe breast screening with ultrasound will be in place. Right now, if you have any suspicions when you do a mammogram, you refer the patient for breast ultrasound, where you can actually see more, and it gives a different picture...In three to five years, you will see ultrasound the size of a stethoscope, allowing patients a lot more accessibility (to ultrasound). Every single primary care physician will be equipped with ultrasound instead of referring patients out and waiting for two or three weeks to get the patient to a specialist. Compact/portable ultrasound is moving into a commodity. Imagine our laptop (ultrasound system) in an iPod size. That is when ultrasound truly turns into a commodity.”

A Toshiba source said that his company also sees ultrasound as a commodity, “You could say that because there’s a lot of parity between the competitors, so what companies are trying to do is differentiate ourselves. We have a few product differentiators from our competitors, but in the overall business model we differ in terms of our service, our training, just the way we look at our customers. But of all the modalities, I could make the same argument for CT.” Siemens’ Kaldowski added, “Established, large players will move the technology and migrate it further down; smaller players would like to commoditize...You will see a difference in strategy between commoditization and striving for the paradigm shift and significant improvement which enables us to get to a new level. People are following different strategies.”

Going forward, each of the companies has a slightly different focus:

- *Philips executive:* “Is ultrasound moving away from complex diagnosis and moving more quickly toward screening? No, absolutely not! If you look at CT and MR, although there have been significant developments in the past few years, it has also been with ultrasound. We’re taking advantage of electronics, the latest in software development, and we’re starting to do advances. For example, there’s volumetric imaging. We acquire volumes of data and give physicians more information than ever before.”
- *Siemens vice president:* “We believe (ultrasound) is here to stay as a strong diagnostic modality, but we believe there are more opportunities upstream in screening and downstream to therapy through image-guided therapeutics. In the molecular imaging space, there are opportunities to use ultrasound therapeutically...We definitely believe it’s not just for screening...I would differentiate among echo, radiology, and OB/GYN. At this point in the market, ultrasound is really a crucial part of diagnosis and will remain there based on its unique capabilities, mainly real time in OB/GYN and the non-radiation element. In radiation, I can see some substitution of diagnosis, and I see ultrasound moving more toward screening, though there are some capabilities that are still

unique. In the cardiovascular field, there are a lot of unique capabilities in ultrasound. Ultrasound is complementary to that.”

- *GE scientist:* “Ultrasound still has a big runway in both innovation and as a commodity, and GE definitely has bets in both areas...Ultrasound shows anatomy well. The challenges have to do with penetration. Sound does bizarre things and scatters. With CT, you can throw more x-ray energy and shoot through anything, so ultrasound will never eclipse that. But without radiation – if you don’t need image clarity – you can do amazing things with ultrasound, like baby face pictures. Ultrasound is probably more of a front-line tool. I can see the day when it is almost like a stethoscope, for example, checking carotid arteries or, instead of feeling organs during a checkup, the doctor will scope around with ultrasound.”
- *GE marketing manager:* “The role continues to be the less expensive diagnostic imaging technology. If you compare it to PET, CT, and MR, it is a much less expensive examination both for the patient and the hospital or facility. Besides that, there are major improvements in diagnostic enhancements in ultrasound very much like CT and MR, where you can scan through the entire pathology...Volume-imaging ultrasound actually captures a complete volume of dataset, and TUI (tomography ultrasound imaging) gives a slice.”
- *Toshiba executive:* “Ultrasound is definitely moving away from complex diagnosis and more quickly toward screening...All the point-of-care is for screening. Someone comes to the ER or someone is in the labor and delivery ward, and they want to know which way the baby is. Or someone comes into the ER for trauma. And they’re also using it for initial screenings. That’s all part of the reasons for the growth of ultrasound. Also, people are getting older...Ultrasound is still being used, though, by radiologists in the ultrasound department, and those types of diagnoses are changing. They’re still trying to detect lesions and tumors. So, the answer really is yes and no.”

### PORTABILITY

Sources agreed that ultrasound portability is becoming increasingly important, but they differed on when portability will become mainstream – and differed even on the definition of portability. A Siemens official said, “The portable segment is something slightly larger than a notebook with a cart.” A GE official said, “The stethoscope is archaic, and you can do a better job with an ultrasound-type device in monitoring blood flow, but you need to get to a hand-held unit, like the size of a BlackBerry, with a probe...The devices are getting smaller and cheaper.”

