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Original Article

Exploring Healthcare Professionals' Preparedness for Health Informatics in Healthcare in a South African Metropolitan City

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Abstract

Introduction: The increased use of computing technologies has led to the integration of digital technologies in most human activities. The term health informatics (HI) is synonymous with the application of digitisation in healthcare. The increasing digitisation in the health sector necessitates HI and digital competencies. Accordingly, healthcare professionals need to be proficient in technology applications to be effective users. Consequently, this research explored healthcare professionals' preparedness for HI and digitisation in the healthcare sector.

Methods: The guidelines of the Consolidated Criteria for Reporting Qualitative Research (COREQ) steps were employed to conduct the study. 31 participants were acquired through purposive and snowball sampling strategies. The interviewed participants comprised healthcare students, lecturers and practitioners from medicine, social work, nursing, occupational therapy, physiotherapy, dietetics and dentistry disciplines. The data analysis was conducted through thematic analysis.

Results: The findings revealed that most participants possessed basic knowledge, except for a few technology enthusiasts. However, most were eager about healthcare digitisation. Most participants acquired computing skills through basic computer literacy classes during their education and work training programmes, but they were not adequately prepared for the inevitable complex digital technologies in healthcare.

Conclusion: Considering current and future anticipated technological innovations, it is crucial to address healthcare professionals' HI and digital competencies, which are likely to be further exacerbated by the fifth industrial revolution. It is imperative that healthcare stakeholders, including government bodies, regulatory agencies, educational institutions and healthcare facilities, prioritise engagement and strategies regarding the use of HI and technologies in healthcare.

Keywords: Health informatics, Healthcare, Preparedness, Healthcare professionals

Introduction

The healthcare sector, like the majority of organisations, has experienced a surge in information and communications technology (ICT) integration. ICT is a common term that refers to machinery or devices commonly employed for telecommunications, data processing, and storage (1). eHealth and health informatics (HI) are some of the terms used when discussing healthcare and digitisation. The eHealth term can be described as the use of ICT appliances and services that aid in disease "*prevention, diagnosis, treatment, monitoring and management*" (2). Then, HI may be explained as a subset of the information systems discipline and accordingly includes computer science, social science, behavioural science, information technology and health or medical care practices for information processing and problem-solving activities in healthcare (3).

The integration of ICT in healthcare has had an effect on the health sector's operations, infrastructure and processes (4). ICT-related implementations in healthcare practices and administration have led to the increase of computerised systems, including hospital information systems (HIS), electronic prescribing (ePrescribing), telemedicine, mobile health (mHealth), internet of medical things in health care (IoMT), wearables, virtual reality

(VR) and artificial intelligence (AI) (5). The possibilities of such applications have resulted in increased ICT investments in healthcare to enhance the technology to improve healthcare quality, support decision-making and lower service and operational costs (6). Furthermore, it is noteworthy that healthcare technologies have altered how patients perceive health and healthcare as well as how they relate to and correspond with healthcare professionals (7).

The general populace's access to technology and internet use has improved general medical literacy and increased people's demand for quality healthcare (8). This has intensified discussions and the implementation of patient-centred care. Patient-centred care approaches consider the patient's input and their distinct health characteristics, for individual-specific medical interventions (9). The impact of digital systems promises significant potential in driving patient-centric practices through processes that support information sharing, decision-making, health awareness, diagnosis support, continued care, improving healthcare access, lowering services' costs, enhancing outcomes and patients' overall positive experiences (7). Furthermore, the impending technology of the fifth industrial revolution (5IR) is expected to increase innovative robotics that, in comparison to the current fourth industrial revolution (4IR), will have a more holistic effect on people's lives (10).

South African healthcare systems are subjected to multiple challenges, including a high prevalence of communicable and non-communicable diseases, excessive violence and trauma cases (11), health professionals' migration, large numbers of immigrants, population growth, poor healthcare resources management (12) and unequal distribution of healthcare resources (13). As these factors have an adverse effect on the healthcare sector, innovative strategic leadership and transformation of healthcare professions education (HPE) for positive outcomes are imperative (14).

Discussions on HPE necessitate deliberations on healthcare professionals' core competencies. This consideration acknowledges the healthcare sector's dependence on human resource capabilities to provide healthcare services (15). Core competencies are fundamental capabilities, mannerisms and expertise that enable professionals to perform their work within acceptable standards (16). Therefore, the addition of digital skills to healthcare professionals' list of essential capabilities prepares them for inevitable technological innovations and data-centric practices (7). However, this does not require healthcare professionals to be HI experts, but some understanding of digitisation to enhance technology acceptance and innovations in healthcare (17).

