

IMPROVING THE HEALTH OF ME



TOWARD Personalized, Proactive and Ubiquitous HEALTH AND WELLBEING

The individual is at the heart of a health and wellbeing model that is human by design, trustworthy and knowledge-driven. In this paradigm, which focuses on the particular needs and goals of the individual “Me,” improvements require a new way of thinking about all the elements that define health and wellbeing. It means enabling the right technology powered by trusted data for more personalized and precise care. Above all, it calls for a fresh mindset.



Traditional healthcare organizations play a primary role in this transformation. Still, the scope is more comprehensive, including life sciences and research organizations, digital start-ups, community and faith-based organizations and retail outlets. Viewed most widely, the new model touches upon all businesses that value their employees and customers. It also empowers individuals themselves to make proactive decisions and improve their own health outcomes.

From the perspective of the individual, this new model cuts across three domains. First, it presses ahead toward more personalized and precise care. Second, it envisions not only prevention but also proactive intervention. Third, it aims for ubiquity to reflect better the realities of those it seeks to serve.



**PERSONALIZED,
precise and
empowered
CARE**

We have grown used to doing business online with companies that know their customers well. They not only greet us by name but also anticipate our buying intentions and offer intelligent recommendations. In many sectors of the economy, personalization has become a minimum expectation.

This data-fueled digital transformation has reached healthcare organizations, although more slowly. Digital adoption (in terms of medical records alone) has steadily grown over the past dozen years, but a patient's typical experience in a clinician's space has undergone minor changes. Being asked to re-enter basic information by hand, for instance, reinforces the impression that traditional healthcare can be impersonal, cold and annoyingly repetitive.



Artificial intelligence (AI) can allow us to do personalization, become faster, more accurate, more targeted in getting the right message to the right person over the right channel at the right time.

Milissa Campbell - Managing Director and Health Insights Lead at NTT DATA Services

The healthcare system is good at diagnosing and treating illness. Yet, for various reasons, it is often less able to grasp the person beyond the condition, including the social determinants that account for the majority of health outcomes. Healthcare providers are mindful of privacy concerns yet are impeded from innovating or collaborating due to dated policies and regulations.





Medical professionals aspire to new models of care and technologies, however, legacy systems are holding back progress. Clinicians are forced to work within specific, archaic workflows that have many drawbacks.

**Michael Petersen, M.D., Vice President
Consulting and Chief Clinical Innovation
Officer, NTT DATA Services**

Technologically, healthcare IT is often far from cutting edge. “Artificial intelligence (AI) can allow us to do personalization, become faster, more accurate, more targeted in getting the right message to the right person over the right channel at the right time,” said Milissa Campbell, Managing Director and Health Insights Lead at NTT DATA Services. “Many organizations have high hopes for AI, but if they haven’t mastered the fundamentals or basics like data governance, they’ll be unprepared to address AI plans today or in the near term.”

Life sciences are also targeting the individual. Knowledge of a patient’s genetic and molecular information leads to an improved ability to predict which treatments will work best for specific patients. Pharmaceutical companies are developing smaller drugs and more precise delivery systems. Chemotherapy can target tumors rather than impact the whole body, and “poly-pills” hold several medications for multiple illnesses with different release times. Nanotechnology and biological 3D printing are enabling other customized treatment and monitoring solutions.

Disruptive innovations outside of traditional healthcare are nonetheless catalyzing a more personalized and precise approach. Smartwatches can measure the electrical activity of the heart, blood oxygen and blood glucose. Apps that prompt users toward healthy lifestyles are in widespread use. Consumers can also directly purchase reports on their genetic makeup and unique health risks.

In the realm of basic research, the NTT Research Medical & Health Informatics (MEI) Lab is also working on biological nano-sensors and has launched an ambitious bio digital twin project, focusing initially on the cardiovascular (CV) system. The idea of a CV bio digital twin may sound futuristic, but the roadmap is realistic and serves as another indicator of an ongoing shift toward a “Health of Me” paradigm.