Most sources believe there will be substantial growth in portables. A Siemens official said, “On the portable side, that is a market space by itself which has its own dynamics and a

set of different players. There is an advantage to having well-established 'non-hand-carry' systems as well...Portable systems by themselves are a different market segment. We are interested in adding as many high-end applications as possible, and then cheap ones just trying to do something...We don't believe the (portable) segment is cannibalizing existing systems. If you go to a classic situation of 10 systems in a hospital, they are ultimately not looking for notebooks, which are used in 10% of cases when they go to the bedside. That is ultimately additional units. Part of it is addition, limited substitution, not changing ultrasound room equipment with portables...Even if you use ultrasound as a stethoscope for the first review, whenever you find something, you will go back to more serious ultrasound that is more advanced and functional. There is an opportunity to think of the early steps in the workflow to see images that today we cannot see, but it won't pull ultrasound out of its role in downstream workflow."

Taking ultrasound to the patient, not the patient to the ultrasound machine, is what's driving portability. Philips' Brown said, "That involves a smaller ultrasound system. I think that's what's pushing development in that area. It's not good to make something small just for the sake of it. We can make it small, but how does it match up in the clinical environment? We have a portfolio that has small portable products that can be wheeled to the bedside, taken to the point of care, and used in triage-type environments, but we also have a range of products. There will always be a need to have small products, but we also need products that do advanced diagnostics."

Toshiba's Parhar offered another perspective: "There are a lot of new ultrasound companies and systems that are really small, like laptop computers, and you can take those anywhere. It's point-of-care delivery. You can take it to any location, you can examine a patient, and you can tell right away if there is something wrong. For example, does this person need to go to the operating room, yes or no? That's something that's driving ultrasound: portability and using it as an initial screening tool to triage patients. The performance (of the smaller units) is getting close to the larger units, but they aren't there yet, and they're not going to replace the big machines."

### IMPROVING WORKFLOW

"The biggest headache for ultrasound is trying to get the information instead of spending time on interpretation," Siemens' Kaldowski said, adding, "So workflow improvements are crucial elements that need to improve significantly...Acquiring image information and automating interpretation of the data – which goes as far as computer-aided detection in ultrasound scans – is improving...We have made some strides, but this is where we (Siemens) are more vulnerable at this point, and it is where Siemens has the biggest opportunity for improvement or growth. If we can do that faster and with less

user dependence, and make it so less well-trained people are able to acquire information, you would improve workflow burdens."

Asked if Siemens is taking a more hospital-based than physician-based approach with its ultrasound programs, Kaldowski said, "No. The problems with the private doctor is also a time issue. He either does the scanning himself, or it is done by a technician, so time is always an issue."

However, integrating ultrasound into systems and procedures is critical, Kaldowski said. He explained, "That is very important, especially on the hospital side. It is increasingly important for the daily work. From a strategic perspective, it is even more important...You need as much integration in departments as possible and into the hospital information system. That is where we at Siemens feel we have a lead. We are perceived as the largest IT (information technology) provider to the healthcare world...That is a big advantage for Siemens when it comes to talking to larger hospitals, though it is not as helpful in smaller places."

Toshiba's Parhar agreed that workflow improvements are important. He said, "Everyone's trying to do more with less – add another patient, add revenues. You have to treat it as a business, so there's a lot of workflow in productivity tools. A lot of manufacturers have implemented these onto the systems so that people can do more with less."

Parhar also stressed the importance of workflow improvements. He said, "The accuracy of an ultrasound exam is exclusively dependent on the skill and experience of the operator. No matter how knowledgeable the physician or interpreter is, if the technician misses the disease during the actual real-time scanning and fails to record it on some archiving medium, it's highly unlikely that the disease would ever be picked up. It places a unique responsibility on the operator. To improve standardization, to make sure that Suzie Q, who has one (ultrasound) in Des Moines, Iowa, has the same quality ultrasound as someone who has a scan at a teaching hospital in New York, there has to be some sort of standardization. Otherwise, if the operator in New York is less experienced, he or she is not going to get the same level of expertise. Companies are trying to improve the standardization and remove the operator dependence, so it becomes more like CT and MR."

Asked how you would do that, he said, "One way to do that would be volume ultrasound. That takes the operator dependency away by allowing the person who's scanning to move the device. It can be moved and take volume data sets. You take volumes that are reviewed later, let's say at a workstation, and the interpreter – the physician – can see planes that were never originally archived when the ultrasound was done in real time. That improves standardization, and it also decreases operator dependency. Toshiba and others are moving into that realm."

