Australian Medical Council Limited

Australian Digital Health Agency and the Australian Medical Council:

Synthesis of Evidence and Recommendations for a Capability Framework in Digital Health in Medicine

Milestone 6: Preparation of Digital Capability Framework in Digital Health in Medicine in Australia

(Part A – Synthesis of Evidence and Recommendations for a Capability Framework in Digital Health in Medicine. See also Part B - Consultation version of Digital Health in Medicine Capability Framework)

19/04/2021

Contents

Introduction

This document is a synthesis of evidence and recommendations for how the continuum of medical education can produce a digitally capable medical workforce in Australia and New Zealand. It draws an extensive literature review of national and international evidence concerning digital capabilities in medicine and more broadly in health. It was also shaped by advice from the Medical Workforce Digital Capabilities Advisory Group – with broad representation from across the continuum for medical education in Australia and New Zealand – as well as results from an online survey and follow up consultation focus groups, which sought feedback from the Medical Workforce Digital Capabilities Advisory Group and broader stakeholders of medicine concerning current digital capability frameworks and the proposed model. This work is commissioned by the Australian Digital Health Agency (the "Agency") and undertaken as a joint project with the Australian Medical Council (AMC) and key stakeholders of health.

This documents sets out the background of the partner organisations and their respective strategic priorities and frameworks, and the findings of the preliminary literature review (key trends in current and future technologies in medicine and the context of workforce change in health).

Additionally, the document elaborates on a sample option for foundational capability development in medicine based on Entrustable Professional Activities (EPAs) (Ten Cate 2013). The three proposed EPAs align with the three horizons of the Australian National Digital Roadmap. This document also sets out the evidence related to the development of teaching and learning and assessment programmes to support the learning of digital capabilities across the medical continuum.

The paper concludes with a summary of potential next steps for further collaboration between the AMC and its partners: to pilot and implement the framework as well as to support the creation of a certificate in horizon medicine in health reform with a focus on a micro-credential in digital health leadership and other key areas of change required of the medical and broader health workforce in the coming years.

The document also includes a number of appendices which provide details of three proposed sample EPAs, stakeholders impacted by this initiative, and provides details of the Advisory Group Members and AMC team who are supporting the design and development of this project.

Background

In this section, we outline key background about the AMC and the Agency, and their strategic priorities. We examine the points of intersection concerning their efforts to support the development of a digitally capable Australian Medical Workforce and associated impacts on curricula design and accreditation practices.

Our Partnership - The AMC and the Agency

The Australian Medical Council (AMC) and The Australian Digital Health Agency (the Agency) have formed a partnership to engage in a new project aimed at understanding how technology impacts the standards of medical education, training and practice in Australia. This aligns with the AMC's roles as a national standards body for medical education and training, and as the accreditation authority for the medical profession under the Health Practitioner Regulation National Law (Figure 1). The Agency is the corporate Commonwealth entity tasked with improving health outcomes for Australians through the delivery of digital healthcare systems and the national digital health strategy for Australia (Figure 1). As part of this strategic project, an Advisory Group has been established which provides expert advice and feedback to the project and its components from peak bodies in medicine and stakeholders of digital health. Central to this project is also consultation with broader stakeholders of health to ensure that the proposed approach to capability development in digital health is fit for purpose for the medical profession.

The Australian Medical Council – The AMC

The AMC ensures that standards of education, training and assessment of the medical profession promote and protect the health of the Australian community. The AMC is the accreditation authority for medicine under the Health Practitioner Regulation National Law (the National Law) and undertakes accreditation of programs in New Zealand in collaboration with the Medical Council of New Zealand. The AMC develops and maintains accreditation standard across all phases of the medical education continuum and accredits 23 Australian Universities for primary medical programs, eight state-based intern training accreditation authorities, and 16 specialist colleges for their vocational training programs and lifelong learning. In addition, the AMC sets standards for and conducts assessments of international medical graduates seeking to practise in Australia, via a computer adaptive multiple-choice examination, a clinical examination delivered through the AMC National Test Centre, and accreditation of workplace-based assessment programs offered in Australian health services. In line with its strategic plan, the AMC is building and demonstrating the value of its knowledge, expertise and relationships as a standards setting and accreditation body, to meet National Law objectives and the AMC's organisational purpose.

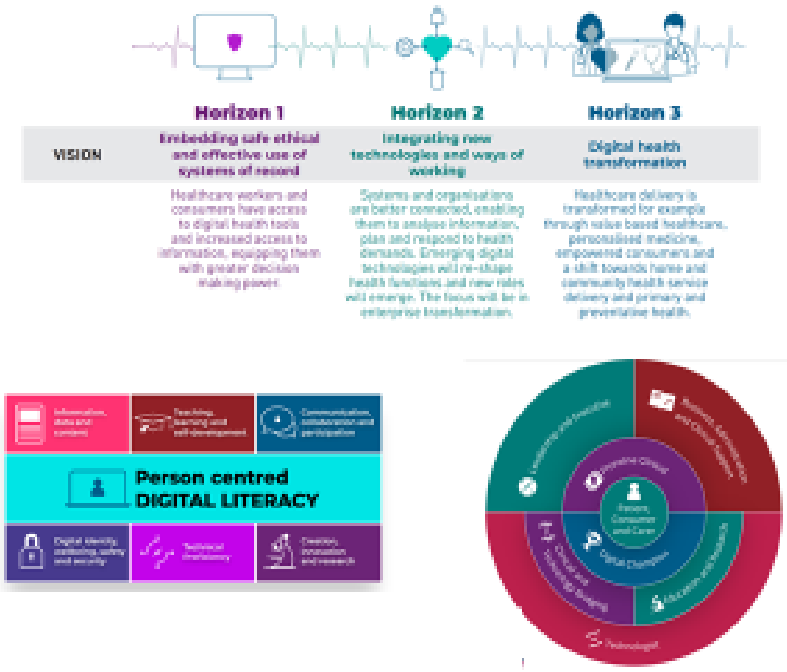
The Australian Digital Health Agency – The Agency

The Agency is the lead organisation in Australia responsible for the fostering of a digitally capable workforce and health community. The Agency's remit is to foster "Better health for all Australians enabled by seamless, safe, secure digital health services and technologies that provide a range of innovative, easy to use tools for both patients and providers". The Agency is tasked to deliver these world-leading digital health capabilities through an open, transparent and collaborative approach.

The Agency recently conducted an extensive strategic consultation to determine the National Digital Health Workforce and Education Roadmap. This document builds on Australia's National Digital Health Strategy and the Associated Framework for Action. It seeks to provide a basis for understanding the digital capability requirements of all those involved in the health system including health workforce, volunteers and health consumers. The Roadmap and Snapshot document can be downloaded here: https://www.digitalhealth.gov.au/about-the-agency/workforce-and-education

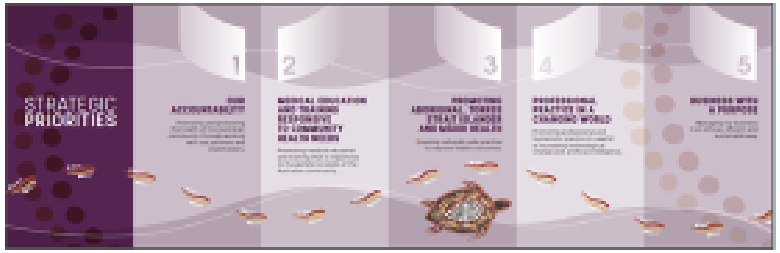
Aligned Agency and AMC Strategic Plans

Australian National Digital Health Workforce Roadmap



Pillar 6: Digital Health Strategy - Workforce and Education

AMC Strategy Plan 2018 - 2028



4.1 We will use accreditation standards and procedures to encourage medical education and training that is consistent with how technology and artificial intelligence could affect the future delivery of medical care.

4.2 We will collaborate with stakeholder groups to develop ethical standards for the use of technology and artificial intelligence in medical care; AND

4.3 We will promote the attributes of humanism, compassion and cultural safety, which are central to the delivery of good medical care, in medical education, training and professional performance curricula.

4.4 We will collaborate with stakeholders to encourage the use of technologies that drive higher standards of healthcare and reduce health inequity.

Pillar 4: Professional Practice in a Changing World

Figure 1: The Agency and AMC Strategic Plans

Methodology

This section outlines the methodology underpinning this evidence based review. This document includes a multi-modal methodology, which seeks to gain data and input from multiple sources to ensure relevant views are reflected in the approach to capability development in digital health of the Australian Medical Workforce.

Advisory Group Expert Input

The Advisory Group in Digital Health comprises 23 members with representation across all sectors of the medical education continuum, peak bodies and broader stakeholders of health. This Advisory Group provides feedback on the digital health in medicine project including the capability framework.

Review of National and International Literature

A comprehensive review of national and international literature in digital health has been undertaken to establish the current and future state of medical education in digital health across the medical education continuum.

Online Survey Data

A number of surveys have been conducted with the Advisory Group and other stakeholders of the medical education continuum and findings incorporated into this scoping paper.

Forum and Focus Group Data

The AMC and Agency are conducting a Forum on digital health and workforce development in medicine, which will include opportunities for discussion and feedback on the proposed framework. In addition, Focus Groups will be conducted with the Advisory Group and other stakeholders of the medical education continuum to further explore the current and future states of capability development in medical education across the medical education continuum.

Current State Analysis of Digital Health in Medical Education

This section outlines key findings of a current state analysis of digital health in medicine. It focuses on answering four key research questions:

1. *What is the current state of capabilities across the continuum of medical education provider and accreditation standards?*
2. *What are the key trends in current and future use of digital technologies in medical practice?*
3. *What are the foundational capabilities required of doctors for future workforce and community needs?*
4. *What teaching and learning, and assessment methods optimise development of digital workforce capabilities?*

This current state analysis draws on a review of National and International literature in digital health in medicine and more broadly in health education, survey results and key discussion points from the project Advisory Group, consultation with medical education providers and key stakeholders of medical education as well as a mapping of current curricula and other key policy and accreditation documents related to medical education across the continuum in medicine.

Current State of Interest and Expertise in Digital Health in Medicine

The medical education continuum comprises four key stages: medical school training, prevocational training, specialist vocational training and continuing professional development. The following section reviews each of these areas of the continuum.

Medical Schools

There are 23 medical schools in the Australian and New Zealand Higher Education system accredited through the AMC. There are both undergraduate and graduate medical programs; the former require the Undergraduate Medicine and Health Sciences Admission Test (UMAT) whereas the latter require the Graduate Australian Medical School Admissions Test (GAMSAT).

The Preparedness for Internship Survey is a useful source of information about the current perceived skill level of junior doctors in Australia. The survey is run jointly between the Australian Medical Council and the Medical Board of Australia, which set national standards for medical school programs and the intern year. The survey is designed to find out how work-ready interns feel after medical school and improve how medical schools prepare graduates for internship, and is sent to all interns in Australia each year. The most recent survey, completed in 2019, included a question related to digital capability.

The question is: “Based on what you learned and experienced at medical school, how prepared do you now feel you were for the following in clinical work: Understanding the role of clinical informatics and data technology in improving healthcare” (1 = not prepared at all to 5 = very well prepared)

Results from the 2019 Survey were that this skill was the second-lowest rated of all the skills queried, below a 3 (= somewhat prepared) (Figure 2).

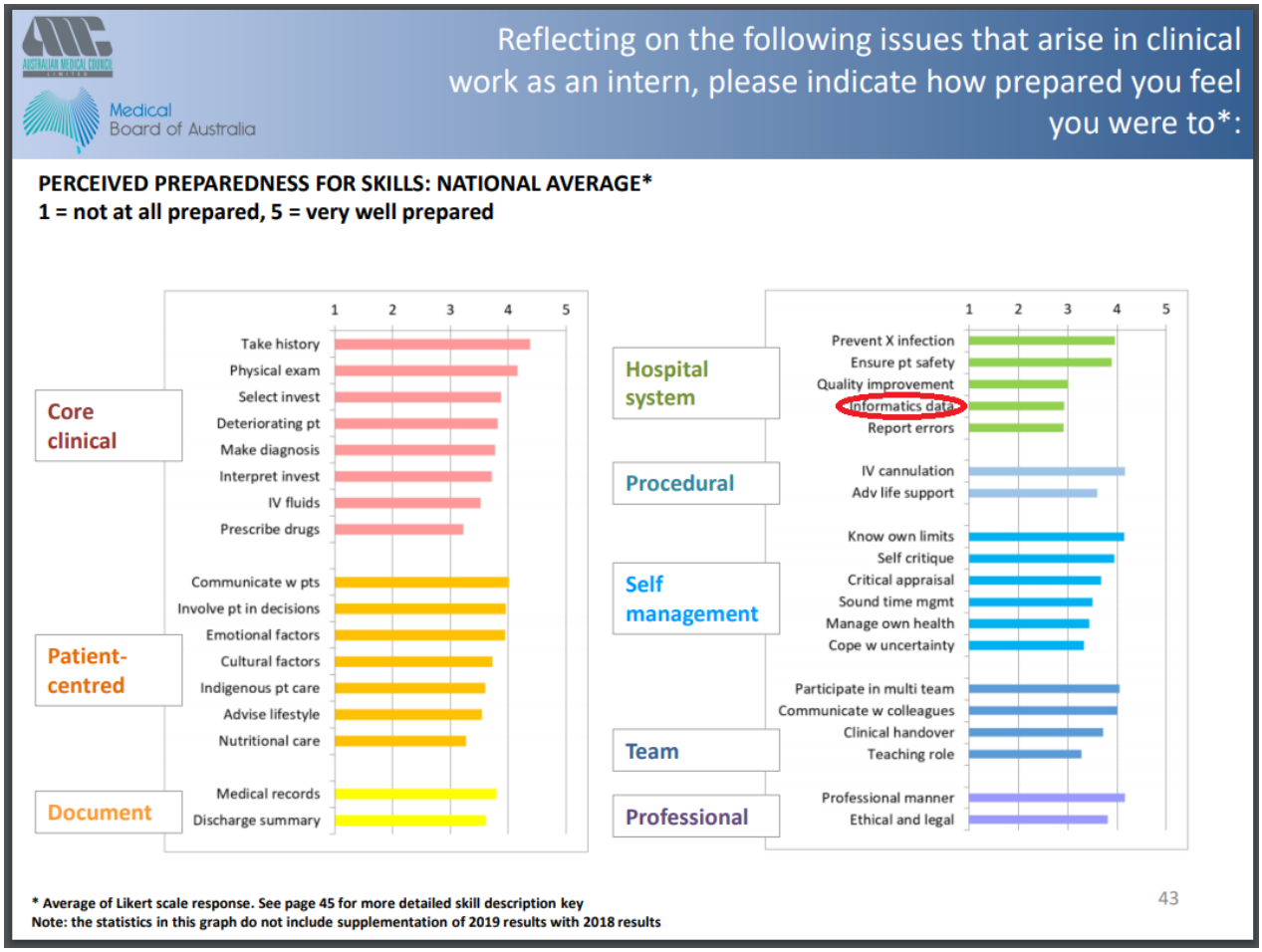


Figure 2: Results of Preparedness for Internship Survey

The Survey response rate ranged between 12% to 42% across medical schools. Those medical schools with a low response rate had responses from 2018 and 2019 combined to improve statistical reliability.

A further source of information about the current state of medical school capability development is to review the curricula of all medical education providers to ascertain the planned outcomes and competencies of medical education programs. Medical Schools generally do not publish their curricula publicly. A previous evaluation of the available or provided curricula of the then 22 primary medical degree providers in Australia and New Zealand indicated that although many had some learning outcomes in digital health, few had dedicated modules and none had a comprehensive programme in digital health (O'Neill 2018).

To assist with the current state analysis all medical schools were sent a survey to complete as part of the consultation concerning current and future possible solutions to digital capabilities in their medical school programs – response rates were low but generally show variability in uptake of digital health in medicine.

These findings are similar to those drawn through analysis of current national and international literature on digital capabilities in medical schools, which shows a gap in current medical school

curricula pertaining to the integration of digital capabilities into medical school curricula, teaching and learning, and assessment programs in national and international medical school programs. Ken Masters (2017) in *Medical Teacher Article AMEE Guide 2017 — Preparing the medical student for the ePatient* acknowledges that 'medical teachers and professionals may wonder where to find time and space in the curriculum' (for learning about eHealth) but goes on to argue that 'educators and doctors need to recognise that patients will use the Internet and apps irrespective of guidance'. In this way, he argues for an increased focus in medical school training on eHealth and the context of the ePatient. Furthermore, Echelard et al. (2020) conducted a comprehensive review of existing literature on medical student training in eHealth throughout the world. Their key findings were that 'the most studied aspects of eHealth were m-health, online medical resources, electronic health records and telehealth, while as a broad concept the Internet of Things (IoT), Artificial Intelligence and programming were the least studied aspects. The marked increase in the number of publications on eHealth and medical students in 2019 (six times more than the previous year) indicates that a greater amount of research has been conducted in the last few years, and is likely to portend an increasing number of publications in the next few years.' This study shows an increased focus on eHealth although results are still relatively modest in terms of the rate of uptake and inclusion of digital health in medical school curricula globally and in mainstay not reflective of the significant changes which technology has brought to bear on health care delivery and patient safety.

Equally, analysis of Australian medical school accreditation standards shows that there is little focus on digital capabilities in the graduate outcomes statement or medical school provider standards. The standards are an acknowledged lever for change, as Edirippulige et al. (2018) in their study of all medical school curricula and interviews with curriculum and program leaders point out in *Its Important, but not important enough: eHealth as a curriculum priority in medical school education in Australia.* In this article, they conclude that 'medical schools consider eHealth to be important but systemic problems impede its inclusion in the curriculum. Until accrediting bodies expect competence in eHealth the situation is unlikely to change, and the future workforce will remain unprepared.'

The Medical Deans of Australia and New Zealand (MDANZ) have representation on the Medical Workforce Digital Capabilities Advisory Group. In addition, there is a member from the Medical School Accreditation Committee of the AMC and other key medical school representatives with expertise in digital health in medical schools on the Advisory Group. This linkage, as well as ongoing consultation with the medical school sector concerning how digital capabilities are best integrated into medical school programs, is designed to ensure that digital capabilities of medical school students are fostered in this project as an integral part of the medical workforce and capability development of the new generation of doctors.

Prevocational Training

Prevocational Training is the foundation of medical education from which doctors develop competencies after completion of their basic medical qualification. The first two postgraduate years after medical graduation (PGY1 and PGY2) provide a grounding (or basis) for future vocational training. These first two or three years are spent primarily in public hospitals and/or community settings. Postgraduate Medical Education Councils have been established in all Australian States and Territories to oversee training and educational opportunities for junior medical staff in these early postgraduate years.

State and Territory Postgraduate Councils have a responsibility for intern (and PGY2 in most states) accreditation of training posts in health services. Further information on each states' accreditation process can be viewed on their respective websites.

In 2014, the AMC implemented a new national framework for medical internship on behalf of the Medical Board of Australia. The Framework replaced state-based internship requirements and complemented new national registration requirements of the Medical Board of Australia.

The Framework is a suite of documents that link to and provide guidance related to the registration standard on granting general registration to Australian and New Zealand medical graduates on completion of internship. In addition to setting national guidelines, the AMC also has a role in accrediting the postgraduate medical councils, who are responsible for accrediting the training programs. The AMC is currently conducting a comprehensive review of all of the elements of the National Framework for Medical Internship. The review scope has been expanded to include developing a two-year Capability and Performance Framework, including Entrustable Professional Activities (EPAs), and e-portfolio specifications on behalf of the Australian Health Ministers' Advisory Council (AHMAC). This work arose from the Health Ministers' response to the recommendations of the 2015 COAG Review of Medical Internship. Further information can be found below on the AMC website.

The revised two-year framework will include the following components. Noting that in this revised two year framework, the point of general registration will remain at the end of PGY1 (Figure 3).

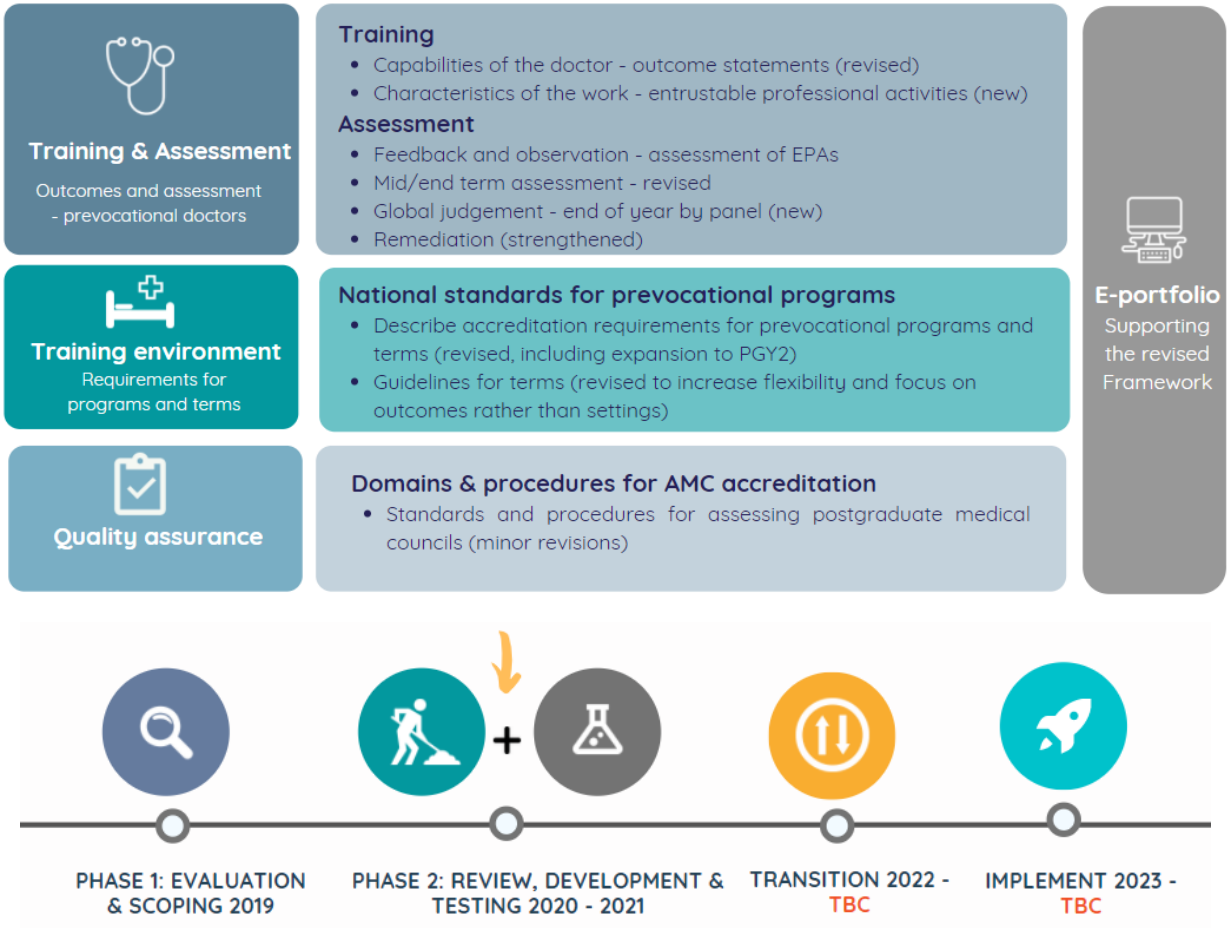


Figure 3: The revised two-year prevocational framework and key project milestones

Phase 1: scoping & evaluation, is complete. A summary of the confirmed review scope is provided in a communique sent to stakeholders in April 2020, available on the AMC website.

In 2020 and 2021 the AMC is progressing with **Phase 2** of the review and has recently completed a formal consultation on the first package of review and development work.

Analysis of the proposed model of the Intern Training program shows that digital capabilities are planned to be integrated into the new training program in the following key ways:

Framework component	Requirement/ Standard
Training and assessment – Outcomes and assessment – prevocational (PGY1 and PGY2) doctors	
Capabilities of the doctor: Intern outcome statements – State broad and significant outcomes prevocational doctors should achieve by end of program	The current outcome 2.9 is focused on utilising clinical data systems effectively. The proposed revisions to outcome 2.9 expand the previous statement to encompass flexible and adaptive practice in context of changing systems and technology.
Characteristics of the work: Entrustable Professional Activities (new component) – describes the key work of the PGY1/PGY2 doctor	The EPAs describe the key work of PGY1 and PGY2 doctors anchored to the outcome statements. They include descriptions of behaviours that would assist a supervisor to make a decision about entrustability. There are likely to be behaviours in the EPAs linked to the revised outcome statement 2.9.
Term assessment form – nationally available form to facilitate assessment against intern outcome statements	Similarly, the term assessment form is based on the outcome statements. This means that the PGY1/PGY2 doctor will be assessed against outcome 2.9. The AMC is also considering ways in which PYG1/PGY2 doctors might demonstrate attainment of outcomes in an e-portfolio that is broader than direct assessment by a supervisor.

The Chair of the National Framework For Medical Internship is a member of the Medical Workforce Digital Capabilities Advisory Group. This linkage, as well as ongoing consultation between both projects, provides opportunities for alignment between the review of National Framework for Medical Internship and the Digital Medicine Project and more broadly with stakeholders of prevocational training to ensure that digital capabilities of interns are fostered as an integral part of the medical workforce and capability development of the new generation of doctors.

Vocational Specialist Training

Following completion of university medical education and the pre-requisite intern year, medical graduates may decide to undertake specialist medical practice. In order to do this, they must complete a recognised medical specialty training program.

The only accredited providers of such programs are the specialist medical colleges. There are 16 Medical Colleges in Australia, a number of which oversee Australian and New Zealand Medical Programs. Specialist Colleges' programs are accredited by the AMC.

There is no single entry point to vocational training. Specialty training programs start in either the second or third postgraduate year, but not all who enter vocational training do so at the earliest opportunity. To gain entry into a training program in their chosen specialty, individuals must succeed in a competitive selection process for a fixed number of accredited training positions

(posts, usually called “registrar” in the workplace), or a place in an accredited facility or in an accredited training program. The number of trainee positions offered is also dependent on the health services capacity to accept trainees. Some specialist medical colleges' vocational training programs have a basic and an advanced training component. Basic training is the entry point for specialist training and must be completed before progressing to advanced training. Advanced specialist trainees then work in a series of training positions in which they are supervised and mentored by appropriately qualified specialists. The combination of these training positions constitutes the individual’s advanced training program.

Supervision of junior registrars is usually undertaken by a specialist and/or a senior registrar in association with a specialist. Over time, the registrar takes increasing responsibility for decision making about patient management and learns a wider range of practical skills. The time required to complete vocational training programs varies from about three to seven years, depending upon which specialty is undertaken.

Most specialist colleges have both clinical and practical exams and the majority have an exit exam. Increasingly, a range of other in-training assessments of both a formative and summative nature are being included so that the full range of skills and behaviours, including communication, team work and other forms of professional behaviour, can be assessed.

Some standout innovations in Australian Specialist Colleges in terms of forging a strategic platform of change in digital health include the position statement of the Royal Australasian College of Medical Administrators (RACMA) which focuses on recognising the significant impact of digital technologies on health and the role of medical administrators in leading system change. In addition, the Royal Australian and New Zealand College of Radiologists (RANZCR) have produced a paper – Towards Interoperability: Clinical Radiology Forging the Path Ahead, A vision for Clinical Radiology in the World of Digital Health (2020). Furthermore, the Royal Australasian College of Physicians (RACP) has an impressive curated collection of resources to support its members in gaining capabilities in digital health. This curated collection was developed in partnership with the Australian Digital Health Agency. The Australian College of Rural and Remote Medicine (ACRRM) has innovated extensively in the digital space. It has a dedicated digital health team which supports members in their knowledge, skills and confidence using digital technologies, https://www.acrrm.org.au/resources/college/digital-health. Nevertheless, a review of current vocational specialist training programs and curricula frameworks in specialist Colleges shows that digital capabilities are integrated only to some extent across specialist medical education programs.

Again, this trend of the lack of focus on digital health capabilities at the postgraduate specialist medical education level is reflected in international trends. A recent systematic review published in BMJ Open 2019 by Jidkov, L et al. comprised a mixed methods study of digital health in UK and international curricula. It drew on a scoping review, curricula content analysis and expert interviews. From 2734 references it identified 21 curricula documents eligible for inclusion including 12 papers from the USA, 3 from Canada, 2 from the Netherlands, 1 from Australia and a collaboration between the Netherlands and Germany. The curricula content analysis found over half of proposed curricular outcomes were not represented in ANY of the 71 UK postgraduate curricula examined and that the mean was 7, of a potential total of 50. It concluded that ‘Health Informatics education for postgraduate doctors is not fit for purpose, partly due to inconsistencies in HI terminologies and scope within existing HI curricula. They go on to argue that ‘it is unsurprising that without agreement on what to teach, postgraduate training curricula often represent a ‘token competency’ approach’.

Similar to the AMC medical school accreditations standards, AMC Specialist College standards have minimal focus on digital technologies in specialist medical education programs. It is

anticipated with increased focus in the medical education accreditation standards on digital health further innovation in medical education programs would occur. It is to be noted that specialist medical education providers are under significant pressure to implement changes to meet current AMC standards and COVID-19 has impacted significantly on Colleges from a business and educational perspective. Colleges have indicated to the AMC that if further change is made to AMC accreditations standards it would be useful to have further information and sample models of what good practice looks like rather than leaving it to each specialist education provider to do all the hard lifting in design of new approaches aligned with new accreditation standards.

Continuing Professional Development

A feature of the 21st century workplaces globally is disruptive, complex and continuous change. Furthermore health systems face exponential increases in health demand, Integral to the ability of medical professionals in the Australian medical workforce to keep pace with these challenges is the need to create the vision and business culture to enable the provision of quality lifelong learning products and services of medical health providers.

Continuing professional development is the means by which members of the profession maintain, improve and broaden their knowledge, expertise and competence, and develop the personal and professional qualities required throughout their professional lives. (MBA 2016)

In 2016, the Medical Board of Australia introduced a new registration standard for continuing professional development. This registration standard sets out the Medical Board of Australia's minimum requirements for continuing professional development (CPD) for medical practitioners. Medical practitioners who are engaged in any form of practice are required to participate regularly in CPD that is relevant to their scope of practice in order to maintain, develop, update and enhance their knowledge, skills and performance to ensure that they deliver appropriate and safe care.

Medical practitioners who have specialist registration must meet the requirements for CPD set by the relevant specialist medical college for every specialty in which they hold specialist registration. There may be CPD activities undertaken that fulfil the CPD requirements of more than one specialist college or specialty, and can only choose a self-directed programme of CPD if that programme meets the requirements for CPD set by the relevant specialist medical college (MBA consultation 2020).

Specialist Medical Education CPD programs vary in their place on a continuum of change towards reform in lifelong learning to meet the needs of the community and health systems. These reforms can be thought of in terms of a number of key shifts in learning provision:

- Adopt competency-based systems and monitoring systems, which are digitally enabled to gather learning analytics about competencies and capabilities achieved at multiple touchpoints within the continuum of learning, across different roles, scopes of practice and institutions;
- Align competency-based system and monitoring systems with broad health priorities based on evidence of health community needs, current gaps in professional practice and a focus on new capabilities for a changing world;
- Shift thinking about learning so that it is seen as integral to practice with a focus on performance improvement and continuous improvement cycles based on peer learning, authentic learning and assessment tasks rather than simply knowledge acquisition and learning through knowledge dissemination;
- Recognize and explicitly integrate lifelong learning into the learning pathways and performance improvement practices of health workers, providers and regulators worldwide;

- ❖ Build continuity of lifelong learning across the education continuum and career of health workers;
- ❖ Shift lifelong learning models from more quantitative measures of success (points, time and activities) to outcomes and impacts;
- ❖ model and share good practice in lifelong learning globally;
- ❖ Support design of flexible pathways and options for lifelong learning with a focus on just in time training and micro-credentialling to maximize practice improvement and reduce likelihood of burnout, burden and non-compliance - particularly in low-income and middle-income countries;
- ❖ Expand lifelong learning to health communities, patients, carers and their families;
- ❖ Increase the likelihood of multi-level impacts of lifelong learning through involvements of Nation States, Regions, Health workers, Policy Makers, Educators Leaders and Consumers across the global health systems.

In November 2019 the Medical Board of Australia launched a new consultation on its proposed revised CPD Registration Standard. Under the proposed CPD registration standard practitioners must:

- complete a minimum of 50 hours of CPD per year that includes a mix of:
  - at least 25 per cent on activities that review performance
  - at least 25 per cent on activities that measure outcomes, and
  - at least 25 per cent on educational activities
- have a CPD home and participate in its CPD program
- do CPD that is relevant to their scope of practice
- base their CPD on a personal professional development plan.

https://www.medicalboard.gov.au/News/2019-11-13-public-consultation-draft-revised-registration-standard.aspx

The Royal Australasian College of Physicians (RACP) provides a useful model of how to integrate this into a workable CPD program – through the MyCPD program (link below):

https://www.racp.edu.au/fellows/continuing-professional-development/2019-mycpd-framework

Although the Medical Board standards do not specify content of learning or relate CPD activities to a capability framework, clear indications from the literature on lifelong learning is linkage with a number of key shifts in medical and health practice. Integral to the vision of quality lifelong learning and achievement **lifelong learning reform** across the globe in medicine is change to the design and implementation of learning systems by building on existing good practice in knowledge dissemination by education providers, and by proposing programs focused on behaviour change in health. Key to such behaviour change is a shift in current practice from disease specific, conventional care to holistic health and primary care which leverages the use of current, emerging and personalised technologies. Equally important is the development of lifelong learning approaches which focus on fostering the health literacy of patients and caregivers by improving their ability to operate effectively as partners in health care. A global consumer-centric health movement is underway that promotes self-care, shared decision-making and engagement with health workers from an informed position. Given these systemic shifts in global health, learners and educational systems are transforming programs of teaching and learning, assessment and certification based on new behaviours, ethics and ways of working. Data is driving this change, which focuses on analysis of current and future needs and measurement of impact of learning and capability development.

