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MIXiii Biomed 2017: Aging, Technology & Robotics In The Digital World

by Catherine Longworth

How can medical technology improve the lives of our rapidly aging population? Companies from across the Israeli medtech industry, as well as delegates from around the globe, convened at the 16th MIXiii Biomed life sciences and technology meeting in Tel Aviv to discuss the impact of aging and demonstrate the latest innovations in the field.

People worldwide are living longer with 30% of the population in developing regions expected to be aged 60 or over by 2050. So what challenges and opportunities will this rapidly aging population provide for the healthcare system? Israel's life sciences and technology conference, MIXiii Biomed, held on May 23-25 in Tel Aviv, brought together companies, investors and academics to explore the impact of an aging population on healthcare.

First day discussions opened with how medical technology can offer solutions for the elderly. Former president of Intel Israel Shmuel Eden told the audience in his keynote address how technological advances could enable independent living for the elderly at a reduced cost compared to hospital care. He said healthcare costs in the hospital and care homes were not sustainable in an aging population and companies had a huge opportunity to address this need.

Eden joked that the increased availability of wireless implantable devices such as pacemakers, insulin pumps and gastric stimulators will see humans turn into "cyborgs." He posited in the future we could see chips embedded inside people to aid them in carrying out everyday tasks and how eventually we will have a "brain-computer interface," with the internet functioning as an extension of the human brain. "The technology is already there," said Eden. The question now is how do we implement it in an ethical fashion, he said.

Robots will also make aging easier, according to Eden. "A robotics population will complement an aging population by supporting the economy and providing care for the elderly," he said. Home care robotics formed one of the central themes of the second day's discussions, with

companies presenting innovations designed to allow elderly citizens to stay at home longer and enable their families and caregivers to track their health remotely.

However, conference participants heard that many elderly people could find their user experience of robotics and digital health "frustrating." Intuitive use of digital technologies was more difficult to achieve for older users due to decline in motor and cognitive abilities and less cultural expectation and motivation to use them said Tamar Weiss, head of the laboratory for innovations in rehabilitation technology at Haifa University, Israel. She suggested companies needed to collaborate with the elderly to improve design and robotic devices should "complement human therapists" and be used within the context of an array of treatment techniques, including wearable sensors, and virtual reality. She explained it was important to increase personalized use and tailoring therapies and assistance to individuals.

Digital health start-ups presenting included, Kytera Technologies which is developing a remote monitoring system for elderly living at home. The system is based on "contextual activity analysis," which uses advanced machine learning algorithms and sensing technology to learn the routine of seniors at home to detect deviations from the routine and distress situations. Assaf Sella, Kytera CEO, said more seniors than ever were now living alone but needed tools to permit independent living in a safe environment. Kytera's technology consists of a wristband worn by the senior and sensors that are installed around the home which can then send alerts to family members remotely.

Medtech M&A Activity At All Time High

On the commercial side of medtech, Jefferies managing director Gil Bar-Nahum told the audience despite market uncertainty, the industry on the whole should feel encouraged. Medtech M&A activity is at an all-time high and 2017 is on pace to be the third consecutive year with 10 or more transactions worth more than \$1bn he said. Pre-commercial device M&A activity was also staying relatively steady, with cardiovascular, ophthalmology and orthopedic sectors experiencing the most activity. Bar-Nahum said that early stage medical device companies "selling the dream" to acquirers were also achieving higher valuations than FDA approved companies. Figures showed pre-FDA approval companies achieved on average \$398m per acquisition, compared to an average of \$320m for post FDA approved companies. However, these early stage deals were occurring at a lower frequency compared to later stage companies as the market is more discerning about price.

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Bar-Nahum said significant acquisition and consolidation in the medtech sector were being driven by several factors. Firstly, the market was seeing a decline in growth rates of the two largest markets, cardiology and orthopedics from double-digit growth to low single-digit growth. In addition, there is a slower, high risk regulatory process and a shift in balance of power from device companies to hospitals/payers. Greater pressure on product pricing for medical device companies and a shift to value-based reimbursement in the US were all also having an impact on medtech M&A, said Bar-Nahum. "Medtronic has carried out 12 acquisitions in past five years totaling \$50bn, while Stryker has had 11 acquisitions [over the same time period]," he said. "There has been a strong consolidation in recent years so we are now seeing a reduced pool of medtech buyers remaining."

Tax reform and cash repatriation under a Trump administration could be positive factors for M&A activity in 2017 but a repeal of the Affordable Care Act and the strengthening of the dollar, could all impact company earnings negatively.

He added cost effectiveness would be a key driver of funding in the future, with point of care testing devices, personalized medicine and digital health all earmarked as being at the forefront of the industry in future.

That said, it has not stopped innovators from innovating and Israel has traditionally been, and continues to be, fertile ground for the development of cutting-edge technologies.

The conference hosted a start-up competition, of which the winner was E-Shunt, which has developed a drainage device to treat glaucoma, a disease that causes intraocular pressure to rise to the point where it can damage eyesight and ultimately cause blindness.