Ergonomics also can be improved. Parhar explained, "Many sonographers are suffering from work-related stress injuries, and all the manufacturers are trying to minimize these because again people will go to worker's comp, and it just adds to the cost. Manufacturers can minimize these. It's a win for everyone and a win for society in general. Toshiba has specific items as well, and we do have special items to reduce those types of injuries."

### ULTRASOUND VS. CT AND MR

Weighed against other modalities such as CT and MR, sources said that ultrasound plays a *complementary* role. Philips' Brown said, "There are a lot of areas where ultrasound is an important, complementary modality to CT and MR. By no means is it taking a second place to those other modalities. We want to play a key role in these others. We also have to look at not only what are the impressions in North America, but what are they in the world, where does MR and CT play there, and ultrasound plays more realistically than CT and MR."

Ultrasound has several advantages over CT and MR. GE's Andreasen said, "Ultrasound is non-invasive, fast, and continues to be very inexpensive. CT and MR would have a hard time reaching that level because you also have the dose-to-patient issue. However, they continue to try to make them smaller." Siemens' Kaldowski said, "If you compare CT and ultrasound, you are looking for substantially different things. Consider the real-time nature of ultrasound as one element, but also the ability of ultrasound to affect functional behavior. With MR, it is ultimately more complementary than a substitution for ultrasound." Philips' Brown pointed out, "CT and MR are good in some areas, and in some areas they aren't as good. (With CT and MR) you're talking about big pieces of equipment. Ultrasound is more agile when it comes to that; it's smaller and can be moved from lab to lab, department to department. The way we visualize structures are different. (With ultrasound), it is non-ionizing, and we can see things in live, real time. There are certain benefits to ultrasound that CT and MR probably won't have. That's not to say they're not good modalities, but for follow-up procedures, and the interventional process, ultrasound will play an important role."

Sources said that there are some areas where only ultrasound works, and other areas where it can't be used. Toshiba's Parhar said, "If it's a female, and she's pregnant, we are obviously not going to do a CT or MR, so I guess a lot depends on what type of person comes into the door and needs an exam. The philosophy of the doctor also comes into play. Some doctors love CT or MR, and some doctors love starting with ultrasound. A lot depends on what kind of diagnosis they're looking at as well. For example, ultrasound doesn't work with bone or air. So if you're looking at a bony structure or anything encased in bones, like brain or lungs, you have to do CT or MR...There are still types of exams that ultrasound is better at than CT or MR. Echocardiography is much better

to see in real time, and neither CT nor MR is there yet for real-time visualization of the heart, but maybe one day CT will get there." A Philips source said, "There are more applications for ultrasound, from primary care doctors to hospitals, than CT or MR...If the price of CT and MR were the same as ultrasound, there would still be a use for ultrasound because it is non-invasive, and you can see things live as they happen. Tissue ultrasound slices are like CT but more instantaneous."

Sources also stressed the cost-effectiveness of ultrasound compared to other modalities. Philips' Brown said, "With ultrasound, it's a non-invasive modality versus CT. It's a modality that by and large is more cost-effective. Typically patients can get it and get scheduled quicker, physicians get answers quicker, and follow-ups show dynamics and motion." Toshiba's Parhar said, "Ultrasound is the most cost-effective imaging tool there is. Compared with CT or MR, for example, if I do an ultrasound of the abdomen, it's only going to be \$150, but if done with CT, it's going to be \$300, and MR is \$600 or so. (President) Bush is always talking about saving money, keeping costs under control, so ultrasound is definitely cost-effective. When you buy the equipment, it's a tenth of the cost of a CT or MR scanner. So the overall costs are much lower, plus the diagnostic tool is very accurate. In Europe, they use ultrasound even more than in the U.S. because of capitation...I don't think it's going to happen, but (if the cost of CT or MR approached ultrasound) ultrasound would still be needed."

Sources agreed that CT and MR would never become as inexpensive to use as ultrasound. A GE scientist said, "I don't know how CT and MRI can get that cheap. You can't make a hand-held CT scanner." Philips' Brown said, "You can't use CT in obstetrics because of the radiation, for example, and in fact there is a hypersensitivity to over-radiating people, especially in other parts of the world, where you don't see the use of CT as in some areas of North America. There's sensitivity to exposure to radiation. A lot of patients can't have MR, for example, those with metal implants. MR is contraindicated for those patients. MR is not the easiest process to do because it's claustrophobic and the patient has to be in an enclosed area, something some people don't tolerate."