Central to any proposed approach to building a capability framework to guide CPD for medical specialists in Australia will be the need for the approach to align with the new proposed revised CPD Registration Standard.

The Chair of Medical Workforce Digital Capabilities Advisory Group is a member of the Specialist Accreditation Education Committee (SEAC) of the AMC. In addition, there is a dedicated member, as part of this group, from the SEAC Committee of the AMC. Furthermore, there is broad representation in this Advisory Group from various specialist medical Colleges as well as a member of the Council of Presidents of Medical Colleges (CPMC). This linkage, as well as ongoing consultation with specialist medical Colleges and peak Specialist Medical Education Bodies, provides opportunities for alignment between the Digital Medicine Project and the needs of specialists as an integral part of the medical workforce and capability development.

Gap between Interest and Expertise Across the Medical Sector in Digital Health

While the case has been made for including digital capabilities in medical graduates and postgraduate learning and development, there is a gap between interest and expertise across the medical sector in digital health (Figure 4). This analysis of the Changing Face of Clinical Careers Survey was conducted by Wavelength International and Centric which partnered with the Creative Careers in Medicine (CCIM) community, led by GP and digital health expert Dr Amandeep Hansra. The research project gauged clinicians' interest in Divergent Careers for Clinical Professionals. Respondents to the survey include over 840 Medical Leaders and Specialists, Registrars, Nurses and Allied Health. The results show that there is a high level of interest in digital health, particularly with junior doctors who are arguably more competent and comfortable with new technologies than their more experienced medical colleagues. The interest represents an opportunity for interested professionals to develop their expertise in key areas related to digital health in medicine. The gap between the interest and expertise show the importance of workforce development and education across the medical education continuum. Other literature points to the intense competition globally within the medical profession with young doctors seeing the development of digital capabilities as an opportunity to increase their marketability and likelihood of securing a job. This research highlights the demand and need for the development of capabilities in digital health in medicine.

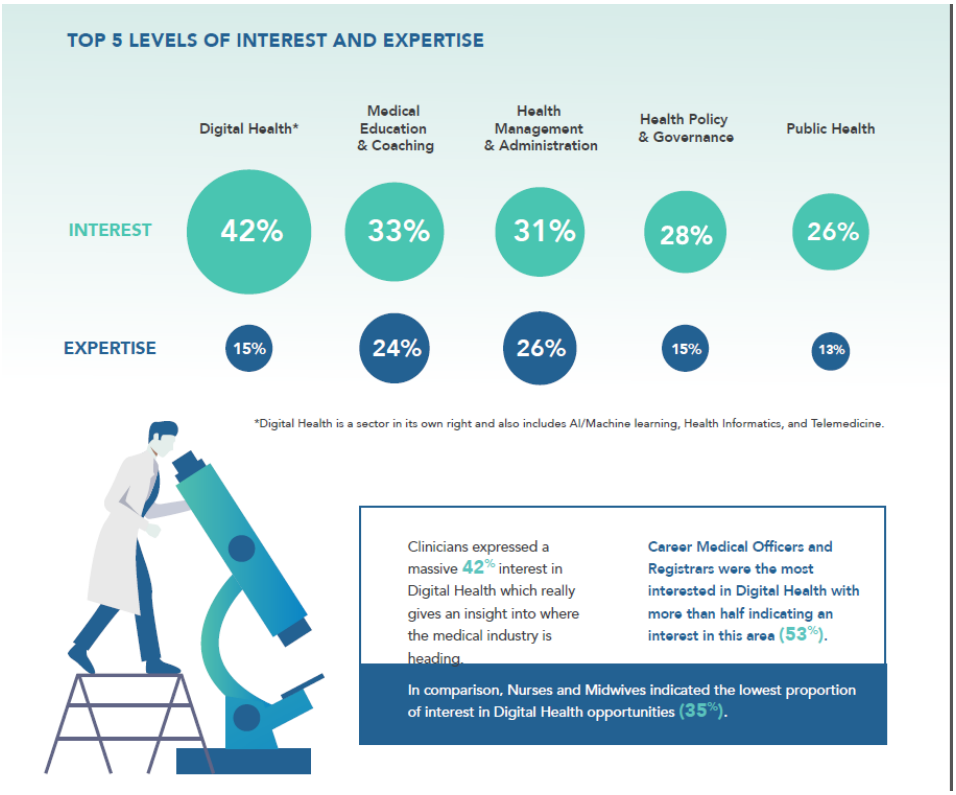


Figure 4: Gap between Interest and Expertise Across Medical Sector in Digital Health.

Good Practice Strategies to Inform Future Directions in Developing a Digital Health Capability Framework in Medicine

This section of the literature review provides summaries of a range of international and national strategies and reports which are useful in providing insights into digital health. Summaries also include links to the full reports.

International and National Strategies and Reports on Digital Health

NHS - UK

The Topol Review: Preparing the Healthcare Workforce to Deliver the Future: An Independent report on behalf of the secretary of state health and social care (February 2019).

Key Messages on Digital Medicine:

The review proposes three principles to support the deployment of digital health care technologies through the National Health Service (NHS):

1. Patients need to be included as partners and informed about health technologies, with a particular focus on vulnerable/marginalised groups to ensure equitable access.
2. The healthcare workforce needs expertise and guidance to evaluate new technologies, using processes grounded in real-world evidence.
3. The gift of time: wherever possible the adoption of new technologies should enable staff to gain more time to care, promoting deeper interaction with patients.

Genomics, digital medicine and AI will all have a major impact on patient care in the future. A number of emerging technologies, including low-cost sequencing technology, telemedicine, smartphone apps, speech recognition and automated image interpretation will be particularly important for the health workforce.

Key Messages on Workforce Capability in Medicine:

There is a need to raise awareness of genomic and digital literacy among the health and social care workforce.

Process of Development:

The review sought out expert opinion from a broad range of stakeholders – desk reviews of available literature, one-to-one interviews, meetings with experts, visits and seven round table events including representatives from patients and patient advocacy groups, industry education, professional groups and regulation.

URL: https://topol.hee.nhs.uk/

World Health Organisation

Digital Education for Building health workforce capacity (2020).

Key Messages on Digital Medicine:

Global health mandates and resolutions have consistently emphasized the need for health workforce strengthening through lifelong learning opportunities. A thematic analysis of recent global health-related international resolutions (including United Nations General Assembly resolutions, World Health Assembly resolutions and other intergovernmental organizational strategies and workforce related strategies) reveals an urgent need to address global health workforce challenges to deliver better health services performance and outcomes. These concerns are presented under key themes and sub-themes that provide a framework for policy directives on digital education (also known as e-learning) to address health workers' issues. This broad array of educational needs differs by setting. Some relevant examples include the need to increase student enrolment, improve learning outcomes, deliver education to health workers in remote areas, strengthen the competency of educators and enable lifelong learning.

Key Messages on Workforce Capability in Medicine:

Digital education has the potential to improve the competencies and satisfaction of health professionals. However, the effectiveness of digital methods depends upon the manner of implementation. Published studies that point to the benefits of digital health education have been found to have variable evidence quality and limited generalizability. Effectiveness of digital health education and outcomes vary widely depending on the learning objectives, modality (e.g. mobile phones, online digital education, virtual reality, serious gaming and gamification), delivery mode (e.g. fully digital or blended), instructional method (e.g. simulations, direct instruction), assessment methods (i.e. use of validated or non-validated instruments), learning pedagogies (e.g. digital problem-based learning or digital team-based learning), study population (e.g. nurses, allied health professionals, doctors), and the topic, discipline and health condition being taught (e.g. smoking cessation, diabetes management, domestic violence, antibiotic management, dermatology, child health, elderly care). The phenomenon of the digital divide is also important from an implementation perspective as it exists both within and between countries, and may be a significant barrier for students, limiting equal access to digital education. Further research, rigorous evaluations, audits, investments and collaborations are required to optimize approaches for the effective use of digital education.

Process of Development:

This paper combines evidence from the scientific literature (including evidence from a collection of systematic reviews on digital tools and health workers' education), practical suggestions for stakeholders to formulate approaches, and guidance in using digital tools to scale up health workforce education and capacity.

URL:https://www.who.int/publications/i/item/dfigital-education-for-building-health-workforce-capacity-978-92-4-000047-6

MIT Technology Review

Asia's AI Agenda: AI and Human Capital (2019)

Key Messages on Digital Medicine:

The impact of AI on work, jobs, and people is one of the most controversial aspects of today's technological wave that will undoubtedly transform companies, industries, and societies in the years ahead. In this report, "AI and human capital," part of our research program Asia's AI agenda, we explore the degree to which executives in Asia Pacific are expecting and preparing for the automation of job roles. We also look at how staff working in companies across the region are responding to the increasing need to work "shoulder to software." The report also explores a new data set provided by Faethm, a future of work software as-a-service company. It shows, by country and industry, the proportion of formal sector jobs that will become redundant through automation. It also shows the proportion that will be supported and augmented by AI, making those jobs more productive and highly skilled.

Key Messages on Workforce Capability in Medicine:

Front and centre. AI deployment is not a zero-sum game where headcount is reduced in lockstep with new AI software. For Asian businesses, this is doubly so, for not only are businesses in the region increasing their headcount to capitalize on market growth, the departments which are growing their staff the most—front-line, customer-facing talent—are also where most AI investments are going.

- AI will be a major growth driver for Asia in the coming decade.
- The large majority of companies are expecting headcount to increase.
- AI will affect one in every five jobs in Asia— eliminating one in eight.
- AI will produce winners and losers.
- Talent and technology agendas must align to sustain long term growth.

Process of Development:

Analysis of trends using workforce modelling with Faethm software, review of literature and survey data.

URL: https://www.technologyreview.com/2019/05/10/135421/asias-ai-agenda-ai-and-human-capital/

EY

Health Reimagined: A New Participatory Health Paradigm (2016).

Key Messages on Digital Medicine:

A significant catalyst for change is an engaged and participatory patient or healthcare consumer; one that assumes a role as an equal partner in their healthcare experience. Participatory health is supported by:

- Technology that orients around the person and mobility features that support health anytime, anywhere.
- Core features common to a vast range of devices (sensors, cameras, connectivity to social platforms) and emerging intelligence capabilities in recognising and understanding an individual's habitual behaviour patterns.
- Cheap wireless technology and extensive connectivity of everyday things with sensors to the internet.

Key Messages on Workforce Capability in Medicine:

As healthcare becomes untethered by mobile technologies the epicentre of healthcare shifts to the home and community. In person encounters and hospitals will always play a vital role in any health system, however, digital and mobile technologies make considerable headway towards re-envisioning healthcare way beyond episodic acute and facility-based care.

Process of Development:

Consultancy research – method not disclosed.

URL: https://www.ey.com/en_au/health

EY

The Future of Health Insurance: A roadmap through change (2015)

Key Messages on Digital Medicine:

Disruptive ideas related to change for insurers and digital health include:

1. Could your new approach be powered by m-health technologies – allowing much greater insight and influence over patients' behaviours and driving down costs through widespread adoption?
2. What if you could make data a central component of a new insurance offering – creating the complete picture that has so far been missing to better understand and influence risk.
3. Could you develop a proposition that places the customer squarely in the centre – using deep data about customers to understand their needs and deploying m-health technologies to build relationships and guide customers' behaviours?

Key Messages on Workforce Capability in Medicine:

Insurers need to not only price and underwrite risk but influence and reduce risk as well.

Process of Development:

Consultant report.

URL: https://www.ey.com/en_au/health

The Medical Futurist Institute

Trends in Digital Health In 2020

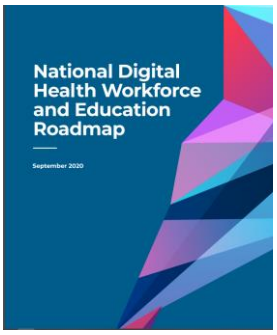
Key Messages on Digital Medicine:

Key trends for 2020 are:

1. Amazon's employees to get a full scale electronic medical system.
2. An FDA curated and approved database of medical AI based algorithms.
3. At home blood testing becomes the new DNA testing.
4. Betting on its acquisition of Fitbit, Google will launch a new "made by google" line of fitness trackers.
5. A major pharma company will make an unexpected acquisition of a medtech or wearable player.
6. Facial recognition algorithms will be used to predict medical conditions such as atrial fibrillation.
7. Magic Leap will share its first mixed reality healthcare application.
8. An AI start up using AI for drug design will venture to become a pharma company and run the trials itself.
9. A 5G application will be deployed in a healthcare setting.
10. Based on the AI policy recommendations from the American Medical Association, the WHO will release one too.
11. At least five countries will follow Germany and Denmark's example in officially embracing digital health.

URL:

https://medicalfuturist.com/Digital-Health-Best-Practices-For-Policy-Makers-The-Medical-Futurist-Institute.pdf



The Australian Digital Health Agency, Commonwealth Government of Australia

The National Digital Health Workforce and Education Roadmap (2020)

Key Messages on Digital Medicine:

Using horizon thinking, this strategy sets out three horizons for future workforce development in health:

- Horizon 1: Embedding safe, ethical and effective use of systems of records
- Horizon 2: Integrating new technologies and ways of working
- Horizon 3: Digital health transformation.

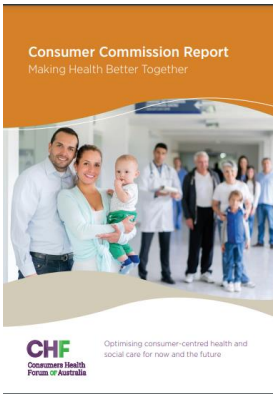
Key Messages on Workforce Capability in Medicine:

- Horizon 1: Healthcare workers and consumers have access to digital health tools and increased access to information, equipping them with greater decision making powers.
- Horizon 2: Systems and organisation are better connected, enabling them to analyse information, plan and respond to health demands. Emerging digital technologies will reshape health functions and new roles will emerge. The focus will be in enterprise transformation.
- Horizon 3: Healthcare delivery is transformed. For example, through value-based healthcare, personalised medicine, empowered consumers and a shift towards home and community health service delivery and primary and preventative health.

Process of Development:

Broad consultation, review of the literature and engagement with stakeholders of health

URL: https://www.digitalhealth.gov.au/sites/default/files/2020-11/Workforce_and_Education-Roadmap.pdf



Consumers Health Forum of Australia

Consumer Commission Report: Making Health Better Together – Optimising consumer-centred health and social care for now and the future (2020).

Key Messages on Digital Medicine:

The Consumer Health Forum (CHF) Consumer Commissioners Group. The Consumer Commission was formed by the CHF to ensure a strong consumer voice was helping to shape the healthcare of the future.

A new report has called for a Consumer Health leaders Academy to strengthen the role of consumers in health system decision-making. The outcome of the Consumer Commissioners conversations were that 4 strategic areas to improve health were agreed upon, being:

1. Mental Health & Wellbeing
2. Integration & care coordination
3. Health equity; and
4. Digital Health.

Key Messages on Workforce Capability in Medicine:

Digital Health can be found on pages 4 and then pages 19 - 20.

Digital health is an enabler to empower consumers/carers to manage their own health & wellbeing and *"support provider teams to work within flexible, integrated interoperable & digitally-enabled environments."*

The report raises number of concerns which included that it is important to ensure equal access for all (address poor internet, lack of a device to connect or afford internet services) and also digital literacy.

Process of Development:

Broad consultation, review of the literature and engagement with stakeholders of health

URL:
https://chf.org.au/sites/default/files/docs/chf_consumer_commision_report_v4final.pdf

International and National Capability Frameworks in Health and Medicine

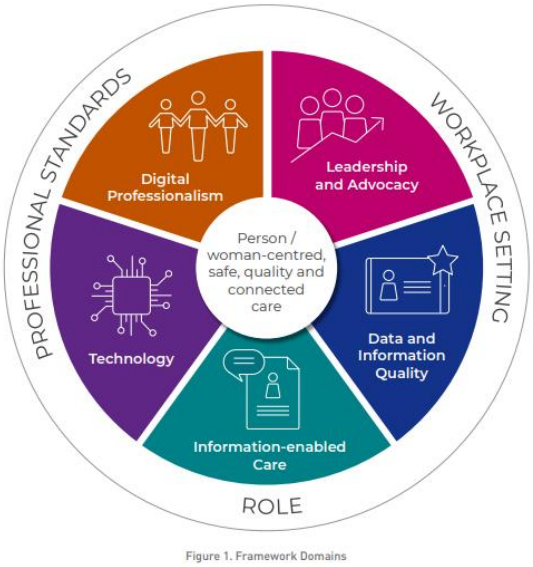
This section of the literature review includes a range of digital capability frameworks from international and national studies from medicine, nursing and health. Links to the full framework are included below. This section also includes a mapping of the domains across these eight key frameworks and Advisory Group feedback concerning the importance of these concepts for inclusion in a proposed proof of concept for a capability framework for medicine.

NHS – A Health and Care Digital Capabilities Framework

https://www.hee.nhs.uk/sites/default/files/documents/Digital%20Literacy%20Capability%20Framework%202018.pdf

Figure 5: NHS of the UK – A Health and Care Digital Capabilities Framework

National Nursing and Midwifery Digital Health Capability Framework



https://www.digitalhealth.gov.au/about-the-agency/workforce-and-education/National%20Nursing%20and%20Midwifery%20Digital%20Health%20Capability%20Framework%20publication.pdf

Figure 6: Agency, Commonwealth Government of Australia - National Nursing and Midwifery Digital Health Capability Framework

CHIA – Certified Health Informatician Australasia

https://www.healthinformaticscertification.com/wp-content/uploads/2016/02/CHIA-competencies-Framework_FINAL.pdf

Figure 7: Australian Institute of Digital Health - CHIA – Certified Health Informatician Australasia

CPHIMS - Certified Professional in Healthcare Information & Management Systems, Chicago, USA. This certificate has 3 main domains with 9 subdomains:

- General
- Systems
- Administration

https://www.himss.org/sites/hde/files/media/file/2020/08/18/cphims-handbook.pdf

Undergraduate Medical Competencies in Digital Health and Curricular Module Development: Mixed Methods Study – Berlin, Germany (Poncette et al 2020)

Figure 1. This sunburst diagram represents the qualitative results. Within the 4 themes (inner ring), subthemes (middle ring) are assigned and specified (outer ring). ELSI: ethical, legal, and social implications.

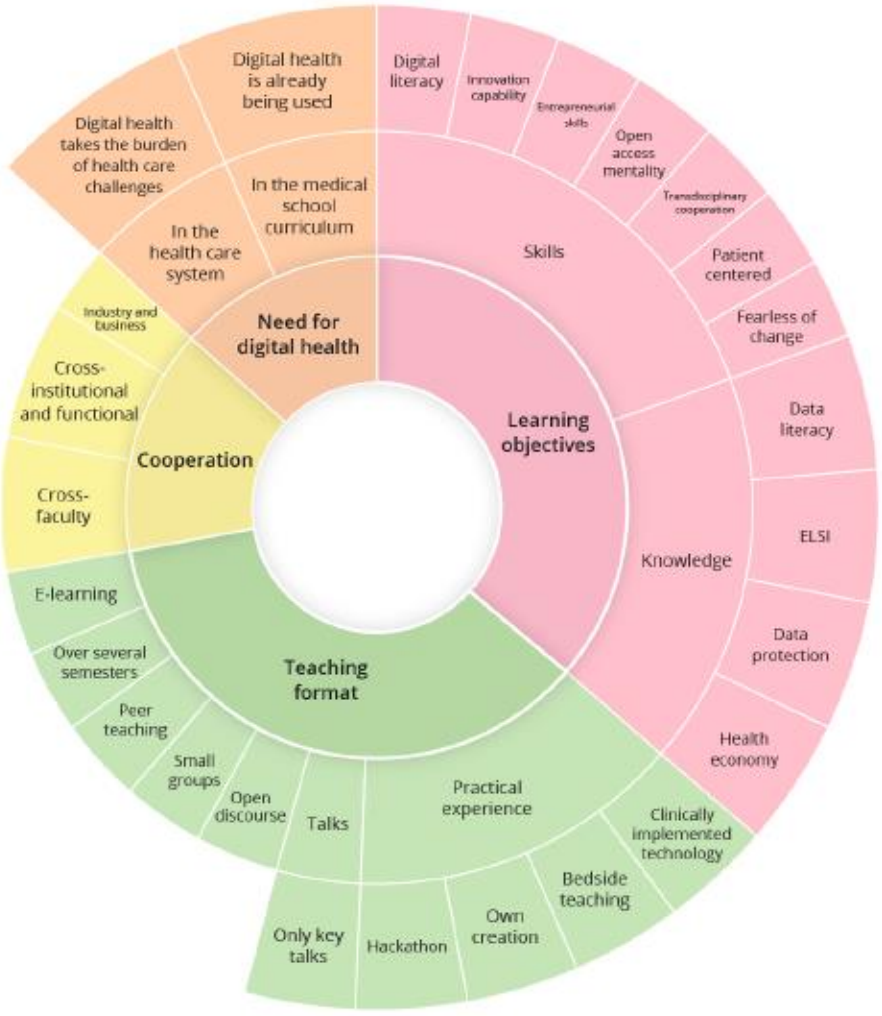


Figure 8: Undergraduate Medical Competencies in Digital Health and Curricular Module Development: Mixed Methods Study – Berlin, Germany (Poncette et al. 2020)

University of Queensland and Queensland Health

The link below is a consensus statement published from Queensland on digital clinical priorities:

https://pubmed.ncbi.nlm.nih.gov/31744594/

The Metro North digital workforce education strategy run out of University of Queensland and Queensland Digital Academy is adopting a three horizon approach to workforce education development.

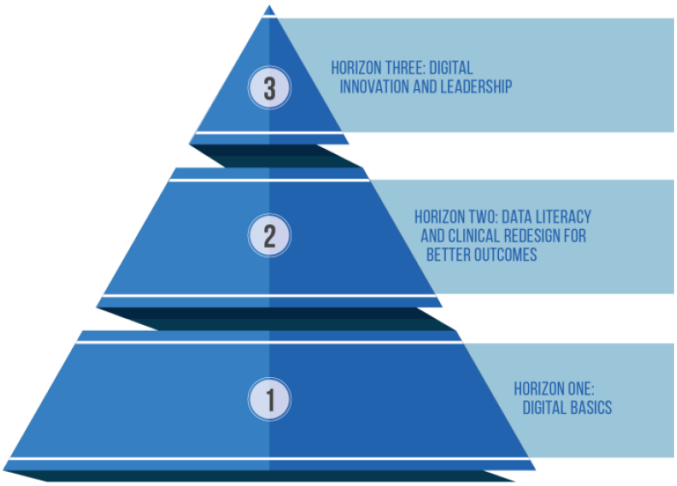


Figure 9: Layered Approach to Build Digital Health capability. For the Queensland Digital Academy

University of Sydney and New South Wales Health

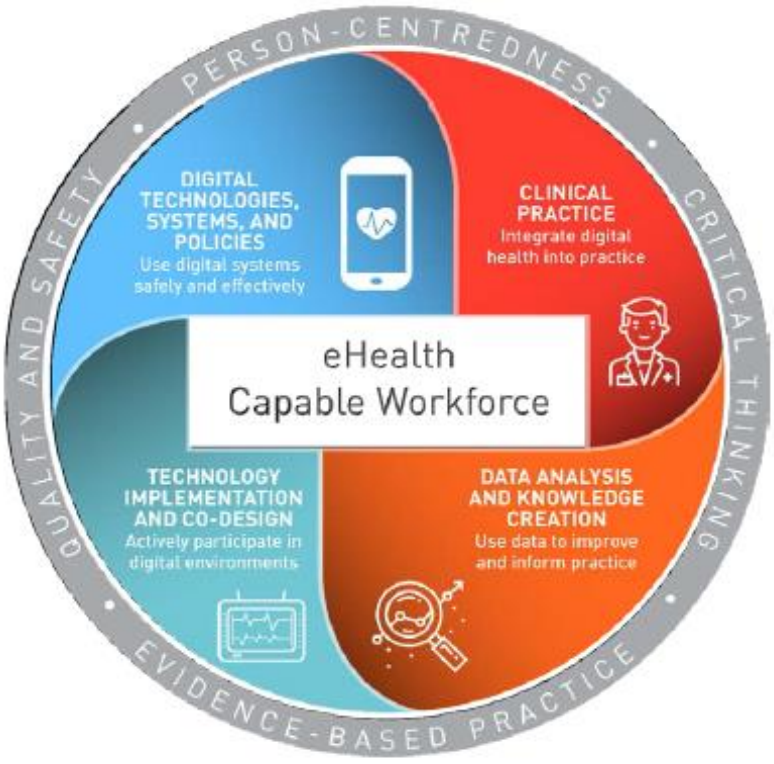
EHEALTH CAPABILITY FRAMEWORK

Background

The University of Sydney has collaborated with NSW Health to develop eHealth capability statements to inform and guide consistent high-quality teaching and learning experiences for both health professional students and the workforce.

This document outlines foundation levels of knowledge and performance required by all healthcare professionals practicing in digital healthcare environments. This level directs the expectations of training and entry-level health professionals who provide direct clinical care to patients and who work under supervision across all sectors, that is, inclusive of all Australian health care settings.

The Framework includes four domains as outlined in diagram below.



https://www.jmir.org/2018/5/e10229/

Figure 10: University of Sydney and New South Wales Health - eHealth Capability Framework University of Sydney and NSW Health

Mapping of the International and National Capability Frameworks in Health and Medicine

A mapping of the eight identified international and national frameworks in digital health identified six key themes as outlined below. Members of the Advisory Group were asked to rank these domains in terms of their importance to the future capability development of the Australian Medical Workforce. The response rate for the online survey was a consistent 18 responses out of 23, representing 78.3%. Bold indicates highest ranking per domain.

	Very Important	Important	Less Important
Clinical Practice Domains			
Clinical Practice	**15 (75.00%)**	5 (25.00%)	0 (0.00%)
Patient-centred	**17 (89.47%)**	2 (10.53%)	0 (0.00%)
Information-enabled Care	**12 (63.16%)**	6 (31.58%)	1 (5.26%)
Health and Bio Medical Sciences	**9 (47.37%)**	8 (42.11%)	2 (10.53%)
Digital Literacy Domains			
Digital Basics	**11 (57.89%)**	5 (26.32%)	3 (15.79%)
Digital literacy	**14 (73.68%)**	5 (26.32%)	0 (0.00%)
Data literacy	**12 (63.16%)**	6 (31.58%)	1 (5.26%)
Data literacy and clinical redesign for better outcomes	**9 (47.37%)**	7 (36.84%)	3 (15.79%)
Data analysis and knowledge creation	**13 (68.42%)**	4 (21.05%)	2 (10.53%)
Digital Leadership and Collaboration Domains			
Leadership and Advocacy	**10 (52.63%)**	6 (31.58%)	3 (15.79%)
Transdisciplinary cooperation	**12 (63.16%)**	6 (31.58%)	1 (5.26%)
Communication, Collaboration and Participation	**14 (73.68%)**	4 (21.05%)	1 (5.26%)
Innovation Domains			
Creation, Innovation and Research	**8 (42.11%)**	7 (36.84%)	4 (21.05%)
Innovation Capacity	**12 (63.16%)**	4 (21.05%)	3 (15.79%)
Digital Innovation and Leadership	**11 (61.11%)**	7 (38.89%)	0 (0.00%)
Information and Technology Domains			
Technology	**9 (47.37%)**	7 (36.84%)	3 (15.79%)
Information and Communications Technology	**11 (61.11%)**	5 (27.78%)	2 (11.11%)
Digital Technologies. Systems and Policies	**14 (73.68%)**	4 (21.05%)	1 (5.26%)
Technology implementation and Co-design	**9 (47.37%)**	6 (31.58%)	4 (21.05%)
Information, Data and Content	**12 (63.16%)**	6 (31.58%)	1 (5.26%)
Data and Information Quality	**14 (73.68%)**	5 (26.32%)	0 (0.00%)
Organisational Domains			
Management Sciences	**11 (57.89%)**	5 (26.32%)	3 (15.79%)
Fearless change	**13 (68.42%)**	3 (15.79%)	3 (15.79%)
Entrepreneurial skills	**12 (63.16%)**	5 (26.32%)	2 (10.53%)
Other Domains			
Open access mentality	2 (11.76%)	**10 (58.82%)**	5 (29.41%
Teaching, Learning and Self Development	**15 (83.33%)**	2 (11.11%)	1 (5.56%)
Digital Identify, Wellbeing, Safety and Security	**10 (55.56%)**	7 (38.89%)	1 (5.56%)
Data protection	**10 (55.56%)**	7 (38.89%)	1 (5.56%)
Digital Professionalism	**12 (66.67%)**	6 (33.33%)	0 (0.00%)
Technical Proficiency	1 (5.56%)	**13 (72.22%)**	4 2.22%
Human and Social Context	**9 (50.00%)**	7 (38.89%)	2 (11.11%)
General	0 (0.00%)	4 (23.53%)	**13 (76.47%)**
Systems	0 (0.00%)	7 (41.18%)	10 (58.82%)
Systems	0 (0.00%)	7 (41.18%)	**10 (58.82%)**
Administration	0 (0.00%)	7 (41.18%)	**10 (58.82%)**
Health Economy	0 (0.00%)	**13 (76.47%)**	4 (23.53%)

Figure 11: Survey Results of Advisory Group Ranking of Domains of the eight identified international and National Frameworks in Digital Health

Broader Trends in Curriculum Innovation in Medical and Health Education

In this section of the literature review, we focus on some of the broader trends in medical education curricula innovation with a particular focus on Entrustable Professional Activities (EPAs). EPAs are used to frame curricula across a range of medical education programs nationally and internationally. Most notably in Australia, the Royal Australasian College of Physicians (RACP) has an EPA based curricula for its basic training program with plans to design EPA based Advanced Training curricula for all physician specialty programs. In addition, the Royal Australian and New Zealand College of Psychiatrists (RANZCP) has an EPA based curricula. Furthermore, the Royal Australian College of Surgeons (RACS) designed their Jdocs program on the basis of an EPA style curricula model. The Intern Review, currently in consultation phase, is also designed around an EPA based curricula. A number of medical schools are also basing their curricula on an EPA based curricula model.

A key broader trend in curriculum innovation in medical education is the concept of EPAs. This is a useful concept which is being taken up nationally and internationally with a focus on making capability development, its teaching and learning as well as assessment manageable in the busy high volume and high risk environments such as healthcare settings. This curriculum innovation provides us with a way of thinking about how the teaching and learning, and assessment of digital capabilities can work in medical education.

Entrustment and Core Tasks for Learning The concept of EPAs, first proposed by the Dutch Medical Educationalist, Olle Ten Cate in 2005, is an innovation in competency-based medical education.

EPAs help to address some of the criticisms of competency training:

- **Detailed competencies can be difficult to operationalise and implement.** This means that many curricula frameworks remain such – a framework which does not show how outcomes, teaching and learning, assessment and measurement of impact is achieved within the program.
- **Competencies can be atomistic** – the separate parts not being representative of the whole.

As described by Ten Cate (2013):

- EPAs are not an alternative for competencies, but a means to translate competencies into clinical practice.
- Competencies are descriptors of healthcare practitioners, EPAs are descriptors of work.
- EPAs usually require multiple competencies in an integrative, holistic nature.

EPAs and competencies differ in that an EPA is a description of the work to be done, and competencies describe an individual's characteristics and abilities – EPAs require workers with competence.

Competencies	EPAs
person-descriptors	**work-descriptors**
knowledge, skills, attitudes, values	essential tasks in professional practice
• content expertise • health system knowledge • communication ability • management ability • professional attitude • scholarly skills	• discharge patient • counsel patient • lead family meeting • design treatment plan • Insert central line • Resuscitate patient

Figure 12 – Competencies vs. EPAs
(ten Cate et al. 2010; ten Cate & Scheele 2007)

EPAs focus on the concept of *trust*. In high stakes environments such as health, where the competence of workers is paramount to the health and safety of patients and wellbeing of co-workers, trust and the degree to which workers can *entrust* more junior or less experienced members of the health team to perform tasks independently is central to the smooth operations of health settings and quality patient outcomes.

