TRANSFORMATIONAL TRENDS IN HEALTHCARE

October 2017

Associated Medical Services (AMS) is a small Canadian charitable organization with an impressive history as a catalyst for change in healthcare. By innovating healthcare education and practice, supporting leadership development and advancing research, in both the humanities and health, AMS strives to improve the healthcare of all Canadians.

Associated Medical Services. 2017 (October).

Contents

INTRODUCTION

Healthcare education and practice are continuously evolving in response to demographic, economic, environmental and societal issues and changes. More recently, two major trends have been significantly transforming healthcare education and practice, and are explored in this paper:

- Technological Advancements, and
- Patient-centred Care.

The paper ends by identifying opportunities for development arising from these trends.

TECHNOLOGICAL ADVANCEMENTS

This section presents information on:

- The Profound Nature of Technological Advancements
- Types of Technological Advancements, and
- Implications of Technological Advancements.

THE PROFOUND NATURE OF TECHNOLOGICAL ADVANCEMENTS

Technological advancements are having a broad impact on how humans organise their systems and how they live and work. The profound impact of technologies has been compared to the impact of machines in the industrial revolution.

The industrial revolution – known as the 1st machine age – enabled humans to overcome the limits of their muscle power and generate massive amounts of useful energy at will. (Brynjolfsson et al. 2016) The 2nd machine age – which includes digital advances such as computers – is doing for mental power (the ability to use our brains to understand and shape our environments) what the steam engine and its descendants did for muscle power.

Schwab (2016) refers to the profound impact of digital technologies as the 4th industrial revolution. (The 1st industrial revolution shifted humans' dependency on animal power to mechanical production in the mid-1700s; the 2nd revolution led to mass production in the late-1800s; and the 3rd revolution introduced computing and digital technologies in the 1960s.) According to Schwab, the 4th industrial revolution – which occurred around 2000 – builds on the digital revolution in highly sophisticated, advanced and significantly different ways: the 4th revolution is characterized by an extensive mobile internet, smaller and more powerful sensors that are less costly, artificial intelligence and machine learning, all of which are "more sophisticated and integrated and are transforming societies." (Schwab 2016, p. 7)

Key characteristics of the revolution in advanced technologies include the following: (Brynjolfsson et al. 2016; Kraft 2011; Schwab 2016)

- Technologies are being diffused more quickly and more widely than ever before in terms of sustained exponential growth. [1]
- Big data is growing. Large amounts of digitized information is being created, made widely accessible and is being used. Information is costly to produce but once digitized, it is very cheap to replicate, chop up, and share widely and often. (Brynjolffson et al. 2016) To illustrate:
  - More data has been generated in the past two years than in the history of humankind, with an ever increasing proportion derived from and passing through mobile devices. (Topol 2015)
  - The amount of available digital data is doubling every two years: in 2014, it took up 4.4 zettabytes and is predicted to reach 44 zettabytes or 44 trillion gigabytes by 2020. (Artificial Intelligence Will Redesign Healthcare, 2017)
  - The literature of medicine contains about 24 million records and expands at a rate of 2,100 articles per day. (Eric Brown as cited in Wachter 2015)
  - Cisco Systems estimated that between 2006 and 2011, worldwide internet traffic increased 12 times reaching 23.9 exabytes per month. (Brynjolfsson et al. 2016)
- Technologies are generating innovation by combining and recombining ideas from different areas in radically new ways. (Brynjolfsson et al. 2016)
- The impact of advanced technologies is pervasive in terms of their breadth and depth, and encompasses individuals and many sectors of society including the economy, business, healthcare and others.

Although there have been many impressive advancements in technology over the past few years, "they're the warm-up acts." (Brynjolfsson et al. 2016)

TYPES OF TECHNOLOGICAL ADVANCEMENTS

It is useful to think of major technological advancements (megatrends) in terms of three clusters of activity: physical, digital and biological. (Schwab 2016) The three clusters are interrelated and the technologies in each cluster benefit from the discoveries and developments in the other two.