Integration of ultrasound with modalities such as CT and MR is expected to increase in the future. A GE scientist said, "MRI with ultrasound is the big research buzz. At the RSNA (Radiological Society of North America) meeting, focal ultrasound was a hot topic. This is taking ultrasound beyond imaging to an interventional application, where you may be able to isolate a tumor with MRI and then go in with high energy ultrasound and possibly intervene with the tumor. But that is way down the road." Siemens' Kaldowski said, "We agree that a combination of modalities like what is called 'fusion' is the future – ultrasound combined with other things...Fusion is certainly a major element in interventional procedures. IVUS is real time, and there is no radiation...We also have a tool, Acuson, which is a transducer introduced into

a catheter to image in the heart, and that is a crucial tool for many heart procedures. That is very established.”

Indeed, some sources mentioned the fragmentation of the market because of ultrasound’s expansion into more areas. A Toshiba source said, “Before, ultrasound used to be 100% in the realm of radiologists. Now there’s so much fragmentation of ultrasound. It’s in the ER, ICU, the surgeon’s office, vascular offices, breast surgeons’ offices, labor and delivery and echo labs, and radiology. Everyone wants their own ultrasound machine. What’s happening there, as a result of demand and fragmentation is that there are companies that are developing and manufacturing products that are specifically targeted to these types of users. So, we’re seeing a lot of ultrasound systems designed specifically for someone who works in the vascular lab, who works as a urologist, or someone in ER.”

### PRODUCTS FOR THE FUTURE

Asked what products are in the pipeline or on the horizon, sources mentioned contrast imaging and 3-D/4-D imaging. Siemens’ Kaldowski said, “The 3-D/4-D discussion is something everyone is talking about. There are still major developments needed there to make that more doable and practical and integrate it into standard clinical practice. A couple of angles where we see significant opportunities for advancement include molecular imaging – for example, working with collaborators, in detection with ultrasound contrast agents with biomarkers on them. Research is being done to see if you can resolve thrombus with contrast agents and ultrasound. There are a couple of things on the molecular, imaging side, and we think there is room for a lot of growth there...Also, real-time 3-D – if we get the resolution right and the frame rate, and, more importantly, the workflow so it doesn’t take longer to use 3-D, that will be a big jump, but the industry isn’t there yet.”

Sources also predicted ultrasound will be used more in advanced diagnostics. Philips’ Brown said, “We’re going to see more emphasis on volumetric imaging and ultrasound – acquiring more information, getting more diagnostic information from images, more in the areas of automation, analysis of the volume to assist physicians in making clinical diagnoses. We’ll see some more quantification in the information to help us in classifying disease states or improving therapeutic uses. Those are some big areas we are focusing on, to take ultrasound to the next step. For example, if we were managing a disease such as heart failure, the ability to acquire a volume of the heart on a patient, and then allowing the ultrasound to basically analyze the motion of the heart, could help clinicians make decisions on how they’re going to treat the patient. Are they going to use just medicines, or are they going to be doing biventricular pacing? We are developing the tools that go to the next step in diagnostics, and heart failure is an area that we’re playing a key role in.”

Oncology is another area where ultrasound will be used, sources said. Philips’ Brown commented, “In interventional areas, ultrasound is great to visualize needles for biopsies in order to improve accuracy. It is also good for ablation types of therapies, using RF ablation procedures to destroy tumors. Ultrasound is a great tool to improve outcomes, and that’s another area where ultrasound will play.”

Sources also mentioned contrast imaging as an exciting area for ultrasound. Philips’ Brown said, “There is the ability to inject the contrast agent into the body. That will improve visualization of structures by ultrasound – contrast agent imaging and molecular imaging as well. Ultrasound will play a key role in that area. It’s already being used outside the U.S. In the U.S., contrast agents for ultrasound are only approved for left ventricular procedures, but, hopefully, in the next several years we’ll be able to use contrast agents to do more and more diagnostics, especially in liver lesions. There are parts of Europe and Asia that are using contrast agents to do some exquisite work in liver lesions.” Toshiba’s Parhar said, “(Contrast media) right now can only be used for echocardiography, so we’re still waiting for the green light from the FDA. It defines tumors easier, so you’d have an unequivocal diagnosis, where today many times you don’t. You wouldn’t have to send the patient for the more costly CT or MRI studies, and you would reduce overall healthcare costs.”