EPAs have been adopted at a global level to support workforce health development worldwide as can be seen from the extract of tasks drawn from the OECD (2018) Feasibility Study on Health Workforce Skills Assessment: Supporting Health Workers Achieve Person Centred Care, OECD Health Division Team:

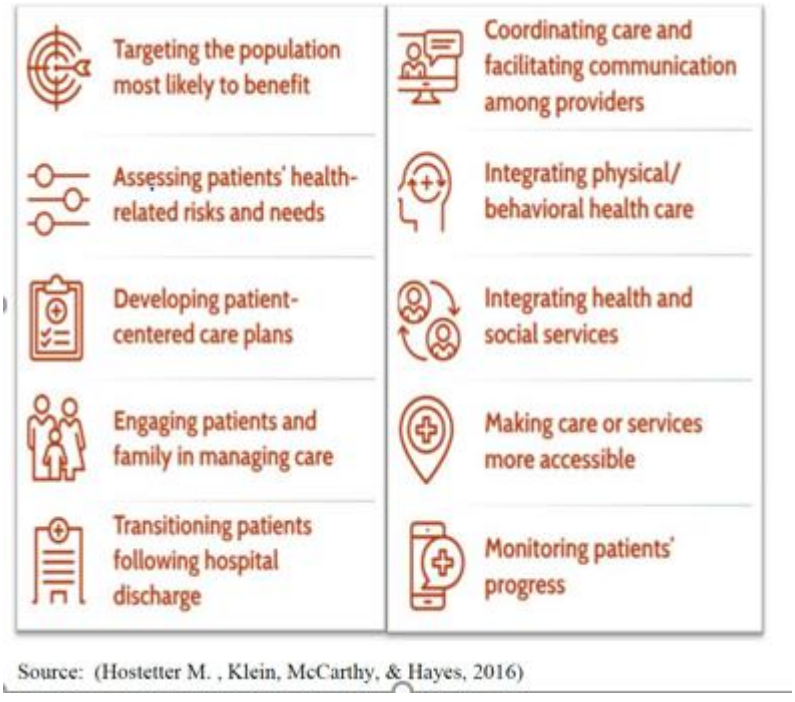


Figure 13: Sample Entrustable Professional Activities

EPAs provide context for competencies as health workers must draw upon numerous competencies in order to earn entrustment for an EPA, e.g. 'taking a patient history' requires the lifelong learner to integrate communication, medical expertise, safe practice etc; see *Figure 14* below. If a program is mapped well, it can be assumed that a health worker has gained all competencies outlined in the education program if they have been entrusted with all EPAs.

	EPA1	EPA2	EPA3	EPA4	EPA5
Medical expert	++	++	+		++
Collaborator	+		+	++	
Communicator	+	++			+
Leader		+	++	++	
Health advocate	+		++	+	
Scholar	+				++
Professional	+	+	+		

Competencies inferred

Assessment based on EPAs

Figure 14 – Matrix of competencies vs. EPAs (ten Cate 2016a)

'Competence' for an EPA is the threshold level of ability that permits trust in a health worker to complete a task unsupervised. When a health worker is entrusted with an EPA it is assumed that they have the requisite competencies to perform that task, without the need to observe and assess each competency individually.

Ten Cate is insistent that an EPA is not exclusively assessment, although assessment is clearly a key component. The EPA clarifies the competencies required to successfully complete a task. In addition, it focuses on how the learner needs to learn and what teaching and learning they need access to in order to maximise their performance. The assessment is the third component, discussed in further detail in the next section of this design brief.

Assessment and EPAs

EPAs are signed off through direct observation of learner performance using an **entrustment scale**. Ten Cate describes these entrustment levels in 5 key levels of supervision:

Assignment and supervision scale with five levels	Expanded entrustment and supervision scale for undergraduate and postgraduate medical education
1. It is not allowed to practice EPA.	1. It is not allowed to practice EPA: a. Inadequate knowledge / skills; not allowed to observe (e.g., lack of biosafety knowledge). b. Adequate knowledge, some skills; allowed to observe.
2. It is allowed to practice EPA only under fully proactive supervision.	2. It is allowed to practice EPA only under fully proactive supervision: a. As a co-activity with the supervisor. b. With the supervisor in the room willing to intervene, if necessary.
3. It is allowed to practice EPA only under reactive supervision or supervisory request.	3. It is allowed to practice EPA only under reactive supervision or supervisory request: a. With an immediately accessible supervisor, and all findings and decisions have been double checked. b. With an immediately accessible supervisor, and key findings and decisions have been double-checked. c. With a supervisor at distance (e.g., phone), and findings and decisions have been promptly reviewed.
4. It is allowed to practice EPA without supervision.	4. It is allowed to practice EPA without supervision. a. With at distance monitoring (e.g., check student's questions on the next day). b. Without monitoring.
5. It is allowed to supervise others in EPA practice.	5. It is allowed to supervise others in EPA practice.

Figure 15: Ten Cate 5 Point EPA Entrustment Scale

https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0100-55022019000500712

Intuitively, these levels are very clear, as they are based on current supervisory practice whereby supervisors incrementally reduce the level of supervision as the learner gains in independence and are comfortable to increasingly provide the learner with less 'supervisory oversight'. Typically, this has been referred to as "Hands On" "Hands Off" and is informed by Vygotsky's learning theory of scaffolding. What is less clear is how such levels can be objectively determined as they describe the supervisor behaviour rather than what constitutes the learners evolving expertise or what it is about the learner's context which may determine their ability to incrementally work towards independence safely and competently. In this way, the levels, as described by Ten Cate, do not so much describe the learning levels of the learners but rather defines learner performance through the behaviour of the supervisor as he/she makes judgements of the learners' performance through observation. A further challenge with Ten Cate's scale is that in the realities of work in a busy clinic, trainees may provide supervision to more junior colleagues for a segment, if not an entire task, well before they reach level 5 of the continuum. Nor does this scale capture leadership. The trainees role in medical education, is the highest level to be achieved. Again, this does not necessarily reflect the realities in clinical contexts – clinical leadership is an important aspect of trainee performance to be measured as part of such a scale. A further point for consideration is that these tasks are designed for doctors in training under supervision but are highly relevant to teaching and learning as well as assessment of Fellows (those who have graduated from a specialist training vocational training program and have ongoing learning commitments through undertaking Continuing Professional Development) in the context of lifelong learning with some changes to assessment, with a focus on peer review activities, as explored below.

A possible solution to some of the challenges of implementation of these entrustment scales is to combine Ten Cate's intuitive levels describing the supervisors lessening role in direct supervision through observation of trainee performance with the work of Stephenson (1999) which explores growing expertise across professional domains in a more learner centric model of entrustment. Furthermore, in the context of revalidation and recognition of lifelong learning, it would be useful to broaden this out so that tasks and their teaching and learning as well as assessment can also apply to Continuing Professional Development (CPD) and revalidation models with peer assessors rather than supervisors.

In Stephenson's work, as outlined in the table below, expertise is seen as being developed across four key domains: **Foundational** where learners can operate safely within known contexts – checking and asking for help when out of depth is central to safety at this level, **Routinised Practice** where learners are competent within boundaries of routinised practice **Complex Problem Solving** where learners can engage in multi-tasking and complexity and **Leadership** providing vision and leadership in the clinical context.

The table below shows how Stephenson's levels can guide learner's capability development in digital learning and their support through digital teaching and learning, and assessment and how this relates to Ten Cate's intention that performance on core tasks should be well supported with teaching and learning, and assessment:

Level	Description	Digital Supported Teaching and Learning	Digitally Supported Assessment
Foundational: ***Work within a known and stable context, consulting when anomalies arise before taking action.***	The baseline capabilities required for competent and safe performance. At this early stage in the development of domain knowledge, learners may be gaining awareness of the scope and content related to a specific field or skill but may not yet be able to perform tasks competently. Because of this it is very important at this stage for the learner to reflect on their prior knowledge, practice their skill development in simulated environments, have ready access to supervisor support to guide their learning and be encouraged to ask for help when required.	Optimise learning through: • self-directed learning • reflective activities to clarify needs and prior knowledge • simulation • access to digital modules • online journals and other online resources.	• Learning needs analysis. • Online quizzes. • Tele-supervision.
Routinised Practice ***Act independently on routine tasks within scope and in response to knowable dilemmas.***	At this level the novice is able to exemplify "rule governed behaviour", which constitutes safe and competent performance of tasks. They can perform such skills in routine situations but struggle with unforeseen complexity or novel situations not previously experienced.	Optimise learning through: • clear and close supervision and reference to checklists with access to online checklists • decision support • practice the task through full supervision and for Fellows with reference to a peer assessor.	• Tele-supervision. • Case-based/ scenario based testing of skill level • Supervisor/Peer Assessment observations
Complex Problem Solving ***Act independently in complex situations within scope***	As the learner progresses, they are able to apply their knowledge in diverse contexts and in novel situations to resolve problems not previously experienced. This occurs with reference to pattern	Optimise learning through: • clear and distant supervision/peer assessor able to be accessed by the learner on a needs basis to	• Tele-supervision. • Supervisor/Peer Assessment observations • Analytics drawn from assessment of multiple

and in response to unknowable dilemmas	recognition and creative thinking skills.	foster growing learner independence and expertise.	biopsies of performance – programmatic assessment supported through an ePorfolio assessment.
Leadership ***Provide vision and direction, and shape and implement strategies and initiatives that enable others to perform as required.***	At the most advanced level, learners develop their leadership capabilities in digital health which focuses on team, system and workforce development in digital health.	Optimise learning through: • mentoring and modelling opportunities • experience based leadership opportunities.	• Tele-supervision/ mentoring/peer coaching and review. • Analytics drawn from assessment of multiple biopsies of performance – programmatic assessment supported through an ePorfolio assessment. • Multi-sourced feedback from interprofessional teams.

Key Trends in Current, Emerging and Future Technologies in Medicine

This summary of key trends in current, emerging and future technologies in medicine draws on the three horizons of the Australian National Digital Health Roadmap as the parameters for the scope of the analysis of literature impacting medicine. For each horizon we explore why the technology shift for each horizon matters, a definition of terms, benefits and challenges of the technology shift in medicine and conclude each section with a reflection on the implications of each horizon for capability development of the medical workforce. In this review of technologies we will explore the horizons from 3 to 2 and then 1.

Over the next twenty years the global health landscape will be impacted by current, emerging and new technologies. Current technologies include telehealth and digital recording systems for safe and quality delivery of care, with a focus on increased and more convenient access. Emerging technologies include genomics, Artificial intelligence, and robotics. In addition, new technologies, focused on personalised healthcare are increasingly becoming available.

Central to the effective use of technology in healthcare is the use of validated tools and sharing of good practice implementation across the globe and the integration of value-based and people centred approaches to healthcare delivery. This means that the implementation of technology innovation in healthcare needs to be undertaken in such a way that it is less about the technology and more about the delivery of patient-focused care. Sometimes referred to in practice and the informatics health literature as value-based care, such philosophy shifts in healthcare delivery are seeing 'a profound shift in perspectives towards wellbeing and wellness, convenience, flexibility, self-direction and personalised experience. This goes beyond sick care to healthfulness inspiring, encouraging and teaching individuals to make positive care and lifestyle choices and engage in accountability for lifelong health.' (Coughlin et al. 2017)

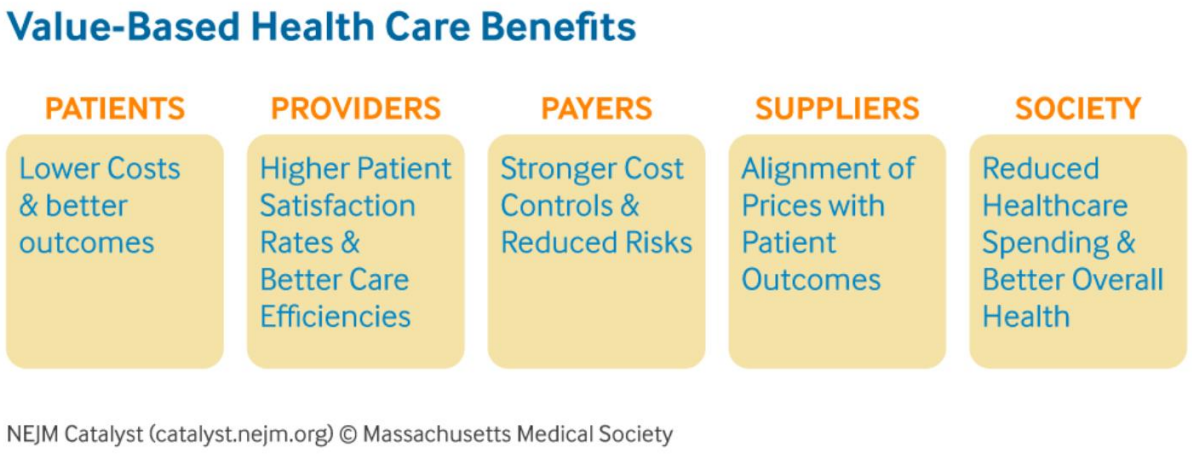


Figure 16: High Value Healthcare – key benefits

For these current, emerging and personalised technologies to deliver on their promise for improving healthcare and patient wellbeing, they need to be implemented in such a way that value-based care principles are met.

Horizon 1: Current Technologies in Healthcare

Telehealth

Why Telehealth Matters?

Telehealth can have significant benefits for patients, specialists and their teams. When used in the right context, telehealth can offer an effective alternative to face-to-face consultations (Figure 17).

Figure 17: Why Telehealth Matters
https://specialist-toolkit.digitalhealth.gov.au/telehealth-consultations

A Definition of Terms

Telehealth consultation is the provision of healthcare over distance using communication technology. Technologies such as telephone and video conferencing enable specialists and patients to connect remotely, saving time and travel costs.

https://specialist-toolkit.digitalhealth.gov.au/telehealth-consultations

Challenges of Using Telehealth in Medicine

Some of the challenges, solutions, and lessons learned reported by the Agency for Healthcare and Research Quality (AHRQ) included:

- **Security and interoperability** presented challenges for these providers, because disparate healthcare organizations were required to communicate information. To overcome these issues, grantees coordinated common security technologies, including firewalls and encryption, while sharing and maintaining security protocols. This required cooperation between different healthcare providers and the coordination of departments beyond IT. The report pointed out, "*Changing organizational policies requires buy-in from organization leaders who understand the value of telehealth for providers and patients."*
- **Image resolution** and video quality requires significant bandwidth. Providers reported low-resolution video was less-than-adequate for healthcare applications. The providers recommend introducing telehealth in pilot projects in order to work out these kinks. However, it should be noted that the study encompassed the years 2004 through 2014, and bandwidth, as well as the resolution and quality of digital video cameras, have greatly improved today.
- **Technical support** that is efficient and cost-effective is a requisite for these programs. For the academic facilities, internal technology departments provided technical support. Rural healthcare programs had fewer resources and many times technical support was provided by a consultant or third-party vendor. This was an expensive undertaking several years ago that has been mitigated over time with more user-friendly applications.
- **Organisational culture** changes as part of any telehealth services offering. Gaining the buy-in of stakeholders is imperative in any new service line. Yet the grantees found that because patients saw many different providers within a healthcare organization, telehealth helped facilitate a team-centric approach that lent itself to coordinated care. The challenge of coordinating care improves with telehealth, because it eliminates geographic distances that stymie communication between providers and their patients. The study said, "*Telehealth supports and enhances team-based care by connecting providers remotely to foster collaboration and health information exchange."*
- **Provider retention in rural areas** is often a significant challenge. Rural doctors can feel isolated and may seek a more urban practice. Interestingly, the study found that telehealth had a side benefit of connecting rural providers with their peers from other hospitals in both urban and rural settings. One project funded by AHRQ developed a telehealth-driven learning network for doctors and other clinicians. The project surveyed network participants and found that the clinicians felt more confidence when treating complex and chronic diseases. They also reported higher job satisfaction. Prior to implementing telehealth, some of these providers had to drive up to 100 miles to participate in healthcare learning events and networking activities. After implementing the telehealth learning network, grantees reported lower turnover among doctors, nurses, and other clinical providers. The study reported: *The investigators learned that the practice staff enjoyed interacting with peers at other practices and felt connected to their profession in a way they had not prior to the implementation of the telehealth network.*

Electronic Records

Why Electronic Records Matter?

The benefits of electronic records have been demonstrated internationally of providing people and clinicians with access to shared health information include improved patient safety and health outcomes through increased adherence to treatments, and health system efficiencies relating to time savings for clinicians, reduced unnecessary duplication of investigations and avoided hospital admissions. (Digital Health Evidence Review 2018).

Keeping good medical records, preparing timely medical reports and providing accurate medical certificates are essential components of good medical practice. As tangible evidence of standards of medical practice readily visible to others, these three components are a frequent basis of complaints made against doctors and for this reason alone deserve to be dealt with conscientiously. (Breen 2015)

In Australia, My Health Record is a secure online summary of a patient's health information and is available to all Australians. Healthcare providers and other staff that are authorised by their healthcare organisation can access My Health Record to view and add patient health information.

Information that can be accessed via My Health Record includes shared health summaries, medicines information including prescription and dispense records, discharge summaries, pathology reports and diagnostic imaging reports.

Figure 18: Why Electronic Records Matter
https://specialist-toolkit.digitalhealth.gov.au/myhealthrecord

A Definition of Terms

Breen provides a useful definition of **what constitutes a medical record:**

A patient's medical record includes information recorded about the medical history, findings on physical examination, possible diagnoses, investigations, treatment provided and follow-up advice. The record also includes correspondence from other doctors. Information usually kept separately—such as images from X-rays, ultrasounds or other techniques, and clinical photographs—also form part of the medical record.

Medical record remains a convenient term that includes all the information about a patient to which the doctor's ethical and legal duties of confidentiality apply, but neither the concept nor the term is used in privacy law. The key terms there are *personal information* and *health information*. The Commonwealth *Privacy Act 1988* and health privacy acts in New South Wales and Victoria use similar definitions of *health information*, which indicates what a medical record would normally contain. For example, Victoria's *Health Records Act 2001* defines *health information* as:

a) information or an opinion about —
   (i) the physical, mental or psychological health (at any time) of an individual; or
   (ii) a disability (at any time) of an individual; or
   (iii) an individual's expressed wishes about the future provision of health services to him or her; or
   (iv) a health service provided, or to be provided, to an individual – that is also personal information ; or
b) other personal information collected to provide , or in providing, a health service ; or
c) other personal information about an individual collected in connection with the donation, or intended donation, by the individual of his or her body parts, organs or body substances; or
d) other personal information that is genetic information about an individual in a form which is or could be predictive of the health (at any time) of the individual or any of his or her descendants.

Normally, copies of medico-legal reports, such as those requested by and provided to lawyers and insurers, are held within the patient's medical record. It is important to note that such reports are the property of the agency that requested them. Where they have been prepared in contemplation of litigation, their release will be restricted and they should not be released without the permission of the owner. Correspondence with a medical indemnity organisation about a patient should not form part of the patient's medical record.

The Medical Board of Australia (MBA) provides clear guidelines about good practice in maintaining medical records. Section 8 of the MBA's code of conduct sets out clear guidelines for effective use of medical records in the medical profession:

8.4.1 Keeping accurate, up-to-date and legible records that report relevant details of clinical history, clinical findings, investigations, information given to patients, medication and other management.

8.4.2 Ensuring that your medical records are held securely and are not subject to unauthorised access.

8.4.3 Ensuring that your medical records show respect for your patients and do not include demeaning or derogatory remarks.

8.4.4 Ensuring that the records are sufficient to facilitate continuity of patient care.

8.4.5 Making records at the time of the events, or as soon as possible afterwards.

8.4.6 Recognising patients' right to access information contained in their medical records and facilitating that access.

8.4.7 Promptly facilitating the transfer of health information when requested by the patient.

Challenges of Using Electronic Records in Medicine

In spite of significant health uptake of digital technologies in delivery of care there has been a lag at a system level in digital health Electronic Medical Record (EMR)** and Electronic Health Record (EHR)^^. Innovation and uptake has been patchy with few integrated systems internationally. The challenges of largescale EMR/EHR implementations are well documented in the literature and shared on a global scale through the Global Digital Health Partnership (GDHP) convened in February 2018 as an international collaboration of governments and government agencies responsible for the delivery of digital health systems as well as the World Health Organisation (WHO). Internationally similar nationally implemented systems to My Health Record in Australia, allowing citizens access to their health information, may be found in Austria, Denmark, Estonia, France and Sweden. Legislation varies internationally regarding specified content, the need for patient consent, a patient's right to access and the mandatory use of electronic health records and personal health records.

In Australia, paper-based systems and faxes remain the standard communication method for sharing of patient data at a system level in many hospitals. Uptake by General practitioners has been more successful than at the specialist care level.

** digital record systems created and residing within a single healthcare organisation.

^^ information, which can be managed across multiple healthcare organisations.

Telehealth and Electronic Records and the Capability Development of the Medical Workforce

Central to workforce capability development is the need to engage in lifelong learning and to integrate learning into new workflows incorporating digital technologies across the medical education.

For further information see https://specialist-toolkit.digitalhealth.gov.au/cpd

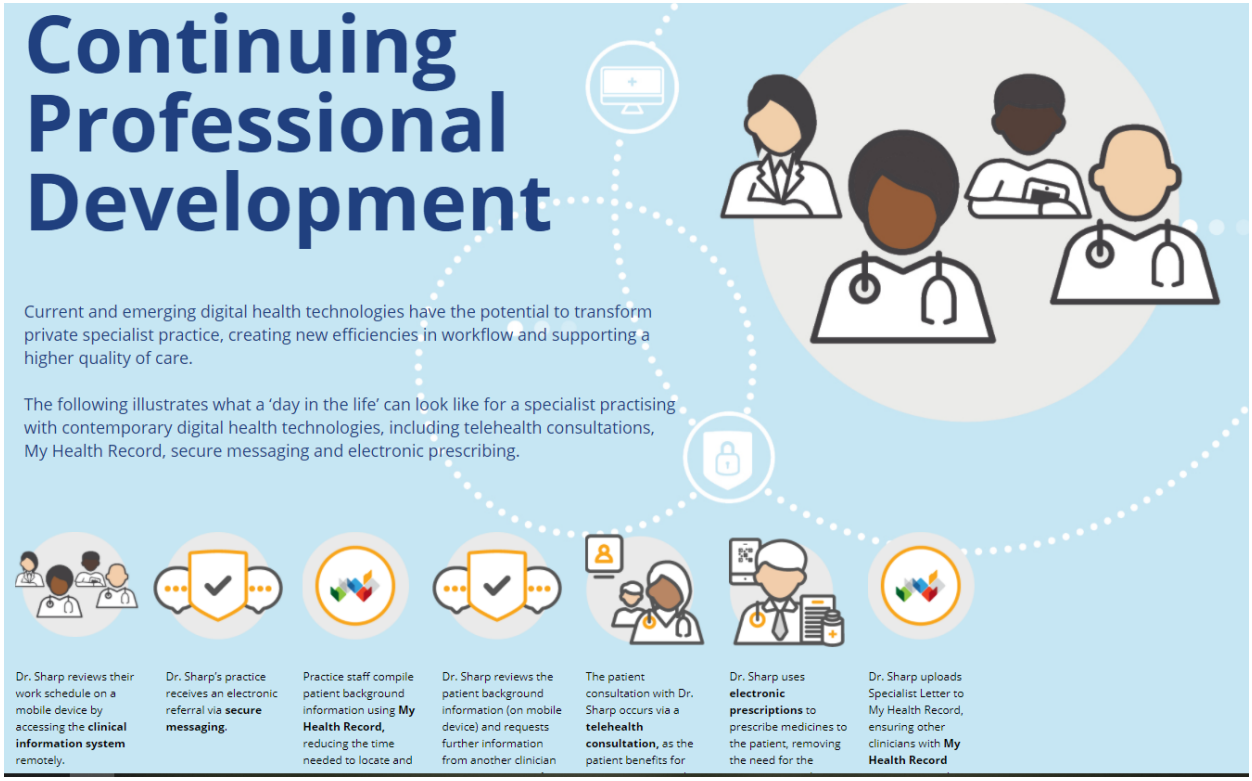


Figure 19: Rethinking the medical workflow with use of technologies – digital records and telehealth https://specialist-toolkit.digitalhealth.gov.au/cpd

In this model, patient and health worker workflows are reconfigured to incorporate effective use of technologies to improve the patient experience and health outcomes as well as to improve communication between health workers and improved efficiencies at a system level. As shown in figure 19 the workflow includes the medical professional:

- reviews their work schedule on a mobile device by accessing the clinical information system remotely
- receives an electronic referral via secure messaging
- gains background information about the patient compiled by practice staff using My Health Record, reducing the time needed to locate and access important information
- reviews the patient background information (on mobile device) and requests further information from another clinician via secure messaging
- conducts the patient consultation via telehealth with patient benefits for connecting remotely outweighing the benefits (in this instance) of attending a face-to-face consultation
- uses electronic prescriptions to prescribe medicines to the patient, removing the need for the patient to visit the practice
- uploads specialist letter to My Health Record, ensuring other clinicians with My Health Record access can see key information about the consultation, such as diagnoses and medicines.

Horizon 2: Emerging Technologies

Why Emerging Technologies Matter?

Emerging Technologies can improve people's lives and health in many ways. Technological advancement can help health workers to complete tasks more efficiently, keep patients safer and healthier and also protect the environment:

- **Efficiency**
- **Safety**
- **Better Health Outcomes**
- **Environment**

There are a variety of potential technologies, at varying stages of development and application (Figure 20)

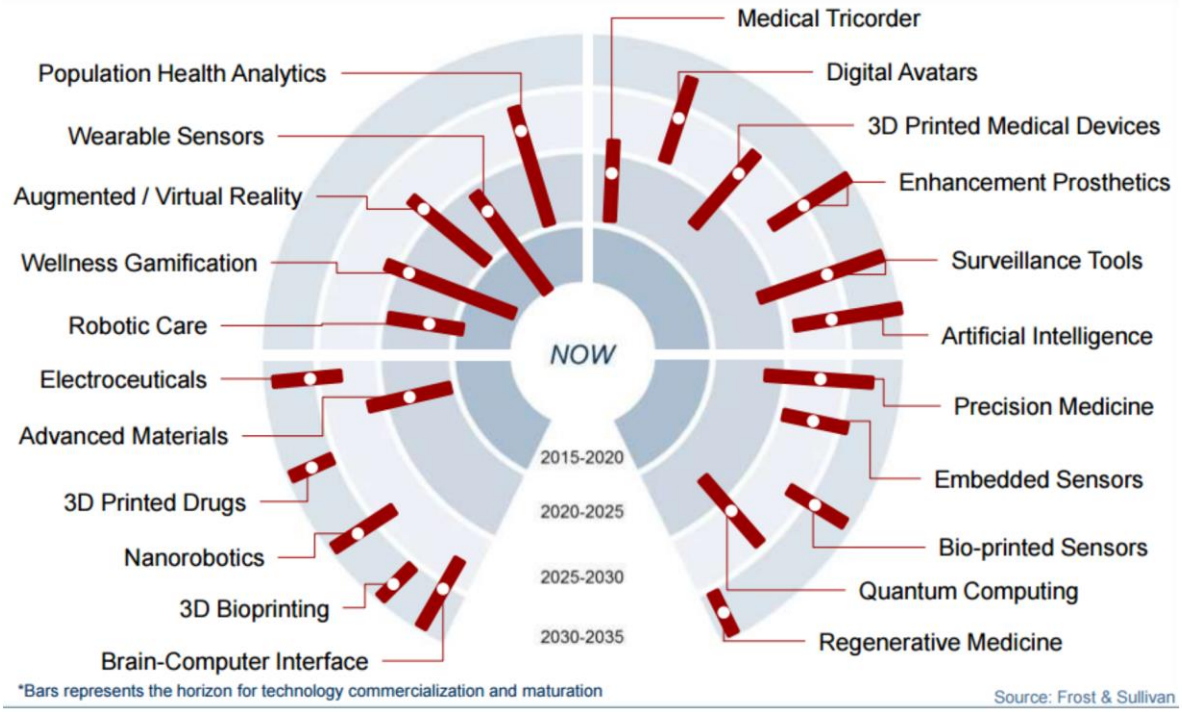


Figure 20: Technology Commercialisation and Maturation – Frost and Sullivan https://ww2.frost.com/

Key to learning about these new technologies is for doctors to gain capabilities in how they are used to support decision making, the changes to workflows and work practices, how data sets from these different technologies integrate and how such data can be used for more sophisticated data driven models of care. Furthermore, use of these technologies involves new ethical decisions as well as privacy and security issues.

A Definition of Terms

Key findings from the National Digital Workforce and Education Roadmap drawn from Faethm research into predictions concerning impact of emerging technologies on Specialist Health of the Future, is adapted into the table below which shows that the top five technology impacts include predictive analysis, suggested provision, process automation, assistive robotics, and decision generation

Technology Impact	What is it?	What will be different?
Predictive Analysis	Predictive analytic Technologies are tools that use algorithmic-based process and prediction software to evaluate historical and real-time data.	Relevant information is extracted to make predictions about the future. Predictive analysis is capable of searching through very large and varied source of data and using them to predict outcomes for individual patients.
Suggestion Provision	Suggestion Provision technologies are tools that reactively prioritise and rank data to identify relevant recommendations for specific parameters and goals.	Data is filtered, using machine learning and specific parameters of a problem, distinguishing and ranking outcomes to provide estimated solutions. Doctors have access to an interface which they use as decision support. Doctors can ask questions in natural language about symptoms and treatments. Within seconds they have access to a technology informed, evidence-based response.
Process Automation	Process automation is defined as technologies programmed to complete pre-defined, logical and rule-based processing of tasks such as quantitative calculations, process onboarding, monitoring and simple robotic jobs and movements. This works by applying rule-based logic to take structured inputs and using predefined executable steps, deliver structured outputs.	Healthcare is highly process driven from admission to discharge, patients follow numerous processes many of which can potentially be augmented with automation to reduce time to perform low value tasks.
Assistive Robotics	Robots in medicine assist by relieving medical personnel from	Assistive robots have the potential to provide support for a range of care-related tasks such as physical and social

	routine tasks that take time away from more pressing priorities, and by making medical procedures safer and less costly for patients. They can also perform surgery and transport dangerous substances.	assistance, physiotherapy and rehabilitation.
Decision Generation	Clinical Decision Support provides timely information, usually at the point of care, to help inform decisions about a patient's care. Clinical decision support can effectively improve patient outcomes and lead to higher-quality healthcare.	Decision support systems allow for more informed decision-making, timely problem solving, and improved efficiency in dealing with issues or operations, planning and even management. Clinical decision support (CDS) provides clinicians, staff, patients or other individuals with knowledge and person-specific information, intelligently filtered or presented at appropriate times, to enhance health and health care. CDS encompasses a variety of tools to enhance decision-making in the clinical workflow. These tools include computerised alerts and reminders to care providers and patients; clinical guidelines; condition-specific order sets; focused patient data reports and summaries; documentation templates; diagnostic support, and contextually relevant reference information, among other tools. https://www.healthit.gov/topic/safety/clinical-decision-support https://ecqi.healthit.gov/cds

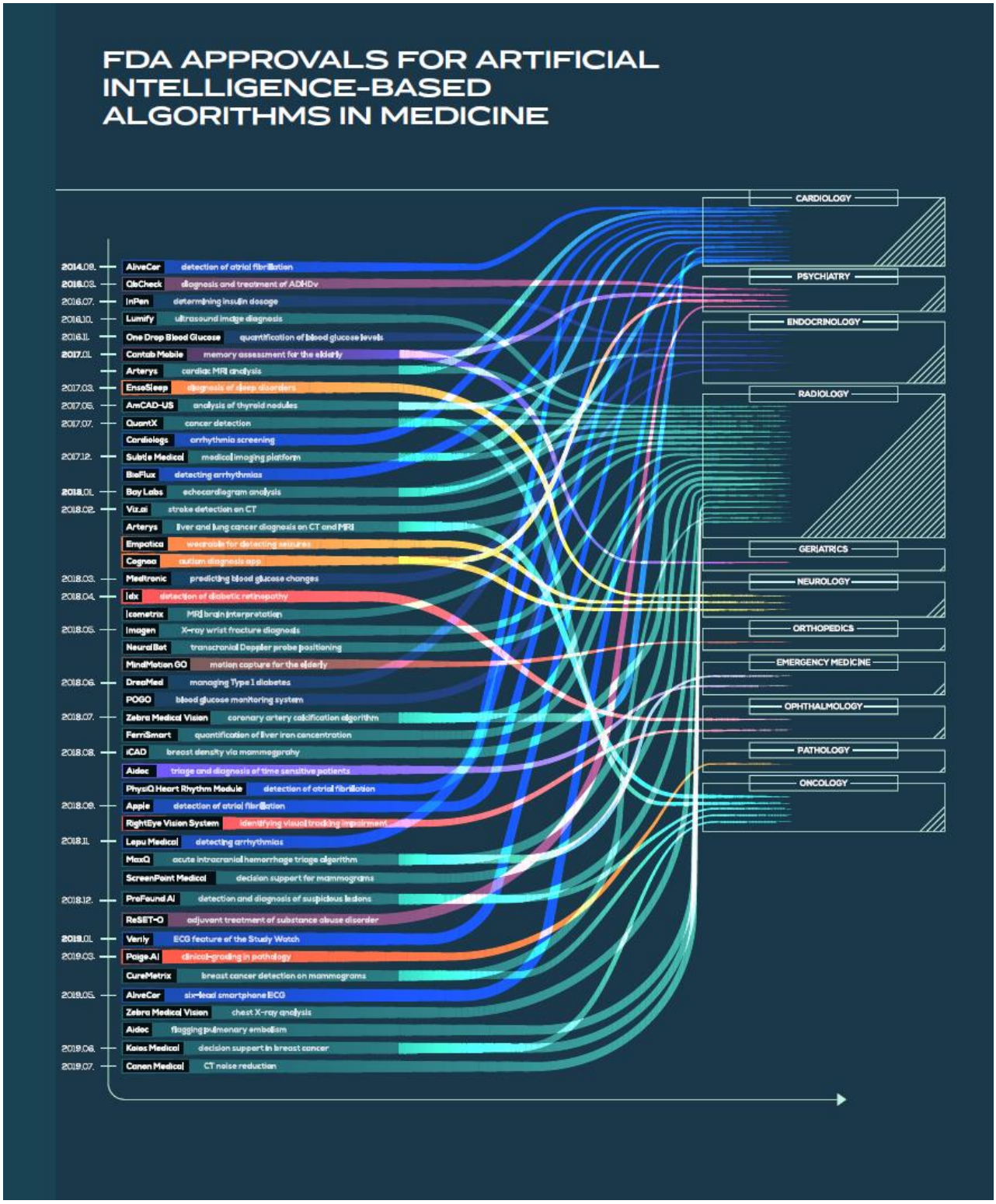


Figure 21: USA – Food and Drug Administration (FDA) Approvals for Artificial Intelligence-Based Algorithms per medical specialty[Extract The Medical Futurist Institute Trends in Digital Health In 2020]

Challenges of Using Emerging Technologies in Medicine

Sung et al. (2020) point to four key challenges related to the use of emerging technologies such as AI in medicine:

Quality of data – Algorithms are being developed and validated on data generated by health care systems where current practices may not be optimal – furthermore, some data may privilege dominant cultural groups. This means that the AI system will replicate these biases and problems which may lead to continuing reinforcement of current structural inequalities of healthcare

Data sovereignty and stewardship – The public has concerns about the use of public data by private industry. We need clear governance about secure use of data.