Physical Technologies

Physical technologies create tangible observable products or matter that is used to help perform certain activities. Examples of physical technologies include the following (Bini 2016; Brynjolfsson et al. 2016; Schwab 2016; World Economic Forum 2015):

- Driverless vehicles. These sense the environment around them and can navigate without human input.

[1] Schwab (2016) notes that this is not universal. For example, the 2nd revolution is yet to be fully experienced by 17% of the world who have no electricity, and the 3rd revolution has not been experienced by more than half of the population with no internet access.

- Digitized matter. [2] Commonly referred to as 3D printing, physical objects are printed from raw materials. This process is transforming industrial manufacturing, is being used in multiple sectors for many tasks, allows products to be printed at home, and can improve human health (e.g., 3D printing of human organs and tissue). [3]
- Robotics. [4] Machines are used to navigate and interact with the physical world. Examples include robotic surgery where a robotic system is programmed to perform surgical tasks and is controlled by a surgeon who may be in a remote location, [5] and telepresence robots used in medical rounds and education. [6]
- New materials. These materials are lighter, stronger, recyclable and adaptive.

Digital Technologies

Digital technologies are pervasive and are enabling advancements in physical and biological technologies. Major digital trends include the internet of things and artificial intelligence.

The Internet of Things [7] [8]

The internet of things or internet of all things (IoT) refers to connective technologies and devices that make possible relationships between and among people and things (such as products, objects, services and places). Examples of IoT include:

- Augmented reality which provides a view of a real-world environment whose elements are augmented by computer-generated sensory input such as sound, videos, graphics. Augmented reality changes the user experience. An example is surgical guidance where the surgeon can see a 3D map of a patient's system while he or she is operating. [9]
- Virtual reality is a created interactive 3D world. Virtual reality tools are used in such areas as medical school education, clinician training, and to distract patients or

[2] Digitization of matter (3D printing) is: i) one of six software and service megatrends shaping society according to the World Economic Forum (2015); and ii) one of eight technologies with great potential to disrupt the US health industry over the next decade according to PWC Health Research Institute (2016).
[3] For 3D printing of human organs and tissue, see http://www.nature.com/news/the-printed-organs-coming-to-a-body-near-you-1.17320.
[4] Robotics is one of eight technologies with great potential to disrupt the US health industry over the next decade according to PWC Health Research Institute (2016).
[5] For robotic surgery, see: http://www.davincisurgery.com/.
[6] For robots in medical rounds and education, see https://www.youtube.com/watch?v=GrBaHBSXdqk and https://www.youtube.com/watch?v=KOLcTKhPEhE.
[7] General information on The Internet of Things is taken from Bini 2016; Mesko 2014; Schwab 2016; Topol 2015; World Economic Forum 2015.
[8] The Internet of Things is: i) one of six software and service megatrends shaping society according to the World Economic Forum (2015); and ii) one of eight technologies with great potential to disrupt the US health industry over the next decade according to PWC Health Research Institute (2016).
[9] For Augmented Reality Technology, see http://www.cbc.ca/news/canada/montreal/augmented-reality-sinus-surgeries-1.4140338.

reduce their stress. For example, SymPulse lets clinicians experience simulated tremors of a patient with Parkinson's disease. [10]

- Smart devices – such as chips, sensors and communication devices – monitor and feed information back to individuals. These sensing devices may be near us (such as in our homes, workplaces or public spaces), worn on our clothes or body, or imbedded or implanted in our bodies. Smart devices can feed information to individuals or their healthcare providers about their physical condition (blood pressure, sugar levels, heart rate and vital signs), the life of their medical implant, and so on. For example, Eko Devices has developed wireless stethoscopes that individuals use to monitor their heart rate and other vital signs. [11]

Artificial Intelligence [12] [13]

Artificial intelligence (AI) refers to software algorithms and systems that enable tasks to be performed that normally require human intelligence and reasoning. Examples of commonly used include internet searches, driving directions, computer generated suggestions for products we might like, and software that schedules meetings. More complex examples of AI are noted below.

