

Healthcare Cognology: autonomous agency for patient empowerment and system reform



Dr Michaël Tremblay · [Follow](#)

8 min read · 3 days ago



Listen



Share

Healthcare systems have been slowly evolving toward a model of care delivery that seeks to leave behind the traditional medical model, based on fighting diseases — sometimes called the *lesion-theory of medicine* — and which has driven health care thinking since the 1800s.

The direction of travel is toward the *health ecology model* conceiving healthcare as about helping people live their lives well, seeing ill-health and disease within an ecology comprising choices they make, the context in which they lead their lives and importantly, on the central role of the individual within that ecology to decide how to organise healthcare to help them lead this life. In that respect, the ecological model is more in tune with the real, complex, nature of the world with the various parts working together more in a self-organising manner to achieve desired results. This contrasts with the never-ending top-down plans of state run systems, over harnessing the forces in the society to drive quality and performance improvement of outcomes.

Self-care has been the main policy response to the realisation of this complexity

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52

Open in app ↗

[Sign up](#)

[Sign In](#)



At present, many health systems and policymakers are focused on chronic ill-health or long-term conditions, which entail continuing healthcare requirements perhaps over the lifetime of individuals and requiring varying degrees of support and

perceived unsustainable funding needs. Many long-term conditions arise from lifestyle choices in part and that explains why there has been a focus on engaging the patient in the care process, to ensure that they are inclined to make the necessary choices to avoid further exacerbations in their conditions, or indeed to avoid these conditions in the first place; another goal of self-care is to achieve a policy driven cost-shift to the patient user, to exploit financial co-payments, for instance, to alter behaviour, in the spirit of liberal paternalism.

We know technology helps to enable not just efficiencies and effectiveness, but also the greater personalisation of services — consumerisation if you think that is also important.

The impact of technology, therefore, includes, but is not limited to:

1. breaking down (or disintermediating) processes to remove steps that do not add value to the end-user experience, or which have no useful role to play, despite being seen as current good practice by professionals; this can create novel service integration
2. shifting skills toward customer-facing staff (e.g. consider how different banking has become)
3. widening public access to hitherto restricted health information to patients, including information on clinical performance. In some cases, this has been mandated (such as public information on hospital performance) or has evolved in response to customer interest (such as health websites providing information and advice on health conditions)
4. enabling organisations to create new ways to engage with the consumer or end-user more effectively in improving products and services than the traditional customer/supplier relationship.

A particular impact is relevant in healthcare, namely, moving knowledge across the boundaries of regulated professions (e.g. to imaging technologists from radiologists, from doctors to nurses).

Healthcare is highly controlled and the application and use of professional knowledge legally regulated. The effect of this has been to compartmentalise knowledge and skills within a broad hierarchy, with the doctor at the top, in effect, as the default health professional who supervises and validates the application of

knowledge and skills by other professions. This, of course, is changing, partly as a response to the sheer complexity of healthcare and the levels of knowledge and skill involved, but also through new ways of working, in teams, and across organisational boundaries, with skilled nursing care facilities, polyclinics, etc. The patient, though, has not been an immediate beneficiary of this.

As knowledge has migrated away from people into devices, we have seen the invention of patient-use devices which in the past have required sophisticated testing and professional knowledge; an obvious example is the pregnancy testing kit, and many mice and rabbits are no doubt relieved at its invention.

The impact of embedding knowledge in devices in healthcare, and thereby the potential impact on the internet of things within hospitals and for patients unbundles knowledge cartels and redistributes it.

Putting knowledge into people means training them, and it can either shift knowledge to other professionals, such as is found in interventional radiotherapy (imaged-guided surgery), whereby surgeons interpret imaging results in theatre, replacing a separate radiologist. Knowledge can also be given to patients, often by simply enabling them to have access to more knowledge and insight; this has been a key impact of the internet and which has raised many issues around the quality of health information on the internet.

Knowledge can be put into devices, which can be used by patients and consumers, and where the device does what a health professional used to do. This is the artificial intelligence revolution.

Finally, technology can enable knowledge to be put into ‘systems’ to generally interact with people, such as in the home, or hospital, for instance; it is the embodiment of smart devices within systems that offers particular benefits.

The Internet of “Healthy” Things can help achieve greater personalisation of service delivery and move toward such notions as the Smart Hospital and the Smart Home to support the Smart Consumer.

Why do we want this greater personalisation within a healthcare context? Because evidence demonstrates that customising services is effective — patient outcomes are improved, patient experience is positive, and the provider gets better value for money.

Personalisation has the potential to be enabled through autonomous agents acting on behalf of patients, enabling the patient/consumer to drive their preferences and choices, rather than these emerging through professional delegation or proxy interpretation. Is this Alexa or Google's Assistant on steroids?

A vast array of device technologies are used in healthcare, particularly in hospitals, probably the most complex organisations in our society. A known priority within healthcare is to integrate the vast sea of information produced, whether conclusions by clinicians, activities of patients, the output of devices, or underlying information such as financial performance, inventory, or quality. Progress is slow and mixed.

E-health has largely failed to get substantial traction, either as a mode of service delivery, or commercially, despite being seen as having considerable potential, by enabling better linkages between operational parts of the healthcare system with the patient. This, despite evident progress is still work in progress.