Changing standards of care – The medical profession and other health workers will need to address how it partners effectively with AI for better health outcomes.

Clarification of regulation around legal responsibility for AI caused injury – As boundaries shift between machine and human in decision making, regulations will need to be clarified around legal responsibilities.

According to MIT Technology Review Insights 2019, many roles in healthcare will be augmented in the next ten years through AI decision support. The Top Challenges in deploying AI have been identified (Figure 23):

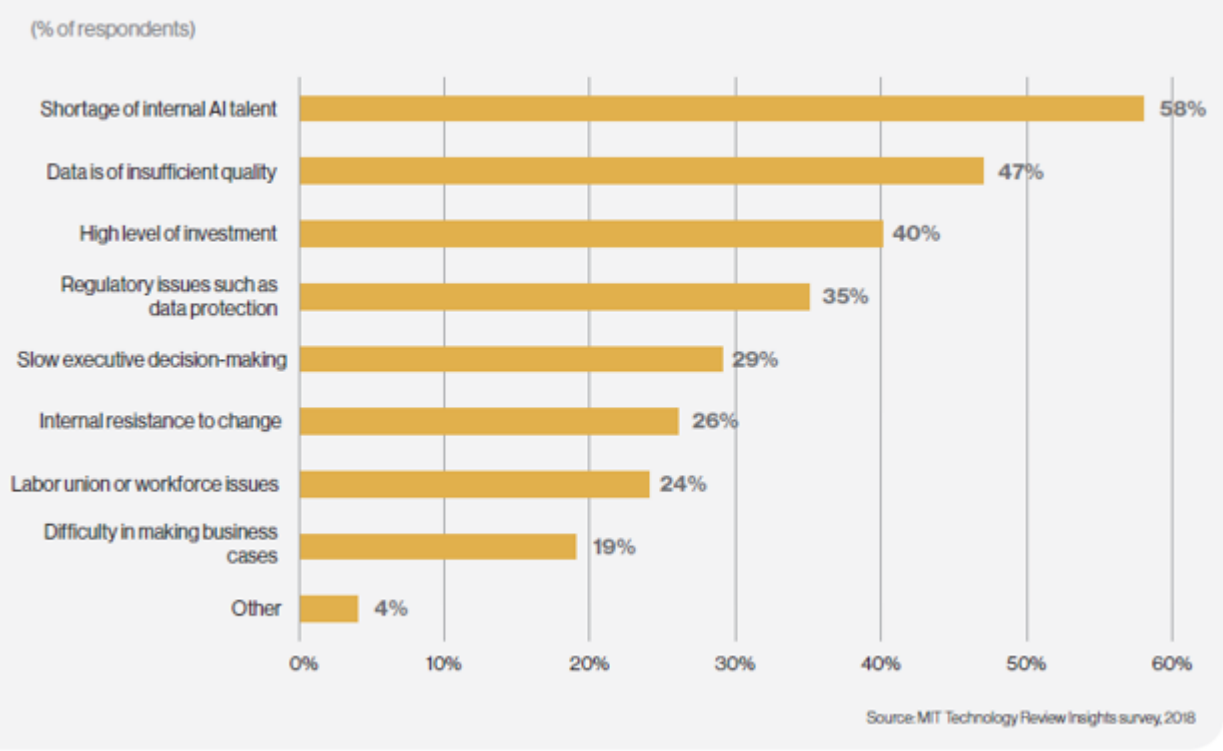


Figure 22: Top Challenges in Deploying AI - MIT Technology Review Insights Survey 2018.

Emerging Technologies and the Capability Development of the Medical Workforce

The health digisphere focuses on access to a range of current, emerging and personalised technologies which consumers of health can use 'to self-manage, make smarter choices and moderate health consumption and expectations.' (Figure 24) As Coughlin et al. point out 'the challenge will be to ensure some degree of equity as this transition occurs'.

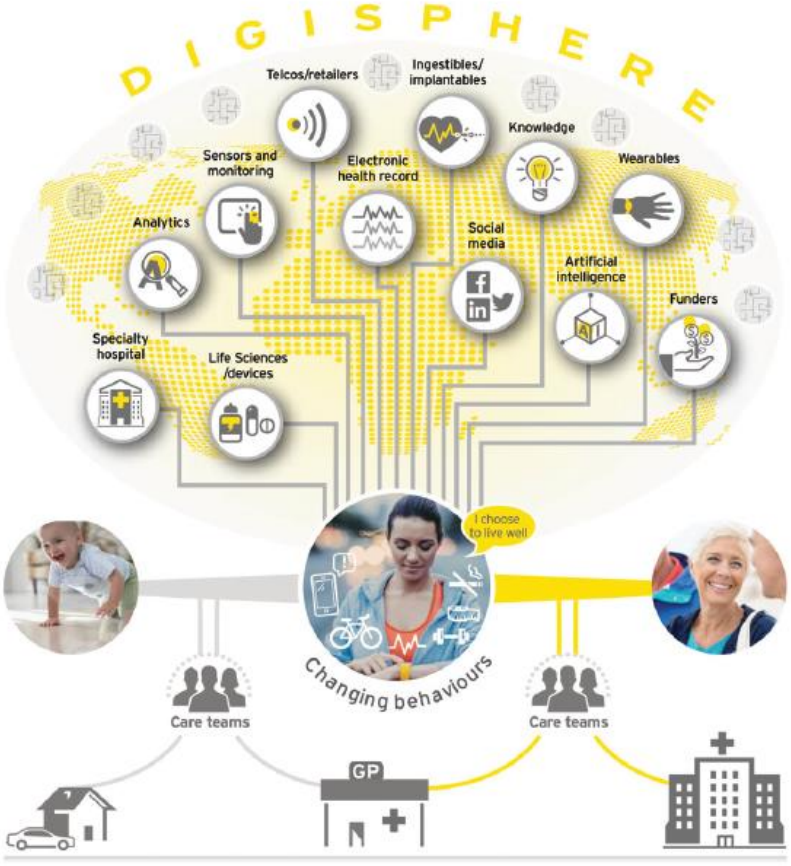


Figure 23: The Health Digisphere

The implications of these current, emerging and new technologies in healthcare delivery for the Australian medical workforce provide health workers and other key stakeholders of health with the required skills to navigate these changes in health. This includes:

- critical analysis of these technologies, access to information about validated tools,
- curated collections of technologies to integrate into healthcare delivery to improve the quality and access to safe care,
- modelling of effective use of current, emerging and new technologies in WHO Academy products and services,
- contingencies for contexts which have low technology resourcing so that accessibility and relevance of innovations in health and opportunities for health workforce development are not compromised,
- seeding grants to pilot and support the improved technology infrastructure for lifelong learning in low resource contexts,

- horizon scanning of technology innovations and workforce plans for digital health workforce development globally and align plans for future technology access and reference in products and services with strategic platforms of change.

Ethical Use of AI and Technology Enabled Learning

Possible considerations for the ethical use of AI in lifelong learning and health are outlined as:

Key Themes	Future Focus
Multi-Disciplinary Capability	**Foster Multi-Disciplinary Capability in AI Design, Implementation and Ongoing Development and Research** AI development and research is being driven chiefly by large technology companies and technology experts. AI has multi-dimensional impacts. The forging of multi-disciplinary projects and opportunities for multi-disciplinary learning and education drawing on a range of perspectives including of health workers, policy makers, educators and consumers is central to the success of AI in health.
Transparency	**Ensure Transparency through Explainable and Interpretable Outputs and Audit** It is vital that in health we unpack the "black box" of AI technological modelling and that the data sets and assumptions on which health modelling are based are transparent and discoverable to ensure that there is no bias and discrimination which creeps into the design and implementation of AI decision support. This is important to ensure that the current inequities in health care are reduced rather than widened through progress and change.
Security and Privacy	**Observe Security and Privacy of Patient and Health Community Health Data** Central to all digital innovation and healthcare practice is considerations of data security and privacy.
Strength-based Partnerships	**Construct Strength-based Partnerships between Machines and the Health Workforce** Increasingly machines are taking more advanced roles in decision support. The power of machines is their access to huge data bases and ability to outstrip the human brain in processing this data to make an accurate determination. The impacts of such technologies are already changing the nature of many procedural medical specialties including dermatology and radiology through pattern recognition. Equally, robotics is significantly enhancing surgical practice. In healthcare practice it will be vital for career progression and workforce effectiveness to anticipate and plan for technological change. Skills development must focus on effective use of technologies and the elements of practice which humanize care and which humans alone are best suited to perform.
Bias and Discriminatory Impact	**Reduce Bias and Discriminatory Impact of AI Healthcare Education and Health Products and Services** The data sets and analytics on which they are based may have bias and discriminatory impact built into them. It is important that these data sets and analytics are analysed from a cultural safety perspective and that AI in healthcare practice is safeguarded against such effects which could

	negatively impact health outcomes and experiences of marginalized and vulnerable groups in the community. Equally, bias and discriminatory impact can occur in the context of poor access to technology infrastructure when required to use a learning resource. The Academy must be aware of the limitations in access to learning technology infrastructure in certain areas of the world and provide alternative technologies to the workforce in these nation states for comparable learning experiences, workforce development and support.
Responsibilities and Accountability	**Build Clarity around Responsibilities and Accountability for Decisions and Risk through AI Systems, Processes and Regulatory Frameworks** Clear governance frameworks around AI systems, processes and outcomes is vital to ensure that responsibilities and accountabilities for decisions and risks are identified and managed effectively.

Horizon 3: Personalised Technologies

Why Personalised Technologies Matter?

In Australia, we have a strong medical workforce and a robust health system but future health systems and delivery may look quite different. Whilst technology trends such as telehealth have been increasing in up-take over the past few decades, the COVID-19 pandemic forced rapid uptake of health technologies that could minimise face to face contact and ensure safe health care provision. It will be important to monitor how such trends and uptake will continue over the coming years. Some key challenges and key innovations by way of technological capabilities are providing us with opportunities to look at healthcare differently.

In the 21st century many Australians enjoy good living conditions and health. Our communities are, however, not without considerable health challenges: People are living far longer than in previous generations and with increased prevalence of chronic disease. In parallel, many people are within double income families so this makes caring for the elderly and long-term ill more challenging. For those living with chronic disease, disability and are elderly, the key challenge is how do I stay in my home and enjoy a degree of independence and lead a meaningful life? Being admitted to hospital and having healthcare significantly focused on the sentinel event of a hospital admission does not address the daily healthcare needs of the majority of people of the 21st century. The hospital focuses on the emergency and increasingly hospital stays are shorter. Many patients struggle with prevention and rehabilitation – the phases in healthcare which wrap around the admission to hospital. Our challenge in the 21st century in healthcare is to establish better ways of dealing with these phases in the health and wellbeing of patients and as a consequence to review medical workflows and practices. Technology provides opportunities for improvements to healthcare. Furthermore, improvements in healthcare are highly dependent on intra-organisational and system connections which can be facilitated through joined up health, employment, social housing, and community care and engagement as well as better social security systems.

Horizon 3 is essentially about moving to a world of real-time risk assessment across complex health systems and the use of combined data sets that support continual monitoring and outreach as well as virtual care navigation. We currently have little or no contact with patients between events. This horizon represents a far more patient-centred and proactive system that challenges current models and funding.

An example of such a shift is managing a person post discharge with cardiovascular disease. The doctor can use Interactive Voice Recording systems to monitor patients and assess risk as well as triage to live call and intervention as required. Technology improves access to ensure patients have a GP and that they get to that GP. It also involves the use of apps and devices to encourage compliance with medication. This horizon also enables a shift away from annual cardiac check-ups with cardiologists for low risk patients based on continual monitoring of primary, acute and personal device data.

This horizon is fundamentally about team work, empowering patients and revising roles.

In this section, we explore some of the problems impacting the current health system with implications for the 21st century which are putting pressure on those systems and ways of working.

A Definition of Terms

Specialist medical care concentrates on disease-specific outcomes following practice guidelines for specific conditions. Disease-centred decision making results in 'treatment burden when patients must adhere to multiple guidelines and harm when guideline recommendations conflict." (Tinetti, M. et al. 2016)

To consider an alternative to disease-centred decision making that better aligns care with what matters most to patients and reduces treatment burden, it is helpful to think of healthcare decision as value propositions in which value = health outcome/cost (Figure 24).

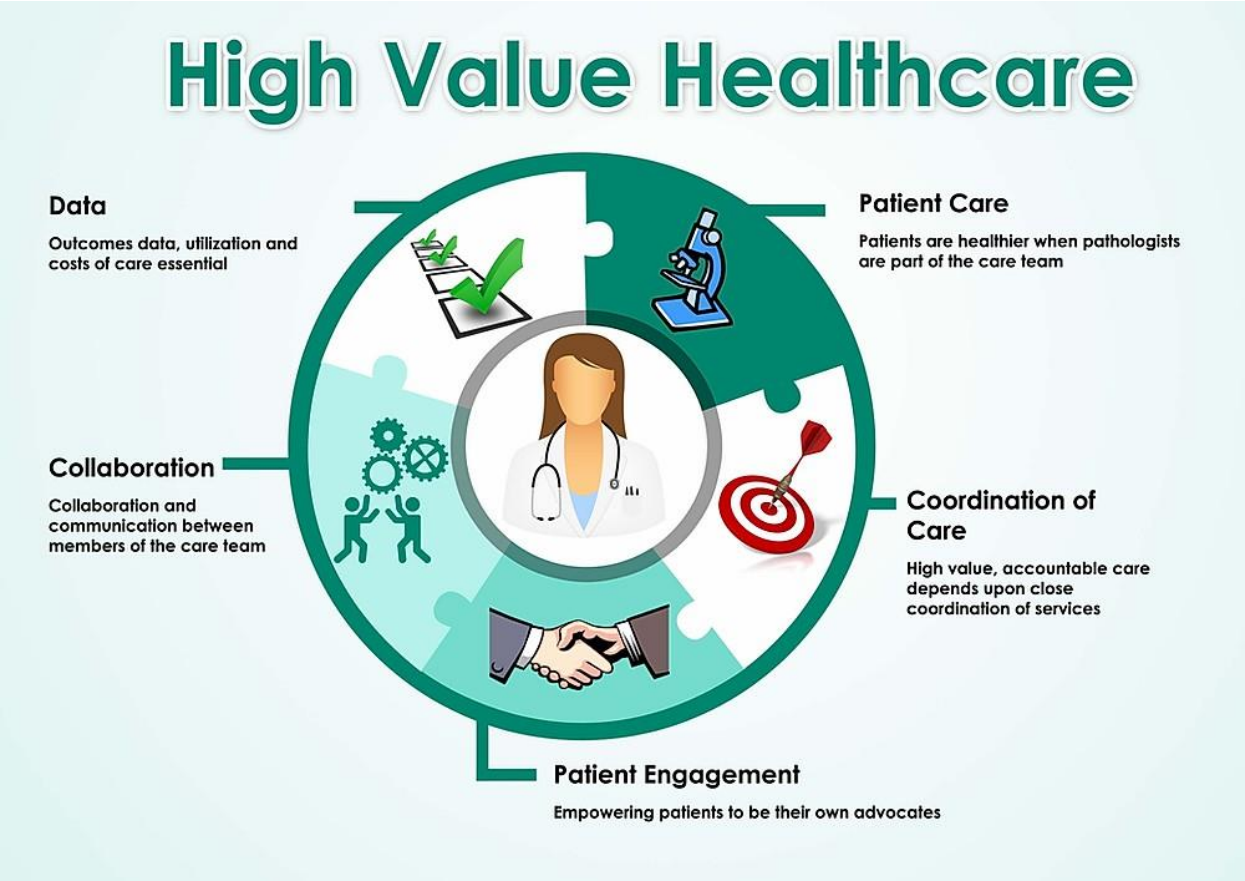
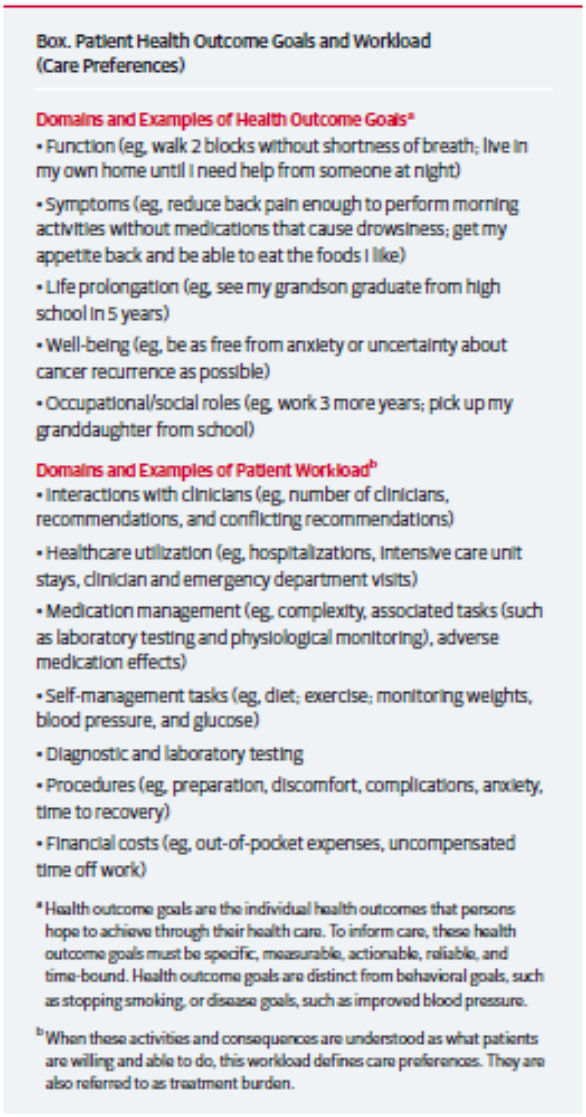


Figure 24: High Value Healthcare – key benefits

https://www.pathreport.org/post/2015/09/07/value-based-healthcare-and-the-triple-aim



Box. Patient Health Outcome Goals and Workload (Care Preferences)

Domains and Examples of Health Outcome Goals[a]

- Function (eg, walk 2 blocks without shortness of breath; live in my own home until I need help from someone at night)
- Symptoms (eg, reduce back pain enough to perform morning activities without medications that cause drowsiness; get my appetite back and be able to eat the foods I like)
- Life prolongation (eg, see my grandson graduate from high school in 5 years)
- Well-being (eg, be as free from anxiety or uncertainty about cancer recurrence as possible)
- Occupational/social roles (eg, work 3 more years; pick up my granddaughter from school)

Domains and Examples of Patient Workload[b]

- Interactions with clinicians (eg, number of clinicians, recommendations, and conflicting recommendations)
- Healthcare utilization (eg, hospitalizations, intensive care unit stays, clinician and emergency department visits)
- Medication management (eg, complexity, associated tasks (such as laboratory testing and physiological monitoring), adverse medication effects)
- Self-management tasks (eg, diet; exercise; monitoring weights, blood pressure, and glucose)
- Diagnostic and laboratory testing
- Procedures (eg, preparation, discomfort, complications, anxiety, time to recovery)
- Financial costs (eg, out-of-pocket expenses, uncompensated time off work)

[a] Health outcome goals are the individual health outcomes that persons hope to achieve through their health care. To inform care, these health outcome goals must be specific, measurable, actionable, reliable, and time-bound. Health outcome goals are distinct from behavioral goals, such as stopping smoking, or disease goals, such as improved blood pressure.

[b] When these activities and consequences are understood as what patients are willing and able to do, this workload defines care preferences. They are also referred to as treatment burden.

Figure 25: Patient Health Outcomes and Workload – Sample from Cardiology of Value Based Care [Extract Tinetti. M. et al 2016].

The value-based care model drawn from a study in cardiology (Figure 25), shows a shift in the types of communication and priorities with which the doctor and the patient engage. This example shows that the doctor engages with the patient to identify what their goals are in a range of different domains including function, symptoms, life prolongation, wellbeing and occupational and social roles. This shifts from the current state medical model, which relies heavily on pharmaceutical solutions to care, and is not always focused on the patient's needs and goals. The advantage in this shift is that the patient is engaged in their health and care and is a partner in health. In this way, the patient is more likely to develop health literacy and is involved in the difficult decisions of balancing quality with quantity of life; and responsible use of finite health resources. This proposes a more patient focused model of care.

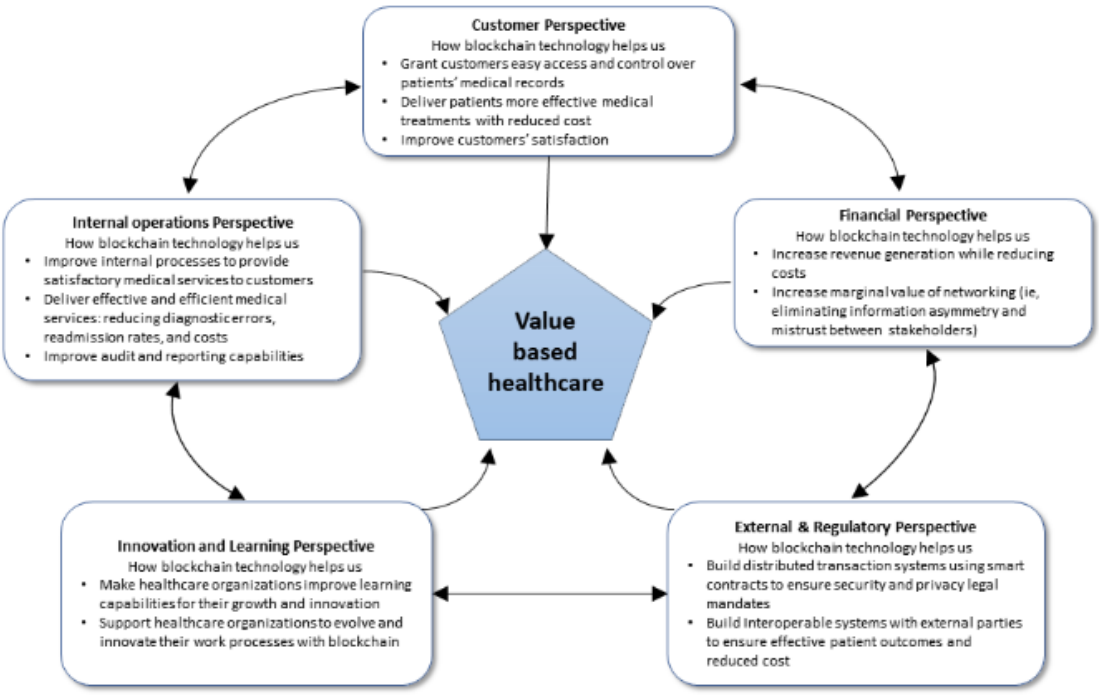


Figure 26: Value Based Healthcare – Multiple Perspective approach – Proposed Framework for evaluating blockchain Initiatives for Value-Based Care https://www.jmir.org/2019/9/e13595/

There are a number of proposed benefits and technology requirements and infrastructure for achievement of value-based care (Figure 26). These incorporate the various perspectives underpinning value-based healthcare including the customer perspective, financial perspective, external regulatory perspective, innovation and learning perspective and internal operations perspective.

Challenges of Value-Based Care in Medicine

At a system and professional practice level value-based care means adopting new work practices and ways of thinking about care. Providing patient-centred, integrated, evidence-based and collaborative models of care pose challenges to systems. NSW Health, as the largest health jurisdiction within Australia, is seeking to implement value-based care (Figure 27):

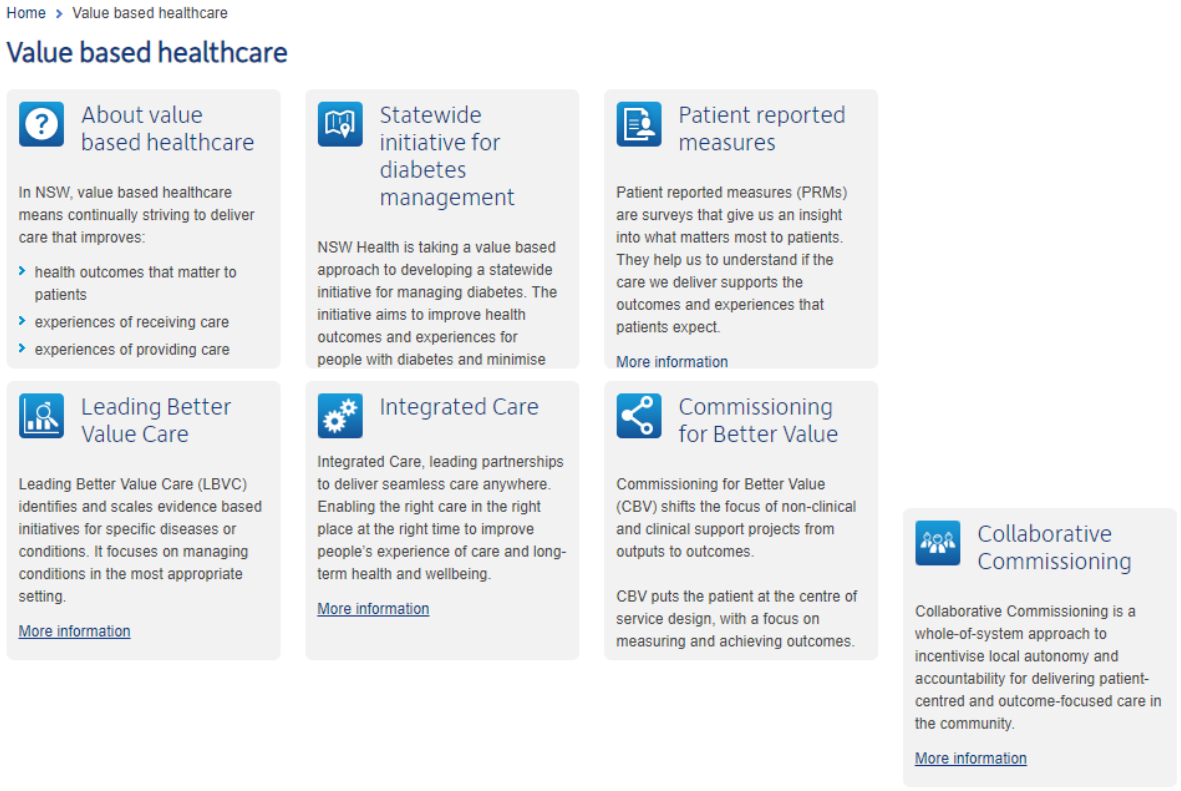


Figure 27: Value-Based Care – NSW Health
https://www.health.nsw.gov.au/Value/Pages/default.aspx

Particular challenges can be experienced in measuring outcomes and costs of care – for useful resources see *https://valuebasedcareaustralia.com.au/resources/measuring-outcomes-and-costs/*

Value-Based Care and the Capability Development of the Medical Workforce

As pointed out by Value-Based Australia - Value for patients is created at the local level, by the combined efforts of providers in partnership with patients. Clinician and organisational leadership have been identified as critical factors in successfully shifting to value-based approaches to care. Defining patient groups or population segments, and mapping their healthcare journey is an important first step to get a shared understanding of the patient experience by everyone involved in the care cycle. Experience-based co-design is important for services considering the patient's healthcare journey, and shared decision-making important for clinicians working with individual patients in clinical practice.

Shared decision making
Experience-based co-design
Using data and digital to improve the patient experience
Clinician leadership
Patient journey mapping
For further resources to support the integration of patient-centred care see

https://valuebasedcareaustralia.com.au/resources/value-in-partnership-with-patients/

Why a Model for Digital Health in Medicine that Crosses the Continuum

Capability development of the health workforce is enabled through the creation of a capability framework which sets out the core learning outcomes which doctors need to achieve for safe and quality practice. Central to the successful uptake of such capabilities by medical education providers is the need to identify evidence-based and realistic foundational outcomes for all doctors to achieve as well as to outline aligned teaching and learning, and assessment plans. In this section, we set out the proposed option for a Capability Framework for Digital Health in Medicine.

Current State – Models of Curriculum Design in Medicine

Curriculum design in medicine currently operates in such a way that innovations can occur across any of the four broad areas of the continuum (Medical Schools, Intern Training, Specialist Vocational Training and CPD). This can pose challenges which impact on agile cross curriculum skills development for the medical workforce in areas such as digital health:

1. **The assumption that beginning learners are digital natives and don't need formal training in digital health** – research into digital health shows that many junior doctors feel ill equipped to learn the foundations of clinical practice as well as having primary responsibility to learn new technology systems in healthcare settings. A common comment from junior doctors is that although they use their phones and social media more than older cohorts, this does not equate to the complexity or nature of learning required to navigate technology systems in healthcare settings. They do not have the underpinning knowledge related to these systems, and they are not familiar with the new ethical, quality and safety issues these technologies represent. Junior doctors also indicate that they need more formal training in how to use these systems effectively to maximise the care of their patients and minimise stress and burnout in their training. Equally, many settings use different levels of technology – junior doctors need the skills to help them understand good medical practice in highly developed technology settings as well as in low use technology settings.
2. **The length of time it takes to integrate curricula change across the entire continuum is slow** – the changes taking place in areas of medicine are moving quickly – even as part of COVID the protocols and workflows have changed significantly with increased uptake of telehealth and ePrescribing. This means that there are some changes i.e. digital health in medicine, which affect skill development for all – for junior doctors, interns and specialist medical doctors. It is important that we adopt models of curricula change for such important areas of skill development in such a way that we can share some common areas of learning across the entire continuum so we all have, at a minimum, some shared areas of foundational capability.
3. **Impacts on the health system** – there needs to be more connected methods of co-designing and diffusing medical education innovations across the health system so that workforce skills

are shared across the continuum of medical education and other health professions. This aims to support collaboration between health workers, and foster system integration through the sharing of common learning frameworks and agreed work practices.

The AMC plays a key role as the accreditor to support education providers to build curricula which:

- promote incremental learning across the medical continuum
- clarify foundational requirements in areas of innovation such as digital health
- provide joined up solutions to workforce education across health settings
- share good practice across the professions and sectors within the medical education as a means of increasing collaboration and minimising time consuming and costly reinvention of innovation in silos.

Integral to any approach to curriculum innovation will be the need to ensure that education providers who are early adopters in medical education innovation in digital health are able to continue with their advanced program offerings and their programs are not disrupted by any proposed approach to digital health in medicine.

This proposal is designed in response to a call for action by Australian Medical Education Providers to the AMC. These providers have stressed that it is important for the AMC to provide samples of what good practice looks like and guidance for areas of significant change.

The proposed approach is aligned with good practice in change management. Such an approach stresses the need for system leader support, supervisor and peer train the trainer support, and jurisdictional and technical support underpinning a lifelong learning approach to building a digitally capable medical workforce. It also foreshadows the resourcing requirements for such a change and advocates for increased support for education providers to make this change a reality. Furthermore, the proposed approach is seen to be short term only with education providers integrating customised approaches to capability development in digital health into their curriculum renewal projects.

