

Paradoxes in medical technology

As medicine becomes more high-tech, doctors need to be more high-touch. And as it becomes more specialised, more good generalists are needed. These are some paradoxes driving the medical technology field today.

Ho Kwon Ping

Scientific and technological innovations usually come in waves or cycles, and many observers believe we have already passed, or will soon pass, the peak of Internet-based and digitally determined innovations.

Digital technology will undoubtedly still wreak major changes to the future of work, the organisation of companies, and so forth. But further disruptions will follow the law of diminishing returns. 5G Internet technology will be like moving from the steam train to the shinkansen high-speed train: improvements in speed but not fundamentally different. Future iterations of smartphones will just showcase marginally new features, unlike when the first Apple iPhone was launched.

In stark contrast, the world of medicine and life sciences is just on the cusp of a new cycle of discoveries and innovations, which are revolutionary because of their impact on the very nature of life itself, and on the structure and texture of human society.

The last major medical revolution was arguably the discovery of bacteria several centuries ago, which led to the entire discipline of microbiology, the development of antibiotic medicine and its impact on human life. However, this, too, has run through its innovation life cycle.

On the other hand, many decades ago, the discovery of DNA led to gradual advances in molecular medicine, but it was not until genome sequencing, which enabled dramatic advances in genetic engineering, that we are now at an inflection point in the discipline called life sciences.

Life sciences is exactly what the word implies: the ability to manipulate, alter and extend the fundamental essence of human existence – life itself.

Young people will be in the thick of this cycle and entering the world of medicine in possibly the most exciting time in the past and present century. From cell-based meat substitutes to genetic prevention of hereditary disease, from the commercial cloning of organs and entire creatures to

humankind's ultimate goal – the significant prolongation of life itself – these examples are just a tiny fraction of what is to come.

Though the field of life sciences will inevitably involve every discipline from biomechanics to computing sciences, the greatest impact will be on and through medicine.

I would like to highlight a few paradoxes in the future world where medicine and technology are exponentially intersecting.

ETHICAL DILEMMAS

The first paradox of technological change is that it is simultaneously both positive and negative to human progress, leading to profound ethical dilemmas.

Change has a dialectical nuance where good is also bad. The global spread of non-censorable social media enabled the liberation of oppressed peoples, but these original idealistic visions also resulted in a dystopian world of fake news propagated by proto-fascists. The creation of female oral contraceptives ended the Malthusian nightmare of cycles of overpopulation, but it also led to massive disruption to traditional social relations.

This duality in any kind of technological change will lead to profound ethical dilemmas. This can be seen in the controversy over stem cell research and human cloning, to name just two obvious examples.

Those who specialise and then excel in highly focused fields of research must be keenly aware of the broader context of ethical responsibility for the social impact of their research findings. They cannot hide behind the false veil of pure academic research and avoid having a view on ethical dilemmas.

A doctor, even a medical researcher, is not just a scientist, but also and above all, a humanist whose primary role is to heal people and to do no harm.

THE NEED FOR INTUITION

The second paradox is that the more sophisticated the technological change, the more the change-leaders will need to be intuitive rather than simply clever and rational. In other words, the more high-tech the change, the more high-touch you need to be.



The exponential increase in the application of robotics and artificial intelligence in medicine, or what some call medtech, will ironically not require as a core attribute of young doctors, high skills in computer science, coding or understanding of algorithms. That will all be done by computers, which can exhibit machine learning and solve logical problems such as medical diagnostics faster than any human doctor.

In a world of medtech, the human doctor must mediate between the cold, logical conclusion of medical science and the recipient of these conclusions – the human patient. More than lawyers, accountants or other professions, the doctor deals with a hugely complex range of human emotions, much of which is not rational at all.

This will demand of doctors deep insights into human nature and an empathy for emotional needs, for you are not just medical engineers. A doctor is also a healer of souls in their most desperate and vulnerable moments. That calling – embodied in legends such as Albert Schweitzer and many others – goes to the very heart of medicine as perhaps the most noble vocation a person can aspire to.

