Conference Report - ‘ICI 2019 Meeting – Digital health day’

Written by Dan Coster & Omer Noy 8/12/19, Reviewed by Ron Shamir 31/12/109.

Background

ICI meeting is an International Conference for Innovations in Cardiovascular Interventions (Heart, Brain and Peripheral Vessels) and High-Tech Life Science Industry. In fact, this is the Israeli annual meeting of cardiologists and traditionally the conference presented many medical device companies that try to enhance cardiovascular procedures.

This year, one of the conference track was dedicated to ‘Digital Health’ and that occurred on the first day of the conference. The meeting was held in David InterContinental Hotel, Tel-Aviv on 8-10 December 2019. The conference’s meeting directors are Rafi Beyar (an Israeli medical doctor, entrepreneur, and professor who is the director of Rambam Health Care Campus) and Chaim Lotan (The Director of The Heart Institute in Hadassah health center).

The attendees were clinicians and scientists from the industry (from Israeli start-ups to giant pharma\technological companies) Around 150 participants attended the digital health track. The ‘digital health’ day had 4 sessions, each session contained between 4-7 talks of 15-20 minutes each. Unfortunately, most of the talks did not have in-depth scientific content.

The sessions were:

- Data to Services: Healthcare Then, Today and Tomorrow
- From Discovery to Consumer - Digitizing Pharma
- From Devices to Software, From Hospital to Home
- The Future Healthcare: From MD to AI

Below we summarize a few talks we found more interesting.
Psifas ("Mosaic") - The National Initiative for Precision Medicine

Dr. Yael Villa, CEO of Mosaic Project

Psifas is Israel’s National Precision Medicine Initiative. Psifas is designed to collect health data and biological samples from hundreds of thousands of volunteers establishing a community of participants. The information obtained will accelerate the development of medical care specifically tailored to the diverse ethnicities that comprise the Israeli population.

Dr. Villa mentioned that the Mosaic Project was declared as one of the potential national growth engines that are being promoted by the government. The project works as an independent body (‘start-up’ mode) between different ministries and their budget is 300M NIS for 5 years. They wish to collect data from 500K patients and integrate both EMR and demographics. The talk especially used the word ‘collaboration’ but no information in regard to the current data status was presented.

MyHeritage Health

Dr. Yaniv Erlich, Chief Science Officer of MyHeritage

MyHeritage has a unique benefit since they have access to three types of data:

(1) Family trees (3.2B records, 43M users)
(2) DNA (3.5M genomes with 700K SNPs)
(3) Survey with 270K responders and ~94 data-points per user.

Last year they decided to launch a new health product that contains 34 Genetic risk conditions:

- 4 polygenic risk scores – Heart Disease, Type 2 Diabetes, High Blood Pressure and Breast Cancer.
- 14 Monogenic conditions.
- 20 Carrier Status conditions.

Erlich described in detail the Heart Disease polygenic risk score that is based on 46K SNPs and was developed based on 5 independent cohorts. He mentioned that their polygenic score classifies 2.5% of the patients to be in the ‘high risk to cardiovascular disease’ group, whereas the common risk score that is based on familial hypercholesterolemia detected only 0.5% of those patients (no information was supplied in regard to the False Positive Rate of the method).
Figure 1: Y-axis presents the odds ratio of having heart attack, X-axis present 5 percentile intervals of MyHeritage polygenic Risk Score.

He presented preliminary results, and as expected high-risk patients (both males and females) have worst survival outcomes than low-risk patients. In addition, the cumulative hazard function of smoker males with High-Risk score is much worst than non-smokers males with High-Risk score. Moreover, it is presented that smoking characteristic has a much more drastic impact among high-risk patients than among low-risk patients (the difference between smoker vs. non-smokers is bigger).

Figure 2: (Left) Kaplan-Meier Curves where the failure event is the occurrence of heart-attack, divided to females\males and stratified by MyHeritage polygenic risk score to heart attack. (Right) Hazard Curves where the failure event is the occurrence of heart-attack, divided to High-risk\Low-risk scores according to the MyHeritage polygenic risk score and stratified by smoker \ non-smoker.
The ER of the Future

Dr. Kira Radinsky, Chairman and CTO of Diagnostic Robotics, Israel

Diagnostic Robotics develops the product ‘WeTriage ER’ – an AI station that conducts an automated triage in the emergency department. As part of their algorithm, they create a knowledge graph based on David Sontag ‘Concept Extraction’ model. One of their conclusions following their preliminary research is that there is a huge difference between the way that a patient describes its symptoms and the way the physician documents those symptoms (and that could lead to a bias).

Figure 3: knowledge graph based on David Sontag ‘Concept Extraction’ model

They conducted joint research with Rambam’s Emergency Department with data between 2012-2018 with more than 30K patients. They developed a model to predict headache and evaluate it by counting “how many times the headache diagnosis was surfaced in the top-k predicted diagnosis set”? (One can question the relevance of this criterion). In addition, she presented more results that were validated on another test set from Singapore (predicting sinusitis and meningitis).

Meningitis AUROC among 2 Datasets

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Headache (Top-K accuracy)
Dr. Zimlichmann states that drastic changes in healthcare practices are inevitable as we try to answer our biggest challenges (rising cost etc). Hospitals will need to be one of the first to go through a full redesign. That was “an inspirational talk”, he just arrived back from a seminar with the directors of the biggest hospitals in the world and they discussed the following question - How are we going to build a new hospital that will still be relevant for the next 30 years?

- Hospitals of the future need to be seen as a hub within an ecosystem, or an “academic health system” delivering integrated care.
- Thanks to personalized medicine (predict and prevent), care will be pushed out of hospitals to the home. Technology will enable breaking geographical boundaries.
- The hospital will become smaller with fewer real beds and more virtual beds.
- Untraditional partnerships (internet, welfare, education).

Dr. Zimlichmann states that future medical centers will need to adapt and respond to the changing landscape today. This needs to include adopting AI, embracing telehealth, hospital at home etc.

**Will Image-based FFR Expand the Use of Physiological Guidance in Coronary Artery Disease**

Mr. Jim Corbett, Cathworks CEO USA

Stenosis is abnormal narrowing of blood vessels, Fractional flow reserve (FFR) is a technique used in coronary catheterization to measure pressure differences across a coronary artery stenosis to determine the likelihood that the stenosis impedes oxygen delivery to the heart muscle (myocardial ischemia). CathWorks is a medical technology company focused on applying its advanced computational science platform to optimize Coronary Artery Disease (CAD) therapy decisions and elevate coronary angiography from visual assessment to an objective FFR-based decision-making tool for physicians.
There was a brief overview of the system technology: given an optimal (good quality and static) 2D angiograms, the system first reconstructs the geometry of the coronary tree in 3D. The system then scans the entire reconstructed 3D tree and looks for stenosis and narrowed regions (done automatically through PCA edge detection algorithms). Finally, FFR is calculated as the ratio between the flow rate in the stenosed artery and the flow rate in the same artery in the absence of stenosis.

Mr. Corbett presented, among other things, the need for guidance in stent size selection. Stent size decisions are often based on visual assessment alone, which could lead to misestimations and complications. Their tool integrates the physiological information and also give some guidance for an appropriate stent size selection.

Figure 4: An Illustration of FFRangi by Cathworks