Healthcare professionals' inadequate knowledge and competencies in ICT applications (18) are supposedly major challenges in health informatics. Research in the nursing profession has revealed limited HI competencies (19), low digital competencies, and ICT infrastructure limitations, as some of the barriers to digitisation adoption in healthcare (20). Accordingly, healthcare professionals' preparedness for digitisation and HI in healthcare was explored in the current study. The research addresses challenges of HI competencies of diverse healthcare professionals to enhance technology acceptance and use in healthcare. It is hoped that this research will contribute to improving access and quality of healthcare in accordance with goal number three, namely, good health and wellbeing's Universal Health Coverage (UHC) of the Sustainable Development Goals (SDGs) (21).

Methods

A descriptive qualitative approach (22) was employed to acquire participants' insights related to their preparedness for digitisation and HI in healthcare. The consolidated criteria for reporting qualitative research (COREQ) (23) guided the presentation of the research. Purposive and snowballing sampling strategies were employed to recruit participants through email and referral correspondence based on their professional affiliations. While purposive sampling enabled the inclusion of subject-knowledgeable participants who could provide in-depth insights into the phenomena under research (24), snowball sampling afforded the referral of more participants who met the recruitment criteria (25). The sample comprised 31 participants, including 11 lecturers, 6 final-year students from a university and 11 professionals from a healthcare facility in a South African metropolitan city. Furthermore, the participants were from eight healthcare professional disciplines, specifically, medicine, nursing, dietetics, physiotherapy, occupational therapy, dentistry, pharmacy and social work (Table 1).

Table 1: Study Participants

	Lecturers	Students	Professionals
Medicine			2
Dentistry	1		2
Nursing	2	2	3
Physiotherapy	2	1	1
Occupational Therapy	2	1	1
Dietetics	2		1
Pharmacy	3		
Social Work	2	2	1
Totals	14	6	11

Data Collection

Data collection was conducted by a male doctoral student. Individual semi-structured interviews that lasted between 10 and 40 minutes were conducted in person or online through the medium of English. With the participants' consent, all the interviews were audio-recorded. Two pilot interviews were conducted to pre-test the interview schedule's feasibility and suitability. The in-person interviews were conducted at the university and hospital premises. With the exception of the researcher's intention that was communicated through the information sheet, the researcher and participants had no prior relationship. The interview guide is attached as an appendix.

Data Analysis

The audio recordings were transcribed through three different processes, by the researcher (n=3), an independent transcriber (n=15) and Riverside, a digital platform (n=13). Moreover, the researcher verified the 28 digital and independently transcribed recordings for accuracy, thus enhancing the accuracy and objectivity of the transcriptions (26). The data were analysed using the six-step thematic analysis method to synthesise the findings (27). Step one requires thorough familiarisation with the data (28). The researcher conducted the 31 interviews, transcribed and read through all the transcriptions, and cleaned up the transcription data. Step two, the data coding stage, was conducted through Taguette, an online qualitative data analysis application that assists in data coding and management. Two researchers coded datasets independently, that were compared and reviewed for intercoder reliability (ICR) (29). Step three, theme identification (28), involves rearranging the codes into related themes to acquire constructive meaning. Three themes were subsequently identified. In step four, the themes are reviewed for meaning and coherence in logical data reporting (28). The codes were written up and reallocated to different themes where necessary to acquire a coherent results report. Step five involves analysing and discussing themes (28). Accordingly, the themes were analysed, renamed and rearranged to provide a final coherent report. Finally, step six comprises the report compilation (28). The discussion, a section of the report, describes the results in conjunction with empirical literature to deliberate on the research findings.

Research Rigour

Considering that qualitative methods are not rigid, the rigour of qualitative research may be considerably elusive. However, without rigour, qualitative studies lose their scientific credibility (30). The researcher endeavoured to achieve rigour by exercising various reliability and validity factors across the research (27). First, an environmental triangulation strategy was considered, with participants drawn from a tertiary education and healthcare facility comprising multiple healthcare professional disciplines and different departments (31). Second, an independent transcriber transcribed 48% of the recordings, and the coding process was conducted between two researchers (30). The coders reported an 87.5% ICR (29). The researcher, being aware of possible biases, employed member checking to ensure that the results and discussion were not distorted (32).

