





MEDinISRAEL 2019 GOES DIGITAL HEALTH



Professor Ran Balicer, MD, PhD, MPH Founding Director, Clalit Research Institute, Israel

An Israeli Case Study About Transforming Healthcare with **Digital Health Innovation**

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Leveraging unique data assets and AI capabilities, Clalit Health Services (Clalit) is undertaking globally-noticed transformative implementation at scale of predictive, proactive, and high-precision care initiatives.

A decade ago, years before the global interest in Al in healthcare, researchers at Clalit Health Services (Clalit), Israel's largest healthcare provider, used advanced analytics to create a predictive model that identified who, among seemingly healthy people, would end up in dialysis five years later. The model, that targets less than 1% of the population, was based on decades of digital health data from over half of Israel's population – some 4.5 million patients that Clalit routinely cares for.

The Clalit Research Institute and Clalit's Community Division then asked frontline general practitioners to reach out to these tens of thousands of individuals who were identified as selected at-risk patients. Following this preemptive intervention, recent data suggests a decrease in new dialysis cases among this group. This ratified previous work on preventing readmission through similar smart predictions that showed a 12% decline in readmission following prediction-based intervention.

["]We have been doing the same in recent years trying to prevent at scale cases of diabetes, pneumonia, and even cancer. We expect to measure their impact in the coming years," says Professor Ran Balicer, MD, PhD, MPH who serves as the founding director of the Clalit Research Institute, one of Israel's most prominent data-driven health innovation centers.

["]We can undertake these initiatives in Israel because there are decades of longitudinal electronic medical records embedded in our institutions and in integrated datasets. These, alongside strong economic incentives, keep patients healthy over time, also because Israel has prioritized digital innovation in healthcare," says Balicer, who also serves as the head of the World Health Organization (WHO) Collaborating Center for chronic disease prevention.

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Can you give us another example of unexpected predictive links?

"A while ago we had collaboration where we built a model to predict who would suffer an osteoporotic bone fracture (brittle bones that tend to break). For some reason, the algorithm insisted that eye diseases were a strong component of the prediction for these fractures. Obviously a glitch, we thought. I know from medical school that those two have nothing in common. We tried to fix the model, but the algorithm was not letting go of its analysis. And then it hit us... Eve problems are not associated with brittle bones; but vision problems cause patients to fall, hence the fractures. And this is a critical point: computers outperform humans in picking up multiple, subtle signals and patterns in masses of data. We can use these insights to also predict which treatment will work best for which patients."

Towards Personalized Medicine

Nowadays, physicians can benefit from the collective experience of millions of patients they've never met. Increasingly strong computing power and advanced analytics, including machine learning and artificial intelligence tools, can scan vast quantities of health data in huge repositories spanning geographies and even generations.

["]Predictive algorithms can search and identify patients, just like the one sitting in front of the doctor, out of millions of past records, and determine from their recorded experience the best course of action," Balicer adds. "We created such a tool in a project led by Dr. Noa Dagan at our institute. The tool won the prestigious global data analysis competition of the New England Journal of Medicine – the SPRINT Challenge. There is so much we can already do today. Just imagine what can happen as we fully deploy our ongoing efforts to create Israel's largest bio-bank. Our patients' everyday care and suggested treatment will truly be individually tailored."

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Globally Unique Development and Testing Ground

Balicer emphasizes that Israel's information technology infrastructure and its historical data repositories serve as a platform for data-driven innovation. "For example, Clalit's data warehouse has nearly two decades of extensive identity-documentation-tagged, geo-coded, and person-level detailed inpatient and outpatient clinical data (such as diagnoses, laboratory results, medication prescription and dispensing, and imaging studies) on its 4.4 million members. This clinical data repository is a unique development and testing ground for new data-driven care models, while it maintains strict patient privacy and advanced cyber-security standards."

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In a key article published in the prestigious The Lancet medical journal, Balicer and Professor Arnon Afek, director general (DG) of Israel's Ministry of Health and the associate medical DG of the Israeli Ministry of Health (2014-17), describe four unique aspects that render Israel the **Digital Health Nation**. These attributes are known as "the 4 i's." These include: Israel's information technology infrastructure, integration of care with interoperable data flow, implementation-read institutions and the unique Israeli innovative spirit and hutzpa.

Israel's unique advantages have led the Israeli government to launch a national initiative to support digital health innovation. Balicer believes that such an initiative, coupled with Israel's innovative spirit and technological ecosystem, could facilitate harnessing digital health innovation for the benefit of patients and could boast the implementation of more new technologies into Israel's healthcare system.

"Now that Clalit has declared a new, long-term strategy to become an innovation-driven organization, we are looking for the most ambitious, local and global players to join us in co-creating the future of healthcare," he states. Judging by the well-earned global reputation Clalit has gained in recent years as a forerunner in this field, as well as success stories of start-ups like Zebra Medical Vision that work closely with Clalit, it seems likely that these will spark considerable interest among global leaders in the health care and tech industry.



For more than one hundred years, Clalit Health Services has been Israel's leading and largest healthcare organization. Today it serves as a non-profit integrated care organization for over four million patients, which is more than half of the country's population. With universal healthcare coverage in Israel, most Clalit members remain covered by the organization for their entire lives (>95% five year retention). Clalit owns and operates 1,500 primary care clinics and 14 hospitals, including 30% of Israel's hospital acute care beds, and employs nearly 35,000 doctors, nurses, pharmacists, paramedics, technicians, and administrators.

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