The Internet of Things and Healthcare
Policy Principles

Background

Within the next ten years, it is expected that half of all care will be delivered virtually, with providers paid based on their teamwork and quality. We expect 24x7 diagnostics monitoring from phones, wearables, and even implantables with dramatic growth in sensing technologies from the hospital to the home. The integration of device data (inpatient, outpatient, and home- or mobile-based) into medical records will be a major push for the foreseeable future. In large part because of widespread wastefulness in service delivery and need for virtual care models, McKinsey Global Institute forecasts that 40 percent of the global economic impact of the IoT revolution will occur in healthcare, more than any other sector.¹ Mobile healthcare devices will be used to track everything from fitness goals to surgical rehab faster, more convenient, and at reduced costs. Two factors have the potential to make dramatic changes in Europe’s healthcare: consumer engagement and personalised care. These are crucial to meeting the needs brought by shifts in demographics.

Emerging 21st century care platforms require titanic shifts in thinking, business models, and infrastructure. The old “mainframe health” paradigm (i.e., centralised, hospital-centric, expert-driven, reactive, costly) is giving way to a new “personal health” paradigm (i.e., distributed, data-rich, preventative, home- and consumer-centric, and efficiency-driven). Demographic and economic drivers to a personalised healthcare shift include:

Population ageing – a shift from younger to older population. Only 3 years from now, the human population will hit a crossover point for the first time in history. There will be more people over age 65 than under age 5. “No other force is likely to shape the future of national economic health, public finances, and national policies as the irreversible rate at which the world’s population is ageing,” according to Standard & Poor’s.² By 2020, for every person aged over 65, Europe will have three working-age people, down from four in 2010.³

Chronic diseases – a shift from predominantly infectious disease threats to predominantly chronic diseases, often exacerbated by lifestyle. Population aging increases the number of patients with heart disease, cancer, diabetes, lung and kidney disorders, Alzheimer’s, and overweightness. These issues

hinder productivity and are expensive and difficult to treat, requiring behaviour changes. Today, 63 percent of the world’s deaths are from non-communicable diseases (non-infectious; not transmitted by humans).\(^4\) Low- to middle-income countries now carry roughly 80 percent of the burden of diseases like cardiovascular disease, diabetes, cancer, and chronic respiratory diseases.\(^5\)

**Global shortage of healthcare workers.** The EU estimates a potential shortfall of around 1 million healthcare workers by 2020, rising up to 2 million if long term care and ancillary professions are taken into account. This means around 15 percent of total care will not be covered compared to 2010.\(^6\) Yet this pales in comparison with the needs in Asia and Africa.\(^7\)

**On top of demographic and workforce problems, the healthcare sector is dramatically inefficient.** Even if healthcare services were delivered efficiently, it would be extraordinarily difficult for a shortage of medical professionals to care for greater numbers of sicker people over the next several decades. Yet by all accounts, there are hundreds of billions of dollars in wasteful spending that need to be squeezed out of healthcare systems worldwide.

**With the rise of the internet culture, there is a shift from passive to active patients.** Patients and families are more engaged and digitally monitored by a growing array of apps and devices. The Intel Healthcare Innovation Barometer, an eight-nation, 12,000-adult survey last year,\(^8\) revealed:

- 80% are optimistic about healthcare through innovation and technology.
- 70% are willing to see a doctor via video conference for non-urgent appointments.
- 70% are open to using toilet sensors, prescription bottle sensors, or swallowed health monitors.
- 50% believe the traditional hospital will be obsolete in the future, and would trust a test they personally administered as much or more than if performed by a doctor.

**Health apps, social networks, and collaboration tools are growing rapidly.** Enterprise and consumer health apps will continue to proliferate. PWC and GSMA indicate that mHealth alone can save 99 billion EUR in annual healthcare spend in 2017, equating to treatment of an additional 24.5 million people.\(^9\)

**Three categories are emerging for IoT healthcare: Person to Person, Person to Computer, and Person as a Computer.**

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\(^7\) Forecasting the global shortage of physicians: an economic-and needs-based approach, World Health Org. (July 2008), [http://www.who.int/bulletin/volumes/86/7/07-046474.pdf](http://www.who.int/bulletin/volumes/86/7/07-046474.pdf).


