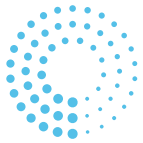




The Status of Informatics/ eHealth Integration in Medical and Nursing Curricula

From a Global Perspective Survey



The Status of Informatics/eHealth Integration in Medical and Nursing Curricula from a Global Perspective Survey

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This project was led by TIGER Intern, Mirna Hussein, during her internship with HIMSS TIGER (sponsored by the HIMSS Foundation) during the academic year 2021-2022.

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Executive Summary

The *Global eHealth/Informatics Survey* conducted by the HIMSS TIGER Initiative questioned educators teaching in medical schools and undergraduate nursing programs around the world to investigate if eHealth was integrated into their curricula. To achieve global coverage, the survey was offered in English, Arabic, German and French.

"The [Technology Informatics Guiding Education Reform \(TIGER\) Initiative](#) from HIMSS provides the global health workforce with innovative informatics/eHealth tools and resources to transform health for all. The global TIGER network collaborates to integrate informatics/eHealth into healthcare education, certification, practice, and research through an inclusive, interdisciplinary, intergenerational approach" (HIMSS, 2021).

"Informatics" and "eHealth" are used interchangeably to denote the knowledge and skills associated with understanding the use of clinical information and communication technologies in nursing and medical education and practice. The [HIMSS TIGER Global Informatics Definitions Document](#) defines eHealth (e-health) "as an emerging field in the intersection of medical informatics, public health, and business" (HIMSS, 2020). It refers to health services and information delivered through the internet and related technologies. Informatics refers to technology applied resources in all-health related field including bioinformatics, but not limited to, clinical informatics, health informatics.

This Informatics/eHealth survey presents global perspectives of medical and nursing faculty on the maturity of eHealth content integration in medical schools throughout several countries. The survey also includes on factors that impede further proliferation of informatics as a firm component of medical and nursing school curricula.

Data generated from the survey provides respondent demographic information: Age, faculty gender, country, language, profession, degree, HIMSS membership status, and years of clinical and teaching experience. The demographic information, followed by curriculum content related questions, measure the extent of eHealth/informatics resource integration into undergraduate-level content offered in nursing/medical schools. The survey findings also reveal types of modules and/or courses integrated in benefit of target audiences and which topics are most relevant from a faculty perspective. Finally, the survey insights highlight advancements underway to transform traditional medical and nursing curricula offerings along with challenges and barriers that may be impacting progress.

In total, there were 175 global participants (77 complete and 27 incomplete responses; 71 were completely void of survey question answers). Only completed responses (N=77) were considered in the data analysis forthcoming results:

- Highlights the need to upgrade curricular programming with a focus on integrating new modules and/or courses.

- Shared insights regarding faculty participation in global conferences (digital/in-person) and if online courses are leverage to expand their informatics/eHealth skillset.
- Points to the challenges hindering academic curricular reformation due to lack of subject matter expertise (SME) dominated the responses.
- Establish the need to tailor eHealth/informatics resources to meet in-country needs such as local language. 53 participants prefer to have resources available in their native language.
- Convey the need to involve industry professionals to support facilitating informatics related content.
- Call out the relevance of local legislative policies.
- Demonstrate how in-country technological innovations impact how students are taught within medical and nursing programs.

Introduction: Why Conduct this Survey?

Whether one looks to the wellness or monitoring apps that are used at home, or continually evolving electronic patients' records employed in health systems, the spread of digital health technologies is accelerating. Digital Health technology has advanced into a mainstay to prescribe, predict and enhance the quality and safety of patient care. However, medical and nursing curricula continues to fall short in preparing digitally enabled professionals who can leverage technologies in ways that deliver interdisciplinary evidence based patient care. Curricular reforms are essential to address this gap.

Based on an informal questionnaire circulated to medical and nursing students who graduated in 2020 from the American University of Beirut, it was reported that no major informatics/eHealth related courses were offered throughout their program. The Lebanese student insights inspired the creation of this survey to assess the integration of informatics topics in medical and nursing undergraduate curricula in several countries from a global lens.