AI enables humans to make sense of big data. The human brain cannot stay on top of the sheer volume and complexity of information that is being produced and tracked, nor can it easily connect multiple pieces of information required to make complex decisions. IBM estimates that it would take a human physician 160 hours of reading each week to keep up with relevant new literature. (Brynjolfsson et al. 2016)

Examples of AI (or cognitive computing) in healthcare include the following:

- Medical records systems collect, store and provide access to patient information. More advanced systems can analyse information to identify safety issues in care.
- IBM Watson for Oncology can identify key information in a patient's medical record (structured and unstructured data in clinical notes and reports), identify relevant articles, and suggest evidence-based treatment options to consider. [14]
- Watson is being used by the Memorial Sloan-Kettering Cancer Center to provide chronic care and cancer treatment diagnostics. Information from 600,000 medical

[10] For Empathy Gadgets (Jauhar 2017), see https://www.nytimes.com/2017/07/29/opinion/sunday/empathy-gadgets.html?mcubz=1.

[11] For an app that can examine your heart (Pogash 2017), see https://www.pressreader.com/canada/the-globe-and-mail-alberta-edition/20170816/282230895800377.

[12] General information on Artificial Intelligence is taken from: Artificial Intelligence Will Redesign Healthcare 2017; Bini 2016; Brynjolfsson et al. 2016; Frey et al 2013; Mesko 2014; PWC Health Research Institute 2016; Wachter 2015; World Economic Forum 2015.

[13] Artificial Intelligence is: i) one of six software and service megatrends shaping society according to the World Economic Forum (2015); and ii) one of eight technologies with great potential to disrupt the US health industry over the next decade according to PWC Health Research Institute (2016).

[14] For IBM Watson for Oncology, see https://www.ibm.com/watson/health/oncology-and-genomics/oncology/.

evidence reports, 1.5 million patient records and clinical trials, and two million pages of text from medical journals, are used for benchmarking and pattern recognition. The computer compares each patient's individual symptoms, genetics, family and medication history, and so on to diagnose and develop a treatment plan. (Cohn as cited in Frey et al. 2013).

- AI-aided software is being developed in clinical areas. For example, IBM's Medical Sieve is being developed to assist in clinical decision making in radiology and cardiology.[15] At University Health Network in Toronto, AI systems take four minutes to develop a radiation therapy treatment plan that took human radiation therapists and physicists over two hours. (Hodges 2017) It is predicted that software will likely eventually "crack the code in radiology and in similar areas such as dermatology and pathology." (Wachter 2015, p. 62)

Increasingly, AI applications are being developed that are useful to consumers especially in healthcare. For example, individuals can get online medical and healthcare consultations and assistance.

- Babylon has been described as putting an "AI doctor in your pocket" using an app that can be accessed by mobile phone, tablet or web. Babylon provides 24/7 health advice based on one's symptoms, provides appointments (video chats) with a general practitioner, sends prescriptions, reminds patients to take their medications, provides follow up connections, and tracks test results, activity levels and health information. [16]
- Sensely's mobile app provides a virtual nurse, Molly, who has a strong focus on chronic diseases, monitors conditions and treatments, provides follow-up care, and supports patients in-between their physician's visits. Some of Molly's features are described as "[engaging] users with her empathetic, supportive demeanor … and [handling] any question or symptom with gentle aplomb." [17]

The interest in developing AI applications is increasing. One review documented about 826 companies working simultaneously to develop AI in such areas as machine learning, computer vision, smart robots, virtual personal assistants, natural language processing speech recognition, speech-to-speech translation, gesture control, recommendation engineering, and automatic content recognition. (Artificial Intelligence Will Redesign Healthcare, 2017)

