

Retail Medicine in an Era of IoT and Medical Errors in the Age of Ubiquitous Connectivity

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Letter from Academia

Digital diffusion in healthcare is poised to usher delivery of care in integration with software as a service to the edge. Time compression due to the latter may catalyze the convergence between "sense and response" in a manner which may enhance quality of service (QoS) or quality of care at the point of contact (PoC). Digital transformation is likely to influence the broad spectrum of instances ranging from high acuity patients to preventive care scenarios. Access to healthcare for individuals before they become patients may eventually lead to improved health and reduced healthcare cost.

1 Introduction

The deaths due to medical errors (Figure 1) in the US are, in part, due to greed. It stems from the mantra of maximum profit optimization which is the daily chant of vendors in the health industry in the US. In an age where ubiquitous connectivity can be a part of our daily regimen, the resistance to medical device interoperability¹ is a cold blooded strategy exercised by the medical industry to build walls around "their" medical devices and data to prevent the collective view, analysis and shared use of distributed information access which may reduce medical errors. The laissez-faire US policies empowers these egregious errors and Wall Street rewards the practitioners of this epic evil in unhealthy proportions.

¹ <http://www.mdnpnp.org/> Accessed November 2016

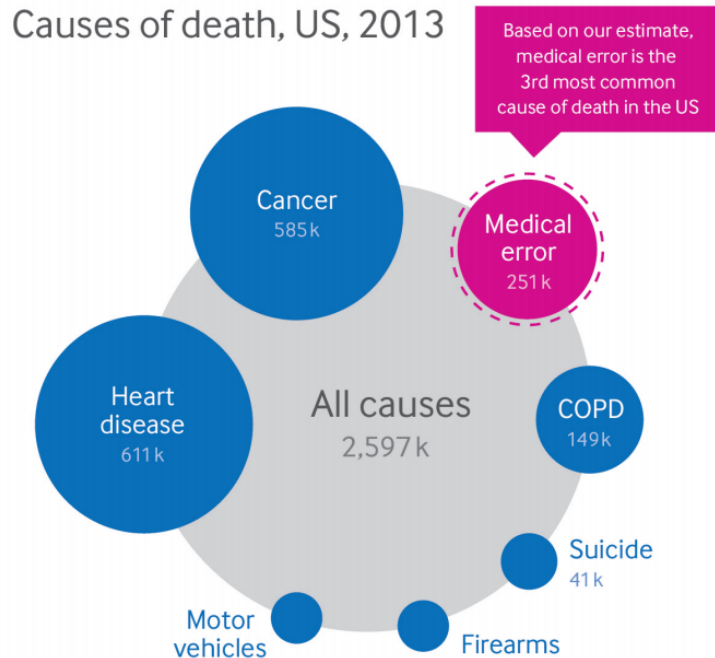


Fig. 1. Most common causes of death in the United States, 2013 (Martin and Michael 2016)

Decentralization of this epic evil control with secure open data (EHR, EMR) and a new breed of medical device manufacturers promoting interoperability by design, may be one solution. A choke point is the lack of infrastructure required for semantic interoperability between systems which uses different standards. Thus, interoperability between standards is equally critical but one which the behemoths may vociferously resist to protect their turf.

2 Elusive Quest for New Roads

Over the past half century, the principles of ubiquitous computing has percolated down to the practice of ubiquitous connectivity. One manifestation is the concept of the networked physical world which led to a range of ideas commonly referred to as the internet of things.

IoT is a design metaphor and the quintessential infrastructure for digital convergence by design. It is in this domain that we may seek conceptual resolution of some of the problems in health IT. But, IoT is not a panacea for health and healthcare. It will not resolve all the ills and chronic malfunctions in the medical industry unless the human roadblocks are dead.

“Eine neue wissenschaftliche Wahrheit pflegt sich nicht in der Weise durchzusetzen, dass ihre Gegner überzeugt werden und sich als belehrt erklären, sondern vielmehr dadurch, dass die Gegner allmählich aussterben und dass die heranwachsende Generation von vornherein mit

der Wahrheit vertraut gemacht ist.” (Max Planck) (Wikiquote, 2016).

[A new scientific truth does not, generally speaking, succeed because the opponents are convinced or declare themselves educated, however because they die and the new generations from the beginning learn about it as the truth.]