Can that initiative speak to current affairs? The COVID-19 pandemic has drawn attention to urgent matters of public health, including access to care by underserved communities. The medical research community largely attributes poor outcomes in the pandemic to social determinants and chronic diseases. Yet one can also imagine a role for more finely tuned treatments, such as enabled by bio digital twins.



When we consider the variety of complex presentations of patients infected with COVID-19, we bear sad witness to the profound need for individualized care.

**Joe Alexander - MEI Lab Director
and Distinguished Scientist**

INNOVATIONS THAT SUPPORT MORE PERSONALIZED AND PRECISE HEALTHCARE

CARE DELIVERY INNOVATION

Consumer-driven Genomics	Genetic tests on ancestry and health factors without the involvement of a healthcare provider.
Digital Twin	A virtual copy of a physical entity or process could increase efficiency, precision, personalization.
Bio 3D Printing	Custom treatments in regenerative medicine, including transplants, repairs, prosthetics, etc.
Precision and Nanomedicine	Leverage genetic or molecular data; smaller drugs, more precise delivery systems.

CONNECTED HEALTH SYSTEM

Lifestyle medication	Evidenced-based practices to help individuals adopt and sustain healthy behaviors.
Remote monitoring, IoT	Connected devices and tools that provide extensive, fast and reliable health data.
Augmented/virtual reality	Wearables that enhance diagnosis and treatment via faster, more precise information.

INTELLIGENT AUTOMATION

Diagnostic AI	Artificial intelligence (AI) leveraged across a spectrum, from limited validation to full automation.
Predictive analytics	Alert patients and care providers; earlier diagnosis and detection possibly using machine learning (ML)

DIGITAL ENGAGEMENT

The waiting room of the future	Digital workflow orchestration, capturing patient information and boosting efficiency.
Patient-provider experience	Immersive technologies that enhance communication, improving outcomes.



From PREVENTION to PROACTIVE INTERVENTION

Healthcare, especially emergency-related, is reactive by nature. No one plans a car accident or heart attack. Anyone, however, can take preventive measures, such as wearing a seatbelt or minimizing cardiovascular risk factors. But what about preemptive measures? Can you neutralize a pending threat?

As it happens, you can if you can gain more intimate knowledge of “Me.” To take the automotive example, integrated sensing devices can activate braking systems in the face of imminent danger, and telematic devices linked to insurance companies can prompt safer driving. Proactive intervention, in other words, goes beyond an annual inspection. In like manner, getting ahead of the health and wellbeing curve calls for more than a physical exam.

Given the proliferation of consumer health IT devices, many individuals are already equipped to monitor their health and take proactive measures when available. After all, as the pandemic has revealed, healthcare can be difficult to access at times. A forecasted shortage of physicians is another reason to empower patients to follow through on better health decisions they make. Cost reduction is yet another driver. An ounce of prevention – and proactive intervention – is worth a pound of cure.

Fortunately, everyone follows broadly predictable patterns. The physical “Me” passes through youth, adulthood and elderhood. Likewise, medical conditions follow well-understood pathways. Identifying one’s place on any number of journeys can set up the possibility for effective preemption:

- **Diet and weight** – Many food and exercise apps work with individuals on individually chosen objectives, nudging them toward daily progress.
- **Pregnancy** – A familiar pathway with known mileposts provides an opportunity for anticipatory guidance on possible complications. Some health plans have provided smartphones or tablets to help with access to care challenges and education.
- **Mental health** – Whether reminding one to breathe deeply or intervening to moderate anxiety disorder, apps can be cost-effective, anonymous and convenient tools.
- **Diabetes** – Expected to have an outsize impact on global disability-adjusted life years (DALYs) over the next two decades, diabetes could be checked in part through autonomous, closed-loop therapeutics.
- **Cardiovascular health** – Basic monitoring is a start, but more sophisticated solutions are on the horizon. Advanced pacemakers, for instance, could be trained to alter the pace based on changed underlying rhythms.