### RESEARCH & DEVELOPMENT

The four companies vary in their approach to R&D and manufacturing overseas: GE is global, Siemens does most of its R&D in the U.S., Philips works mostly in the U.S. and Europe, and most of Toshiba’s R&D and manufacturing are in Japan. GE’s Andreasen said, “GE has R&D all over the world. For example, Voluson was developed in Austria, and an office still exists there, and we do R&D there. Logic (an ultrasound GE product) comes out of Israel and is made there. Some of the entry-level ultrasound consoles are engineered in China. R&D is worldwide – wherever the development team happens to be. If ultrasound were a commodity product, it would probably all be in China. Innovation works its way through the system, but less development work and more production efficiency is being sought...Voluson was very innovative. Seeing a baby’s face is cool, but we are trying to apply 4-D to real clinical circumstances in the cardiovascular area, and that is being done in Austria.”

GE has a large commitment to R&D around the world, and a GE official offered this explanation for the use of multiple global sites: “We try to facilitate as many markets as possible. We listen to our customers worldwide. If you only manufacture in the U.S., you tend to listen more to U.S. than Japanese customers, so we try to capture the voice of the customer globally, and that voice is very different. In Europe, for example, physicians do their own ultrasound exam, as opposed to the U.S. where you have sonographers, so it varies

a lot. Each R&D site makes a global product but with input from all over the world...The Logic 9, which is our highest-end product, is made in Wisconsin, but when they develop equipment and new features, they gather from around the world.”

Asked what R&D in China might add, Andreasen said, “China is very much into miniaturization. They are very on the forefront of that, making things smaller – iPods and Bluetooth for cell phones. China is not just cheap labor, not just looking to price, but to accommodate as many professionals as possible. No matter how good you are at reaching out globally, you still tend to listen more to where you are manufacturing, but when you place R&D all over the world, we all have to talk together. Imagine an advisory board with 400 people gathered to toss ideas around, with facilitators trying to accommodate ideas from all over the world. It is being in the forefront of technology.” GE also has an ultrasound R&D operation in India. Andreasen said GE does not plan to reduce it in more expensive countries such as the U.S. and grow it in India and China.

Siemens’ Kaldowski said his company does the majority of its R&D in the U.S., but also has some sites outside the country, “There is some R&D in Asia/Pacific, and a lot of activity is shared with other modalities, mainly in post-processing applications – like real-time 3-D and how to work with images...The main driver for putting more effort in Asia/Pacific is that we want to be closer to the market. We learned workflows are somewhat different and expectations somewhat different there, so development for products in the U.S. is in the U.S., and products aimed to Asia/Pacific are being worked on there.” Asked about GE taking a more global approach to R&D, Kaldowski said, “Closeness to customers is the main reason for that. I don’t agree that that is necessarily a measure of commoditization to make systems cheaper. If I can do the same quality in India, customers will ask, ‘Why don’t you do that?’”

Most of Philips’ R&D is still done primarily in the U.S. and Europe, according to Brown. He said, “We have some clinical studies maybe done in those areas, but not primarily R&D. The major R&D is still in the U.S. and in Europe.” Asked if the company is outsourcing to China and India, he said, “It’s probably both. We can gain some cost effectiveness when we look at places for offshore development, but we really want to develop products that are specifically designed for those marketplaces as well. There are differences in medicine around the world. Other countries’ healthcare cycles are different from our healthcare cycles, and the emphasis on lower cost product portfolios would be very different, although in some areas in India and China they are focusing on the high-end because they use ultrasound as a primary diagnostic tool.”

As a Japanese company, Toshiba’s R&D is in Japan. Parhar said, “Globally, all of the R&D is done in Japan, the data inputs are gathered all over the world, and the information for

the U.S. market is then fed back through Toshiba America Medical Systems, which is a subsidiary of Toshiba, and we drive that information back into Japan and to our colleagues in India, China, Thailand, and Canada, and that leads back.” He said outsourcing to China and India is “absolutely cost-saving. R&D is deployed to China. Everyone is doing it. Everyone is into off-shoring. We can have people working in China for a fraction of the cost (of doing it in the U.S.), and it’s the same for India.” ♦