Literature Review and Similar Studies

eHealth/informatics integration in medical school and nursing undergraduate curricula is not an original discussion. As mentioned in Triola et al. (2010), the [Association of American Medical Colleges \(AAMC\)](#) surveyed medical schools in 2006 to determine the presence of health information technology (IT) or HIT topics in curricula. This research conveyed that curricular objectives covering computer-based HIT systems exist in fewer than one-third of all medical schools. Similarly, an assessment performed by the [Canadian Association of Schools of Nursing \(CASN\)](#) aimed to understand the integration of Informatics in Nursing education, acknowledged the need to develop content reflective of information and community technology (ICT) application in care delivery and nursing practice (Mann et al., 2013). In Europe, a 2020 Pan-European study assessed the preparedness of European medical students ability to work in a digitized healthcare ecosystem. The study reported that “40.6% of students felt prepared to work in a digitized health care system, whereas more than half evaluated their eHealth skills as poor or very poor” (Mosch et al., 2021). According to the results of a 2016 online survey developed by UK professional bodies including General Medical Council (GMC) and National Health Services (NHS) among many others, the proportion of health informatics in the medical

undergraduate curriculum is low. Findings also conveyed that health informatics integration is rarely measured and there is lack of updated content (Walpole et al., 2017).

Academic institutions worldwide have started to integrate informatics/eHealth courses into medical and nursing program curricula. An April 2021 published literature review (Aulenkamp et al, 2021) included an overview of digital health focused courses taught at German medical schools in 2020. Only some offered courses on digital competencies (DiCo) as part of their elective curriculum. In 2020, the United States (U.S.) Mayo Clinic's Alix School of Medicine also integrated a mandatory pre-clinical, pre-requisite informatics/eHealth focused course. The school specified this requirement as "(1) foundationally relevant, independent of a student's chosen future professional path; (2) durable, still useful after training; and (3) positioned appropriately in the preclinical years" (Rosenman & Swanson, 2020).

Since 2012, CASN has tackled the challenges of curricular reform noting the "limited integration of informatics content in existing nursing curricula, the need for entry- to-practice indicators reflecting skills and knowledge needed to work in technologically enabled practice environments, the lack of shared understanding and consensus among educators on required informatics competencies for entry-level practice" (Nagle et al., 2012). Triola et al (2010) added additional barriers to curricula reformation such as the lack of instructors, the irrelevance of eHealth/informatics competencies at preclinical level and legal issues attributed to teaching these topics.

CASN (2020) also highlighted the role educators play in reforming digital health education and practice for nursing focusing on informatics as a necessity in the era of digitization (Nagle et al., 2020). In March 2022, a publication in the *Medizinische Information und Dokumentation (mdi)* journal in Germany addressed immense innovation in training, current and continuing education. Dr. Schmücker, professor at Mannheim Institution, department of medical informatics, mentioned that flexible and innovative forms of learning and online programs play a crucial role. Sabine Brase, a nursing lecturer at University of Applied Sciences Jena in Germany, stressed that digital competence is an important prerequisite to the formal qualification/degree to practice the health profession (mdi, 2022).

Methodology

Survey Design

The HIMSS TIGER online based survey was created with Checkbox software. Individuals and academic professionals were invited to participate by leveraging the global HIMSS and TIGER networks. The survey was further shared via social media channels (LinkedIn, Twitter) and network of networks.

Survey questions were designed in concert with leading global subject matter experts (SMEs) in informatics/eHealth, leveraged from the HIMSS TIGER International Task Force (TITF) leadership and members along with emeritus volunteers and pioneers reflected in the global TIGER network (GTN) who are

global health informatics leaders representing by 34 countries worldwide. The GTN networks were also leveraged to disseminate the survey. Closed-ended questions with multiple choice responses and true/false selection options dominated the survey's design. Respondents were given the option to select "other," "All of the Above" and "None of the Above" when applicable. In addition, respondents were provided answers in a Likert scale format.

The survey questions were broken into three main sections: (1) Demographic information (participants' age group, location, language of teaching profession, years of teaching and clinical experience plus professional membership); (2) Assessment questions to assess curricula's content, professional development opportunity as well as challenges encountered; and (3) Knowledge measurement questions with the option to share their recommendations (see Appendix).

Survey Circulation and Legal Requirements

Respondents were able to answer in English, Arabic, German or French. However, since the survey was circulated through social media channels and email, participants from outside of the originally targeted countries were also able to take part, for example, Spanish speaking countries.

Before survey deployment, the HIMSS Legal team reviewed and granted approval for circulation. In compliance with the European Union (EU) General Data Protection Regulation (GDPR), no personal identifiable data was collected from respondents.