Biological Technologies

Biological innovations focus on living systems. The main example is genetics and genomics. The Human Genome Project – completed in April 2003 – was a collaborative

[15] For Medical Sieve, see http://researcher.watson.ibm.com/researcher/view_group.php?id=4384. Retrieved September 15, 2017.
[16] For Babylon, see https://www.babylonhealth.com/. Retrieved September 15, 2017.
[17] For Sensely, see http://sensely.com/features/. Retrieved September 15, 2017.

international biological research effort that sequenced and mapped the genome (all the genes) of the human body both physically and functionally. Ongoing biological innovation includes activating and editing (or changing) genes, as well as using this biological knowledge to develop targeted therapies to fight disease. Personalized or precision medicine focuses on providing individuals with the best therapy for their particular illness given their genetic data.

IMPLICATIONS OF TECHNOLOGICAL ADVANCEMENTS

The implications of technological advancements include:

- Improving Lives
- Adapting Clinical Education
- Highlighting the Need to Work Effectively with New Technologies
- Changing How Care is Provided
- Influencing the Patient Encounter and the Patient Experience
- Democratizing Access … to a Point, and
- Impacting on Health Human Resources.

Improving Lives

Technological advancements improve and save lives. Examples noted above include 3D printing of human organs, augmented reality apps to guide surgical procedures, robots for remote surgery and medical rounds, and smart devices to monitor vital signs, symptoms and implanted devices. In addition, AI technologies – such as IBM's Watson – help diagnose and determine optimal medical management.

Adapting Clinical Education

Technological advancements are changing clinical education in a number of ways.

Virtual reality is being used more in education. Examples include dissecting and reassembling virtual cadavers, allowing students to interact virtually with different organs, and practising highly specialized procedures that are rare using virtual organs, which may actually shorten training time. (Bini 2016)

Technologies that are being taught today will change by the time students become practising professionals. Hodges (2017) suggests that admission to health professional programs needs to select students who can adapt to changing roles and be leaders in changing contexts. Hodges (2017) further suggests that undergraduate curricula include courses about AI, deep learning and automation, and that metacognition, situational awareness and other higher human cognitive functions be enhanced in medical schools and residency programmes. Others have suggested that students need to be taught to be web and tech-savvy and have the skills to navigate the changing world of medical technology and information. (Mesko 2014) As well, students need high resolution math

and computer science skills so they can understand the information that new technologies will provide such as algorithms, datasets and probabilities. (Bini 2016)

A greater emphasis may be needed on teaching students humanistic skills such as compassion and empathy. This is especially important given that the use of technology may make patient-provider encounters more distant and impersonal. This skill set has been referred to as "screen-side manner rather than bedside manner." (Bini 2016)

Highlighting the Need to Work Effectively with New Technologies

For patients to benefit the most from new technologies, healthcare providers need to accept these advancements and adapt their practices accordingly. There is widespread agreement that having professionals work collaboratively with technology is more effective and creative than having professionals and technologies competing or working alone. (Brynjolfsson et al. 2016; Mesko 2014; Wachter 2015)

There may be increasing polarization in the world by those who embrace change versus those who resist it. (Schwab 2016) Technical problems can be solved with new tools, new practices and conventional leadership; in contrast, adaptive problems require people themselves to change. (Heifetz as cited by Wachter 2015) The wiring of healthcare has been called the "mother of all adaptive problems" that transforms medical work, the people who do it, and their relationships with one another and with patients. (Wachter 2015, p. xiii)

A number of issues need to be addressed for effectively working with new technologies.