Ethical Considerations

The Biomedical Science Research Ethics Committee of the University of the Western Cape gave permission for the study to be conducted and issued ethics number BM21/4/9. The participants were provided with information

sheets to familiarise themselves with the research and were required to complete a consent form in which they agreed to participate, and the interviews could be recorded. There was no remuneration for participating in the study (33). The participants' anonymity was realised by allocating them pseudonyms, where the first two or three letters denoted the profession, the third or fourth the occupation and finally, a number was allocated to denote the number of participants in the profession; for example, a practising social worker (SWP), a nursing student (NurS1) and a physiotherapist lecturer (PhyL2) (34).

Results

In this section, the participants' preparedness for digitisation and HI in healthcare is discussed. Three themes were identified, namely, comprehension of ICT and HI, attitudes towards digitisation and HI preparedness, which comprises three sub-themes: HI infrastructure, digitalisation skills and training.

Theme one: Comprehension of ICT and Health Informatics

In this theme, the participants' understanding of ICT, digitisation and HI was explored. It is noteworthy that most of the participants had no comprehension of HI. Therefore, it was more practical to assess their understanding of ICT and healthcare digitisation to acquire their insights on the subject.

Most of the participants understood or could at least explain the meaning of ICT. The participants' descriptions varied; while most focused on information management and communication, a few acknowledged the Internet in their descriptions. The few who were confident in their comprehension of ICT considered communication, enabling devices and the Internet: "*So it is communication using technology which can be the internet, your cell phone, wireless devices or, yeah, video conferencing, networking, any application that uses technology to communicate*" (PhyL1). However, others were unsure about how to describe ICT. In their tentative descriptions, they highlighted their limited understanding: "*Sho, that's deep. Information and communication, I would say my understanding about that is sharing information and data*" (SWP). Furthermore, some were ignorant of ICT and what it entails.

Regardless of the participants' comprehension of ICT, they were able to discuss digitisation in the context of their professions.

The participants described how technology is used in practice or in their respective professions or disciplines. Based on their professional years of practice, they explained how computers have changed their working processes in healthcare practice. Some participants were able to discuss process facilitating, records management and information sharing: "*The systems that we use in the hospital help to facilitate how we take care of our patients, either by getting access to past records or reports or imaging or blood and lab results*" (MedP). There was an emphasis on improved records management and security in other descriptions.

Theme two: Attitudes towards digitisation

In this theme, the participants' attitudes towards ICT and digitisation were examined. The participants' attitudes were essential for determining the success of HI integration in healthcare. They were all receptive to digitisation to a certain extent. The strongest supporters of digitisation noted that it was a vital component of practice: "*A vital part of our practice in the 21st century*" (MedP1). However, some participants acknowledged that with reservation: "*Nurses are there for the patient and not for the technology*" (NurP2).

Several participants acknowledged the value that digitisation presents in healthcare settings: "*I think digitisation is an important tool. You know, to help not only the public but also healthcare professionals. It's increasing access to information among healthcare professionals. And then it can also be a useful tool for patients' education*" (PhaL2).

However, others were receptive based on the assumption that it was inevitable and they had no choice but to embrace the change: "*I'm on my way out, so I don't worry about that now. Yeah, no, definitely we need to change too because the younger generation knows about the technology*" (NurP2). This comment further highlighted age as a factor that can influence technology acceptance. The comment also suggested that the younger professionals were more comfortable with technology. Another participant concurred: "*I don't know, I'm going to use this opportunity to say because I'm younger. I try and use IT where*

I can because there are spaces where it's limited" (DieL2). However, one older participant did not follow the norm and stated: "*It's a vital part of our day-to-day work*" (MedP1), defying the seemingly common age and digitisation perception.

Some participants' digitisation acceptance was influenced by their occupations. One of the participants noted the possibility of being oblivious to technology advancements because of one's occupation within the professional discipline: "*I think if I wasn't at the university, I would have been even further behind. A colleague of mine, who retired, once said he couldn't keep up with the changes. I actually vowed to myself that day that I will not become like him. I've accepted that I will always be behind because I don't actually have the time*" (DenL).