Person to Person: Dulcie Madden of Mimo developed an infant monitor that sends parents real-time information on their baby’s breathing, skin temperature, sleeping position, and activity level. Mimo sends the baby’s sleep data straight to her parents’ smartphones.

Person to Computer: Vigilant, a Swiss company, has developed a smart insulin injection tracker to help diabetic patients manage their health. The injection tracker, called Bee+, is an electronic cap that fits most insulin pens on the market. It wirelessly transmits a diabetic’s insulin injection data to a smartphone app.

Person as Computer: Myo (pictured right) uses the electrical activity in your muscles to wirelessly control your computer, phone, and other favourite digital technologies. With a wave of your hand, Myo will transform how you interact with your digital world. The technology is by Thalmiclabs, an Intel Capital investment.

Policy Principles

The potential for IoT and consumer engagement to dramatically improve health status/outcomes is limited by policies defined by face to face transactions. The shift is beginning and we urge Europe to embrace new healthcare models by tackling difficult policy decisions.

Require Data Standards for Connectivity and Interoperability

- IoT in healthcare has the potential to aggregate data from patient records, wearable sensors, labs, diet, the environment, and social networking in real time, but only if the data can be analysed. This takes standardised data formats. Policymakers should strengthen current requirements for data exchange among electronic health records (EHRs) and the emerging IoT devices/solutions.

Regulate Smartly/Don’t De-Innovate

- The increasing convergence of consumer electronics with medical, health and wellness applications challenges the boundaries between regulated and non-regulated things including software. There must be a balanced regulatory approach that ensures users’ safety without crippling developers of lifestyle solutions with disproportionate regulation. The International Medical Device Regulators Forum has added the Standalone Medical Device Software Harmonization Work Group to address these issues from a global perspective.

- Regulatory pathways should be refined to reflect health technologies that are not medical devices. This will require alternative frameworks to ensure functionality and safety.
Re-Thinking healthcare delivery model

- IoT provides a new platform for capturing daily biometric data that shows trends and changes in health status in real time. However, this rich and actionable data is not being used today because our health systems are unprepared to incorporate the data into current healthcare delivery models. The EU project Momentum compiled a list of 18 critical success factors for effective deployment of telemedicine amongst which feature culture readiness, financing and change management. These factors all need to be mustered to ensure adoption in routine care.

- Healthcare IoT solutions poised to change access and outcomes for chronically ill patients are now delayed not by technology, but by the lack of payment where virtual care is substituted and enhanced over face to face visits.

Capture Patient Generated Health Data (PGHD) as a Vital Part of the Patient Record

- Whilst 75 percent of European hospitals and 95 percent of General Practitioners are equipped with EHR systems, the real time data from sensors, tablets, smartphones, and peripherals are not captured in the EHR. Physicians can now diagnose a patient’s medical condition from daily feeds provided by IoT devices noting changes in environment, diet, exercise, and medications, giving more accurate and longitudinal data rather than through readings from occasional office visits. The EU and Member States should address the issues of liability and data overload associated with PGHD and then recommend best practices for all future EHR regulations, to include PGHD.

Privacy and Security Required for IoT solutions

- Intel believes effective privacy and security solutions are critical to promote trust and encourage IoT adoption in the healthcare sector. Robust Privacy by Design driven solutions must be developed by evaluating healthcare specific use cases which follow the patient’s sensitive data throughout the IoT compute continuum. Use cases provide an effective mechanism to evaluate the specific privacy and security challenges inherent in IoT healthcare solutions and also provide an opportunity to develop robust privacy and security strategies to mitigate identified risks. IoT also presents new challenges for traditional privacy principles. Consumer notice and consent continue to be important but other principles, such as accountability for appropriate collection, use and data protection, must also be emphasized.

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