- Half of American physicians are over 55 years of age and are far removed from "digital native" status (i.e., under age 30) and a willingness to adopt wireless devices for their medical practices. (Topol 2015) While digital native graduating and early career physicians understand the "sea change that is unfolding," millions of practising physicians do not. (Topol 2015, p. 289) It must be noted that so-called digital natives are not necessarily more digitally proficient than older generations and still need to be taught necessary skills. (Kirshener as cited in Sharping 2017) However, younger generations may be more willing to work closely with technology.
- The "productivity paradox" is the time gap between when a technology is introduced and when its benefits are realised. For implementation to succeed, innovative new technologies need complementary innovations such as process changes (work flow, procedures, layout), as well as trained staff who embrace the new technology. (Brynjolfsson et al. 2016; Wachter 2015) A study of 600 firms found that it took an average of 5-7 years before the full productivity benefits of computers were visible given the time and effort needed to prepare processes and people. (Brynjolfsson et al. 2016) In the medical community, it has been estimated that there is an average time gap of 17 years from innovation to adoption in medical practice. (Topol 2015) Topol (2015) argues that cultural change – which is exceeding difficult – is needed which includes an aggressive commitment to the education and training of practising physicians to foster their effective use of new technologies.

Changing How Care is Provided

Technological advancements are changing how care is provided in a number of ways.

Patients are more active in their own health and healthcare. For example, there are do-it-yourself medical smartphone applications (Topol 2015) that allow individuals to measure and monitor many of their own health-related parameters. It is suggested that these e-patients need to be educated about the use of the digital world to find what they need online and to become skilled in proper health management. (Mesko 2014) Patients also seek information and advice from other patients through online health communities.[18]

Two, more healthcare encounters are becoming virtual or remote interactions between patients and providers. In only about 20% of visits does a physician have to lay hands on a patient, so telemedicine visits, IT-enabled care or other approaches would work in these instances. (Kraft 2011; Mesko 2014; Wachter 2015) Healthcare will occur less in physical health facilities such as hospitals and clinics and more in the home or workplace which may be as effective and perhaps more safe. (Elton et al. 2016)

Influencing the Patient Encounter and the Patient Experience

There are different views about how technologies are impacting on the patient encounter and experience.

Perceived negative impacts have been described as follows.

- Technologies have created the "iPatient" who is defined by their test results, consultation notes, diagnoses, procedures and the information in their medical charts. (Verghese 2008) Physicians especially in hospitals and specialty practices may meet the iPatient long before they meet the actual human patient. "When residents don't witness the bedside-sleuth aspect of our discipline, they may come to view internal medicine as a trade practiced before a computer screen." (Verghese 2008, p. 2749) Furthermore, not talking to or examining patients may result in overlooked diagnoses. (Verghese 2008; Wachter 2015)
- Technologies may threaten to obscure the art of medicine which includes personal interactions, emotional attention and empathy. (Mesko 2014) There are growing concerns that as our relationships with technology deepen, they may negatively affect our social skills and the ability to empathize. (Schwab 2016)

The erosion of personal interactions in healthcare is not viewed totally negatively by everyone. For example, one study found that patients preferred a computerized avatar

[18] For examples of online health communities, see Smart Patients at https://www.smartpatients.com/; and PatientsLikeMe at https://www.patientslikeme.com/.

that educated them about their discharge rather than an actual human by a ratio of 3:1. (Wachter 2015) Another international survey of adult smartphone users in 14 countries found that 80% of consumers want to interact with their physicians on mobile devices, and nearly 70% would prefer to get medical advice on their mobile devices instead of going to the physician's office. (Topol 2015)

Technological advancements may enable healthcare providers to become more engaged with patients since providers will spend less time searching for relevant information, gathering patient data and researching treatment options. (Elton et al. 2016; Mesko 2014) Wachter (2015) describes this as rediscovering the physician's traditional role as healer and counselor who diagnoses, treats, comforts, teaches and discovers. Having said that, there is no guarantee that the time freed up by technological efficiencies will be used for human touch activities unless it is valued and demanded by patients and clinicians. (Wachter 2015)