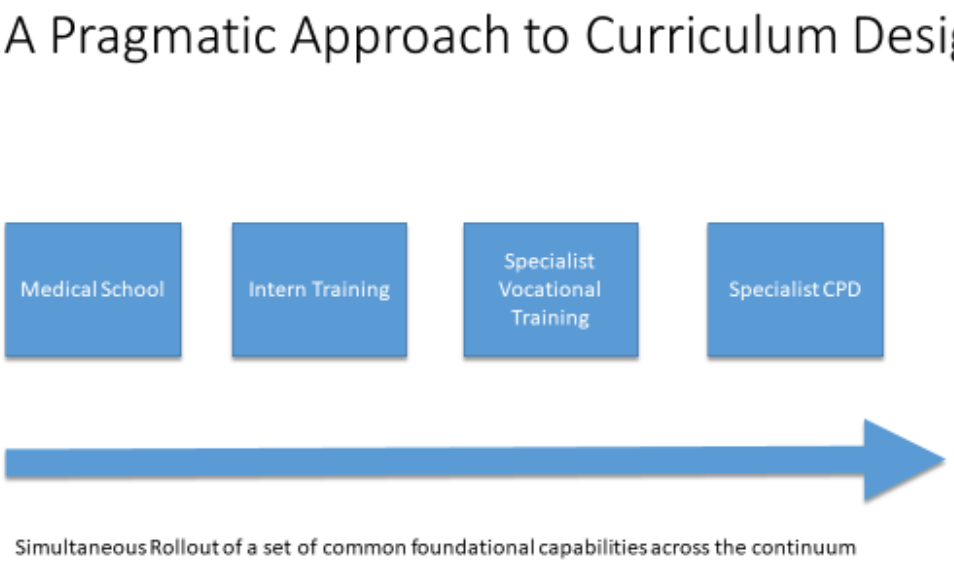


Figure 28: Model of Planned Innovation across the medical continuum

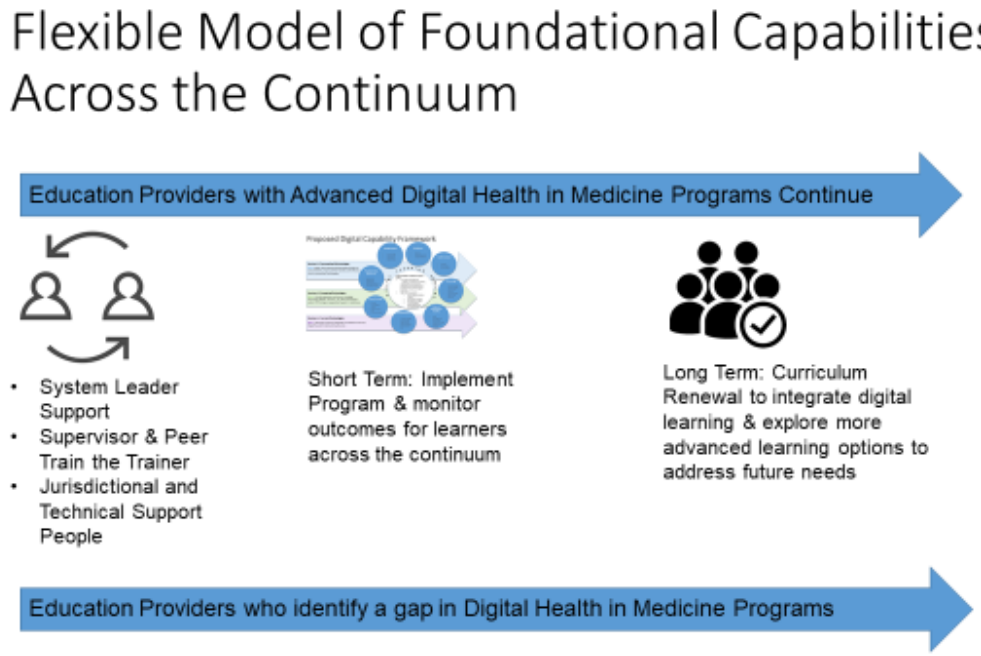


Figure 29: Flexible model of foundational capabilities across the medical continuum

By contrast in the proposed model, foundational capabilities in digital health are identified and rolled out across all stages of the medical education continuum simultaneously.

Advantages of this model are that:

1. **Disruptive change means new learning for all across the continuum of medical education** Change that is a result of broad disruptions are a feature of a changing world, have impacts across the whole continuum of the medical workforce with implications for the need for skill development and new ways of thinking across the whole continuum of medical education, not just for junior doctors. In such a model, the learning needs of all members across the continuum are addressed in the spirit of tacking disruptive change responsively and learning together, rather than focused on hierarchy. Furthermore, through a modest and unifying learning offering, systems leaders are brought on board for the change and resources allocated appropriately to support the change.
2. **Technology is not the only change impacting health** - the challenge of the crowded curriculum means that it is important that change is realistic. Equally, digital capabilities need to be developed in such a way that the approach reflects good practice in medicine and supports the medical workforce to make the required change in practice which new workflows require of them.
3. **Technology is positioned as a tool for improved healthcare** It is important to ensure that technology is seen for what it is – ultimately a tool. We need to think about how we can reimagine healthcare through technology. The alignment of this capability framework with the three horizons of the National Digital Health Workforce and Education Roadmap, with their focus on leveraging technology to bring about health improvements, enables us to achieve this end through future workforce development and education.
4. **Importance of focusing on integration of digital health capability development into changing medical practices and workflows** rather than following technological fads.
5. **The length of time it takes to integrate change is significantly quicker** than in the traditional planned innovation model in medical education – with no learners across the continuum missing out on the learning opportunity given that baseline capabilities in priority areas such as digital health are learnt for all across the continuum.
6. **We need to think of curriculum innovation as a change management exercise with change management methods integrated into its design and rollout** – this means ensuring that supervisors have the skills and programs of learning to provide them with the skills to teach others. We also need to ensure that system leaders and technical staff are well briefed and supportive of the change. Addressing supervisor learning needs means that more senior people within the system are given the skills to help them to lead change initiatives and do not feel disempowered. It is anticipated that this will support change and minimise resistance.
7. **The proposed model of curriculum innovation poses a neat antidote to counteract the assumption that beginning learners have less skill in digital health** – with more junior doctors and more senior colleagues in medicine all gaining some base skills.
8. **A risk is that in this model one needs to ensure that there is access to resourcing across the system to ensure that dependencies of success are addressed**. These dependencies include piloting prior to rollout; communication, technology, education resources, people training (awareness and skills development for supervisors and peer teachers) and impact evaluation (model and technology for data collection and analysis).

Delivering Workforce and Education Objectives

In this section, we draw on key findings from the National Digital Health Roadmap and broader medical and health education literature to propose teaching and learning, and assessment methods to support the fostering of a digitally capable medical workforce.

Delivering workforce and education objectives

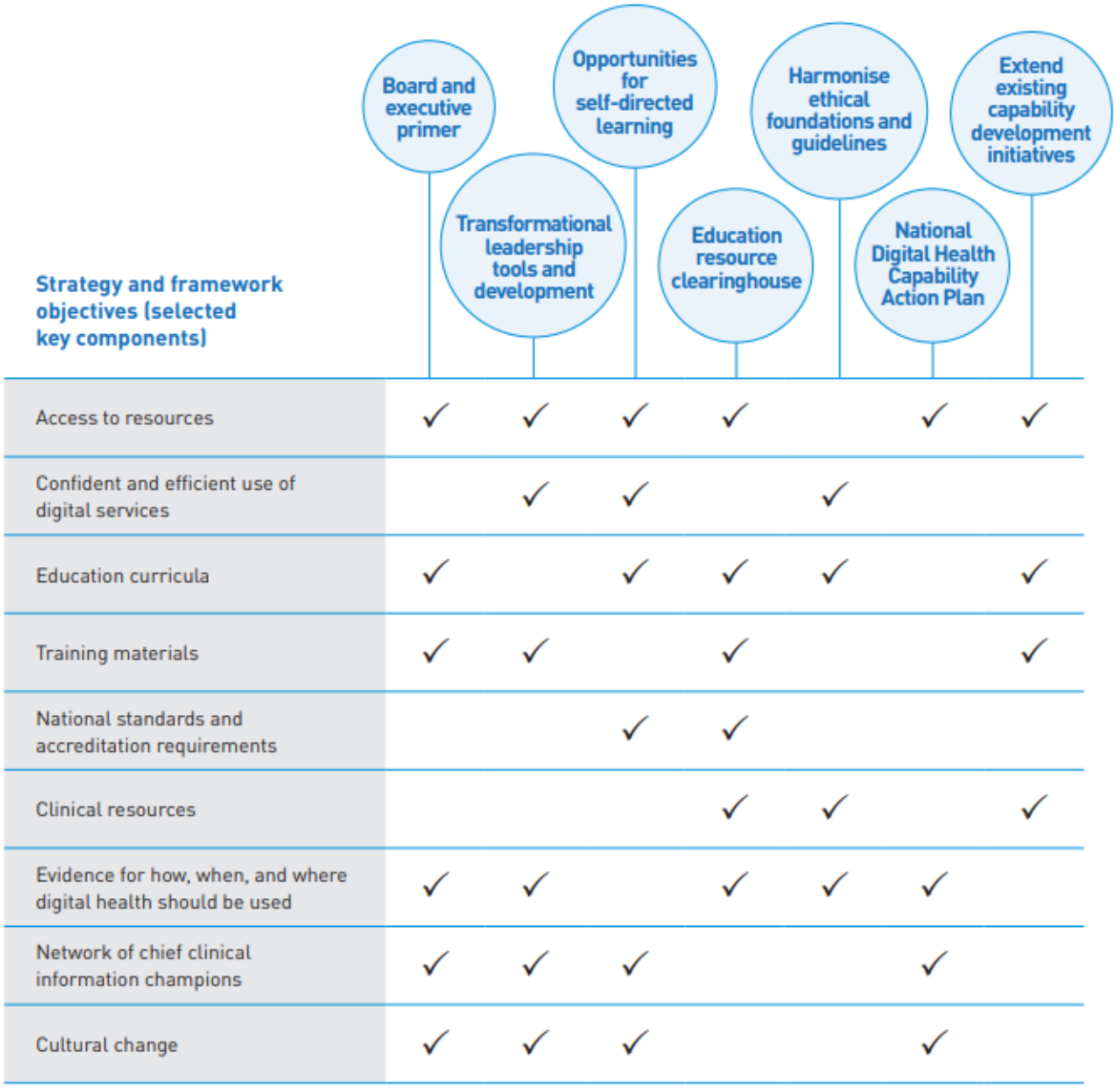


Figure 30: Teaching and Learning Interventions – Framework for Action – Australian Digital Health Workforce Roadmap

Proposed Framework for Capability Development in Medicine

Capability Frameworks can be developed in a range of different formats. The proposed model is designed in such a way so as to maximise impact and uptake by medical education providers. It includes a focus on foundational digital capabilities, teaching and learning programs, assessment and measurement of impact.

This framework seeks to add to the literature and extend the body of work of existing frameworks in digital health in medicine in four important ways:

1. **Strategic Alignment of Medical Education with National Workforce Framework in Digital Health Capability Development** Explicit strategic alignment with the three Horizons of the National Digital Health Workforce and Education Roadmap – see the background of this paper for details of these horizons.
2. **Design for integrated teaching and learning, and assessment of priority work-relevant tasks** Address a key critique of competency based programs that detailed competencies can be difficult to implement and result in atomistic learning through leveraging the medical education innovation of Entrustable Professional Activities (EPAs). Focus on the operationalisation of multiple learning outcomes and gaining holistic teaching and learning as well as assessment of doctor performance on priority work tasks learners can be entrusted to perform with three key EPAs.
3. **Cross continuum focus** – Adopt a cross continuum focus to the capability framework in acknowledgement of the need for capability development for all generations of doctors – junior doctors and their more senior colleagues. The need for agile curricula development cycles to deal with disruptive change and areas of health reform priority such as digital health as well as the building of cohesion of skill development across the medical education sector.
4. **Integration of reference to teaching and learning, assessment and measurement of impact evaluation** rather than leaving these elements to stage 2 implementation plans. These proposed high-level teaching and learning, assessment and evaluation elements align with good practice methods of:
    - **teaching and learning** with scaffolded capability development built through multiple strategies with a focus on self-directed, simulated and workplace learning;
    - alignment with newer methods of **assessment** with a focus on programmatic assessment;
    - the **measurement of impact** being explicit in the model with markers linked to quality, safety and efficiency in healthcare, and continuous improvement cycles across the medical continuum.

The approach to the proposed model is a sample of how such minimum standards can be achieved and seen as an interim step to inform medical education providers as they work towards new models of curricula in the coming years, which provide integrated models of medical education incorporating digital capabilities. In line with medical education innovations across the continuum in Australia and overseas, this proposed framework elaborates on a possible option for how those medical education providers, who have yet to integrate digital capabilities into their curricula, could do so and get started by integrating some foundational capability development in digital medicine based on Entrustable Professional Activities (EPAs) (Ten Cate 2013) into their

medical education programs. The three proposed EPAs align with the three horizons of the Australian National Digital Health Workforce and Education Roadmap.

Foundational Digital Capabilities, Teaching and Learning Programs and Assessment

The framework below could provide a robust framework for the Digital Framework in medicine. Central to this framework is a series of recommendations as to how foundational digital capabilities can be supported and assessed as part of development of digital work readiness across the medical education continuum.

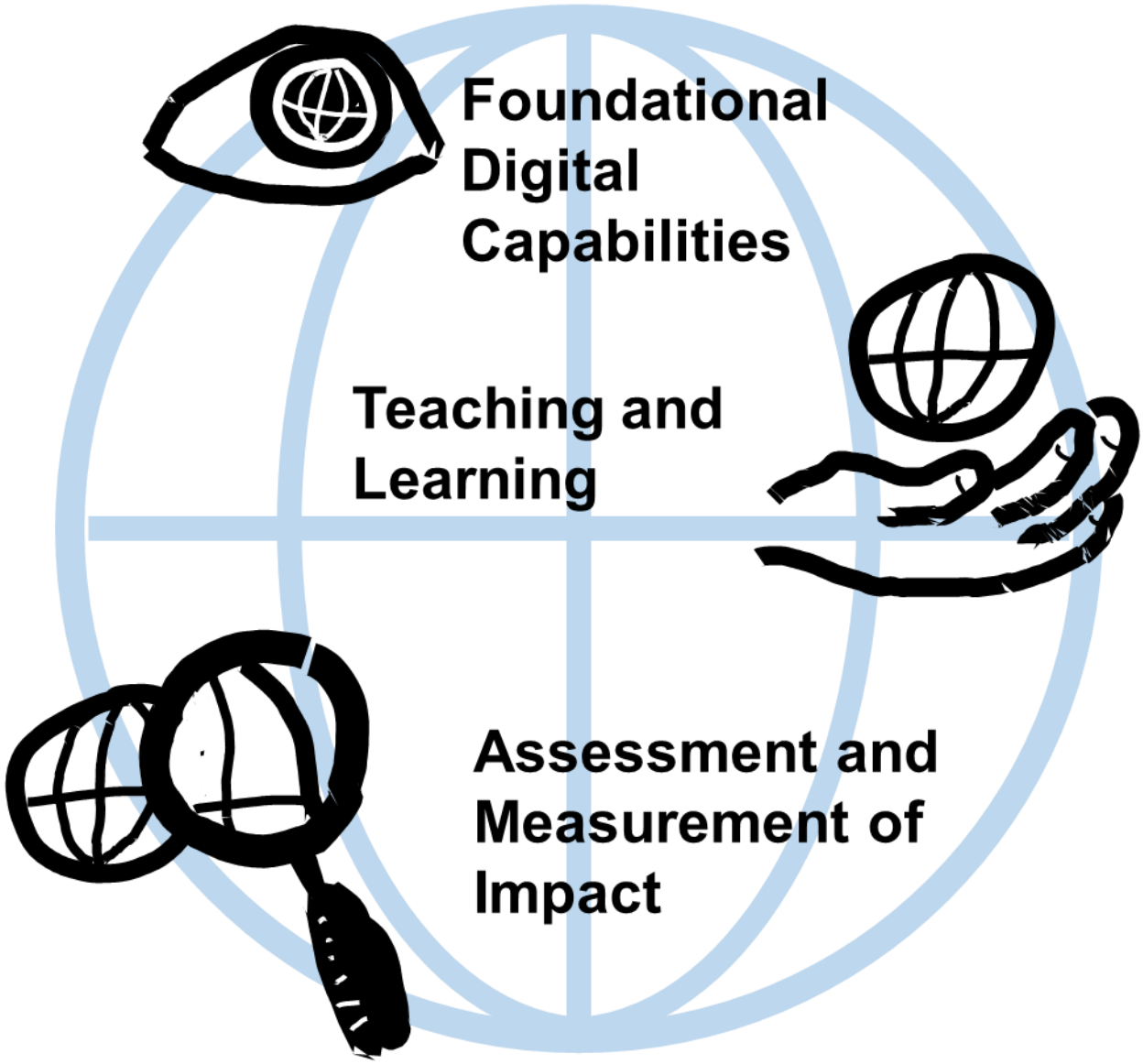


Figure 31: Scope of Digital Capability Framework in Medicine

Foundational Digital Capabilities

In this component of the framework, we articulate the EPAs aligned with the 3 Horizons in the National Digital Roadmap.

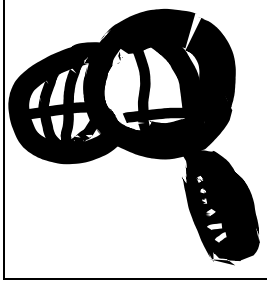
See eight proposed domains each with three sub-domains.

Proposed Sample EPAs for each horizon could include:

Horizon 1 EPA 1: Effectively Conducts Telehealth Consultations and Uses Digital Records for Safe and Quality Care.
Horizon 2 EPA 2: Critically Appraises and Uses an Emerging Technology as Decision Support in Healthcare.
Horizon 3 EPA 3: Provides Value--Based Care For Patients and Their Families with integration of Effective Use of Personalised Technologies.

Teaching and Learning and Infrastructure Support

In this third component of the framework, we provide guidelines and case studies of good practice models of teaching and learning, and infrastructure support required for good digital medical education – again aligned with the teaching and learning of the three proposed EPAs and assessment practices nested within the horizons from the National Digital Roadmap. Out of scope is development of teaching and learning resources and infrastructure.



Assessment and Evaluation of Impact

In this component of framework, we provide guidelines and case studies of good practice models of assessment and evaluation of impact of the three proposed EPAs aligned with the horizons from the National Digital Roadmap. Out of scope is assessment development.

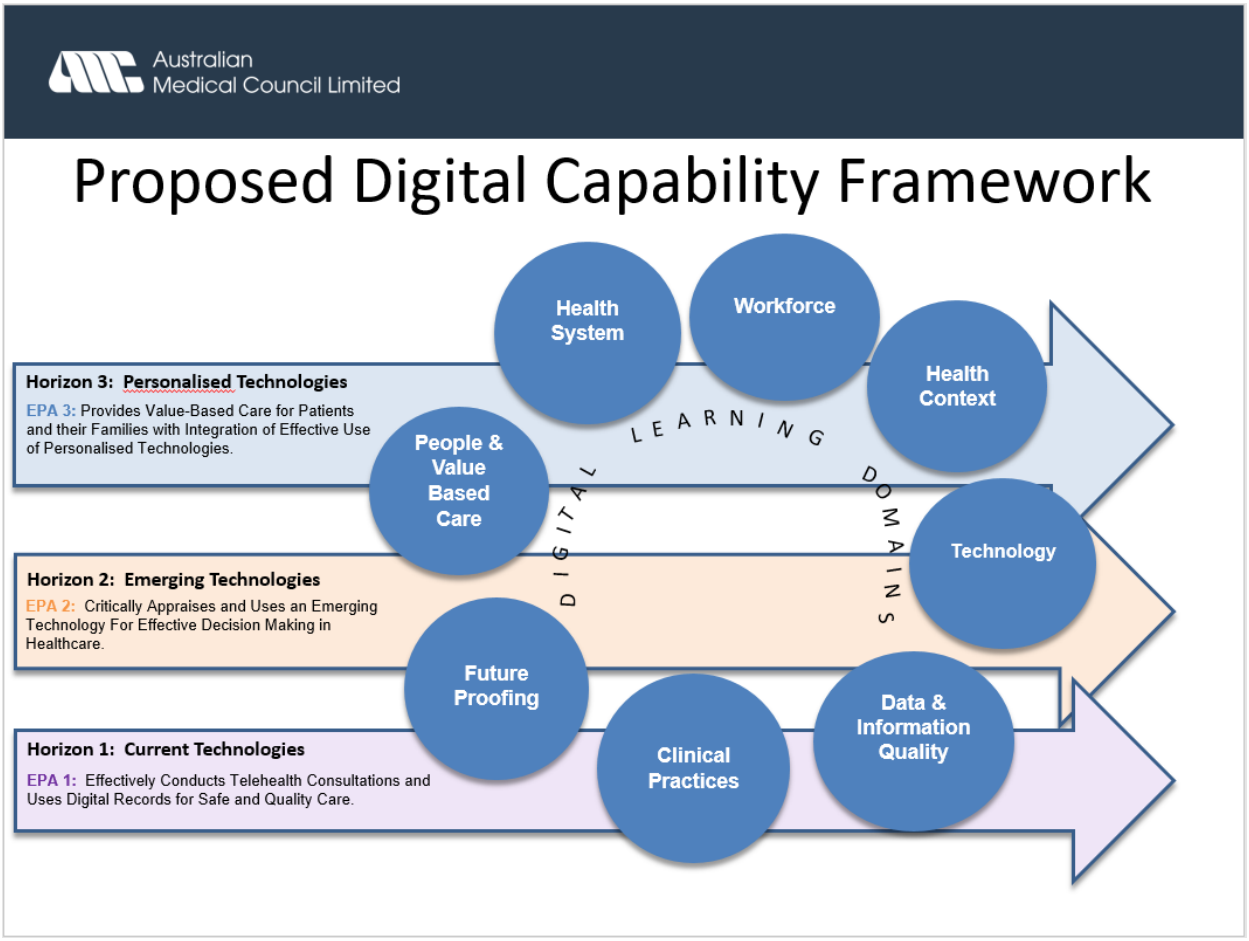


Figure 32: Eight Domains of Learning integrated across the three domains and aligned tasks

Horizons

The three broad horizons that span the Digital Capability Framework in Medicine act as a guide which applies the domains and subdomains, to teaching, learning and assessment programs as well as evaluation of impact across the medical education continuum.

The three EPAs provide the functional aspect and describe the associated capabilities.

Horizon 1: Current Technologies

- EPA 1 - Effectively conducts telehealth consultations and uses digital records for safe and quality care.

This horizon and EPA relates to the current state of digital health, and the ability of the professional to utilise digital technology for safe and high quality health care provision.

Horizon 2: Emerging Technologies

- EPA 2- Critically appraises and uses an emerging technology for effective decision making in Healthcare.

Horizon and EPA 2 is forward thinking, and skills relate to the professional's ability to critically assess and implement new technology into current practice.

Horizon 3: Personalised Technologies

- EPA 3- Provides value-based care for patients and their families with integration of effective use of personalised technologies.

Horizon and EPA 3 are patient and family based, where the professional uses technology in a patient-centred and value-based manner.

Digital Learning Capabilities - Domains and Sub Domains

The following eight learning domains represent key knowledge areas which serve to inform the overarching horizons and are integrated into the learning outcomes of the associated EPAs.

1. **Health System**
    a. Current state
    b. Future State
    c. Continuous improvement

This domain requires an understanding of the health system in its current state and future state. It further requires an appreciation that there is an ongoing need for continuous improvement in order to provide high value and quality care.

2. **Workforce**
    a. Medical
    b. Intra-professional
    c. Inter-professional

An understanding of how the medical workforce is affected by digital technology is important. This domain further illustrates the intra- and inter-professional aspects of the medical workforce.

3. **Health Context**
    a. Community
    b. Hospital
    c. Personalised

This domain takes into account the various population levels at which digital technology can affect. There is natural connectivity through these population levels, requiring a broad understanding of health.

4. **Technology**
    a. Critical appraisal of technologies
    b. Privacy and security
    c. Implementation barriers and solutions

Technology is constantly evolving and medical professionals will be required to critically appraise new technologies and further understand how these technologies can be integrated into care in a manner that maintains patient confidentiality and privacy.

5. Data and Information Quality

a. Data quality
b. Data management
c. Information creation, use and sovereignty

The professional will require knowledge regarding how data is managed and controlled. Understanding issues related to freedom of information and information sovereignty is a key factor and relates to overall patient privacy and confidentiality.

6. Clinical Practice

a. Clinical processes and pathways
b. Expertise and lifelong learning
c. Ethics, policy and the law

The ongoing evolution of digital medicine will require professionals to continuously update and augment their clinical practice, as well as understand the associated ethical, policy frameworks and legal aspects.

7. Future Proof

a. Current challenges in health
b. Opportunities and risks
c. Redundancy

This domains addresses the understanding of future proof, where the professional is able to anticipate future technology evolution and mitigate risk while capitalising on opportunity. There is also a need to understand redundant systems, in order to continue healthcare provision in the event of system failure and cost effectiveness.

8. People and Value-Based Care

a. Culture and Improved Patient Experiences
b. Needs and expectations
c. Lifelong health and learning journeys

Digital healthcare ultimately functions to augment and increase patient and value-based outcomes. This domain keeps the patient and value-based care central to digital health provision.

Online Survey Concerning Proposed Domains and Sub-Domains – Advisory Group

The Advisory Group was also asked to rank the importance of these domains on a three point scale – very important, important and less important. Results were as follows:

#	Question	Very important		Important		Less important		Total
1	Future proofing (current challenges in health; Opportunities and risks; horizon scanning)	33.33%	6	**61.11%**	11	5.56%	1	18
2	People and Value-Based Care (experiences, needs and expectations and lifelong health and learning journeys)	**83.33%**	15	16.67%	3	0.00%	0	18
3	Health System (Current state; future state and continuous improvement)	38.89%	7	**55.56%**	10	5.56%	1	18
4	Workforce (medical; inter-professional and intra-professional)	**52.94%**	9	47.06%	8	0.00%	0	17
5	Health Context (Hospital; community and personalised)	38.89%	7	**55.56%**	10	5.56%	1	18
6	Technology (Critical appraisal of technologies; privacy and security and implementation barriers and solutions)	**58.82%**	10	29.41%	5	11.76%	2	17
7	Data and Information Quality (Data management; information creation and use and augmenting practice)	**77.78%**	14	22.22%	4	0.00%	0	18
8	Clinical Practices (Clinical processes and pathways; expertise and lifelong learning and ethics and the law)	**61.11%**	11	33.33%	6	5.56%	1	18

Figure 33: Advisory Group Online Survey Results

These results show broad support for the proposed domains of the framework with all Advisory Group respondents to the survey ranking the domains either ‘very important’ or ‘important’.

Bringing it Together – A Sample Foundational Digital Health EPA Based Program

Applying the Concept of EPAs to Digital Health in Medicine

In the proposed option for a Digital Framework in Medicine there is an opportunity to align EPAs with the horizons of the National Digital Health Workforce and Education Roadmap:

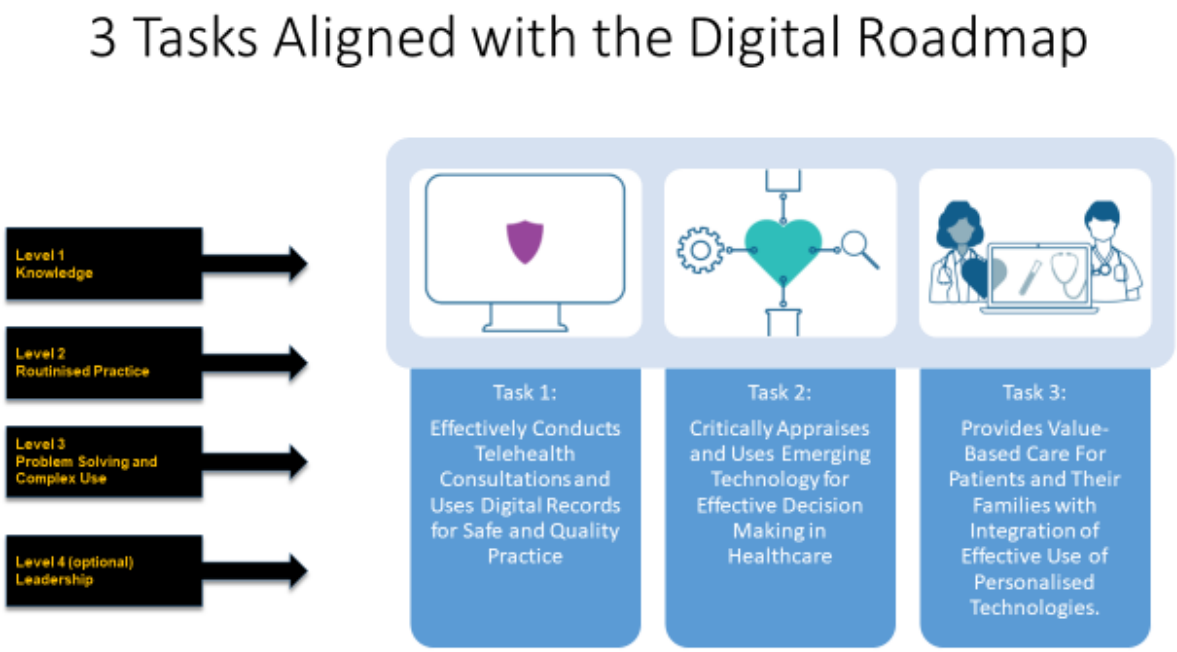


Figure 34: Three Horizons in National Digital Roadmap aligned with Three EPAs

Three Digitally focused EPAs are proposed with the view to integrating these tasks across the medical continuum.

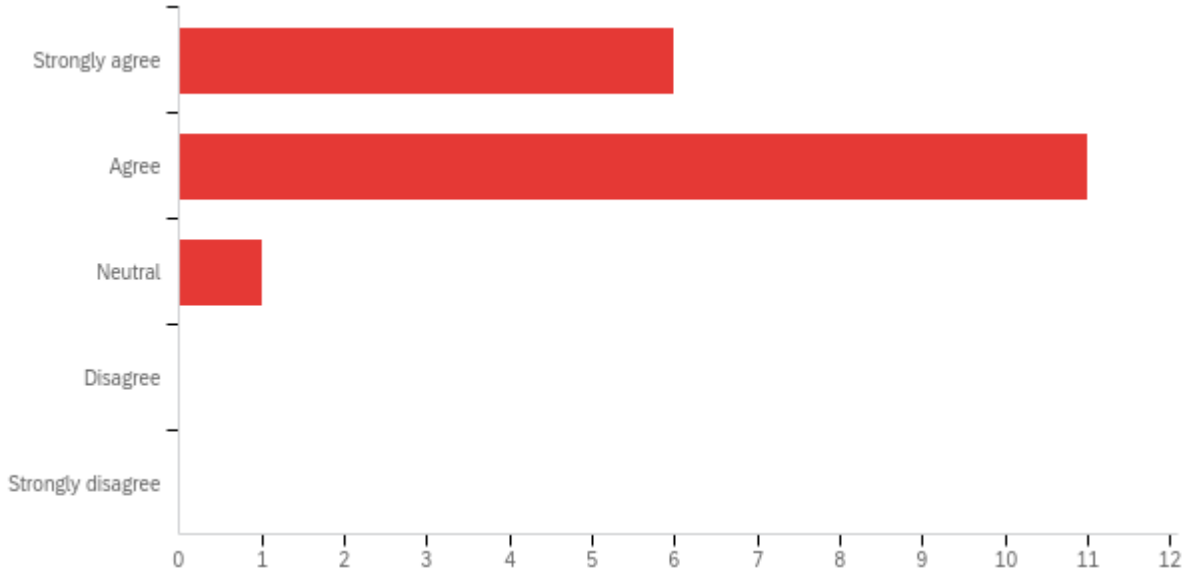
Proposed Sample EPAs for each horizon to make up **foundational capabilities** in the Digital Medical Framework could include:

Horizon 1 EPA 1: Effectively Conducts Telehealth Consultations and Uses Digital Records for Safe and Quality Care.
Horizon 2 EPA 2: Critically Appraises and Uses an Emerging Technology as Decision Support in Healthcare.
Horizon 3 EPA 3: Provides Value-Based Care For Patients and Their Families with integration of Effective Use of Personalised Technologies.