Need emerged as another factor in digitisation acceptance. The participants noted that during the COVID-19 pandemic, it became essential to deploy all available resources, thus denoting that the value and acceptance of technology can also be derived from obligatory or mandatory circumstances. Relating to the COVID-19 pandemic's influence, one of the participants noted: "*Once we started to understand some of the things about how we can use the technology in our profession, I found that things are becoming easier and easier*" (NurP3).

Theme three: Health Informatics Preparedness

This theme emerged as the participants endeavoured to understand how healthcare facilities and participants were prepared for HI and digitisation in healthcare. Preparing for professional practice encompasses an awareness that the implementation of HI is dependent on infrastructure and competencies. While such infrastructure includes technology resources such as software, hardware and systems, competencies consider people's skills and capabilities in using digital implements.

Sub-theme one: Health Informatics Infrastructure

The participants confirmed that current healthcare practices and disciplines are being impacted by digital transformation. Although healthcare facilities have started using digital applications, these are limited to some departments, while other departments still use manual processes. One participant noted: "*The other clinics already operate on a 'computer system'. Everything is on the system. … But in this specific clinic, we are still working with a file*" (NurP2).

Some participants who were keen users discussed the quality, reliability and adequacy of the technology resources in healthcare facilities. While the availability of resources was not an issue in some instances, their quality and functionality were a problem: "*In government, there are so many computers everywhere, but half of them don't even work properly. … if it's an emergency and something happens and you need to log on there to access whatever to help a patient, then it's going to be problematic*" (PhyP). The hospital-practising participants appeared to be more aggrieved by infrastructure issues than the other participants.

Some participants highlighted that they use both digital and manual processes. They further noted that healthcare facilities were not fully utilising digital technologies. They emphasised several issues, including the non-compulsory use of technology implements and limited access. A participant noted: "*Like I said, if it must be like in we have to do it, then I don't have a choice, yes, but I still have a choice, so we are living with a choice*" (NurP2). Some disciplines or facilities were fully manual and were still using their old processes and had no access to computers, the Internet and emails.

Moreover, in some instances, access to digital systems remained limited to certain occupational hierarchy levels or disciplines. One participant explained: "*But in a hospital, the only people that they give that kind of information to find it will be the operational managers. Those are the only people who have by now. You'll find that if the operational manager is not at work, for us now, the professional nurses are stuck. We cannot do anything, we don't have any password, we don't have access to that information*" (NurP3). The participant highlighted that higher-ranking authority staff members were privileged to access the digitised systems in comparison to lower-ranking staff members.

Some participants emphasised that some disciplines were more privileged than others with regards to accessing computers: "*So the goal of services is more, it goes more in the direction of nurses, doctors. We are a social work supportive system. We are not really acknowledged as much as the health staff, like nurses and doctors*"

(SWP). The participants felt that although the computerised systems were mainly set up for clinical healthcare professionals rather than allied healthcare professionals, they believed that access to systems should be inclusive.

Other concerns included cybersecurity, regulatory and other supporting infrastructure stability, including electricity supply consistency. One participant stated: "*I think it's, it's much better because then things won't get lost and you can easily access it, but I also think it may be a bad thing because people can easily hack that maybe, and the thing is also that now the new acts and things, it can be difficult. Also, with loadshedding and things like that, maybe you can't access it because the computer's down*" (NurS1).

Sub-theme two: Digitalisation Skills

Most of the participants, mainly professionals and lecturers, felt they were not adequately equipped with competencies for digitisation in health. The older professionals noted that when they had undergone professional training, computer access had been non-existent or limited. Therefore, computer literacy was not part of their learning outcomes. The HI keen professionals noted that in some instances, they were self-taught: "*I think people of my generation have had to learn by themselves*" (MedP1).

Some participants were exposed to computers during their studies as part of their curriculum: "*I remember in the first year actually we did computers, I think it was called CED, computers for educational development … they taught us basic programming like you know how to use Microsoft Excel, Word, all of the basic stuff and the basic …*" (PhyP). Some participants had lecturers who were digitisation enthusiasts who shared their passion with students.

Even though the professional participants were tentative about their digitisation skills, they did receive training at healthcare facilities: "*When I qualified and started working, they used to offer us courses by the hospital, but those are basic courses on, like you know, the Microsoft, Windows, Excel, Word, all of those. And the rest I kind of just figured out as I went along*" (PhyP), highlighting that digitalisation is considered essential in healthcare facilities, and facilities provide training. Some participants noted that basic computer literacy and exposure to computers developed competencies for professional practice.