IoT is poised to re-invent almost every facet of health and non-emergency healthcare based on ubiquitous connectivity between *in vivo* precision metabolomics and the need for an environment fostering wellness, preventive medicine or collective clinical attention/action.

The tsunami of the principles and practice of connectivity is expected to usher in an unprecedented era of healthcare information technology that shall be woven into the daily fabric of our lives almost through our entire life-cycle, from conception to the grave.

Digital by design is the fabric that businesses may use in an era where IoT may be the predominant design metaphor. As a part of the group that catalyzed connectivity and ushered in the current networked society, one must plan to help the growth of digital entrepreneurship and intrapreneurship to lift many boats, not just a few yachts. Trans-disciplinary convergence of medicine and engineering offers to morph the brick and mortar clinic/pharmacy from its emergency/retail outlet concept to be an integral function at home for health and healthcare with decreasing demand for high acuity units (HAU).

Retail clinics and “pharmacies” will undergo transformation to create the 22nd Century service centers for medicine, perhaps something akin to “Jiffy Lube” (Boots, Walgreens, CVS) rather than a visit to Sears Auto Center (MGH). The transformation will be catalyzed by pioneers who will usher in, albeit in phases, convergence of a wide variety of precision medicine tools applicable on a massive scale and harvest metabolomics data from device-agnostic, protocol-agnostic, platform aggregators which will connect to streaming data inside and outside the body (humans, animals). Predictive analytics from person-specific data will be the digital path for precision clinical “sense and response” system and offer prescriptive analytics. It will serve almost all facets of preventive medicine, non-emergency medicine but may exclude sudden extreme trauma and few selected ambulatory scenarios.

Retail healthcare may serve as the future point of contact for the confluence of preventive medicine, precision medicine, primary care, tele-health and remote diagnostics. Retail health industry must reform their mission from selling drugs to acquiring data, analyzing and advocating in addition to building alliances to serve individuals who are not patients. The potential of digital by design health IoT will generate business growth and generate massive revenue through pay-per-use micro-revenue schemes. It may help those in the US who are less² fortunate and reduce the barrier to entry even for markets in L-26 countries³ where health spending is less than

² <http://www.irp.wisc.edu/publications/focus/pdfs/foc2621.pdf> (Accessed November 2016)

³ <http://www.who.int/healthsystems/topics/financing/healthreport/41FiscalSpace.pdf> (Accessed November 2016)

\$50 pa for 2+ billion people (www.pih.org).

Imagination, invention and innovation must be coupled with wireless telecommunication based remote monitoring where changes in physiological status or alerts could trigger applications via intelligent agents using functional mesh (networks) for multi-directional multi-cast communication of data, information, analytics, intelligence and streams for real time decision support or at-home care or ambulatory access depending on the "sense and response" system of systems that provide one-on-one guidance at point of contact (POC).

The retail health industry must demonstrate this concept on a large scale for credibility. It must create the local and global ecosystem of competencies necessary to provide the end to end value chain. It must be driven by less greed and more pay per service. Cybersecurity⁴, trust, authorization, validation, privacy, policy, regulatory compliance and authentication may require digital ledgers, such as blockchain-like concepts, to track, trace and secure every instance and events related to every process and nested sub-processes.

3 Conclusion

The complexity calls for a global surge of and focus on, collective entrepreneurial as well as intra-preneurial recombinant innovation. It will create new lines of business and immense economic growth but not through traditional channels and existing business models or organizational *status quo*. This calls for a new organizational platform approach where credible groups lead and coalesce tools from a diverse array of providers and champion a new form of delivery. The leadership must embody the relentless pursuit of frontiers without the fear of failure to lift the future plight of humanity through distributed medical care beyond boundaries and definitions. One must continuously re-invent to re-align with new research, new inventions, new theories, new ideas, new science, new ways to help people and customers, locally and globally. If one thinks that any one solution or company or provider or nation holds the key then one may be suffering from that impossibly incurable ailment commonly referred to (in the medical jargon) as solipsistic bliss.

4 References

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https://de.wikiquote.org/wiki/Max_Planck.

⁴ <http://bit.ly/CS-eng-design> (Accessed November 2016)