Online Survey Concerning EPAs – Advisory Group

As a follow up online survey question, the Advisory Group members were asked to respond to a number of questions about the proposed domains of the Digital Health in Medicine Capability Framework. Responses were as follows:

These domains focus on what matters in digital health in medicine

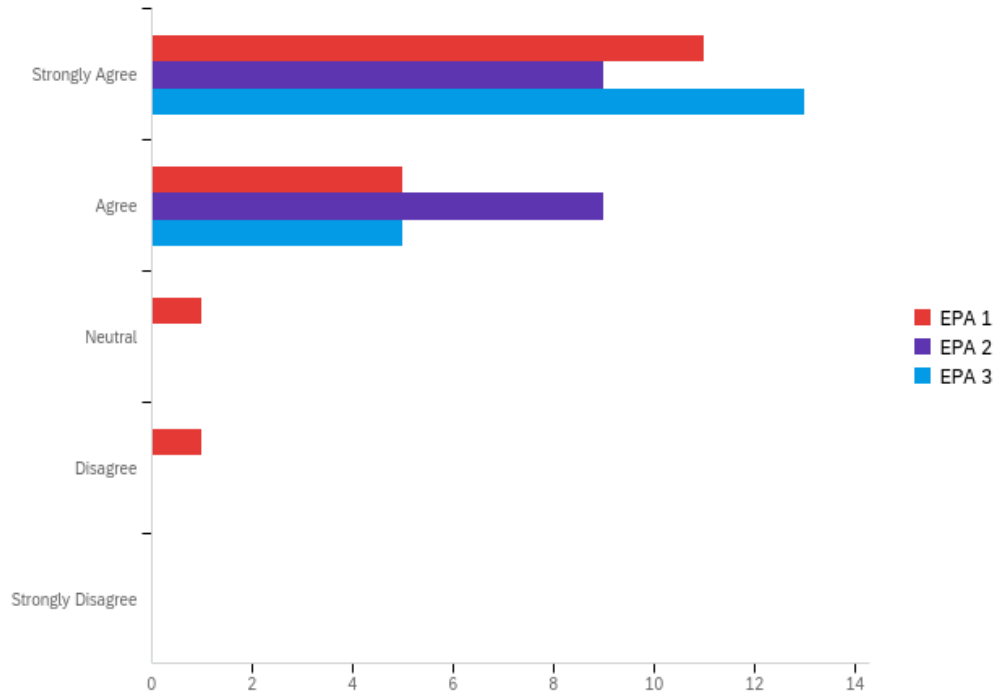


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	2b) These domains focus on what matters in digital health in medicine	1.00	3.00	1.72	0.56	0.31	18

#	Answer	%	Count
1	Strongly agree	**33.33%**	6
2	Agree	**61.11%**	11
3	Neutral	5.56%	1
4	Disagree	0.00%	0
5	Strongly disagree	0.00%	0
	Total	100%	18

Figure 35: Advisory Group Online Survey Results

In response to the online survey question - **These tasks focus on what matters in digital health in medicine workforce capability development** – responses were overwhelmingly in support of the three proposed EPAs aligned with the three horizons In the Digital Health Workforce Roadmap. Details concerning the online survey results are as follows:



#	Question	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree		Total
1	EPA 1	61.11%	11	27.78%	5	5.56%	1	5.56%	1	0.00%	0	18
2	EPA 2	50.00%	9	50.00%	9	0.00%	0	0.00%	0	0.00%	0	18
3	EPA 3	72.22%	13	27.78%	5	0.00%	0	0.00%	0	0.00%	0	18

Figure 36: Advisory Group Online Survey Results

A Summary of Individual Outcomes and Workforce Shifts for Each Horizon

Figure 37, below outlines the individual outcomes and workforce shifts aligned with each of the three horizons in the Australian National Digital Health Workforce and Education Roadmap and the associated EPAs. These outcomes have been developed within a consistent framework aligned with the 4 proposed levels of complexity of tasks (Knowledge; Routinised Practice; Problem Solving and Complex Use; and Leadership):

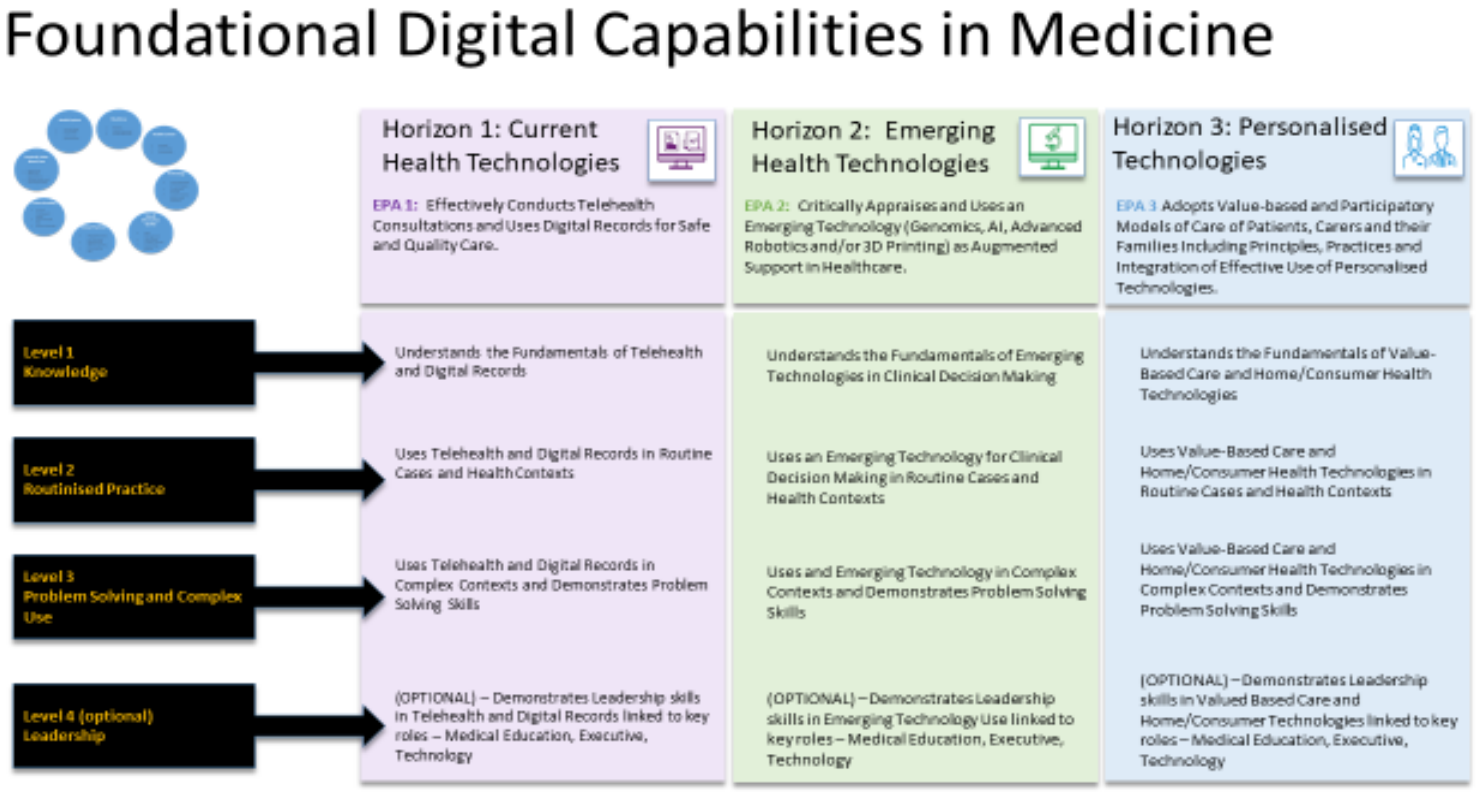


Figure 37: Framework showing how foundational capabilities align with the four levels of learning

See Appendix 1-3 for the proposed EPAs - EPA1 - EPA 3.

EPAs 1-3 – Learning Outcomes at a Glance

Horizon 1: Embedding Safe, Ethical and Effective Use of Systems of Record

[Now - 2022]

A key aim of the National Digital Health Workforce and Education Roadmap is to address the gap between real life medical services and medical education. Horizon 1 focuses on the transition of paper-based practices and systems across healthcare settings to electronic systems of records and use of telehealth and ePrescribing in the delivery of healthcare. This EPA focuses on providing medical doctors across the continuum with the skills and experience to navigate new digital health workflows for safe and quality healthcare delivery: to undertake telehealth consultations, ePrescribing and effective use of electronic record keeping.

Individual Medical Professional Capabilities:

Effectively Conducts Telehealth Consultations and Uses Electronic Records For Safe and Quality Care – EPA1 Outcomes

- Access and review patient information in a digital record system.
- Consult effectively with patients using telehealth systems and, with reference to, electronic records.
- Synthesise information relevant to patient care from multiple sources.
- Observe privacy and security of information in telehealth consultation and digital record system.
- Prepare clear records in line with Australian Medical Board Code of Conduct:

  8.4.1 Keeping accurate, up-to-date and legible records that report relevant details of clinical history, clinical findings, investigations, information given to patients, medication and other management.
  8.4.2 Ensuring that your medical records are held securely and are not subject to unauthorised access.
  8.4.3 Ensuring that your medical records show respect for your patients and do not include demeaning or derogatory remarks.
  8.4.4 Ensuring that the records are sufficient to facilitate continuity of patient care.
  8.4.5 Making records at the time of the events, or as soon as possible afterwards.
  8.4.6 Recognising patients' right to access information contained in their medical records and facilitating that access.
  8.4.7 Promptly facilitating the transfer of health information when requested by the patient

- Upload an electronic record.
- Treat complex case use of telehealth and electronic records (vulnerable patients and patients and/or colleague who may be resistant to digital technologies, sensitively and ethically).
- Reflect on practice performance and improvement through audit of patient records in an electronic record system.

Workforce Capability Shift:

- Improve digital literacy across the health workforce.
- Develop new mindsets and new skills.
- Lead people through complexity.
- Create more adaptive cultures which will challenge deeply held norms of behaviour.
- Mobilise diverse stakeholders to adopt new ways of working and interacting with a focus on change.

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Horizon 2: Integrating New Technologies and Ways of Working [Now to 2027]

Horizon 2 of the National Digital Health Workforce and Education Roadmap focuses on effective use of Emerging Technologies in healthcare delivery. Key to learning about these newer technologies is for doctors to gain capabilities in how they are used to support decision making, the changes to workflows and work practices, how data sets from these different technologies integrate and how such data can be used for more sophisticated data driven models of care. Furthermore, use of these technologies involves new ethical decisions as well as privacy and security issues.

Individual Medical Professional Capabilities:

Critically Appraises and Use of Emerging Technologies in Decision Making – EPA2 Outcomes

- Select a validated clinical decision support tool with integrated technology solutions – refer to a curated collection per specialty, for the various stages in the clinical process (diagnostics, prognosis and therapeutics), and for priority health system contexts of validated clinical decision support tools i.e., chronic care and rural health in the associated Digital Health in Medicine Teaching and Learning Program Guide. These tools have been validated using the GRASP Framework, Khalifa et al. *BMC Medical Informatics and Decision Making* 19, Article No 207, 2019.
- Gain awareness of how to use the decision support tool
- Explore the benefits and challenges for patients and clinicians of usage of the clinical decision support
- Critically appraise the assumptions on which the decision tool algorithms are based and consider ways in which transparency about these assumptions can be improved to foster effective use of the decision tool and rigor of the judgments made in its usage
- Reflect on the similarities and differences of your clinical practice, with and without use of the decision tool, including ethical implications
- Observe privacy and security of information in use of the decision tool and possible areas of bias
- Consult effectively with patients about, and with reference to, decision support
- Treat complex case use of decision support (vulnerable patients and patients/colleagues who may be resistant to decision support) sensitively and ethically
- Reflect on practice performance and improvement through audit of clinical practice with and without decision support – refer to the six dimensions of impact evaluation on clinical practice and health system improvement:
    - effectiveness (curing patients at a better rate – reducing complications, reducing readmission, reducing emergency admission)
    - efficiency of services (using resources in best way, balancing costs and benefits)
    - timeliness (reducing waiting times, GPs or before surgery)
    - patient quality and safety (quality, risk and bias in care)
    - patient-centredness (as measured by patient satisfaction and outcomes)
    - equity (access to quality services).

Workforce Capability Shift

- Anticipate and respond to emerging technologies most relevant to their area of focus.
- Resolve new ethical dilemmas and refine policy and roles related to use of new technologies.
- Learn new ways of working across health with support of emerging technologies and the health team.

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Wasylewicz, A. T. M., & Scheepers-Hoeks, A. M. J. W. (2019). Clinical decision support systems. In Fundamentals of Clinical Data Science (pp. 153-169). Springer, Cham.

Horizon 3: Digital Health Transformation [now to beyond 2027]

Provides Value-Based Care For Patients and Their Families with Integrated Effective Use of Personalised Technologies – EPA3 Outcomes

Horizon 3 of the National Digital Health Workforce and Education Roadmap offers, as the focus of this EPA, models in which technology allows us to reimagine how care can be delivered. This can impact on all aspects of care from how we monitor consumer health, and how and when we intervene and how we actually deliver care by whom.

Individual Medical Professional Capabilities:

- Understands the principles and practice of value-based care
- Gains an in-depth perspective of the challenges associated with engaging in healthcare for patients and carers, and the influences of personal and community context through patient interviews and observations in clinical and home contexts, and patient journey mapping (including patients with routine and complex health conditions and different patient cohorts which may include homeless, paediatric, in aged care facility, adolescent drop in centre, Indigenous, disabled, CALD patient and carer, etc.)
- Reflects on why value-based care matters including review of benefits, risks and required shifts in current practices in terms of fostering health literacy, empowerment, and improved health experiences and outcomes
- Understands how technology can be leveraged to develop sustainable models of value-based care in clinical settings and home and community health environments
- Understands that technologies have underpinning assumptions and algorithms
- Reviews and builds an awareness of the benefits and risks of a range of personalised technologies for different consumer groups, consumer health needs, and preferences aligned with specialty fields of practice and a range of health conditions and health settings
- Identifies opportunities for shifts in personal practice and system improvements to integrate value-based care leveraging sustainable use of personalised technologies
- Reviews current clinical workflows and develop plans to integrate improvement to practices identifying anticipated positive impacts for consumers, personal professional performance and performance at a system level
- Implements the planned change
- Monitors the outcomes and impacts of the planned change
- Reflects on practice performance and improvement of shift in practice towards value-based care through audit of clinical practice using key impact metrics drawing on data entered as discrete data fields in digital record system:
  - effectiveness (curing patients at a better rate – reducing complications, reducing readmission, reducing emergency admission, learning a new skill, making a shift in personal practice)
  - efficiency of services (using resources in best way, balancing costs and benefits)
  - timeliness (reducing waiting times, GPs or before surgery)
  - patient quality and safety (quality, risk and bias in care)
  - patient-centredness (as measured by patient satisfaction and outcomes)
  - equity (access to quality services).

Workforce Capability Shift

- Adopt more patient-centred approaches to health.
- Use new technologies integrated with transformational goals for better care (value-based healthcare, personalised medicine, consumers as partners and care outside hospital settings).
- Engage in small scale trials and transformational change programs in health impacting ways of working, roles, contexts of health provision and outcomes.

References:

General intro to VBC

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Partnerships with patients

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Measuring VBC

https://valuebasedcareaustralia.com.au/resources/measuring-outcomes-and-costs/

https://www.ichom.org/

Teaching and Learning

In this section, we set out some key concepts and methods drawn from the literature in good practice in medical education. Key to the findings of this section is the need for good practice and support in supervision and peer review in medical education. Good practice in teaching and learning involves a combination of self-directed knowledge based learning support as well as opportunities for experientially based simulated learning and practice activities focused on authentic learning tasks scaffolded appropriately in terms of task complexity and contexts of learning (from routinised to complex) with a opportunities for feedback and reflection. We apply these concepts to the teaching and learning and infrastructure support required for the fostering of digital capabilities across the medical workforce.

Supervision and Peer Review in Medical Education

Recent research in health education shows that the level of proficiency a health worker achieves by the end of training is a major determinant of the standard of practice they will achieve throughout their career (Asch 2009). Asch's study provides empirical proof of what we all intuitively understand; training matters. Training needs to be as good as it can be to ensure continued high standards of healthcare.

Across the continuum of medical education, many thousands of supervisors invest considerable time, effort, and energy in supporting their colleagues in their educational journey in training and in peer learning during their life career in health. Knowing that high quality supervision translates into excellent health workers and patient care, we recognise that educational leaders and supervisors are the single most valuable resource in training the health workforce which will meet the health challenges of the 21st century. With medical education moving towards competency-based training in an increasingly complex and challenging healthcare environment, it is essential to recognise the importance of the role they play in shaping a healthcare system fit to meet population needs.

Equally, peer reviewers and collegial support networks of champions of different practice areas are increasingly supporting the learning of practitioners.

For a framework for digital health in medicine to work we need to consider how we will convince the educational leadership, the supervisory workforce and peer reviewers for those already in practice to help foster lifelong learning experiences and peer supported learning in digital health aligned to 21st century healthcare needs. It is vital that they are well supported to undertake professional development opportunities in digital health so that they can best support other more junior staff and navigate change to workflows impacting their own work practices effectively.

The AMC and its partners have an opportunity to design the framework and curate as well as support the development of associated support resources in such a way that they incorporate the teaching and assessment of tasks drawing on the expertise and leadership of supervisors, peer reviewers and Medical Education leaders. Central to the successful implementation of the proposed digital capability framework in medicine is awareness building with supervisors, peer reviewers and Medical Education and System Leaders so that they have an understanding of the aims and scope of the National Digital Health Roadmap and the associated framework for workforce capability development in medicine, supporting teaching and learning as well as assessment guides. These critical champions of change and digital health workforce development will need to be convinced of the merit of this approach. For further information on implementation considerations impacting supervision, see section Possible Next Steps, in the final section of this report.

Reflective Learning and Mindful Practice Reflection and Mindful Practice are central to good practice in health education. Argyris and Schön (1974) wrote extensively about the importance of reflective learning in improving education. Their work is particularly important in terms of the concept of *single loop and double loop learning,* as well as the concept of *reflection in action and reflection on action*.

Single Loop Learning: Routine learning which involves individuals solving problems within structured guidelines. The assumption being that there is one correct solution for any given problem.

Double Loop Learning: Questions the Structured guidelines involves thinking more deeply about the assumptions and beliefs on which one's ideas are based in seeking to resolve the issue.

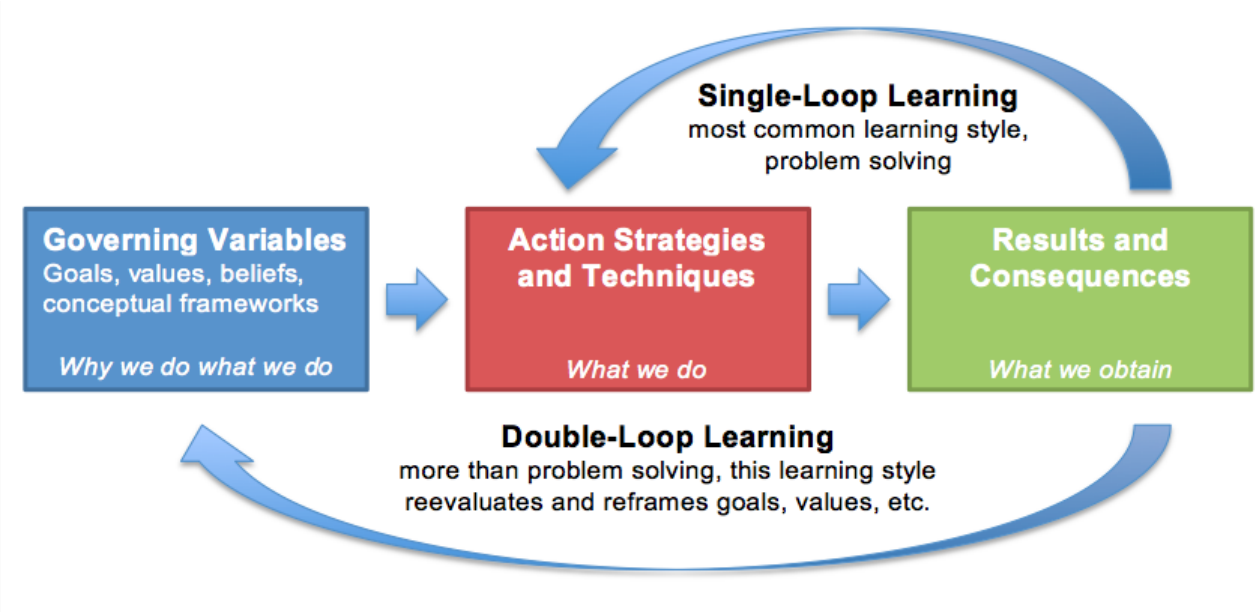


Figure 38: Single Loop and Double Loop Learning - Argyris and Schön

Reflection on Action: Describes the process of reflection which takes place after the event where the practitioner makes explicit recommendations and evaluates the theories of action used to solve the problem.

Reflection in Action: Describes interaction with a 'live' problem as it unfolds. The capacity to reflect in action assumes that the problem-solver has the capacity to surface their 'knowing in action', that is the hidden or tacit knowledge which we use to deal with particular tasks.

Epstein (1999) coined the term "Mindful Practice" in health and drew on the work of Argyris and Schön as well as his own reflections as a medical doctor to think about how reflection can be applied within health to improve practice.

Teaching and Learning in digital health in medicine should ideally incorporate opportunities for learners to engage in reflection in action and on action as well as double loop learning of changing practices using current, emerging and participatory technologies. This can be achieved through the incorporation of scenarios and activities as well as discussion questions to support learners to reflect on their learning and practice. Equally, designing learning interventions so that they encourage learners to reflect on their own practice and develop and practise new skills through simulation in the resource are ways of incorporating such learning into online resources.

Experiential Learning Kolb (1984) is the most influential of the proponents of experiential learning. This theory of learning emphasises the importance of linking experiences to new ways of doing and conceptualising practice. The cycle below shows the steps of engaging with experiences and using experience as a platform for changing conceptions of practice. One can see that this model combines ideas of discovery learning, reflection, kinaesthetic learning (learning from doing), and focuses on the importance of application of skills:

Figure 39: Experiential Learning Model - Kolb

Experiential learning is valuable as it focuses the learner on their real-life experience within their own healthcare settings and consolidates their skill level and performance through reflection and application of skill.

The incorporation of experiential learning into the teaching and learning of capabilities can be achieved through scenario-based learning, case-based and problem-based learning. The teaching and support of learning about EPA tasks is very much aligned with the theory of experiential learning. The EPAs focus on the learning, teaching and assessment of tasks which the doctors need to perform in order to provide quality and safe healthcare for their patients.

In experiential learning programs, learners have access to activities and engage in a live project related to their work. Key to experiential learning is also the opportunities learners have to combine individual, with small group and project type activities which focus learning on their actual work. Simulation, virtual reality and gamification can also be very useful in replicating real life work experiences within safe learning environments to consolidate learning and skills development. Equally, conversation-based learning and discussion can help learners to explore the key issues impacting performance and system goals. Furthermore, the integration of participatory research techniques into learning with its focus on generating data elicited from the

health workers' actual work setting related to a key workplace issue, can assist learners to understand their workplace issues better and work together as a team to identify better system approaches to community health care. Examples of such workplace evidence-based techniques include: oral interviews, shadowing, photo elicited tasks, participatory research workshops, field visit exchanges.

Lived Experience The lived experience movement is considered essential internationally to progress the human rights agenda of health workers to better understand the perspectives of those who live with a health condition. This includes understanding of marginalisation, oppression and discrimination. Underpinning lived experience perspectives includes shared understandings of loss or changes to social status/inclusion; relationships; employment and concepts of self. Significantly, people with their own lived experience have periods of healing and wellness, and can provide advice on strategies for recovery (Mead, S and MacNeil, C. 2006). It is vital that the EPAs and domains of learning in digital health are learnt through engaging with patient experiences and stories in diverse clinical and community settings.

Deliberate Practice Psychologist, Anders Ericsson (2004) coined the term Deliberate Practice while researching how people become experts. He commented "nobody becomes an outstanding professional without experience, but extensive experience does not invariably lead people to become experts". Recognising that many people plateau after their initial training and do not reach expert status, he debunks traditional views that expertise and limits to performance is largely determined by innate qualities such as abilities, mental capacities, and innate talents. In his theory of deliberate practice, he proposes the alternative view that "continued deliberate practice is necessary for maintenance of many types of professional performance". He defines deliberate practice as differing from routine practice in that 'Deliberate practice refers to a special type of practice that is purposeful and systematic. While regular practice might include mindless repetitions, deliberate practice requires focused attention and is conducted with the specific goal of improving performance'.

Examples of activities of deliberate practice in health may involve working with a supervisor, peer, coach or mentor to continuously audit surgery results or clinical records and then acting on practice improvement activities to deliberately improve results. In our context of proposing a EPA based capability framework for Digital Health in Medicine deliberate practice can be incorporated as part of the teaching and learning program designed to support the learning of EPA based foundational capabilities.

Key Learning Points:

- Talent is not enough. **Practice** is the difference between good and great
- Expert performance is hard work and requires repeated actions
- Focus - break it into manageable parts
- Goal setting and perseverance is key
- Feedback in the moment.

The AMC and its partners have the opportunity to foster the incorporation of deliberate practice activities into the teaching and learning options for capability development in digital health to increase the likelihood of developing expertise. Again, deliberate practice can be leveraged through modelling effective use of digital technologies in contemporary learning environments. This can include providing learners with access to decision aids and benchmarked audit results with their peers so that they are clear on gaps in their performance and the standards which underpin quality care. Simulated workshop sessions, projects based on exploration of current workplace problems using action learning methodologies and gamified programs of learning are other examples of learning approaches which can be incorporated into resources to provide

various ways in which skills can be consolidated with real world impacts. Equally, apps can be developed and integrated into learning interventions whereby learners are provided regular and spaced learning opportunities which they undertake in situ in their current workplaces, integrated into everyday work routines.

Feedback Traditionally feedback has been seen as something that the teacher drives and imparts on the learner. Boud and Molloy (2012) provide new perspectives of the importance of feedback in the learning process by emphasising the role of the learner rather than the teacher. They define feedback as:

A process whereby learners obtain information about their work in order to appreciate the similarities and differences between the appropriate standards for any given work, and the qualities of the work itself, in order to generate improved work.

Key Features of this Definition are:

- It centres on learners and what they do rather than what teachers do for them.
- It recognises the importance of external standards applicable to work produced and the need for learners to understand what these are.
- It is a process extended over time and is not a single act of 'reception of information'.
- It sees the appreciation of variation between the standards to be applied and the work itself as an important point of focus.
- It positions feedback as leading to action as a necessary part of the process.

The AMC and its partners has the opportunity to incorporate feedback into teaching and learning programs which make up the digital capability framework in medicine. Examples of AI supported decisions can be included in the teaching and learning program. There is also the opportunity to incorporate less high-tech methods by drawing on the human resources of supervisors, peers and international global networks of health workers online to support feedback cycles. Equally, at a later stage, the AMC could collaborate with its partners to build learning resources with medical education providers with the incorporation of discussion boards and other moderated discussions into resources. This is more labour intensive than stand along models or AI support, but if handled well, with clear roles within the team and training in how to moderate learning, – such methods can be powerful ways to learn through increased opportunities for interaction and engagement of the global health community with others across the globe.

Scaffolding the Learning Experience Vygotsky (1978) used the term scaffolding to refer to how to move students progressively towards stronger understanding, and ultimately, greater independence in the learning process.

Some Scaffolding Techniques:

- Give mini-lessons.
- Model/demonstrate by using simulation or decision support to replicate real world problems.
- Describe concepts in multiple ways.
- Incorporate visual aids or decision support.
- Give learners talk time.
- During lessons or modules, check for understanding.
- Activate prior knowledge.
- Front-load concept-specific vocabulary.

In health, scaffolding is sometimes referred to as 'hands on' and 'hands off'. This emphasises the role of the supervisor or peer in ensuring that learners have enough support to ensure that the patient is safe whilst also ensuring that the learner has opportunities to develop skills in undertaking a task.

It is vital that supervisors and peers have clear ways of assessing the learners' level quickly and accurately to ensure safe teaching and learning practice.

Equally, the scaffolded learning experience can be thought of from the perspective of the team, individual and system. Incorporating multi-level elements into learning resources so that learners reflect on their own learning, the learning of the team as well as system impacts builds a more reflective and competent workforce.

The AMC and its partners has the opportunity to support the creation of guides for supervisors and learners related to how a task can be broken into manageable steps and experience levels. A key complexity in busy health environments is to manage the learning of multiple members of the health team whilst ensuring the patient care and system needs are maintained to a quality level without supervisor burnout. The integration of "train the trainer" elements into the Digital Capability teaching and learning component of the framework is important to ensure the quality of the learning experience and integration of peer and supervisory learning into workforce education learning interventions, products and services.

Cognition and Learning

Recent research into learning shows the importance of memory in learning. The work of Brown, Roediger and McDaniel (2014) in their persuasive book 'Making it stick: the science of successful learning' they point to the fallacy 'in thinking that repetitive exposure builds memory'. Similar to the concept of deliberate practice, they emphasise that we need to make learning challenging to optimise learning. They argue that 'mastery in any field, is a gradual accretion of knowledge, conceptual understanding, judgement and skill'. They go on to argue that 'mastery requires both the possession of ready knowledge and the conceptual understanding of how to use it.'

Tips for Learning Resources (drawn from Chapter 8):

1 Successful **learners take charge of their own learning**, they make a habit of learning and have the resilience to manage setback and continue to push through and gain expertise.
2 Successful learners engage in **self-quizzing** to check their understanding.
3 Successful learners **space out their learning** so that they study information more than once but leave considerable time between practice sessions.
4 **Inter-lever the study of different problem types** to ensure that learning is diverse and learners do not get bored or disengage.
5 Include **elaboration** into design of learning so that learners are required to relate the material to what they already know, explaining it to somebody else in your own words, or explaining how it relates to your life or work context.
6 **Generation** involves getting learners to attempt to answer a question or solve a problem before being shown the answer.
7 **Reflection** Involves exploring what went well what could have gone better.
8 **Mnemonic devices** Help you to retrieve information using a memory device as a prompt.
9 **Calibration** is the act of aligning your judgments of what you know and do not know with objective feedback so as to avoid being carried off by the illusion of mastery.

This points to the importance of designing learning modules so that they encourage learners to build knowledge and skills progressively. Other opportunities for the AMC and its partners are to

promote the use of simulations as a powerful way for learners to practice their skills in a range of settings including problem solving crisis situations.

Communities of Practice and Peer Learning

Communities of Practice emphasises the role of others in the learning process. In their influential body of work Lave and Wenger (1998) starts with the assumption that engagement in social practices is the fundamental process by which we learn and so become who we are.

The implications of their work for the AMC and ADHA is to incorporate the power of peer learning, use of interactive social learning platforms and activities into learning and encourage learners to engage with learning resources in teams and conduct team project practice activities.

Organisational Learning

In the early nineties Peter Senge set out a significant challenge to organisations worldwide. He repositioned learning from something that individuals do and are responsible for to what organisations and broader entities such as systems and Nations can do to improve performance. At the centre of his work are five disciples:

- **System Thinking:** Interdependence among all functions, working together as a whole system.
- **Team Learning:** Accumulation of individual learning, shared with others and becoming team knowledge (community learning stage).
- **Personal Mastery:** Accumulation of individual learning, shared with others and becoming team knowledge (individual Learning stage).
- **Mental Models** According to Senge “Mental models are deeply held internal images of how the world works, images that limit us to familiar ways of thinking and acting. Very often we are not consciously aware of our mental models or the effects they have on our behaviour.” In this disciple we are required to unlearn unwanted values, learn new and applicable values (individual learning stage).
- **Shared Vision:** Vision owned by all levels, creating focus and energy for learning (community learning stage).

The implications of his work for the AMC and its partners are to ensure that the Digital Framework is designed for multi-level impacts (individuals, teams, systems, nations and the global benchmarking in digital health in medicine).

A model for how these teaching and learning strategies could be drawn on to support the teaching and learning program is shown in Figure 40.

Teaching and Learning Program

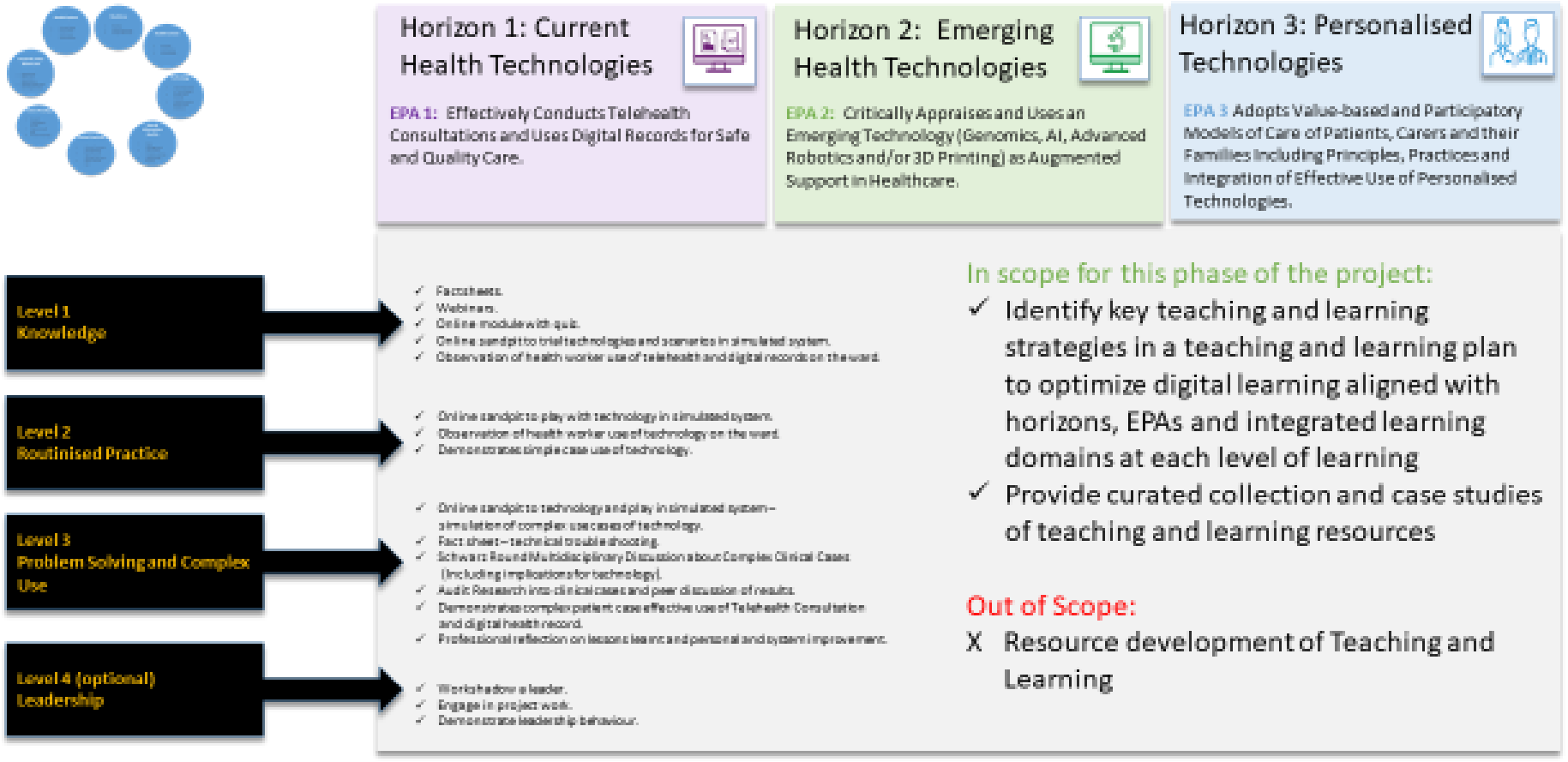


Figure 40: Teaching and Learning Strategies aligned with levels of learning for each EPA

Assessment

In this section, we set out some key concepts and methods drawn from the literature in good practice in medical education. We apply these concepts to the assessment and evaluation of impact required for the fostering of digital capabilities across the medical workforce.