The implant is based on a nano-electro-spinning technology that channels pressure deeper into the eye socket, releasing the pressure on the optical nerve. The implant process takes less than 10 minutes and is designed so ophthalmologists who are not glaucoma specialists can perform

the procedure. E-Shunt's Founder and chief medical officer, Gilad Levin told *Medtech Insight* he wants the device to put the "ease of use for surgeons as a priority and recovery process for the patient is minimal." He said by the end of the process, the patient should be free from dependence on medication, and the disease's progress stops.

Below is a summary of the companies that were also presenting at MIXiii Biomed.

Medical Technology Companies Showcased At MIXiii Biomed

Company	Device Area	Technology	Products
		Diagnostic IVD platform for distinguishing between bacterial and viral infections based on the patient immune response to different infection types.	<i>ImmunoXpert</i> – a CE marked assay test.
MeMed	IVD	Uses computer algorithms to combine immunoassay measurements of three host immune response proteins present in human serum, to distinguish between bacterial and viral infections. Remote monitoring system for elderly. Uses advanced machine learning algorithms and Wearable wrist device	<i>ImmunoPOC</i> – a point of care benchtop device for running the tests
Kytera Technologies	Digital health/Activity monitoring	sensing technology to learn routines of senior in the house and detect deviations from the routine and distress situations.	Sensors installed at home.
Chronisense Medical	Digital health/Patient monitoring	Wearable wrist ICU	Wearable watch, with

		device for continuous measurement of vital signs.	four sensors. Platform connected to smart phone.
		Records bio-signals measured by the device at the wrist, transmits information to smartphone for data analysis and uploads to cloud database. Data is then sent via cloud to healthcare professional or family member. Continuous patient monitoring system.	Aiming to apply for FDA clearance by end of 2017.
EarlySense	Digital health/Patient monitoring	Piezo-electric sensor placed under a patient's mattress which keeps track of a patient's cardiac activity, respiratory rate, movement, and sleep. The system issues real-time alerts in emergencies.	<i>EarlySense System</i> <i>InSight System</i> FDA cleared & CE marked.
		Data is sent wirelessly to nurse's Central Display Station (CDS) continuously so they can supervise and check status of patients. Cancer diagnostics.	
MicroMedic	IVD	Histochemical staining platform allowing color discrimination to	<i>CellDetect</i> – for bladder cancer, prostate cancer and prostate cancer

differentiate between normal and cancer cells.

Uses proprietary plant extract and generic dyes, CellDetect colors the nuclei of cancer cells in red-purple while normal cells are counter-stained with green.

Epigenetics biomarker cancer test. Includes a panel of 15 DNA methylation biomarkers for detection of bladder *Bladder EpiCheck* cancer. A

Nucleix

IVD

bioinformatics tool enabling rapid and systematic development of biomarker panels for a wide range of clinical tasks.

CE marked and available in the EU.

Predictive big data analytics platform.

Applies machine learning with predictive modelling and analytics

Intensix

Critical care monitoring techniques to provide healthcare

professionals with warnings in ICU management to avoid disease deterioration.

Intensix platform for critical care monitoring

Mobile app for cancer patients to help manage treatment. Patients can organize and manage

Belong

Cancer management

Belong app

Currently available free on App store.

		<p>medical records and share with family and healthcare professionals.</p>
		<p>Community support and network.</p>
		<p>Respiratory digital therapy for asthma and COPD patients. Helps users improve their breathing technique and lung function while playing a variety of popular mobile games like Candy Crush.</p>
iFeel	Respiratory disease management/Digital rehabilitation	<p>Wearable pulse sensor and mobile app.</p>
		<p>Wearable sensor tracks users' pulse in real time, users then play a game which teaches them to breathe more effectively using the Heart Rate Variability Biofeedback (HRVB) technique.</p>
		<p>Robotic needle steering for use in minimally invasive interventional procedures such as biopsies and ablations</p>
XACT Robotics	Surgical robotics	<p>Early-stage device company developing an aortic neuromodulator for treatment of heart failure.</p> <p><i>XACT 5 degrees-of-freedom robot.</i></p>
		<p>Harmony System, a catheter-based neurostimulator device</p>
Enopace Biomedical	Neuromodulation	<p>The implantable device increases cardiac efficiency by reducing</p>

		<p>left ventricular workload.</p> <p>Miniature bionic retina for restoring vision lost due to retinal degenerative diseases.</p>	
NanoRetina	Ophthalmology	<p>The <i>NR600</i> Implant, replaces functionality of damaged photoreceptor cells and creates electrical stimulation to activate remaining retinal cells. Minimally invasive ophthalmic devices.</p>	<p>Miniature implantable chip and a set of eyeglasses worn by patient.</p>
		<p>Currently developing implant for treating corneal edema.</p>	<p><i>Hyper-CL</i>, a therapeutic contact lens for treating corneal edema,</p>
EyeOn Medical	Ophthalmology	<p>Based on a silicon film attached to the posterior corneal surface. The implantation of the silicon implant prevents transfer of fluids into the cornea and prevents creation of edema.</p>	<p>CE marked and FDA cleared.</p> <p><i>EndoArt</i> – artificial endothelial layer to cure corneal edema. Currently in development.</p>