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Technology Horizons in the Ultrasound Market

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In 2009, the global market for ultrasound imaging equipment was estimated to be worth 4.9 billion dollars; 6 percent less than in 2008, impeded by factors such as healthcare spending cuts and postponed equipment purchasing in Western Europe and North America. The market is expected to grow to more than 5.3 billion dollars by 2016, driven primarily by growth in hand-carried ultrasound (HCU) devices and expansion in emerging geographic and clinical markets. The major growth facilitating trends in this space include aggressive pricing, opportunities in emerging clinical applications requiring point-of-care imaging and specialised hardware and software for cardiology. Overall growth in medical imaging will also continue due to growing populations of elderly people worldwide, accompanied by a concurrent rise in chronic disease rates. Main restraints in the ultrasound market include the slow economy in many countries, reimbursement restrictions and intense competition from MRI and CT.

The wide range of handheld ultrasound devices have been the most significant technological innovation in ultrasound. HCUs allow ultrasound to effectively monopolise a vast range of applications in point-of-care imaging. After Sonosite Inc. first introduced hand-carried ultrasound in 1999, GE Healthcare jumped on board, quickly establishing a broad base in this segment with a wide range of HCUs. The other significant technological innovation has been the advent of additional software capabilities/algorithms that improve the diagnostic efficacy of cardiac ultrasound equipment. Gripping Heart, a cardiology research company based in Sweden, recently came out with a software platform for advanced analyses of the heart and circulatory system. The software is based on the mechanical functions of the heart and is illustrated by simple diagrams. The programme uses databases for benchmarking and validation within different patient categories.

Current Challenges in Diagnostic Workflow

Described below are some of the top challenges faced by professionals when considering the adoption of new technologies.

- **Lack of experienced and skilled Technicians** - Technical proficiency of staff poses a major challenge. An aging workforce is also a looming challenge. Most technicians are over 40 years of age and there are fewer technicians to replace them as they retire.
- **Differences in Applications of nascent Technologies** - Variability of the application of new technologies tends to create discrepancies in diagnosis as these are nonstandardised across centres. This may result in the prescribing of unnecessary tests.
- **Proliferation of More Complex systems and Technologies** - Innovation has resulted in a proliferation of complex systems in addition to rather than as replacements for existing diagnostic infrastructure. Adding a new feature means an increase in its cost both capital and for training. This also poses challenges in terms of the need for new data structures and reporting templates.
- **Transfer of Data in a non-Digital environment** - Accessibility to and management of increasing amounts of data generated by new diagnostic modalities has been an issue especially in a non-digital environment where diagnostic reports are often distributed using couriers and the postal system and could lead to a breach of patient privacy.

Top Trends in the Ultrasound Market

3D and 4D Ultrasound

Compared to the old generation of 2D ultrasound devices, 3D technology has added a dimension of depth, and 4D a dimension of depth and time. 3D and 4D ultrasound devices are becoming increasingly popular in Eastern Europe, especially in cardiology and ob/gyn ultrasound. The market for 3D and 4D is however not yet saturated there, mainly due to financial constraints. In other regions, such as Scandinavia, the reason for low market penetration of 3D/4D ultrasound is lack of acceptance among doctors. Research shows that doctors in Scandinavia do not consider 3D/4D ultrasound to provide more clinical value during diagnosis and are therefore quite reluctant. Convertors of images in older generation ultrasound units were based on hardware, which was built in the ultrasound device. The new generation uses external computers, which perform the scan conversion. This has resulted in an increase of calculation power of ultrasound devices and has led to major improvements in quality.

Integration with PACs Systems

Healthcare facilities can obtain either a PACS system designed exclusively for ultrasound, or a multi-modality PACS system with a special module for ultrasound imaging. Research shows that the latter option is much more popular among end users. Interoperability with PACS systems is considered to be an increasingly important feature of ultrasound devices. Furthermore, ultrasound manufacturers are increasingly interested in expanding into healthcare informatics. For example, in August 2010, Philips acquired CDP Medical, an Israel-based developer of PACS systems, a subsidiary of medical device distributor Medtechnica.