Although some of the participants did not think basic computer literacy was sufficient, they understood that healthcare professionals do not need to be specialists. Accordingly, they suggested that interested students should be allowed to develop further skills: "*I think the university should try and sort of screen the students to find ones which have a big interest in it, and then to offer them maybe further study opportunities within ICTs or programs. A sort of technological field associated with medicine. I think you have to find the people who want to be involved with them. So I don't think everyone wants to do that*" (MedP). It is significant that while most of the participants had basic computer literacy, only a few had competencies beyond basic computing skills. While there were undertones that those competencies were not enough, some perceived they were adequate for their operational needs.

Sub-theme three: Training

Training is an essential practice for developing competencies in digitalisation. The growing recognition of training highlights the limitations of the skills in health professions disciplines. The participants noted the importance of training for the changing healthcare environment: "*Our times are changing. Everything is now about online, being online. So, yeah. We all need to be, I mean, that needs to be essential now in this day and age*" (PhyP).

The participants stated that they gained digitisation competencies through training courses at work, private training courses, being self-taught, on-the-job training and professional education. With regard to courses at work, a participant noted: "… *because I'm at a state hospital which is at the substitute university, they have provided over the years many courses, which I have done*" (MedP1). However, not all professionals are privileged to attend such courses. Another participant explained that their work schedule was tight, with no extra time for developmental courses, unless they were compulsory. The differences in training might highlight non-standardised training opportunities based on professional discipline requirements or institutions of practice. Some keen participants attended training courses of their own choice, privately.

Other participants acquired their skills through self-teaching and on-the-job training: "*I*

would say a little bit of self-taught training myself. I had to do a little bit of on-the-job training while I was busy in practice" (PhaL3). However, some noted, including students, that there was still a level of exclusion as they were not afforded sufficient opportunities to use digital systems in healthcare facilities. Overall, training was a strong means to improve competencies in digitalisation applications in healthcare.

Discussion

In this study, healthcare professionals' preparedness for digitisation and HI in healthcare was explored. The implementation of ICT in healthcare is a complex ongoing process compounded by continuous development and innovations (6). Technology-based systems' output quality, value and functionality depend on the user competencies (26). It was concerning that most of the participants lacked the basic terminology and could not explain HI, even though they could at least identify traits of ICT. The participants' limited understanding of the concept of HI denotes low digital literacy, which is unsuitable for ICT adoption, use and innovations (12). This is counter-productive to health fraternities' strategies that are gravitating towards information technologies to augment health service and delivery (22).

Comprehension of ICT and Health Informatics

The COVID-19 pandemic-enforced measures led to the easing of regulations related to technology use in healthcare, strengthening the use of electronic health record (EHR) systems and fast-tracked the use of remote technologies that are commonly grouped under telemedicine or telehealth (35). The technological changes in healthcare were not disastrous because most healthcare professionals are generally familiar with basic computing technologies or computer literacy, which they have acquired through their education, work training opportunities and ease of access to technology in general. However, their comprehension of computing technologies and systems, including healthcare applications, was elementary at best. This highlights the need to intentionally develop HI and digital competencies to equip healthcare professionals with relevant skills and terminology (5). This concurs with the literature that basic computer literacy knowledge does not translate into HI competencies (36).

It is imperative to consider HI as an essential component of the healthcare curriculum to enable healthcare professionals to view it as a critical part of their respective professions (37). This will also equip healthcare professionals with relevant HI terminology for effective communication, understanding and active participation in HI developments in healthcare.

Attitudes towards Digitisation

The findings from this study reveal that healthcare professionals generally have a positive attitude towards healthcare digitalisation, regardless of the lack of intensive training that would have equipped them with relevant terminology and competencies. South African healthcare systems face the common challenges revealed in research, including inadequate ICT regulations, unequal distribution of resources and limited IT skills, infrastructure and expertise, which are more prevalent in developing economies (12). The challenges appeared to be more prevalent at healthcare facilities than at educational facilities. This is not unexpected because some of the most impactful future innovations to enhance healthcare are likely to be technology-based (32), and tertiary education institutions are generally the proponents for research and innovation practices.