The pandemic ushered in some novel e-health as humanity faced periods of isolation and quarantine. But while many hoped we would not waste a good crisis and create a new normal, healthcare is slipping back into the old normal. It is hard for people who learned how to run healthcare systems BEFORE the pandemic, change as their knowledge and reference base is out of date, but who's noticed?

There are many approaches to integrating information across the information value chain, with the electronic health record (EHR) seen as key from a clinical perspective, along with opportunities real-time remote and importantly passive monitoring of patients outside hospital through sensors, or interacting with patients through video teleconferencing. Most countries are grappling with how to enable patient access to the EHR, with concerns being regulatory and technical, e.g. identity determination, privacy regulations and security, while where the problems meet the real world road being ignored.

Electronic prescribing, is seen as reducing medical errors, and better correlating patient data with rational prescribing, but the benefits to patients are limited, in the main, to electronic delivery of the prescription to the pharmacy of their choosing, but this is a choice that is already theirs that is not enhanced by e-prescribing itself. The benefits here accrue to reduced processing time, or commercial capture of the

prescriptions themselves through co-location of pharmacies and prescribers, which in the end sort of defeats the point from a patient perspective.

Other areas, such as care management programmes using remote monitoring, SMS alerts, etc. but little of this is really new, as they are mainly automating existing activities, and facilitating better communication.

Let's consider starting in a different place.

I am mindful of underlying clinical requirements in the hospital, such as linking the dispensing of a medicine to a patient (informed through clinical decision-support prescribing systems and documented accordingly) with bed-side capabilities to ensure the right patient gets the right medicine, and linking that in turn back to batch control and inventory control, budgeting and procurement, not to mention links to quality assurance, audit and utilisation review. And should the patient react badly to the medicine, batch control can help identify any problems with the medicine itself, such as expiration date, or even whether it is counterfeit. How are we to design a system that seamlessly makes all this work?

I am starting with the relationship between the patient and the hospital in this discussion (mindful that perhaps what we mean by hospital will evolve over the next decade; my view is the hospital is verging on obsolescence, but vested interests are very protective of their power: see Burns et al, Big Med book).

Autonomous agents and the next stage of evolution of the Internet of Things

“Cognology” is a term I coined to describe the evolution toward technologies with embedded intelligence. We may now be on the cusp of an AI-powered cognology in healthcare.

So what can the internet of things be in this context? I have adopted the operational definition of how the internet of things should work in healthcare from Kosmatos et al 2011:

“... a loosely coupled, decentralized system of smart objects — that is, autonomous physical/digital objects augmented with sensing, processing, acting and network capabilities [augmented with AI capabilities]” my additional words.

The implication of operationalising devices within a cognology and fitting this definition is to alter our current notion of the internet of things from a cognitive perspective. That is to say, the ‘thing-ness’ of devices that we perceive to be the interesting development evolves as autonomous agents give functional purpose to these things, particularly if they are part of a decentralised, networked or distributed system.

This in effect means moving from a view of the internet of things defined as bundles of technological capabilities, and more as a ‘distributed cognitive system’ [Tremblay 2005] defined in its ability to evolve and transform itself in response to changing circumstances, rather than a strict functional hierarchy. And here’s where AI comes in again.

Conversion of the *internet of hospital things* into the *internet of self-care things* (or what might be thought of as ‘*my things*’), through autonomous agents bridges the gap between the hospital setting and the personal context (home, school, work, play), in effect by having the autonomous agents ‘repurpose’ the device.

Could large language models function as these autonomous agents, suitably designed of course, not just “ChatGPT unchained”.

In a wireless world, the individual is the focus of the cognological capabilities provided by smart devices. This achieves the additional benefit of shifting the focus away from technologies to the use of the information and its manipulation to achieve various goals.

I also think it is important to adopt Simon’s *technological agnosticism*, to ensure we are focused on results, rather than ‘things’ as such.

I think of this shift from technology to cognology as achieved in part through advances such as the potential of the internet of things, with the embedding of functional intelligence in devices transforming them from physical things into cognitive things.

Healthcare technologies should have certain degrees of freedom:

1. of geography: in terms of home, hospital/clinic, ambulance, workplace, etc. to support location-independent care;

2. of intelligence: embedded 'intelligence' of one sort or another providing a constellation of capabilities, but perhaps most importantly, a predictive and anticipatory capability;
3. of engagement: seeking out and exchanging at various levels and in various forms with people (doctors, nurses, patients, carers, etc.), with processes (admission, discharge, alerting, quality monitoring, etc.) and with other objects (blood gas monitor, diabetic monitor, cardiac monitor).

Some references:

Kosmatos EA, Tselikas ND, Boucouvalas AC, Integrating RFIDs and Smart Objects into a Unified Internet of Things Architecture, *Advances in Internet of Things*, 2011, 1, 5–12, doi: 10.4236/ait.2011.11002

Simon LD, *NetPolicy.com: public agenda for a digital world*, Woodrow Wilson Centre, 2000.

Tremblay M, *Cognology in Healthcare: Future Shape of Health Care and Society*, Human and Organisational Futures, London, 2005.

Want to know more? There are some diagrams I excluded which showed a schematic of the system at work, and which better illustrate the AI dimension, too.

Healthcare Technology

Artificial Intelligence



Follow

Written by Dr Michaël Tremblay

0 Followers

Health / Life Sciences decision making and clinical reasoning and abstract artist