Re-Construction of Transducers

Silicon transducers have been recently introduced to the market as a viable substitute to the traditional piezoelectric ones. Silicon transducers are known as capacitive micromachined ultrasonic transducers (CMUT). They offer higher quality of image, high frequency, wide bandwidth, high sensitivity, ease of fabricating large arrays, low cost and potential for integration with electronics. An emerging trend, manufacturers are already working to deliver such transducers to the market.

Automation of Ultrasound Scans

Advances in ultrasound technology have led to a trend for automation in ultrasound procedures. Automation minimises human intervention in the procedure, as the system is software-controlled. Automated ultrasound is gaining popularity in breast scans. Such systems integrate an automated transducer arm (instead a handheld probe) with a display workstation. With increasing awareness of breast health and multiple social campaigns promoting early detection of breast cancer, the demand for automated ultrasound is expected to increase, especially as this technology is considered to be adjunct to mammography. The first automated system for breast ultrasound was developed by U-Systems. Later, Siemens developed ACUSON S2000™ Automated Breast Volume Scanner.

Incorporation of GPS Technology

Ultrasound devices are being increasingly used to provide visual guidance in needle procedures. Using this guidance improves performance, outcomes and cost-effectiveness. Image guidance is most frequently used in interventional medicine (during biopsies of breast, thyroid or prostate) as well as anaesthesia and vascular access. For example GE launched Venue 40, a compact ultrasound device for use in point-of-care for diagnostics and needle guidance.

Furthermore, one emerging trend is incorporation of the technology similar to Global Positioning Systems (GPS), which allows visual position tracking during the scan, marking points in the body to locate an anatomical structure from a different angle. It also simplifies the counting of masses, lesions and nodules. GPS technology allows for guiding biopsies in an efficient and effective manner and is predominantly applicable in cardiology and radiology. Companies such as GE (Logiq E9), Philips (PercuNav) or Ultrasonix (SonixGPS) already introduced devices with this kind of technology to their portfolios.

Highest Growth in Surgical Ultrasound

Surgical ultrasound is the smallest among the segments of the total ultrasound market. Surgical ultrasound consists of the high-end equipment used in operating rooms (OR) to visualise the size and architecture of the various organs such as pancreas, liver, spleen, etc. as well as for examining blood vessels, assisting in vascular applications and precise location of anatomical structures to ensure better planning. It is also used for arthro-sonography during joint surgeries.

The pre-operative uses of surgical ultrasound include evaluation of intra-abdominal and intra-thoracic fluid. This market segment also consists of transcranial Doppler used during surgeries. Furthermore, surgical ultrasound consists of equipment for laparoscopic ultrasound, one of the most important applications of ultrasound in surgery. However, it shows higher growth than any other segment.

In some countries, such as the UK, surgical ultrasound is performed by radiologists. This results in lower installed base of surgical ultrasound. Germany is the exceptional market with the installed base being greater than in any other of the markets attributed to the fact that the technology uptake in Germany is in general very fast and induces replacement processes. Moreover, with high-quality educational programmes, German doctors are well-educated and open for innovative solutions. Relatively fast uptake of surgical ultrasound can be observed in Eastern Europe as hospitals are specialising in this region and require more sophisticated equipment. With the availability of EU funds, it is expected that this trend will continue. With technological advancements, surgical ultrasound is increasingly competitive against other modalities, such as CT or MRI.

Conclusion

Ultrasound is considered to be a modality where technology migrates very quickly. Research shows that features of this modality, which were considered high-end two years ago are now seen as mid-range or even low-end ones. This results primarily from high popularity of ultrasound as a primary diagnostic tool leading to fast maturing of the ultrasound market. High level of price competition leading to reducing prices of this modality further enhances the adoption of new technologies among healthcare facilities across Europe.

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