Wireless Electronic Home Healthcare for All

Sean Fenske, Editor-in-Chief

These days, it's as though the medical device industry is more synonymous with the electronics industry than it is with healthcare. Obviously an exaggeration, but there seems to be very few device sectors where electronics are not an integral part of the medical technology solutions being put to market.

As such, many of the issues that the electronics industry has faced or is currently addressing are relevant to medical device designers. Miniaturization, usability, portability, security, wireless capability, and connectivity are all challenge areas for designers of medical electronics. Similarly, when it comes to devices that are intended for the home or to be used by patients directly, the lines between consumer and medical electronics blur even more.

Medical Apps

Smart phones and tablets are fantastic devices that some people feel they can no longer survive without. While noted as hyperbole for many, when it comes to the healthcare apps coming out these days, there are those who may not be exaggerating too much; or at least they won't be in the very near future.

Medical device apps are being released almost daily, especially for patient monitoring applications. While some are still relatively basic solutions, there are those that are providing a much greater level of care to patients. But will apps for these consumer devices ever actually overtake more traditional monitoring devices?

"There is a definite possibility as smartphones and tablets start adding bio-sensors into these gadgets," says Karthik Soundar, segment manager at Texas Instruments.

“From a technical standpoint, the processing power and wireless capabilities in today’s smartphones are, in many cases, far better than the medical devices. Given the ubiquitous presence of these gadgets, it makes sense to leverage them for patient monitoring.”

John DiCristina, medical equipment director, strategic marketing group at Maxim, is not quite as convinced of this technology shift. “I think that apps will play a role but I don’t see them replacing patient monitors,” he explains. “It is more likely that patient monitors will take on a new form factor, such as a wearable shirt, strap, or patch, and this device will communicate to an app.”

Following along with DiCristina’s train of thought, Tony Zarola, vital signs monitoring marketing manager at ADI, replied, “No, not at all. Apps alone cannot replace medical devices. Sensors/connectivity interfaces to the patient along with signal processing elements are still required to measure the patient’s vital signs accurately. The apps can complement the measurement devices in many positive ways, but the notion of them replacing the device is not likely.”

Data Security

Regardless of whether or not apps replace more traditional medical devices used by patients directly or just enhance them through processing power and accessibility, there is still an issue that impacts both types of technology since either would be used outside the hospital. That is, the collection and security of the data being acquired by a device. That issue can extend to all medical electronic devices, from implantables to drug delivery devices to the aforementioned monitoring products. It’s a concern that design engineers who are developing medical electronic devices need to keep in mind.

Addressing the challenges of data collection in medical devices is a group of engineers from Ximedica. “A primary development challenge is providing the ability to collect data from the patient and external sources, and deliver that data in a clear and usable format to the primary caregiver (e.g. doctor, nurse, mother, self), all within an acceptably brief, possibly imperceptible, amount of time,” explains Carl Dumas, software engineering manager, Breck Petrillo, director of engineering, and Andrew Leoncyzk, senior electrical engineer. “Inherent latency in communication technologies, ever increasing volumes of data, expanding network and technology complexities can pose challenging to developers.”

Touching on solutions with regard to protecting data for medical electronic devices, Soundar explains, “Adding advanced security features in medical devices will be critical for medical device manufacturers going forward. The security features need to be added to all parts of the medical devices, including the disposables that are used with many of them. Advancement in semiconductor technology has made it easy for medical device manufactures. Many of the modern day microcontrollers come with hardware implementation of these security features.”

DiCristina agrees, “They can build security into the product using hardware from the conception of the product. This will secure the data at the source. Maxim Integrated provides security solutions that protect patient privacy, ensure authenticity, detect

tampering, and prevent hacking to keep the patient safe, and protect the medical device manufacturers' intellectual property."

On the Horizon

As is illustrated through the variety of issues addressed in this month's cover story [1]on what's ahead for the medical device industry in the coming year, change is not something that anyone who wishes to be successful in this market should be afraid of. Adapting to market trends and, more importantly, the needs of both patients and healthcare providers is something that device designers need to be willing and able to accomplish. The Roundtable participants covered a number of areas as they relate to medical electronics when asked what was in store for this market sector.

Zarola responded with a decisive "Wireless for one." He continued with, "The clutter of wires will be a thing of the past. Sensor fusion will also change the way vital signs are being measured. No longer will we need to rely on the measurement of a particular vital sign from one location when we can more accurately determine our state of health from the combination of the information derived from multiple sensors located at different points on the body. Context-based monitoring will also become possible in the future when not only is the patient being monitored but also the environmental conditions that the patient is in. This additional layer of information will add important context to the vital signs measurements that are made and significantly improve diagnoses."

Sharing this wireless vision is Soundar, who stated, "The clutter of wires will be a thing of the past. Sensor fusion will also change the way vital signs are being measured. No longer will we need to rely on the measurement of a particular vital sign from one location when we can more accurately determine our state of health from the combination of the information derived from multiple sensor located at different points on the body. Context based monitoring will also become possible in the future when not only is the patient being monitored but also the environment conditions that the patient is in – this additional layer of information will add important context to the vital signs measurements that are made and significantly improved diagnosis."

"Treatment and care in the comfort of personal environments is a common theme, exemplified by the preference of a maturing population to 'age in place,'" explains the engineering group from Ximedica. "We are also witnessing a growing interest in the fitness and health optimization area, leading to devices robust enough for a very active user. Both insights point to less invasive and more convenient solutions; reduction in size and mass will continue, as will the reliability of associated body attachment technologies. The need to manage and monitor the care and diagnosis outside of clinics will continue to accelerate data management technologies, tools, and regulations, as well as user interface design."

DiCristina concludes with his own view of the near future, "I think we can lower healthcare cost, improve medical outcomes, and improve the quality of life if we move the healthcare closer to the patient and ultimately, into the home where the patient takes control of their personal health. This empowerment will lead to a more

preventative healthcare system that will lower healthcare costs and improve outcomes."

Conclusion
Medical electronics, as an industry, is impossible to cover in one Roundtable presentation given the fact that the technology touches every sector of healthcare. However, the primary focus on monitoring here is reflective of what's coming for the industry.

DiCristina offers a key word when describing what's ahead for medicine and the medical industry's approach to treatment—preventative. Healthcare, through the use of enhanced patient monitoring technology, will move quickly to a preventative model rather than the more reactive method that best describes how care has been most often provided. Disruptive technologies are already making this possible for certain sectors and the practice will only continue to grow as more effective technology is offered.

Full Responses
To see the full responses of the participants, view these links:

- The Clutter of Wires, a Thing of the Past [2] - Tony Zarola, Vital Signs Monitoring Marketing Manager, ADI
- From the Hospital to the Home [3] - John DiCristina, Medical Equipment Director, Strategic Marketing Group
- Biosensors in Smartphones and Tablets [4] - Karthik Soundar, Segment Manager, Texas Instruments
- 'Aging in Place' and Staying Active [5] - Carly Dumas, Software Engineering Manager, Breck Petrillo, Director of Engineering, Andrew Leoncyzk, Sr. Electrical Engineer; Ximedica

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