Assessment is integral to education programs across the continuum of health education. It is the mechanism by which the medical education provider determines the ability of individual members to meet specific milestones of the training program and ultimately measures readiness for unsupervised practice. Assessment is also fundamentally a learning process in itself. It has long been recognised that assessment drives learning but increasingly assessment *for* learning is emphasised. Assessment should promote learning.

For supervisors and at a system level there is a growing acknowledgement that we need better systems to ascertain what doctors can be entrusted to perform in the workplace through more rigorous programs of assessment.

In recent times, the field of medical education assessment has undergone significant change. This change is linked to the adoption of competency-based approaches to health education whereby supervisors are required to make decisions about the learner's competence across a range of pre-determined standards (Ten Cate and Scheele F 2007).

Supervisors require a large amount of information to support these important decisions about competence and progress. The emphasis on assessment for learning has highlighted the shortcomings of assessments based solely on high stakes examinations. Such examinations do not provide the nuanced information required to have full confidence in the accuracy of assessment decisions, particularly on the assessment of professionalism and actual real-world ability (Rethans J, Norcini J, Báron-Maldonado M, et al. 2002; Creuss et al 2006). This has seen an increased emphasis on work-based learning and assessment (Norcini J, Blank LL, Arnold GK, et al. 1995; Govaerts MJB, Van der Vleuten CPM, Schuwirth LWT, et al. 2007). It also features new thinking about how multiple data points from formal exams and regular work-based low stakes assessments can be synthesised as a program of assessment to make progression and high stakes decisions on performance and work readiness (Van der Vleuten CPM, Schuwirth LWT. 2005; Van der Vleuten CPM, Schuwirth LWT, Driessen EW, et al. 2012).

A program of assessment is the planned and deliberate use of assessment rather than the arbitrary selection of tools and content of assessment. The planning of assessments includes selection of a variety of assessment methods that sample as many situations as possible. A program of assessment ensures that supervisors have clear guidelines and a framework to use as a reference point to guide their individual assessment decisions - therefore improving consistency across settings (Van der Vleuten CPM, Schuwirth LWT, Driessen EW, et al. 2012; Van der Vleuten CPM, Schuwirth LWT, Driessen EW, et al. 2015).

Newer thinking about assessment has also focused on the link between assessment and learning (Cilliers FJ, Schuwirth LWT, Adendorff HJ, et al. 2010; Cilliers FJ, Schuwirth LWT, Herman N, et al. 2012.) and feedback (Ericsson KA. 2007; Boud, D and Molloy, E 2012). This acknowledges that assessment is a powerful way to improve performance and this is best achieved through support rather than punitive means. Assessments should ideally provide feedback on a variety of aspects of practice, such as clinical knowledge, communication and quality and safety. Assessments should also be undertaken across a broad range of contexts and include different methods such as direct observation, case discussions, audit and opportunities for reflection. It is through multiple biopsies of a learner's performance and ongoing feedback that a complete and more accurate picture of their level of ability can be formed and learning is consolidated (Schuwirth LWT, Van der Vleuten 2011).

The field is also marked by new ways of thinking about how the quality of assessments can be determined. It has seen a shift from purely psychometric concerns of assessment focused on statistical analysis of validity and reliability (Norcini et al 1985) to the use of qualitative measures, which are more aligned to the recognition of the subjective nature of assessment decision making (Hodges, B 2014). Van der Vleuten (1996) strengthens this position with the observation that utility is a compromise between reliability, validity, educational impact, cost and acceptability, but in that compromise none of these five aspects can be zero. That compromise is important because it requires fit for purpose thinking and is therefore an essential steppingstone towards programmatic assessment.

Programmatic Assessment, first proposed by leading medical educators Profs Cees van der Vleuten and Lambert Schuwirth is a useful term which encapsulates the key concepts underpinning newer ways of thinking about health education assessment. Central tenets are the need for more transparent benchmarking of assessments across providers (Schuwirth LWT, Van der Vleuten CPM. 2011), and standard setting (Weller JM, Misur M, Nicolson S, et al. 2014; Cook DA, Kuper A, Hatala R, et al. 2016). Newer thinking about determining the quality of assessment also highlights the question of the role of the learner in assessing their own performance, supervisors and other stakeholders including other health workers, employers and consumers. Also, part of the movement towards more contemporary evidence-based decision making in assessment is the use of technology enabled reporting to assist with the storage and interpretation of assessment data (Moonen-van Loon, J.M.W., Overeem, K., Donkers, H.H.L.M. et al. 2013).

In this project the AMC and is partners have the opportunity to support providers to develop their assessment programs of digital health capabilities across the continuum. This sample assessment program can inform the work of medical education providers and other stakeholders of health to explicitly measure individual doctor performance in digital health as part of the curriculum and core capabilities their members need to demonstrate for safe and quality medical practice. In addition, these assessment programs will show the importance of leveraging technology to refine assessment methods. We need robust technology-based methodologies to identify, monitor and support the making of evidence-based decisions about health worker performance and their lifelong performance in a diverse range of health settings. Furthermore, we need to use this data at an individual, program and system level to bring about continuous improvements to health education and healthcare outcomes so we are empowered to make sound evidence-based decisions about progression and readiness for independent practice and the impacts of education programs on systems, workforce development and health outcomes.

Given the scope of these changes there is also a recognition that improved implementation is paramount to the success of assessment innovation. This includes incorporation of change management strategies including co-design, broad consultation, communication and supervisor and assessor training.

A model for how these assessment strategies could be drawn on to support the assessment of the three proposed EPAs with a focus on assessment of performance in four levels (Knowledge; Routinised Practice; Problem Solving and Complex Use; and Leadership) is depicted in Figure 41:

Assessment Program

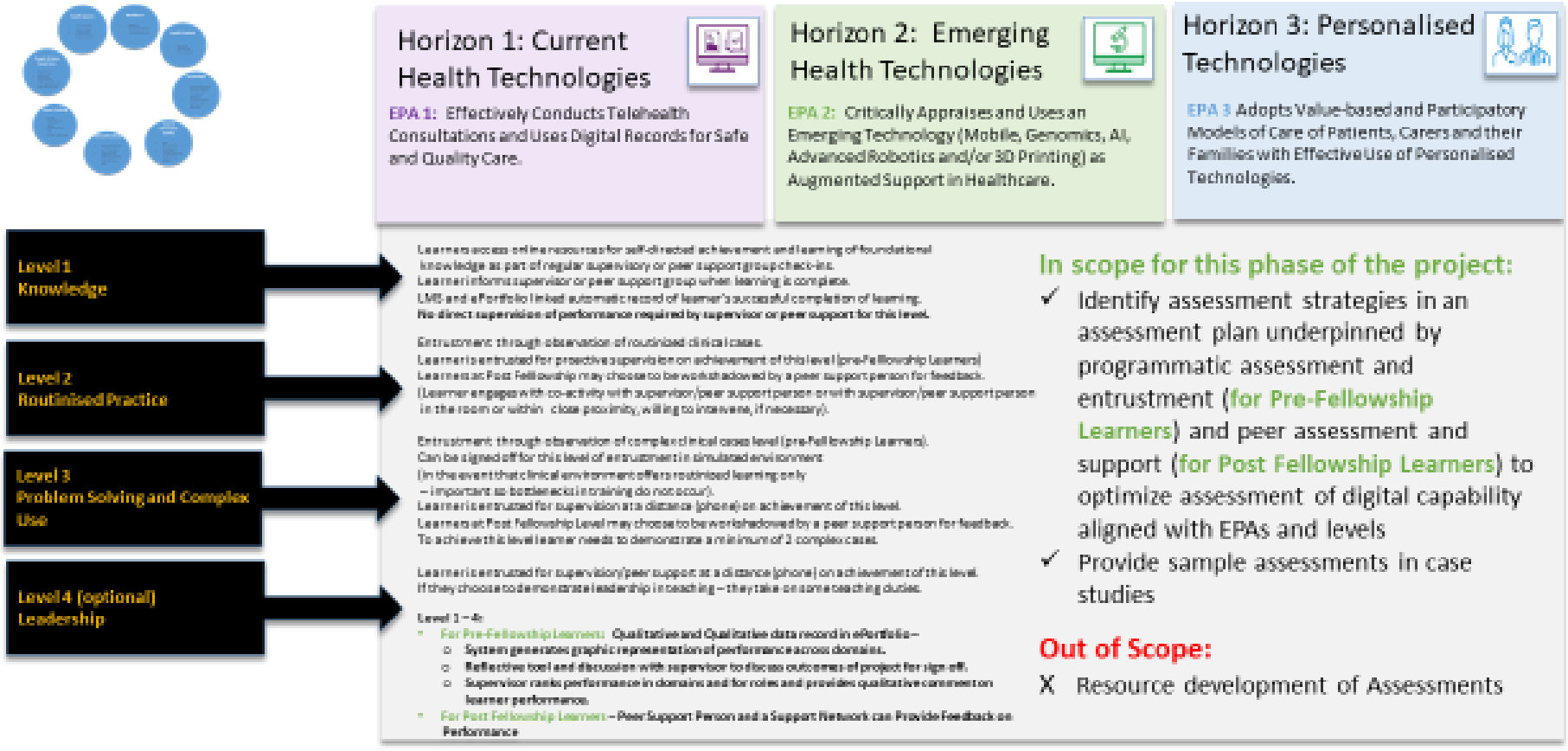
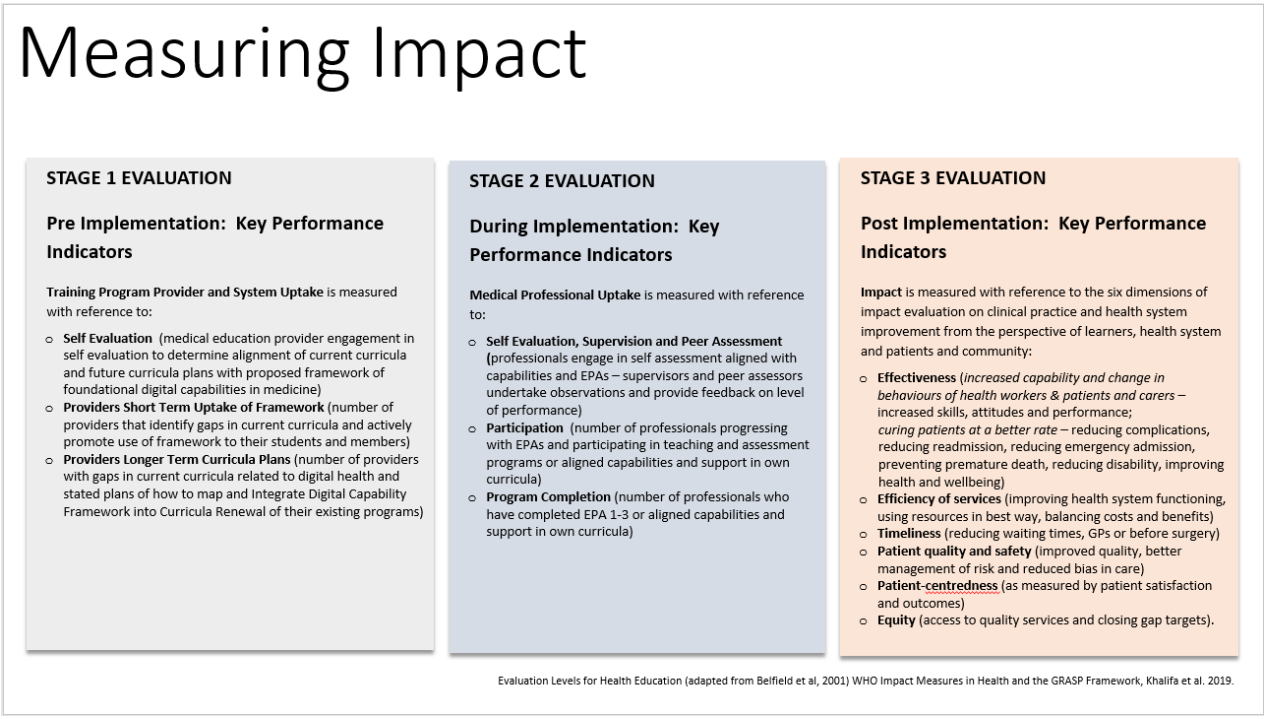


Figure 41: Assessment Strategies aligned with levels of learning for each EPA

Evaluation of Impact

Impact data can be generated from surveys and longitudinal studies to ascertain training program innovation and patient and health community experiences and impacts. Evaluation techniques such as contribution analysis, and ethnographies can be used to gather qualitative data combined with quantitative data. The use of learning analytics and integration of the collection of data into curriculum design and technology delivery systems is paramount to contemporary evidence-based measurement of impact.



See Figure 42. Evaluation levels for health education (adapted from Belfield et al, 2001) and the GRASP Framework, Khalifa et al. 2019.

Level of Impact Measurement	Performance Measures	Methods of Evaluation and Data Collection
Pre-Implementation: In this stage the AMC confirms foundational capabilities and teaching and learning, as well as, assessment programs to support a robust workforce education program in Medicine aligned with the National Digital Roadmap. This stage also includes the provider's self-assessment of current curricula and proposals of how they will implement and evaluate the development of digital capabilities in their component of the medical education continuum.		
Level 1: **KP1 1:1 Existence of Capabilities**	1. Publication of digital framework by AMC and its partners across the medical continuum	• Map design, development, implementation and evaluation of the Foundational Digital

Roadmap, Guidelines or Framework	2. Measure completion and readiness of curriculum product	Capability Framework in Medicine • Conduct debriefs with co-design groups, partners, workstream leads, key committees and working groups and broader stakeholders of Agency and AMC.
Level 1: **KP1 1:2 Training Program Design, Development and Innovation**	3. Self-assessment by medical education providers concerning the integration of digital health capabilities as well as teaching and learning and assessment into current curricula and future curricula plans 4. Measure completion and readiness of curriculum product	• Map design, development, implementation and evaluation of curriculum • Evaluate stages of maturity of product – current and future state provider curricula frameworks - design, development, implementation and evaluation processes
Level 1: **KP1 1:3 Training Program Uptake by Providers**	5. Evaluate uptake of Medical education providers of digital health in medical programs: • Foundational Capabilities • Teaching and Learning Programs • Assessment Programs 6. Measurement of medical education providers already compliant with the requirements of the digital capabilities framework in medicine • Foundational Capabilities • Teaching and Learning Programs • Assessment Programs	• Collect data on those providers already compliant with the requirements of the Digital Health Foundational Capability Framework • Collect data on uptake of digital health in medical education programs • Conduct debriefs with providers concerning uptake – challenges and opportunities.
Level 1: **KPI 1.4 Training Program Implementation and Evaluation Plan**	7. Collect provider plans for implementation and evaluation of their digital health capabilities in their curricula, teaching and learning plans and assessment plans as well as plans to evaluate success	• Gain plans from medical education providers • Surveys and focus groups
During Implementation: This stage focuses the medical doctors' participation and completion of learning and assessment activities which foster digital capabilities in their medical education programs.		

Level 2: **KPI 2.1** **Program Participation**	8. Collect data on learner participation in the digital capability framework per provider	• Participation rates – provided by providers
Level 2: **KPI 2.2** **Program Completion**	9. Collect data on learner completion of the digital capability framework	• Completion rates – provided by providers
Post Implementation: In this stage, the AMC and its partners measure the impact of foundational capabilities and teaching and learning, as well as, assessment programs in supporting a robust workforce education program in Medicine aligned with the National Digital Roadmap. This stage focuses on exploring impact from the perspective of learners across the continuum (their learning experiences and learning outcomes); the health system improvements and patient and community (their experiences and health outcomes). Impact is measured with reference to the six dimensions of impact evaluation on clinical practice and health system improvement: ○ effectiveness (curing patients at a better rate – reducing complications, reducing readmission, reducing emergency admission) ○ efficiency of services (using resources in best way, balancing costs and benefits) ○ timeliness (reducing waiting times, GPs or before surgery) ○ patient quality and safety (quality, risk and bias in care) ○ patient-centredness (as measured by patient satisfaction and outcomes) ○ equity (access to quality services).		
Level 3: **Medical Doctor Learning Experiences and Attitudes**	10. Collect interest and satisfaction data and other attitudinal data	• Surveys to gauge interest in digital health across the medical continuum and where curriculum is in use – data of effectiveness of the EPAs and learning programs/assessment programs • Focus groups and debrief sessions • UX walk throughs and analysis
Level 4: **Medical Doctor Lifelong Learning Behaviour, Performance/Learning Outcomes**	11. Collect comparative data on pre course and post curriculum integration learning, behaviour and performance outcomes	• Pre and Post survey mapped to course learning outcomes • Assessment data drawn from completion of EPAs - assessment tasks and activities • Pre and Post curriculum completion data mapped

		to the six dimensions of impact as set out above • Multisource feedback from workplace colleagues on achievement of learning outcomes and changes in performance levels
Level 5: Health Systems Process Improvement and Performance	12. Collect comparative data on pre course and post curriculum integration outcomes on system	• Pre and Post survey mapped to curriculum learning outcomes • Pre and Post curriculum uptake data mapped to the six dimensions of impact as set out above • Multisource feedback from workplace colleagues on achievement of learning outcomes and changes in performance levels
Level 6: Patient and Health Community Experiences and Outcomes	13. Collect comparative data on pre curriculum and post curriculum integration outcomes mapped to patient and health community experiences and outcomes	• Pre and Post survey course data mapped to patient and community experiences and outcomes – targets of EPAs and broader digital frameworks • Pre and Post curriculum uptake data mapped to patient data related to the six dimensions of impact as set out above • Analysis with comparator data sets at nation state, Regional, health facility and education provider level where available.

Possible Next Steps

In this section, we outline some possible next steps for medical education innovation and possible future areas of collaboration between the Agency, the AMC, other Commonwealth Government Departments and medical education providers, which extends beyond the scope of this current partnership.

Implementing the Digital Foundational Capability Framework in Medicine

Some piloting and implementation considerations are as follows:

Stages of Program	Description
Pilot Design and Implementation of Capability Framework	A pilot of the design and implementation of the proposed medical education framework in digital health is conducted across jurisdictions and with the support of medical education providers across the continuum of medical education.
Dependencies	
Communication	Clear information needs to be provided about the pilot and proposed implementation of the capability framework to medical education providers and jurisdictions. This needs to align with the broader ADHA plans for capability across the health system.
Technology	A dependency of the pilot is the availability of validated technology tools aligned with the three horizons. This is important so that medical practitioners across the continuum can undertake the task and have clear guidelines about optimal technology to access. Technology requirements for the horizons is as follows: • Telehealth (Horizon 1) • Electronic Record System (Horizon 1) • Genomics (Horizon 2) • Advanced Robotics (Horizon 2) • Artificial Intelligence (Horizon 2) • 3D Printing (Horizon 2) • Consumer health app or home technology devices (Horizon 3) A current risk is that smaller rural sites may have less access to emerging technologies than larger and better resourced flagship hospital settings in metropolitan areas. Equally, for horizon 3 technology some consumer groups i.e., aged care may have limited expertise and digital literacy in using consumer centred technology. We need to ensure, through fair and equitable access to emerging technologies, that all medical practitioners have access to the required technologies to achieve entrustment and experience with the required technologies for each of the three horizons and related EPAs. In this

	way, equity of access will be assured, bottlenecks in training will not result and technology is more likely to deliver on one of its core promises and advantages: to improve access and equity in healthcare delivery and education in all healthcare settings.
Education Resources	The EPA templates, teaching and learning programs, and assessment programs suggest a number of education resources which will help support the learning of medical doctors across the continuum. Base curated resources need to be available for the pilot so that medical professionals can learn knowledge, skills and attitudes relevant to each of the tasks and associated horizon in the Australian National Framework. The model will also require increased infrastructure i.e., learning management platform, and ePortfolio. Equally, it would be useful to consider how micro-credentials in Digital Capability Development could be offered as part of a broader Certificate of Health Reform with other micro-credentials on priorities such as Aboriginal and Torres Strait Islander Healthcare, Aged Care, Disability, Improving Access and Equity in Healthcare, Training Pathways, etc.
People Training (Awareness and Skills Development Training)	**System Leaders and Medical Education Leaders:** Health system leaders across the jurisdiction and in Commonwealth Departments and Medical Education leaders in jurisdictions and medical education providers need to have opportunities to gain awareness of the Digital Health Framework in Medicine and implications for their medical workforce and others across the health system. **Medical Education Supervisors:** Vital to the success of the implementation of the pilot and subsequent rollout of the capability framework in medicine is the need to provide quality supervisor training to ensure that supervisors have an awareness of the framework and build skills so that they can implement the framework effectively and integrate it into their teaching and supervisory practice. **Digital Experts in Jurisdictions and Technical Support People:** Digital champions and the technical support team across the jurisdictions need to be aware of this project and the associated technology requirements. They need to be ready to act as champions for the implementation of this framework in their setting and provide the technical support for its implementation.
Impact Evaluation	Impact evaluation needs to analyse the success and challenges of the proposed framework so recommendations for further improvement can be made. Technology solutions for data collection and analysis of impact need to be confirmed.
Research	Ethics approval and a formal research project should be prepared to contribute to the body of this evidence in the formal literature.
Implementation Plans	Following adjustments to the framework implementation plans are developed aligned with pilot recommendations.

Stages of Program	Description
Pilot Design and Implementation of Capability Framework	A pilot of the proposed medical education framework in digital health is conducted across jurisdictions and with the support of medical education providers across the continuum of medical education.
Dependencies	
Communication	Clear information needs to be provided about the pilot and proposed implementation of the capability framework to medical education providers and jurisdictions. This needs to align with the broader ADHA plans for capability across the health system.
Technology	A dependency of the pilot is the availability of validated technology tools aligned with the three horizons. This is important so that medical practitioners across the continuum can undertake the task and have clear guidelines about optimal technology to access. Technology requirements for the horizons is as follows: • Telehealth (Horizon 1) • Digital Record System (Horizon 1) • Genomics (Horizon 2) • Advanced Robotics (Horizon 2) • Artificial Intelligence (Horizon 2) • 3D Printing (Horizon 2) • Consumer health app or home technology devices (Horizon 3) A current risk is that smaller rural sites may have less access to emerging technologies than larger and better resourced flagship hospital settings in metropolitan areas. Equally, for horizon 3 technology some consumer groups i.e., aged care may have limited expertise and digital literacy in using consumer centred technology. We need to ensure, through fair and equitable access to emerging technologies, that all medical practitioners have access to the required technologies to achieve entrustment and experience with the required technologies for each of the three horizons and related EPAs. In this way, equity of access will be assured, bottlenecks in training will not result and technology is more likely to deliver on one of its core promises and advantages: to improve access and equity in healthcare delivery and education in all healthcare settings.
Education Resources	The EPA templates, teaching and learning programs, and assessment programs suggest a number of education resources which will help support the learning of medical doctors across the continuum. Base curated resources need to be available for the pilot so that medical

	professionals can learn knowledge, skills and attitudes relevant to each of the tasks and associated horizon in the Australian National Framework. The model will also require increased infrastructure i.e., learning management platform, and ePortfolio.
People Training (Awareness and Skills Development Training)	**System Leaders and Medical Education Leaders:** Health system leaders across the jurisdiction and in Commonwealth Departments and Medical Education leaders in jurisdictions and medical education providers need to have opportunities to gain awareness of the Digital Health Framework in Medicine and implications for their medical workforce and others across the health system. **Medical Education Supervisors:** Vital to the success of the implementation of the pilot and subsequent rollout of the capability framework in medicine is the need to provide quality supervisor training to ensure that supervisors have an awareness of the framework and build skills so that they can implement the framework effectively and integrate it into their teaching and supervisory practice. **Digital Experts in Jurisdictions and Technical Support People:** Digital champions and the technical support team across the jurisdictions need to be aware of this project and the associated technology requirements. They need to be ready to act as champions for the implementation of this framework in their setting and provide the technical support for its implementation.
Impact Evaluation	A model of impact evaluation needs to be created so that the success and challenges of the proposed framework can be captured and recommendations for further improvement can be made. Technology solutions for data collection and analysis of impact need to be confirmed.
Rollout of Implementation of Capability Framework	Following adjustments to the framework implementation undertaken aligned with pilot recommendations.

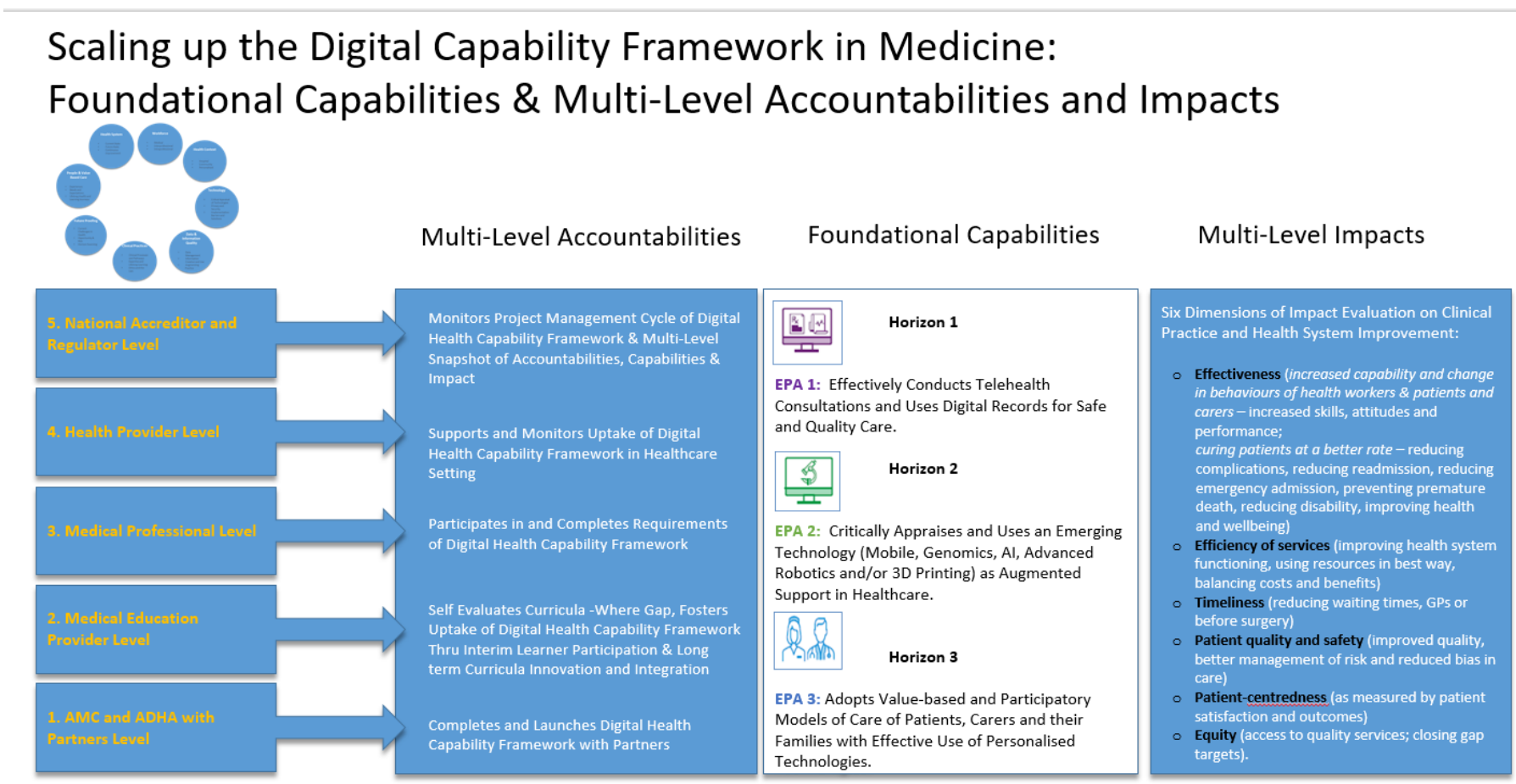


Figure 43: Scaling up the Digital Capability Framework in Medicine

Health Reform and Credentialling

As part of other possible next steps, the AMC could work collaboratively with medical education and health providers in the development of a Horizon Medicine Certificate, or more broadly health, which provides a stackable, micro-credentialled lifelong learning certificate focused on priority areas of health change.

Three-Tiered Business Opportunity

Government Partners	Share insights with other Government Departments on creation of a horizon plan which effectively distils three priority workforce needs related to government priority area i.e., digital health in medicine, social determinants of health, strategic change and leadership in health, social responsibility in health, disability, aged care, Indigenous Health – closing the gap, environmental sustainability in health, public health management of health emergencies and outbreaks.
AMC	Develops the Educational Framework for Medicine and shares with Health sector.
Education Providers	Tenders to support development of associated educational resources and assessment, and supported for implementation.

Learning Model

Delivered in an App, the learning could be viewed on one's phone or tablet and include teaching and learning support, options for sign off of EPAs and digital badges for horizon micro-credential modules completed i.e., digital health.

Other modules could be offered in the future in other priority areas, with further government partnerships including Aged care, disability, Indigenous Health, Environment Sustainability in Health, Managing Pandemics and so on.

The app could include an initial module on **Professional Identities in Disruptive Change in Health.**

Core to successful careers in disruptive environments is for health workers to reflect on their professional identity and to stay abreast of change through commitment to ongoing learning.

The focus within professional learning is on the creation of career maps that combine past learnings and recognition of skills achieved so that learners are able to successfully transfer skills as well as future learning priorities which focus on gaps to ensure that they have a successful career and navigate change effectively:

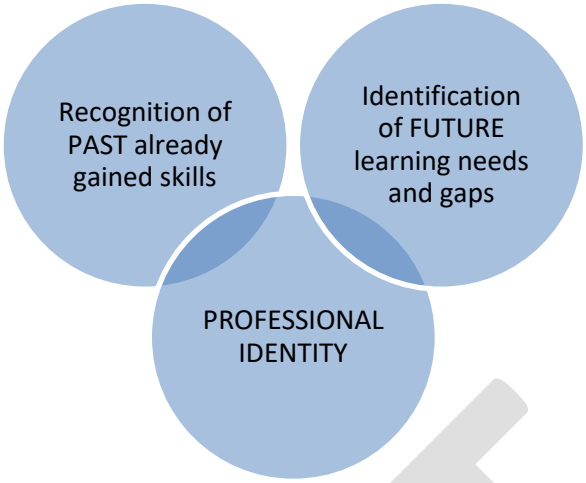


Figure 44: Professional Identity – Method to Recognise Skills and Future Learning Needs and Gaps

Key questions which can help doctors shape their professional identity and explore the relevance of digital health to their future careers is to:

1. Reflect on the core functional roles of new digital identities in health and **think about the skills you already have** – write down core capabilities you can transfer to digital health contexts.
2. Reflect on the core functional roles of new digital identities in health and **think about your gaps and future learning needs** – write down core capabilities you can transfer to digital health contexts.
3. Think about the **evidence you have of your current skills** and document in a professional portfolio.
4. Think about the **gaps and future learning needs and identify the future learning** you can do to meet these gaps and EPAs to perform to demonstrate competence.

Digital Professional Identities and Roles in Medicine

The National Digital Roadmap sets out a range of new roles in digital health to which a series for further EPAs can be mapped. The point of this framework is that these are key functional roles that will be undertaken by a range of health workers within health contexts, including Doctors and other key health workers including Nurses and Midwives, Pharmacy and Allied Health:

Figure 45: Digital Roles in National Digital Roadmap (continued overleaf).

Figure 46: Digital Roles in National Digital Roadmap (continued).