Appreciable opportunities for developing healthcare professionals' HI competencies to improve digitisation acceptance and integration in healthcare exist. In South Africa, the integration of HI in academic programmes is the most promising method for developing the required competencies (38). Subsequently, training at healthcare facilities can contribute to the development of specific practice expertise. However, the participants noted that as healthcare is demanding, time constraints make this option less desirable. Furthermore, voluntary short-course options for the continuous development of relevant competencies are available. When considering these options, it is important to acknowledge that technology acceptance has no age limitation. In accordance with the findings of this study, it is noteworthy that computer skills acquisition may be linked to attitude and aptitude. While some of the young participants were not enthusiastic about technology, some of the older participants were impassioned about technological advancement in their professions. Accordingly, the importance of attitude in technology acceptance

was acknowledged in this study.

With regard to HI content in healthcare professions curricula, the participants identified basic computer literacy content in health professions education. One may deduce that there is limited or a lack of dynamic HI content in their professional curriculum, which highlights the casual consideration of HI in healthcare. This seems oblivious of ICT advancements and investments in health to date. However, when considering the general positive attitude to digitisation and aptitude for computing technologies, integrating technology into healthcare may not be as challenging as anticipated. Therefore, the government must develop and implement policies, invest in infrastructure and retain and reward technology-skilled specialists properly for conducive health informatics competencies and integration in healthcare (39).

Health Informatics Preparedness

Healthcare professionals' current HI readiness is not sufficient for complex HI-driven healthcare practices. The most prevalent adoption practices are reactive, as observed during the COVID-19 pandemic. The positive opportunities for HI applications in healthcare data include coordination of healthcare records management, remote access to healthcare, research in public health, health statistics, ailments predictions, health awareness, disaster management and training or education (21). The current state of healthcare generates considerable amounts of data that could be essential for reducing healthcare costs, improving decision-making in clinical practice and enhancing patient care and health administration if it is effectively and purposefully managed (39). Furthermore, traces of 5IR in healthcare are imminent, with the fifth-generation (5G) mobile network leading to increased connectivity between people and things, including technology gadgets. Medical appliances may include robots that will collaborate with humans, which will require healthcare professionals to be equipped with suitable competencies (40).

Limitations

This study was conducted across two institutions, namely, a public hospital and a tertiary education institution. To address the potential of the limitation, participants from diverse disciplines and occupations, including students, lecturers and practising professionals, were interviewed to acquire comprehensive findings, highlighting the general competencies under study. Furthermore, the findings were based on the views of the interviewed participants and are thus not completely representative of all health professionals' comprehension of HI competencies. However, the findings reveal the participants' general HI aptitude, considering that HI is not compulsory in their professional disciplines. Moreover, the findings provide a general indication of health professionals' preparedness for HI in healthcare.

Recommendations

Healthcare professionals' level of digitisation comprehension is currently unsatisfactory. HI competencies are essential for aligning healthcare systems and processes with modern-day technology demands (41) and preparation for the impending 5IR. Therefore, the inclusion of HI in healthcare professions programmes, through a collaborative effort of all major stakeholders, including healthcare facilities, regulatory bodies, educational institutions and government, is recommended. As the healthcare professional programmes curriculum is saturated substantially with discipline and professional content (36), input from all key stakeholders is imperative for healthcare digitisation and effective use of technology.

Conclusion

In this study, healthcare professionals' preparedness for digitisation and HI in healthcare was explored. HI innovations may reduce healthcare costs and improve access and efficiency if used appropriately. In essence, with the exception of some enthusiasts, the findings revealed a limited understanding of digitalisation and health informatics in healthcare. Accordingly, the inclusion of HI competencies in healthcare professionals' education and training so as to improve computing technology use and acceptance in healthcare is essential. This will require collaborative engagements among the key stakeholders, including government, educational institutions and professional or regulatory bodies.

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Authors' Contribution

Consent for Publication
All participants provided written informed consent for the publication of the anonymized findings obtained in this study.

Conflict of Interest
There are no conflicts of interest.

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Appendix: Interview Guide

1. When you hear Information and Communication Technology (ICT), eHealth and Health Informatics (HI), what comes to mind?

2. What are your views on Information and communications technologies?

3. What is your understanding of health informatics?

4. What is your opinion on HI?

5. What do you think about the current trends of HI in healthcare?

6. What changes do you expect in healthcare with the increased use of ICT?

7. How are HI technologies impacting healthcare?

8. In your views, what are the strengths, weaknesses, opportunities and threats related to ICT competencies for health professionals/students?

9. What should the institution do to improve your ICT competencies?