

Public Private Partnerships Delivering Smart Health to Combat the Tsunami of Noncommunicable Diseases

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Abstract. Key noncommunicable diseases (NCD) such as cardiovascular disease, diabetes, cancer and chronic respiratory disease are responsible for 71% of all deaths worldwide. Many of these deaths are premature and impact low- and middle-income countries (LMIC) the most. The economic realities in LMICs and their greater reliance on development assistance hinder investments in public health to adequately prevent risk factors for NCDs or manage established disease. Public private partnerships (PPP) can deliver smart health solutions to improve the health outcomes of those at risk of NCDs and those who have an illness. These solutions can range from simple digital concepts to complex technology constructs that can utilize artificial intelligence to intervene at many touch points along the patient journey. We present three case studies of smart health deployed through PPP to try improving outcomes.

Keywords. Smart Health, Digital Care, Public Private Partnership, Noncommunicable Diseases

1. Introduction

Around the world, someone dies prematurely every two seconds as a result of cardiovascular disease, diabetes, cancer and chronic respiratory disease. These four groups of illnesses, characterized by their long duration and generally slow progression, represent the key noncommunicable diseases (NCD). They are responsible for more than two-thirds (41 million) of all deaths every year worldwide. 15 million of NCD-related deaths are premature, occurring between the ages of 30 and 69. Over 85% of premature deaths are in low- and middle-income countries (LMIC) [1]. NCDs are a health crisis and appropriate action needs to be taken. The United Nations' Sustainable Development Goals (SDG), adopted in 2015 by all 195 member states, include the target of reducing premature NCD mortality by a third by 2030 [2]. However, the WHO reports that many countries are falling behind and may not be able meet this and other SDG targets [3]. Governments need to allocate a percentage of gross domestic product to address NCDs. However, many LMIC-governments are not able to meet this financing need and rely on development assistance for health (DAH). Unfortunately, not enough of DAH is allocated to NCDs. In 2018 this was less than 1% of the \$38.9

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billion provided [4]. This is one of several factors that contribute to SDG targets not being met.

2. Methods

The private sector and its for-profit businesses, as health stakeholders, have an interest in reducing the burden of illness. Pharmaceutical companies can work with health providers, both public and private, to prevent and manage disease. Embracing the role of the private sector, Pfizer launched Upjohn as a division dedicated to the fight against NCDs through a focused, strategic, and collaborative approach across the healthcare value chain [5].

Public private partnerships (PPP) have successfully demonstrated the catalysis of prevention, access and delivery of care for communicable diseases by providing complementary strengths [6]. Drivers for PPPs include overcoming constraints on government budgets and obtaining innovation through the private sector's enhanced capability [7].

Information and communication technologies (ICT) provide significant utility for the health sector. ICTs can foster patient-centered healthcare, improve the quality of care that provided, and educate health care practitioners and their patients [8].

Upjohn used both these concepts, PPPs and ICT, to address the burden of NCDs. It has partnered with health care providers to leverage ICT, from simple technology constructs such as augmented reality through to more advanced technologies like artificial intelligence, to address challenges and improve outcomes in NCDs. The approach to PPP was simple. Upjohn, as the private sector partner, was responsible for project design, financing and delivery while the public sector participant owned and operated the initiative.

2.1. Case Study - Augmented reality to overcome clinical inertia in hypertension management

Clinical inertia is implicated in poor modification of risk factors for cardiovascular disease, with almost half those with hypertension observed to have inadequate blood pressure control. A recent review showed that strategies such as physician reminders and educational interventions are effective in reducing clinical inertia and improving hypertension management [9].

Upjohn created materials embedded with augmented reality (AR) to better engage and inform healthcare providers and, help overcome clinical inertia. Figure 1 demonstrates how a brief animated video on blood pressure variability (BPV) is triggered by using a smart phone with an AR app. This material was used when detailing to physicians in their offices and at scientific meetings. The novelty of AR is an engaging aspect of a two-dimensional infographic that aims to remind physicians of the cardiovascular risk of hypertension, highlighting the importance of BPV.

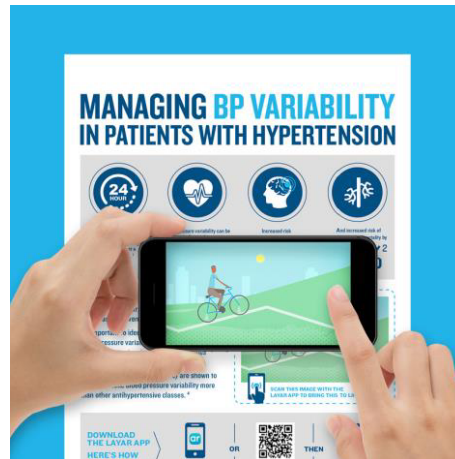


Figure 1. Augmented Reality Material.