Once again, the prospect of digital alter egos provides an opportunity to think big.



In a future world where all patients have bio digital twins, it will be easier to examine patients virtually, using their twins, to determine what unique factors may influence their course of illness. Moreover, we could run 'what if' scenarios to predict their best treatment options.

**Joe Alexander - MEI Lab Director
and Distinguished Scientist**

Care for ANYWHERE, EVERYWHERE



The on-demand revolution has disrupted many industries. Just as feature-length movies are no longer shown solely in movie theatres, medicine no longer happens within traditional medical zones, such as emergency rooms and doctors' offices. The venues could be anywhere and everywhere.

The new health and wellbeing model is aligned to and based on individuals who are as mobile and variable as their conditions. There are now mobile urgent cares, "near home" sites for testing and immunization, and worksite and retail clinics. Another example is mobile doc-in-a-box solutions, such as provided by Everlywell, which delivers test to homes or can be purchased in a retail setting. In addition, telehealth provides additional access outside of any physical office, including the home. The goal is the right care at the right time, where it's needed, including remote and under-served communities.

The requirements for this ubiquitous model are extensive. Interconnected devices that generate data need adequate security and privacy protections. Infrastructure includes hardware, such as medical tablets for mobility, and HIPAA-compliant software, integrated within electronic health records (EHR) systems. Uninterrupted and secure internet is a must both inside and outside of facilities.



Telemedicine is limited by the network capacity to manage massive telehealth data. Ultra-reliable, high-speed, wide-bandwidth and low-latency networks are required to support telehealth.

**Tarun Guirajani - Senior Manager,
Digital Health at NTT DATA Services**

Forward-looking IT and communications partners can anticipate future needs. For example, the Innovative Optical and Wireless Network (IOWN) initiative, launched by NTT and supported by more than 20 members, addresses some of these future needs. The premise is that high performance cannot be limited to one part of increasingly distributed and multi-cloud network topologies and needs to extend between data centers and from end device to cloud to the network edge.

Telecom and IT providers accustomed to maintaining service level agreements (SLAs) are vital to virtual scenarios. In turn, healthcare providers have their own SLA-related concerns. When contracting, for instance, with a health-at-home dialysis service, a provider needs to ask these kinds of questions:

How do we ensure that the level of quality care is equivalent to what a patient would receive in a hospital setting?

Does the nurse arrive when scheduled?

**Does the machine collect data as it should?
Does it transmit securely?**

When is the data collection and transmission scheduled?

Is the data 'noisy'? Is it securely stored?

Hidden backoffice requirements for health and wellbeing ubiquity include, but are not limited to:

Competency in maintaining SLAs for hospital applications running critical medical devices

Hospital management services that ensure continuity of care (such as infusion centers)

Data management that enables secure access to healthcare data between validated providers

SMALL and BIG STEPS



One way to begin realizing this personalized health and wellbeing model is to become more acquainted with the individual profiles of those within your care. Experts at NTT DATA Services, for instance, point to successful outcomes in dual diagnosis (medical and behavioral) using psychographic segmentation and predictive models, all based on publicly available data. “We view health as a combination of physical, behavioral and social factors,” Dr. Petersen said. “The health industry should begin to understand this point of view if they truly intend to make real change.”



The key for IT leaders in healthcare today is to open up backend systems and provide an API layer that offers access for any endpoints. That layer needs to be able to enforce access permissions based on identity. Further, they need to define their data strategy and think about pseudonymization of medical and patient data to leverage AI/ML capabilities in the public cloud, while making sure that they are fully compliant with any future regulatory requirements.

Michael Mossal - Director of Digital Transformation, Group CTO, NTT Ltd.

Whether taking small or more ambitious steps, one is unlikely to improve the health of “Me” without first recognizing and honoring that person’s digital and physical identities. The next paper in this series addresses the “digital ecosystem” that constitutes the platform of this human-centric health and wellbeing model. The takeaway here is that the individual stands firmly at its center.