Make Medical Devices Integrated with Patients

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Tony Zarola, strategic marketing manager of the Healthcare Group at Analog Devices [1], was a part of the staff written article, "Portability Is the Name of the Game [2]." He took time to present a full array of responses that were not able to be included in the article, so they are presented here.

Q: *How are advances in electronic components helping the industry move to portable healthcare?*
Zarola: With the increased level of integration, it's difficult to continue to describe these devices as simple electronic components since they address many system level features. While portability implies low power, with respect to healthcare, it does not necessarily mean performance can be compromised.

Therefore, a good system level understanding is required in order to know how the "component" can operate to meet the power target as well as the performance needs. In order to really drive portability while maintaining performance, it is critical that the end system-level requirements are understood during chip design. One such component that exemplifies this is the ADXL362 ultra-low power accelerometer. The ADXL362 enables low power support on two fronts – at the system level and at the component level. In terms of system power management, the ADXL362 has many novel features. It can be used to wake up the rest of the

system (e.g. microprocessor) through the implementation of a motion activated on/off switch, which allows the rest of the system to be powered down until activity is detected. At the device level, the ADXL362 is architected to operate at low power through state-of-the-art IC design which enables operation at 3uA power consumption at full output data rate.

Q: *How are consumer electronics impacting the design of electronic medical devices?*
Zarola: If there is one thing the medical industry is learning from the consumer industry, it's the concept of adapting the device to consumer and patient lifestyles. In order to be effective, health monitoring devices need to be used—as opposed to collecting dust in a drawer—and any barriers that could jeopardize use must be removed. For example, many of us will not go anywhere without our smartphones; we have integrated these devices into the way we live our lives. To make medical devices effective, they have to address the medical necessity and lifestyle adaptability and become similarly integrated.

Q: *What is the biggest limitation currently holding back medical electronics from developing further?*
Zarola: The technical advances in medical electronics have been significant over the years. Technical barriers are being addressed and overcome as with any other industry, although in some sectors of the medical industry those barriers are being knocked down at a faster rate.

For instance, the shift toward remote health monitoring is happening rapidly. The goal is to enable patients to recuperate in the comfort of their own homes with full mobility, but matching performance with mobility can be a challenge. Products like the ADAS1000 ECG analog front end, which integrates many of the key functions for effectively measuring cardiac vital signs, enable the development of smaller, lower power monitoring devices capable of reliable remote health monitoring. The limitation exists in the rate of adoption of these new innovations, which is dictated largely by economic factors.

Q: *What advances need to be made in power solutions for portable technology to advance further?*
Zarola: There are a couple of areas where power solutions can help to advance portable technology. The first is in the area of energy harvesting. Being able to extend the battery life of a wearable monitor through means of energy harvesting will contribute to the device adoption and hence the integration into our lifestyles. The second advancement that needs to be made is in the area of battery charging—wireless charging will be an important step to enable hermetically-sealed systems to proliferate and make the cleaning and sterilization of medical devices more effective.

Q: *How are electronics impacting traditional non-electronic medical devices?*
Zarola: Take the most traditional of non-electronic medical devices—the stethoscope—and consider how it can be made electronic. There are a couple of technological advancements that are enabling this transition.

One approach adds visualization to the stethoscope and offers a new dimension for clinicians. Portable handheld ultrasound devices are becoming commonplace and a valuable asset for both clinical and field use where triage of patients is required. Another is the use of MEMs microphone technology to essentially mimic the ear of the clinician. The ability to record sounds of a patient's heart in high fidelity and either keep them as a patient record or for use in medical training allows the traditional stethoscope to be reimagined.

Q: *Where are medical electronics headed over the next five to ten years?*
Zarola: Medical electronics is heading to wherever we wish to take it. The future of medical electronics has the potential to become all-encompassing and an integrated part of daily life.

The environments where we will be monitored will expand beyond the clinic. Whether we are in the car, in the office, at the gym, or at home, there will be technology available to monitor our vital signs. For example, monitoring a driver's heart rate may help to avoid dozing at the wheel, monitoring our activity level while seated at our desk may help ensure we are not in a sedentary state for long periods, or tracking our energy exertion during exercise can help keep us healthy and safe in the comfort of our home. Sensor technologies that will support this ubiquitous coverage are available through Analog Devices and include optical, impedance, bio-potential and motion.

Links:
[1] http://healthcare.analog.com/en/segment/health.html
[2] http://www.mdtmag.com/articles/2013/06/portability-name-game