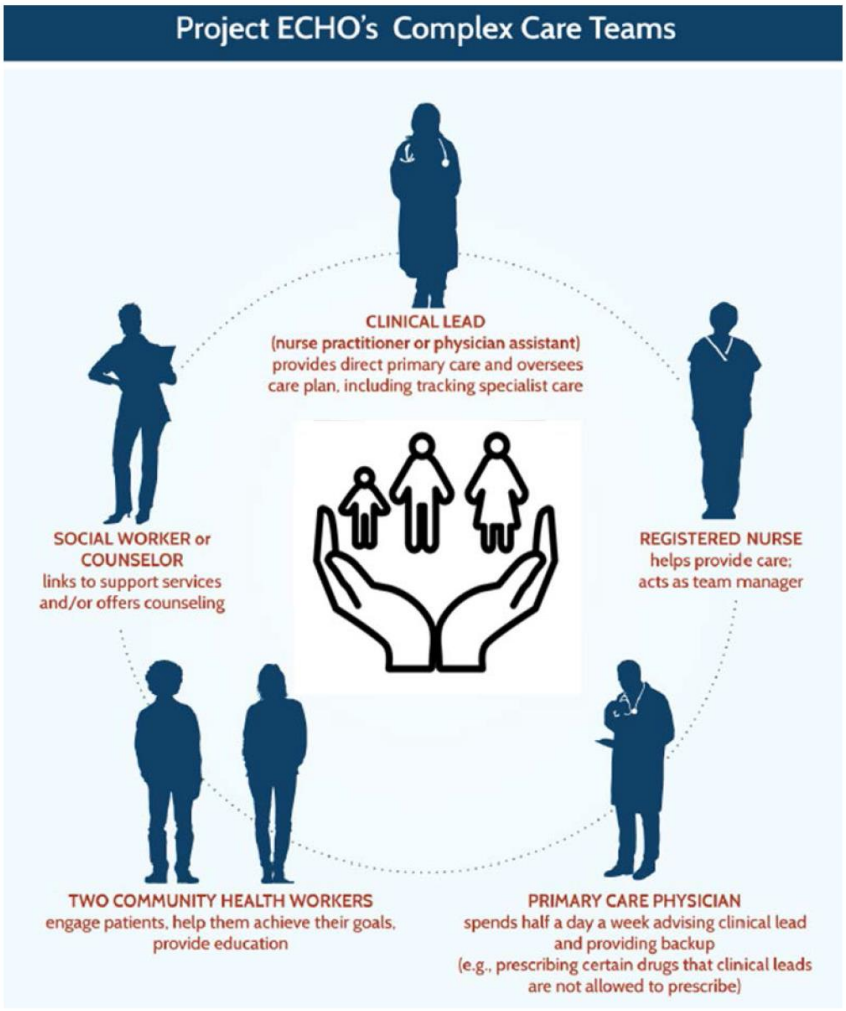
Further EPAs Mapped to the Digital Roles Framework include:

Patient Consumer and Carer	**EPA4:**	**Patient Experience and Outcomes**
Frontline Clinical	**EPA5:**	**Clinical Digital Skills**
Digital Champion	**EPA6:**	**Digital Champion**
Clinical and Technology Bridging	**EPA7:**	**Clinical and Technology Boundary Spanner**
Technologist	**EPA8:**	**Technologist**
Leadership and Executive	**EPA9:**	**Leader and Executive**
Business, Administrative and Clinical Support	**EPA10:**	**Business and Administrator**
Education and Research	**EPA11:**	**Educator and Researcher**

Extending beyond digital capabilities for all, which this foundational framework focuses on, there will be some medical professionals who seek a more advanced knowledge base in this area as well as specific technology-based careers in medicine. As part of next steps, it would be useful to expand on this framework to develop more advanced educational offerings to support medical innovation and new technology leveraged career opportunities for doctors.

Individual and Team based Performance

A further level of analysis worth considering within the context of capability is the concept of 'team competence' or 'collective competence' proposed in the work of Lorelei Lingard (2004). Developing standards and assessments for teams, not simply individuals, is a challenge area given that performance has traditionally been assessed exclusively at an individual level. Shifting assessment to collective and organisational capability is an important mechanism to unlock long held barriers to team performance and interprofessional learning and work practices.



Source: (Hostetter, Klein, & McCarthy, 2016)

Figure 47: The Care Team – An Interdisciplinary Model

Work teams could do the certificate together to consolidate their team performance in specific health workplace settings and learn together how to better anticipate and navigate the impacts of disruptive change in healthcare.

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Appendix 1: Entrustable Professional Activity 1 – Constructive Curriculum Alignment

The table below seeks to show Constructive Curriculum Alignment (Biggs 1999) for EPA1 (alignment between learning outcomes and core domains of practice, alignment with teaching and learning, and entrustment supervision levels in assessment for the task over four levels of Complexity – Foundational Knowledge, Routinised Practice, Problem Solving and Complex Use and Leadership).

<table>
<tr><td colspan="4">EPA Title: Effectively Conducts Telehealth Consultations and Uses Electronic Records for Safe and Quality Care</td></tr>
<tr><td colspan="4">Clinical Context: This EPA applies in admission, reviewing patient on request of particular concern, ward call tasks, ward rounds, lower acuity ED presentations, general practice consultations, or outpatient clinical attendance.</td></tr>
<tr><td colspan="4">Description
A key aim of the National Digital Health Workforce and Education Roadmap is to address the gap between real life medical services and medical education. Horizon 1 focuses on the transition of paper-based practices and systems across healthcare settings to electronic systems of records and use of telehealth and ePrescribing in the delivery of healthcare. This EPA focuses on providing medical doctors across the continuum with the skills and experience to navigate new digital health workflows for safe and quality healthcare delivery: to undertake telehealth consultations, ePrescribing and effective use of electronic record keeping.
This EPA focuses on requires entrustment of the ability to acquire foundational knowledge, to demonstrate routinised practice, perform in complex contexts and problem solve and leadership (optional) to effectively conduct telehealth consultations and uses electronic records for safe and quality care:</td></tr>
<tr><td>Foundational Knowledge
Learning Outcomes</td><td colspan="3">• Understands the benefits and challenges of effective use of telehealth.
• Understands what an electronic record system is and how it functions in clinical care.
• Understands the benefits and challenges of effective use of electronic records.
• Understands the benefits and challenges of effective ePrescribing.
• Demonstrates understanding of privacy and security concerns and practices related to effective use of electronic records.
• Demonstrates understanding of ethics and the law in relation to effective use of electronic records.</td></tr>
<tr><td>Routinised Practice
Learning Outcomes</td><td colspan="3">• Demonstrates effective use of telehealth and electronic records in simple cases and stable routinised clinical environments:
o Access and review patient information in an electronic record system.
o Synthesise information relevant to patient care from multiple sources
o Observe privacy and security of information in a digital electronic record system.
o Consult effectively with patients with telehealth system about, and with reference to, electronic records.
o Prepare clear records.
o Update an electronic record contemporaneously with the patient consultation.
o Upload an electronic record.</td></tr>
<tr><td>Complex Contexts and Problem Solving
Learning Outcomes</td><td colspan="3">• Demonstrates effective use of digital records in complex cases and challenging clinical environments.
o Treat vulnerable patients.
o Effectively manage patients and/or colleagues who may be resistant to telehealth and electronic records, sensitively and ethically.
o Audit practice records through reference to an electronic record system and transcript of telehealth consultation.
• Demonstrate technical resolution and troubleshooting.</td></tr>
<tr><td>LEVEL OF TASK COMPLEXITY AND LEARNING OUTCOMES</td><td>TEACHING AND LEARNING</td><td>SUPERVISOR ENTRUSTMENT AND PEER REVIEW LEVELS</td><td>ALIGMENT WITH CORE DOMAINS OF PRACTICE</td></tr>
<tr><td colspan="4">ENTRUSTMENT LEVELS 1 – 3 (Required for Safe and Quality Practice)</td></tr>
<tr><td>Foundational Knowledge
Learning Outcomes</td><td>✓ Factsheets.
✓ Webinars.
✓ Online module with quiz.
✓ Online sandpit to trial telehealth and play with dummy records in simulated system.
✓ Observation of health worker use of telehealth and digital records on the ward.</td><td>Directs learner to online resources for self-directed achievement and learning of foundational knowledge as part of regular supervisory check-ins.
Learner informs supervisor when learning is complete.
LMS and ePortfolio linked automatic record of learner’s successful completion of learning.
No direct supervision/peer review of performance required by supervisor/peer reviewers for this level.</td><td>✓ Digital Health – Foundational Current Technologies.
✓ Clinical Care.
✓ Critical Thinking.
✓ Privacy and Security.
✓ Ethics and the Law.
Qualitative and Quantitative data record in ePortfolio – System generates graphic representation of performance across domains.
• Performance in task components and domains drawn from scores in teaching and learning and associated assessments.</td></tr>
<tr><td>Routinised Practice
Learning Outcomes</td><td>✓ Online sandpit to play with dummy records in simulated system.</td><td>Entrustment through observation of routinised clinical cases.</td><td>✓ Digital Health - Foundational Current Technologies.
✓ Clinical Care.</td></tr>
</table>

	✓ Observation of health worker use of digital records on the ward. ✓ Demonstrates simple case use of digital records.	**Learner is entrusted for:** • **Direct Supervision –** supervisor/peer reviewers readily available and may do part of the task for modelling • **Indirect Supervision (Reactive) –** supervisor/peer reviewer is nearby e.g. in the same ward or same floor – e.g. able to help quickly • **Independent (learner able to do task independently reliably) –** Supervisor/peer reviewer available on phone or for emergencies. **To achieve this level learner needs to demonstrate a minimum of multiple routinised cases in different clinical contexts.**	✓ Critical Thinking. ✓ Privacy and Security. ✓ Ethics and the Law. **Qualitative and Quantitative data record in ePortfolio – System generates graphic representation of performance across domains.** • **Supervisor ranks performance in task components and domains.** • **Provides qualitative comment on learner performance.**
Complex Contexts and Problem Solving **Learning Outcomes**	✓ Online sandpit to trial telehealth consultation and play with dummy records in simulated system – simulation of complex use cases of digital record. ✓ Fact sheet – technical trouble shooting. ✓ Schwarz Round Multidisciplinary Discussion about Complex Clinical Cases (Including implications for Telehealth and Electronic Records). ✓ Audit Research into clinical cases and peer discussion of results. ✓ Demonstrates complex patient case effective use of Telehealth Consultation and electronic health record. ✓ Professional reflection on lessons learnt and personal and system improvement.	**Entrustment through observation of complex clinical cases.** Can be signed off for this level of entrustment in simulated environment (in the event that clinical environment offers routinised learning only – important so bottlenecks in training do not occur). **Entrustment through observation of routinised clinical cases.** **Learner is entrusted for:** • **Direct Supervision –** supervisor/peer reviewer readily available and may do part of the task for modelling • **Indirect Supervision (Reactive) –** supervisor/peer reviewer is nearby e.g. in the same ward or same floor – e.g. able to help quickly • **Independent (learner able to do task independently reliably) –** Supervisor/peer reviewer available on phone or for emergencies. **To achieve this level learner needs to demonstrate a minimum of multiple complex cases in different clinical contexts.**	✓ Digital Health - Foundational Current Technologies. ✓ Clinical Care. ✓ Critical Thinking. ✓ Privacy and Security. ✓ Ethics and the Law. **Qualitative and Quantitative data record in ePortfolio – System generates graphic representation of performance across domains.** • **Supervisor ranks performance in task components and domains.** • **Provides qualitative comment on learner performance.**
ENTRUSTMENT LEVELS 4 (Optional)			
As an **extension option** - For learners who perform particularly well or have an professional career interest in Digital Health – **Leadership** is demonstrated in one or more roles in digital health: ○ Demonstrates leadership skill related to core roles in telehealth and digital records (digital champion, researcher, teacher, manager and admin, and/or technologist).			

Leadership Demonstrates leadership skills in relation to one or more of the core roles related to telehealth and electronic record systems: • Digital Champion. • Researcher. • Teacher. • Manager and Admin. • Technologist.	✓ Workshadow a leader. ✓ Engage in project work. ✓ Demonstrate leadership behaviour.	**Learner is entrusted for supervision at a distance (phone) on achievement of this level.** If they choose to demonstrate leadership in teaching – they take on some teaching duties. **Learner is entrusted for:** • **Direct Supervision** • **Indirect Supervision (Reactive)** • **Independent (learner able to do task independently reliably)** (see above for definitions of these supervisor/peer reviewer entrustment levels) **To achieve this level learner needs to demonstrate a minimum of multiple leadership roles in different clinical contexts.**	✓ Leadership in Digital Health – Foundational Current Technologies (telehealth and digital records). o Champion of Digital Health. o Research in Digital Health. o Manager and Admin in Digital Heath. o Technologist in digital health. **Qualitative and Quantitative data record in ePortfolio – System generates graphic representation of performance across domains.** • **Reflective tool and discussion with supervisor to discuss outcomes of project for sign off.** • **Supervisor ranks performance in domains and for roles and provides qualitative comment on learner performance.**

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Appendix 2: Entrustable Professional Activity 2 – Constructive Curriculum Alignment

The table below seeks to show Constructive Curriculum Alignment (Biggs 1999) for EPA2 (alignment between learning outcomes and core domains of practice, alignment with teaching and learning, and entrustment supervision levels in assessment for the task over four levels of Complexity – Foundational Knowledge, Routinised Practice, Problem Solving and Complex Use and Leadership).

<table>
<tr><td colspan="2">EPA Title: Critically Appraises and Uses an Emerging Technology as Decision Support in Healthcare.</td></tr>
<tr><td colspan="2">Clinical context: This EPA applies in admission, reviewing patient on request of particular concern, ward call tasks, ward rounds, lower acuity ED presentations, general practice consultations, or outpatient clinical attendance.</td></tr>
<tr><td colspan="2">Description
Horizon 2 of the National Digital Health Workforce and Education Roadmap focuses on effective use of Emerging Technologies in healthcare delivery. Key to learning about these newer technologies is for doctors to gain capabilities in how they are used to support decision making, the changes to workflows and work practices, how data sets from these different technologies integrate and how such data can be used for more sophisticated data driven models of care. Furthermore, use of these technologies involves new ethical decisions as well as privacy and security issues.
This EPA focuses on requires entrustment of the ability to acquire foundational knowledge, to demonstrate routinised practice, perform in complex contexts and problem solve and leadership (optional) of critical appraisal and use of an emerging technology as decision support in healthcare:</td></tr>
<tr><td>Foundational Knowledge
Learning Outcomes</td><td>• Selects a validated clinical decision support tool with integrated technology solutions – refer to a curated collection per specialty, for the various stages in the clinical process (diagnostics, prognosis, and therapeutics), and for priority health system contexts of validated clinical decision support tools i.e. chronic care and rural health in the associated Digital Health in Medicine Teaching and Learning Program Guide. These tools have been validated using the GRASP Framework, Khalifa et al. BMC Medical Informatics and Decision Making 19, Article No 207, 2019.
• Explores the benefits and challenges for patients and clinicians of usage of the clinical decision support.
• Critically appraises the assumptions on which the decision tool algorithms are based and consider ways in which transparency about these assumptions can be improved to foster effective use of the decision tool and rigor of the judgments made in its usage.
• Reflects on the similarities and differences of your clinical practice, with and without use of the decision tool, including ethical implications:
o Understands what a digital decision tool is and how it functions in clinical care.
o Understands the benefits and challenges of effective use of digital decision tools.
o Demonstrates understanding of privacy and security concerns and practices related to effective use of digital decision tools.
o Selects a validated decision tool related to specialty or a priority health context and familiarises oneself with its features.
o Critically appraises the assumptions on which the decision tool algorithms are based.
o Demonstrates understanding of ethics and the law in relation to effective use of digital decision tools.</td></tr>
<tr><td>Routinised Practice
Learning Outcomes</td><td>• Demonstrates effective use of digital decision tools in simple cases and stable routinised clinical environments:
o Use the tool for diagnosis
o Use the tool for prognosis
o Use the tool for therapeutics.
• Observe privacy and security of patient data including considerations of ethics and possible bias in decision making.</td></tr>
<tr><td>Complex Contexts and Problem Solving
Learning Outcomes</td><td>• Demonstrates effective use of digital decision tools in complex cases and challenging clinical environments:
o Use the tool for diagnosis
o Use the tool for prognosis
o Use the tool for therapeutics.
• Treats vulnerable patients and patients/colleagues who may be resistant to digital decision making tools, sensitively and ethically.
• Observes privacy and security of patient data including consideration of ethics and possible bias in decision making.
• Audits practice records through reference to a digital decision tool:
o effectiveness (curing patients at a better rate – reducing complications, reducing readmission, reducing emergency admission)
o efficiency of services (using resources in best way, balancing costs and benefits)
o timeliness (reducing waiting times, GPs or before surgery)
o patient quality and safety (quality, risk and bias in care)
o patient-centredness (as measured by patient satisfaction and outcomes)
o equity (access to quality services).
• Reflects on the similarities and differences of your clinical practice, with and without use of the decision tool, including ethical implications.
• Observes privacy and security of patient data and possible issues of bias and ethical considerations.
• Demonstrates technical resolution and troubleshooting.</td></tr>
</table>

LEVEL OF LEARNING & CORE CAPABILITIES	TEACHING AND LEARNING	SUPERVISOR ENTRUSTMENT	ALIGMENT WITH CORE DOMAINS OF PRACTICE
ENTRUSTMENT LEVELS 1 – 3 (Required for Safe and Quality Practice)			
Foundational Knowledge Learning Outcomes **(see above)**	✓ Factsheets. ✓ Webinars. ✓ Online module with quiz. ✓ User guides and information with links to curated collections of decision tools. ✓ Observation of health worker use of decision tools on the ward.	Directs learner to online resources for self-directed achievement and learning of foundational knowledge as part of regular supervisory check-ins. Learner informs supervisor when learning is complete. LMS and ePortfolio linked automatic record of learner's successful completion of learning. **No direct supervision of performance required by supervisor for this level.** **This level may already have been achieved and may be achieved through Recognition of Prior Learning (RPL) – agreed in discussion with supervisor or peer assessor with view to progress and commence EPA at Level 2: Routinised Practice.**	✓ Digital Health – Foundational Technologies. ✓ Clinical Care. ✓ Decision Making and Judgments. ✓ Critical Thinking. ✓ Privacy and Security. ✓ Ethics and the Law. **Qualitative and Quantitative data record in ePortfolio – System generates graphic representation of performance across domains.** • **Performance in task components and domains drawn from scores in teaching and learning and associated assessments.**
Routinised Practice Learning Outcomes **(see above)**	✓ Use tool for routinised test cases in simulated system. ✓ Observation of health worker use of digital decision tool on the ward. ✓ Demonstrates simple case use of digital decision tool.	**Entrustment through observation of routinised clinical cases.** **Learner is entrusted for:** • **Direct Supervision –** supervisor/peer reviewer readily available and may do part of the task for modelling • **Indirect Supervision (Reactive) –** supervisor/peer reviewer is nearby e.g. in the same ward or same floor – e.g. able to help quickly • **Independent (learner able to do task independently reliably) –** Supervisor/peer reviewer available on phone or for emergencies. **To achieve this level learner needs to demonstrate a minimum of multiple routinised cases in different clinical contexts.**	✓ Digital Health. ✓ Clinical Care. ✓ Decision Making and Judgments ✓ Critical Thinking. ✓ Privacy and Security. ✓ Ethics and the Law. **Qualitative and Quantitative data record in ePortfolio – System generates graphic representation of performance across domains.** • **Supervisor ranks performance in task components and domains.** • **Provides qualitative comment on learner performance.**
Complex Contexts and Problem Solving Learning Outcomes **(see above)**	✓ Use tool for complex test cases in simulated system. ✓ Fact sheet – technical trouble shooting. ✓ Schwarz Round Multidisciplinary Discussion about Complex Clinical Cases (Including implications for Digital Decision making tools). ✓ Audit Research into clinical cases and peer discussion of results. ✓ Demonstrates complex patient case effective use of digital decision making tools. ✓ Professional reflection on lessons learnt and personal and system improvement.	**Entrustment through observation of complex clinical cases.** Can be signed off for this level of entrustment in simulated environment (in the event that clinical environment offers routinised learning only – important so bottlenecks in training do not occur). **Entrustment through observation of routinised clinical cases.** **Learner is entrusted for:** • **Direct Supervision –** supervisor/peer reviewer readily available and may do part of the task for modelling • **Indirect Supervision (Reactive) –** supervisor/peer reviewer is nearby e.g. in the same ward or same floor – e.g. able to help quickly • **Independent (learner able to do task independently reliably) –** Supervisor/peer reviewer available on phone or for emergencies.	✓ Digital Health. ✓ Clinical Care. ✓ Decision Making and Judgments. ✓ Critical Thinking. ✓ Privacy and Security. ✓ Ethics and the Law. **Qualitative and Quantitative data record in ePortfolio – System generates graphic representation of performance across domains.** • **Supervisor ranks performance in task components and domains.** • **Provides qualitative comment on learner performance.**

		To achieve this level learner needs to demonstrate a minimum of multiple complex cases in different clinical contexts.	
As an **extension option** - For learners who perform particularly well or have an professional career interest in Digital Health – **Leadership** is demonstrated in one or more roles in digital health: ○ Demonstrates leadership skill related to decision support and core roles in digital health (digital champion, researcher, teacher, manager and admin, and/or technologist).			
ENTRUSTMENT LEVELS 4 (Optional)			
Leadership Demonstrates leadership skills in relation to one or more of the core roles related to effective use of digital decision making tools in medicine: • Digital Champion. • Researcher. • Teacher. • Manager and Admin. • Technologist.	✓ Workshadow a leader. ✓ Engage in project work. ✓ Demonstrate leadership behaviour.	**Learner is entrusted for:** • **Direct Supervision** • **Indirect Supervision (Reactive)** • **Independent (learner able to do task independently reliably)** (see above for definitions of these supervisor entrustment levels) **To achieve this level learner needs to demonstrate a minimum of multiple leadership roles in different clinical contexts.**	✓ Leadership in Digital Health. ○ Champion of Digital Health. ○ Research in Digital Health. ○ Manager and Admin in Digital Heath. ○ Technologist in digital health. **Qualitative and Quantitative data record in ePortfolio – System generates graphic representation of performance across domains.** • **Reflective tool and discussion with supervisor to discuss outcomes of project for sign off.** • **Supervisor ranks performance in domains and for roles and provides qualitative comment on learner performance.**

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Appendix 3: Entrustable Professional Activity 3 – Constructive Curriculum Alignment

The table below seeks to show Constructive Curriculum Alignment (Biggs 1999) for EPA3 (alignment between learning outcomes and core domains of practice, alignment with teaching and learning, and entrustment supervision levels in assessment for the task over four levels of Complexity – Foundational Knowledge, Routinised Practice, Problem Solving and Complex Use and Leadership).

<table>
<tr><td colspan="4">Title: EPA 3: Provides Value-Based Care for Patients and their Families with integration of Effective Use of Personalised Technologies.</td></tr>
<tr><td colspan="4">Focus and context: This EPA applies in hospitals and health contexts outside hospital settings including community and home care settings.</td></tr>
<tr><td colspan="4">Description
Horizon three of the National Digital Health Workforce and Education Roadmap offers, as the focus of this EPA, models in which technology allows us to reimagine how care can be delivered. This can impact on all aspects of care from how we monitor consumer health, and how and when we intervene and how we actually deliver care by whom.
This EPA requires entrustment of the ability to acquire foundational knowledge, to demonstrate routinised practice, perform in complex contexts and problem solve and leadership (optional) in value-based care for patients and their families through integration of effective use of personalised technologies:</td></tr>
<tr><td>Foundational Knowledge
Learning Outcomes</td><td colspan="3">• Understands the principles and practice of value-based care
• Gains an in-depth perspective of the challenges associated with engaging in healthcare for patients and carers, and the influences of personal and community context through patient interviews and observations in clinical and home contexts, and patient journey mapping (including patients with routine and complex health conditions and different patient cohorts which may include homeless, paediatric, in aged care facility, adolescent drop in centre, Indigenous, disabled, CALD patient and carer, etc.)
• Reflects on why value-based care matters including review of benefits, risks and required shifts in current practices in terms of fostering health literacy, empowerment, and improved health experiences and outcomes
• Understands how technology can be leveraged to develop sustainable models of value-based care in clinical settings and home and community health environments
• Understands that technologies have underpinning assumptions and algorithms
• Reviews and builds an awareness of the benefits and risks of a range of personalised technologies for different consumer groups, consumer health needs, and preferences aligned with specialty fields of practice and a range of health conditions and health settings.</td></tr>
<tr><td>Routinised Practice
Learning Outcomes</td><td colspan="3">• Identifies opportunities for shifts in personal practice and system improvements to integrate value-based care leveraging sustainable use of personalised technologies for patients with routine health condition, in stable health setting contexts and supportive culture.
• Reviews current clinical workflows and develop plans to integrate improvement to practices identifying anticipated positive impacts for consumers, personal professional performance and performance at a system level.
• Implements the planned change.
• Monitors the outcomes and impacts:
○ effectiveness (curing patients at a better rate – reducing complications, reducing readmission, reducing emergency admission, learning a new skill, making a shift in personal practice)
○ efficiency of services (using resources in best way, balancing costs and benefits)
○ timeliness (reducing waiting times, GPs or before surgery)
○ patient quality and safety (quality, risk and bias in care)
○ patient-centredness (as measured by patient satisfaction and outcomes)
○ equity (access to quality services).</td></tr>
<tr><td>Complex Contexts and Problem Solving
Learning Outcomes</td><td colspan="3">• Identifies opportunities for shifts in personal practice and system improvements to integrate value-based care leveraging sustainable use of personalised technologies for patients with complex health condition and dealing with resistance or complex health setting contexts.
• Reviews current clinical workflows and develop plans to integrate improvement to practices identifying anticipated positive impacts for consumers, personal professional performance and performance at a system level.
• Implements the planned change.
• Monitors the outcomes and impacts:
○ effectiveness (curing patients at a better rate – reducing complications, reducing readmission, reducing emergency admission, learning a new skill, making a shift in personal practice)
○ efficiency of services (using resources in best way, balancing costs and benefits)
○ timeliness (reducing waiting times, GPs or before surgery)
○ patient quality and safety (quality, risk and bias in care)
○ patient-centredness (as measured by patient satisfaction and outcomes)
○ equity (access to quality services).</td></tr>
<tr><td>LEVEL OF LEARNING & CORE CAPABILITIES</td><td>TEACHING AND LEARNING</td><td>SUPERVISOR ENTRUSTMENT/PEER REVIEW</td><td>ALIGMENT WITH CORE DOMAINS OF PRACTICE</td></tr>
<tr><td colspan="4">ENTRUSTMENT LEVELS 1 – 3 (Required for Safe and Quality Practice)</td></tr>
</table>

Foundational Knowledge Learning Outcomes **(see above)**	✓ Factsheets. ✓ Webinars. ✓ Online module with quiz. ✓ Patient Interviews in diverse community settings and Transcripts. ✓ Review of Sample Patient Journeys. ✓ Review of Sample Clinical Workflows. ✓ Review of Practice Improvement Plan. ✓ User guides and information with links to curated collections of personalised health technologies. ✓ Observation of health worker and consumer use of personalised health technologies.	Directs learner to online resources for self-directed achievement and learning of foundational knowledge as part of regular supervisory check-ins. Learner informs supervisor when learning is complete. LMS and ePortfolio linked automatic record of learner's successful completion of learning. **No direct supervision/peer review of performance required by supervisor for this level.** **This level may already have been achieved and may be achieved through Recognition of Prior Learning (RPL) – agreed in discussion with supervisor or peer assessor with view to progress and commence EPA at Level 2: Routinised Practice.**	✓ Digital Health – Patient and Home/ Consumer focused Health Technologies. ✓ Clinical Care. ✓ Decision Making and Judgments. ✓ Critical Thinking. ✓ Privacy and Security. ✓ Ethics and the Law. **Qualitative and Quantitative data record in ePortfolio – System generates graphic representation of performance across domains.** • **Performance in task components and domains drawn from scores in teaching and learning and associated assessments.**
Routinised Practice Learning Outcomes **(See above)**	✓ Use tool for routinised test cases in simulated system. ✓ Observation of health consumer and home technologies ✓ Patient Interviews and Transcripts in home setting ✓ Demonstrates simple case use of home technologies and value-based interviewing skills.	**Entrustment through observation of routinised clinical cases.** **Learner is entrusted for:** • **Direct Supervision –** supervisor/peer reviewer readily available and may do part of the task for modelling • **Indirect Supervision (Reactive) –** supervisor/peer reviewer is nearby e.g. in the same ward or same floor – e.g. able to help quickly • **Independent (learner able to do task independently reliably) –** Supervisor/peer reviewer available on phone or for emergencies. **To achieve this level learner needs to demonstrate a minimum of multiple routinised cases in different clinical contexts.**	✓ Digital Health – Patient and Home/ Consumer focused Health Technologies. ✓ Clinical Care. ✓ Decision Making and Judgments. ✓ Critical Thinking. ✓ Privacy and Security. ✓ Ethics and the Law. **Qualitative and Quantitative data record in ePortfolio – System generates graphic representation of performance across domains.** • **Supervisor /Peer Assessor ranks performance in task components and domains.** • **Provides qualitative comment on learner performance.**
Complex Contexts and Problem Solving Learning Outcomes **(See above)**	✓ Use tool for complex test cases in simulated system. ✓ Fact sheet – technical trouble shooting. ✓ Schwarz Round Multidisciplinary Discussion about Complex Clinical Cases (Including implications for home and consumer facing health technologies). ✓ Audit Research into clinical cases and peer discussion of results. ✓ Demonstrates complex patient case effective use of personalised health technologies.	**Entrustment through observation of complex clinical cases.** Can be signed off for this level of entrustment in simulated environment (in the event that clinical environment offers routinised learning only – important so bottlenecks in training do not occur). **Learner is entrusted for supervision/peer assessment at a distance (phone) on achievement of this level.** **To achieve this level learner needs to**	✓ Digital Health – Patient and Home/ Consumer focused Health Technologies. ✓ Clinical Care. ✓ Decision Making and Judgments. ✓ Critical Thinking. ✓ Privacy and Security. ✓ Ethics and the Law. **Qualitative and Quantitative data record in ePortfolio – System generates graphic representation of performance across domains.** • **Supervisor/ peer assessor ranks performance in task components and domains.** • **Provides qualitative comment on learner performance.**

	✓ Patient Interviews and Transcripts in home setting ✓ Professional reflection on lessons learnt and personal and system improvement.	**demonstrate a minimum of 2 complex cases.**	

As an **extension option** - For learners who perform particularly well or have an professional career interest in Digital Health – **Leadership** is demonstrated in one or more roles in digital health:

- Demonstrate leadership skill related to value-based care and core roles in digital health (digital champion, researcher, teacher, manager and admin, and/or technologist).

ENTRUSTMENT LEVELS 4 (Optional)

Leadership Demonstrates leadership skills in relation to one or more of the core roles related to effective use of home and consumer facing health technologies in medicine: • Digital Champion. • Researcher. • Teacher. • Manager and Admin. • Technologist.	✓ Workshadow a leader. ✓ Engage in project work. ✓ Demonstrate leadership behaviour.	**Learner is entrusted for:** • **Direct Supervision** • **Indirect Supervision (Reactive)** • **Independent (learner able to do task independently reliably)** (see above for definitions of these supervisor entrustment levels) **To achieve this level learner needs to demonstrate a minimum of multiple leadership roles in different clinical contexts.**	✓ Leadership in Digital Health. o Champion of Digital Health. o Research in Digital Health. o Manager and Admin in Digital Heath. o Technologist in digital health. **Qualitative and Quantitative data record in ePortfolio – System generates graphic representation of performance across domains.** • **Reflective tool and discussion with supervisor/ peer assessor to discuss outcomes of project for sign off.** • **Supervisor/peer assessor ranks performance in domains and for roles and provides qualitative comment on learner performance.**

References:

General intro to VBC

https://catalyst.nejm.org/doi/full/10.1056/CAT.17.0558

https://www.health.nsw.gov.au/Value/Pages/default.aspx

Partnerships with patients

https://valuebasedcareaustralia.com.au/resources/value-in-partnership-with-patients/

Measuring VBC

https://valuebasedcareaustralia.com.au/resources/measuring-outcomes-and-costs/

https://www.ichom.org/

Appendix 4: Advisory Group and Project Team

Advisory Group Members

Name	Role
Dr Caroline Clarke	Chair
Dr Robert Herkes	Australian Commission on Safety and Quality in Healthcare Nominee
Dr Kerryn Butler-Henderson	Australian Digital Health Agency (Agency) Nominee
Ms Jackie Doolan	Australian Digital Health Agency (Agency) Nominee
Dr Louise Schaper	Australian Digital Health Agency (Agency) Nominee
Dr Bav Manoharan	Australian Digital Health Agency (Agency) Nominee
Professor Tim Shaw	Australian Digital Health Agency (Agency) Nominee
Associate Professor Marco Briceno	Australian Health Ministers Advisory Council Nominee
Ms Belinda Gibb	AMC Aboriginal and Torres Strait Islander and Maori Committee Interim Member
Mr Justin Gladman	AMC Aboriginal and Torres Strait Islander and Maori Committee Interim Member
Associate Professor Amanda Dawson	AMC Assessment Committee Member
Professor Inam Haq	AMC Medical School Accreditation Committee (MedSAC) Member

Professor Brendan Crotty, AM	AMC Prevocational Standards Accreditation Committee (PreVAC) Member
Professor Alan S C Sandford, AM	AMC Specialist Education Accreditation Committee (SEAC) Member
Dr Claire Blizard	Confederation of Postgraduate Medical Education Councils (CPMEC) Nominee
Associate Professor David Francis	Council of Presidents of Medical Colleges (CPMC) Nominee
Ms Debra Letica	Health Consumer Representative
Associate Professor Suzanne Kirsa	Health Professions Accreditation Collaborative Forum (HPACF) Nominee
Dr Alice Ngar Wing Leung	Junior Doctor Representative
Dr Shayne Bellingham	LIME Network Nominee
Associate Michael Professor Franco	Medical Education Expert with Digital Expertise
Associate Professor Rebecca Grainger	Medical Education Expert with Digital Expertise
Associate Professor Clair Sullivan	Medical Education Expert with Digital Expertise
Associate Professor Adrienne Torda	Medical Deans Australia and New Zealand (MDANZ) Nominee

AMC and Agency Project Team

Mr Philip Pigou	CEO, AMC
Ms Amanda Cattermole PSM	CEO, Agency
Dr Julie Gustavs	Project Manager, AMC
Dr Shaun Hosein	Strategy and Policy Officer, AMC
Ms Helen Purdy	Project Support, Agency
Ms Vandana Chandnani	Project Support, Agency
Dr Mohamed Khalifa	Project Support, Agency
Mr Patrick Murray	Project Administrator, AMC
Ms Theanne Walters, AM	Deputy CEO, AMC Senior Project Team Member