Democratizing Access … to a Point

Until very recently, rapid communication, information and knowledge sharing, especially over long distances, were limited to wealthier populations. "Now they're much more democratic and egalitarian, and getting more so all the time." (Brynjolfsson et al. 2016, p. 96) Indeed, the continued rapid decrease in the size and cost of computing and connective technologies is resulting in exponential growth in the potential to access and leverage the internet.[19] (World Economic Forum 2015)

Artificial intelligence technologies that assist in clinical decision making may improve access in some instances. For example, where physicians are below average or where there are no physicians, and a smartphone may be the only diagnostician available, "handing over some of the diagnostic reins to 'Dr. Algorithm' will represent significant progress." (Wachter 2015, p. 112)

In terms of limits to democratization, some advanced technologies are more costly and are not available to average mainstream users or jurisdictions/organizations that do not have enough resources. (Artificial Intelligence Will Redesign Healthcare, 2017) Furthermore, there are concerns about what we are democratizing access to. AI is not necessarily unbiased; if programs are given flawed information, they do not fix the flaws; rather, they just process the information. (Buranyi 2017) Public institutions adopt technology sold by private companies whose processes may not be transparent. (Barocas as cited in Buranyi 2017) Hudson (2017) notes that decision makers cannot shift responsibility to the faux neutrality of data and technology; rather, solutions are a combination of technological, human and moral.

[19] Computing, communications and storage everywhere is one of six software and service megatrends shaping society according to the World Economic Forum (2015);

Impacting on Health Human Resources

Technology is leaving people behind whose capacity as workers does not match the new environment. (Brynjolfsson et al. 2016) Generally, advanced technologies have reduced demand for less educated workers whose jobs usually involve routine cognitive, mechanically repetitive and/or manual tasks. (Brynjolfsson et al. 2016; Schwab 2016)

In their review of 702 detailed occupations, Frey et al. (2013) classified job characteristics and individual occupations by their probability of being automated where computers will substitute humans. They concluded that in the near future, recent developments in machine learning will put at risk a substantial share of employment across a wide range of occupations. The wave of automation will be followed by slowdown because of engineering bottlenecks that inhibit computerisation. With technological improvements – such as pattern recognition, complex perception and the manipulation of irregular objects – more humans will be substituted by computers in areas that are currently at medium risk for automation.

Frey et al. (2013) concluded that occupations that involve complex perception and manipulation tasks, creative intelligence tasks, and social intelligence tasks are unlikely to be substituted by computer capital over the next decade or two. Human social intelligence includes variables such as persuasion, negotiation, social perceptiveness, originality, and assisting and caring for others, all of which characterize healthcare work. Having said that, research is ongoing to program and computerize these tasks using studies that mimic our minds by scanning, mapping and digitizing the human brain. (Brynjolfsson et al. 2016; Frey et al. 2014)

As computing power continues to grow exponentially, the work of professions may be partly or completely automated. (Schwab 2016) It is suggested that if Watson is going to replace any physicians, it will likely be at the low end of complexity for more routine problems; however, a Watson-like tool may also help at the highest end of care, where super specialists see many unusual diseases and need to keep up with the literature. (Wachter 2015) Hodges (2017) predicts that AI and automation will more likely displace workers to new roles rather than replace them totally, and that the workforce needs help to develop new specialised skills.

Demand may grow for roles that machines cannot fulfill and which rely on intrinsically human traits and capabilities such as empathy and compassion. (Schwab 2016) Furthermore, to date computers have not been able to come up with out-of-the-box thinking, brainstorming of good new ideas, concepts, hypotheses, questions, innovations, creative thoughts, large frame patterns and complex communications. (Brynjolfsson et al. 2016) However, “One thing we’ve learned about digital process is never say never … we’ve been surprised over and over as digital technologies demonstrated skills and abilities straight out of science fiction.” (Brynjolfsson et al. 2016, p. 203)

PATIENT-CENTRED CARE

Patient-centred care is transforming the provision of healthcare, and is being enabled by advanced technologies.