DOUBLE-EDGED SWORD OF LONGEVITY

The third paradox is that increasing longevity is a double-edged sword.

According to the International Longevity Centre, the Asia-Pacific region is becoming one of the oldest regions in the world, with about 60 per cent of the world's total population of persons aged 60 years and above. Singapore today ranks among the top 25 per cent of over 200 countries with the highest percentage of old persons.

By 2050, Singapore will climb further up in the demographic rankings (we love rankings as a nation) to be among the top 10 – not 10 per cent – of the oldest countries in the world, making us what demographers call a “super-aged” society.

This rapidly extended longevity within a single generation – propelled by dramatic advances in medicine – is unprecedented in human history. Existing social structures, and particularly the funding of these structures to support ageing societies, have not been able to keep up. All over the world, the costs of medical and related support for ageing populations, even in rich nations such as Singapore, will be unsustainable without changes in the way medicine is delivered.

GENERALISATION VERSUS SPECIALISATION

The fourth paradox is the greater need for more community-based general practitioners in a world of increasing medical specialisation.

Amid all the excitement about predictive, precision and personalised medicine – some of the outcomes of increasing medical specialisation and demographic longevity – is the stark reality that the practice of medicine is not just about scientific advances, but also about humane and holistic patient care.

After all, the concept of hospitals derived from the word *hospitium*, which has as its origins the Latin word for guest or stranger, *hospes*.

But this also means that the mission of a hospital is not simply to cure, but also to care for, the patient. New forms of community-based hospitals, the aim of which is to persuade people to engage in more preventative and self-helping medical practices to mitigate soaring health costs, as well as to retain the critical doctor-patient relationship of trust, are critical for future societies to remain cohesive and sustainable.

ROLE OF TRADITIONAL MEDICINE

The fifth paradox is that as the science of medicine advances, the greater is the complementary role of traditional and alternative medicine.

Advanced biochemical tools of analysis, when applied to empirically rather than scientifically based traditional or alternative medicine, have resulted in a new field of integrative

medicine that borrows the best of both worlds by scientifically reconciling what previously seemed to be irreconcilable differences in approach.

This has given much more evidence and science-based credence to traditional Chinese medicine, Ayurveda, homeopathic medicine, and allowed them to play both a complementary and supplementary role in an overall more integrated approach to the healing of diseases.

These are just a few of the contradictions you will encounter. There will be many more, and it is only when medical practitioners observe, understand, consider and then reconcile dilemmas, paradoxes and contradictions – I call it the “Asking Why” approach to life – will they be better than a machine.

THE ROLE OF ELITES

As doctors, you are already members of an elite, but as Duke-NUS graduates, you are an even more privileged and exalted sub-species.

In the current global mood of radical populism, you will feel enormous pressure to downplay and deny your elite status.

To downplay is good – we are an egalitarian society where any display of superiority, whether intellectual, economic, political or in any other form, is frowned upon. To deny, however, is bad, because it implies you do not recognise that your special privileged status also brings enormous responsibilities.

Elites have always existed, and ironically never more so than in those social groupings that profess the greatest equality, such as pseudo-utopian cults or proto-communist societies.

What marks the progress of humankind is not a reduction in the existence of elites, but their increasing subordination to the values of egalitarianism and the increasing fluidity of their membership.

This is how societies progressed from aristocracies to meritocracies, from absolute monarchy to liberal democracy.

In recent decades, the globalisation of trade, capital and labour, which has lifted tens of millions of people from poverty into middle class, has also resulted in unprecedented inequality. The fact that 1 per cent of the world's population controls 99 per cent of its wealth is so repugnant that the rise of radical populism – has made any form of elitism suspect, dangerous and to be denied.

This has created a crisis of liberal democratic leadership in many Western societies. Fortunately, it has not yet come to Singapore and must be resisted by people who recognise that, as members of an elite, they must on the one hand practise the values of egalitarianism while being willing to undertake – even under social criticism from populists – the responsibilities of leadership that come with being members of an elite.

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This article is adapted from a speech he delivered last Saturday at the graduation and hooding ceremony of Duke-NUS Medical School.