2.2. Case study - Leveraging multiple technologies to create a disease management program that improves diabetes outcomes

Joint Asia Diabetes Evaluation (JADE) combines several technologies to create a disease management program, that has been shown to improve clinical parameters in the management of diabetes [10]. JADE employs a web-enabled patient registry to capture structured clinical information; a risk engine to offer prioritised, evidence-based decision support protocols to clinicians; and data-mining to create graphical reports for patients and clinicians, which promote shared decision-making and foster therapeutic alliances.

The JADE model has improved clinical outcomes in 12 countries and regions across Asia – China, Hong Kong, Taiwan, Singapore, Malaysia, Thailand, Philippines, Korea, Macau, Indonesia and Brunei. Interventions have shown better clinical outcomes for diabetes than traditional care, as well as improved control of cardio-metabolic risk factors [11].

Upjohn partnered with the creators of JADE to make it smartphone-enabled for easier access to reports; for data inputs; and to further enhance shared management.

2.3. Case study - Artificial intelligence (AI) empowering patients with diabetic peripheral neuropathy to seek clinical intervention

The clinical impact of diabetic peripheral neuropathy (DPN) is profound. A significantly diminished quality of life results from painful neuropathic symptoms and neuropathic deficits (which include ataxia and weakness leading to falls, fractures and lacerations). Mortality is increased through foot ulcers and infections [12][13]. Diabetic neuropathy is commonly underdiagnosed. For every missed diagnosis due to gaps in knowledge, ten others are missed for lack of examination [14].

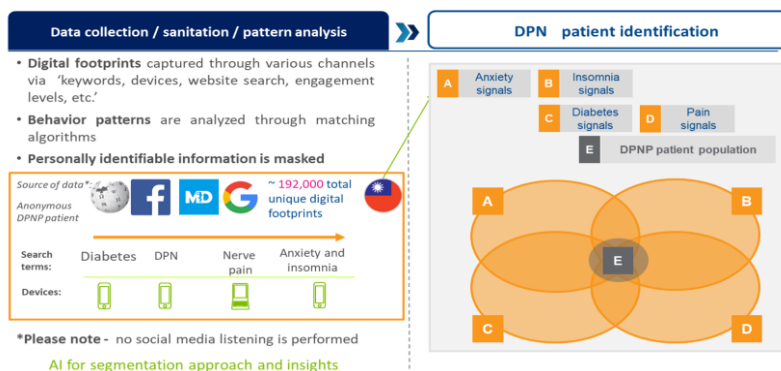


Figure 2. Using AI to improve awareness and management of DPN

In partnership with stakeholders in diabetes care (endocrinology/diabetes medical society and specialist clinicians), Upjohn used AI to identify, inform and engage patients to manage diabetes complications. Online behaviours were analysed with pattern recognition technology to identify and segment those with specific complications of diabetes.

Patient archetypes were then micro-targeted with tailored messaging via relevant media to foster engagement with clinicians (Figure 2). Linking sufferers with specialised clinicians affords early optimised management of diabetes complications that, if left unchecked, can result in significant disability.

3. Results

The objective of overcoming barriers to try reducing the burden of NCDs, such as public sector budget constraints and capacity for innovation were achieved in each of the case studies.

The effectiveness of the specific educational intervention using AR in changing physician behaviour is yet undetermined, but Dirksen and colleagues have asserted that providing direct, immediate guidance at the point of need is unquestionably a well-proven strategy for behavior change [15].

With JADE, putting technology directly in the hands of the patients, encouraging greater patient buy-in while also serving as a tool for those in the medical field helps innovate diabetes care. It also provides patients with access to their data to boost ownership of their own health and encourage dialogue between the patient and their doctor.

The partnership to help diagnose and manage DPN worked well. However, no conclusion can yet be made about the impact health outcomes as enough time has not passed.

4. Discussion

There is a need to effectively catalyze action around a health crisis that is as complex and wide sweeping as that due to NCDs. No single sector can do it alone, especially in LMICs. It is time for multilateral organizations, academia, governments, civil society

organizations, healthcare providers, and the private sector to step up in unison with a new level of urgency and impatience to curtail this soaring public health epidemic.

Embracing the role of the private sector, Pfizer launched Upjohn as a division dedicated to the fight against NCDs through a focused, strategic, and collaborative approach across the healthcare value chain. In this paper, three initiatives are described where PPPs can leverage available technology to improve health outcomes along various touch points of the patient journey, from health literacy and awareness to diagnosis and treatment. We encourage similar partnerships to enable patients to live longer, healthier lives.

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