Topol (2015) argues that advanced technologies and information have flipped the entire healthcare model since patients are no longer subservient and dependent on physicians. Patients are active participants in their care. With access to extensive information and resources, "patients will ask: when do I really need to consult with and trust a credentialed expert?" (Topol 2015, p. 273) The patient becomes the chief operating officer (COO) who monitors all the operations of their body, is fully in charge and gets their healthcare data directly from an information technology team. The COO periodically and on an ad hoc basis reports to the CEO (physician) who delegates responsibility, is available for important issues, and offers guidance, knowledge and wisdom to deal with the problem. The CEO is a kind, compassionate manager, good communicator, multitasker and IT guru. (Topol 2015)

Bini (2016) takes a slightly different view of patient-centred care. He argues that advanced technologies in and of themselves are not necessarily disruptive and revolutionary since the patient-physician relationship essentially remains the same. There is still a patient and a physician, data is collected and is processed more quickly, and the doctor uses new techniques to provide care. Bini notes that true patient-centred care would flip this model on its head and change the relationship. The patient would not only participate in managing their care but would also be a practice partner who participates in how their care is delivered. Individuals would need to be educated about healthcare. They would get all their healthcare data and do with it what they would like including: put the data in various apps, choose to contact a clinician or not, research or access additional information from the internet, connect with individuals who have similar conditions, create interest groups, and so on. (Bini 2016) The physician would be the coach on the periphery with the patient at the centre.

OPPORTUNITIES FOR DEVELOPMENT

Technological advancements and patient-centred care present opportunities for development. Examples of opportunities are categorized below.

The Public and Patients

1. Identify how persons seeking care can be effective advocates for and partner in their health and healthcare, and for compassionate care.

2. Inform the public about the use of health and healthcare information and where to find it, how to manage their healthcare, how to interpret health-related data and the signs and symptoms of illness, and when to consult with a credentialed provider.
3. Contribute to public discussions, debates and decisions on ethical issues about quality of life, limits to medicine, and questions of human value and mortality (given the significant impact of technologies in these areas).

Healthcare Providers

4. Identify how healthcare providers can best use new technologies in their practices (collaboration rather than competition) and the importance of adapting to and working with technologies.
5. Identify how healthcare providers can adapt their practices to incorporate technologies in patient-centred and compassionate ways (e.g., effective interaction with the iPatient and human patient, screen-side and bed-side manner).
6. Identify how healthcare providers can work with persons seeking care as partners and leaders in their care. (This includes the fact that persons seeking care will have a range of preferences for the role they want to play and how they wish to receive care.)
7. Analyse the evolving roles of healthcare providers given the impact of new technologies.
8. Assist healthcare provider groups/members to adapt to the impact of new technologies and job automation.
9. Identify and promote the unique value-added contributions of healthcare providers to persons seeking care (e.g., specialised diagnostic and procedural skills, humanistic skills such as compassion, emotional attention, interactions, empathy, etc.).

Healthcare Education

10. Educate healthcare students on the effective use of new technologies in their practices (collaboration rather than competition).
11. Educate healthcare students about persons who seek care as partners and leaders in their care.
12. Educate healthcare students on compassionate care and the humane aspects of care.

Healthcare Leadership

13. Identify how to lead effectively and with compassion given the cultural evolution in healthcare.

Government Policy

14. Develop and implement ethical standards for the creation and use of digital technologies to ensure that processes are transparent, and systems are equitable and unbiased.
15. Evaluate the performance and impact of new technologies, and identify their outcomes.
16. Support and, where possible, fast track the implementation of new technologies.
17. Support the delivery of care in the community, home and workplaces given that healthcare is happening less in physical facilities.
18. Recognize that the use of public funds for costly life enhancing and extending technologies will increasingly become important political decisions.
19. Increase the tax base to support the successful and timely implementation of beneficial new technologies.

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