In comparison to distribution efforts, the response rate was fair. The total number of people who accessed the survey was 175: 44% (N=77) of the respondents fully completed the survey questions, 15% (N=27) submitted incomplete responses, and 41% (N=71) accessed the survey but did not respond to any question.

Key Observations and Implications

Demographics Analysis

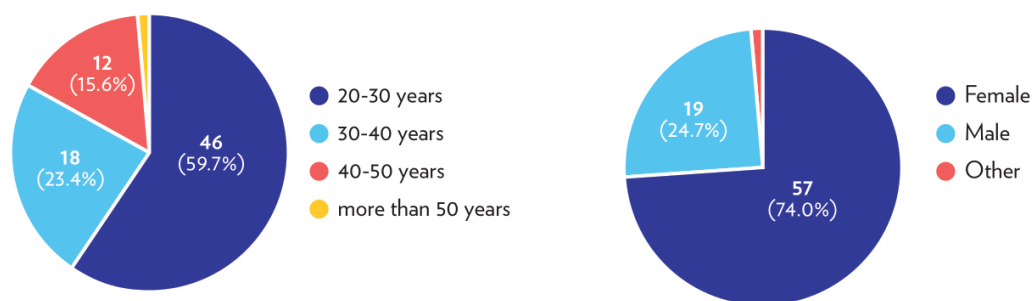


Figure 1: Age group (left) and identified gender category (right)

Among participants who completed the survey (N=77), the majority of 59.7% identified as more than 50 years old. 23.4% were between 40-50 years old and 15.6% were 30-40 years (Figure 1).

Female identified respondents dominated the gender category with 74% of the overall responses. (Figure 1)

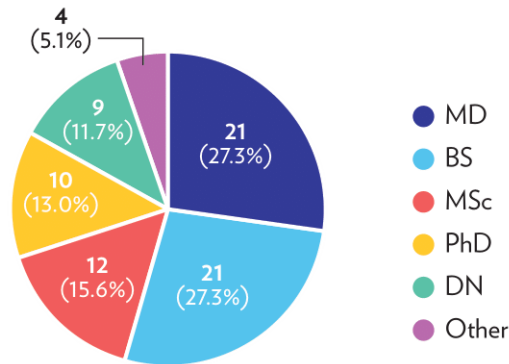


Figure 2: Degree Categories

Among the degree category submitted, 27%, 16%, 13%, 12% and 5% respondents hold PhD, DN, MD, MSc, and BS degrees respectively. In addition to the degrees listed in Figure 2, the “other” section encompassed Bachelor of Medicine, Bachelor of Surgery (MBBS), Director of Nursing Practitioner (DNP), Doctor of Nursing Science (DNSc), Post Graduate Diploma Advanced Nursing Practice, Magister, Doctor of Education (EdD), Master of Science in Nursing (MSN), Bachelor of Science (BS) and Master of Business Administration (MBA), Bachelor of Science in Nursing (BSN), Economics, Bachelor of Arts (BA) and Diploma.

Years of Teaching Experience and Clinical Practice

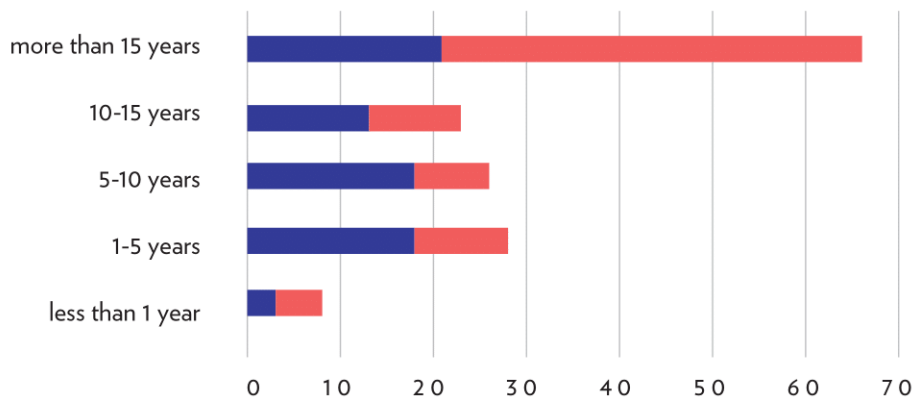
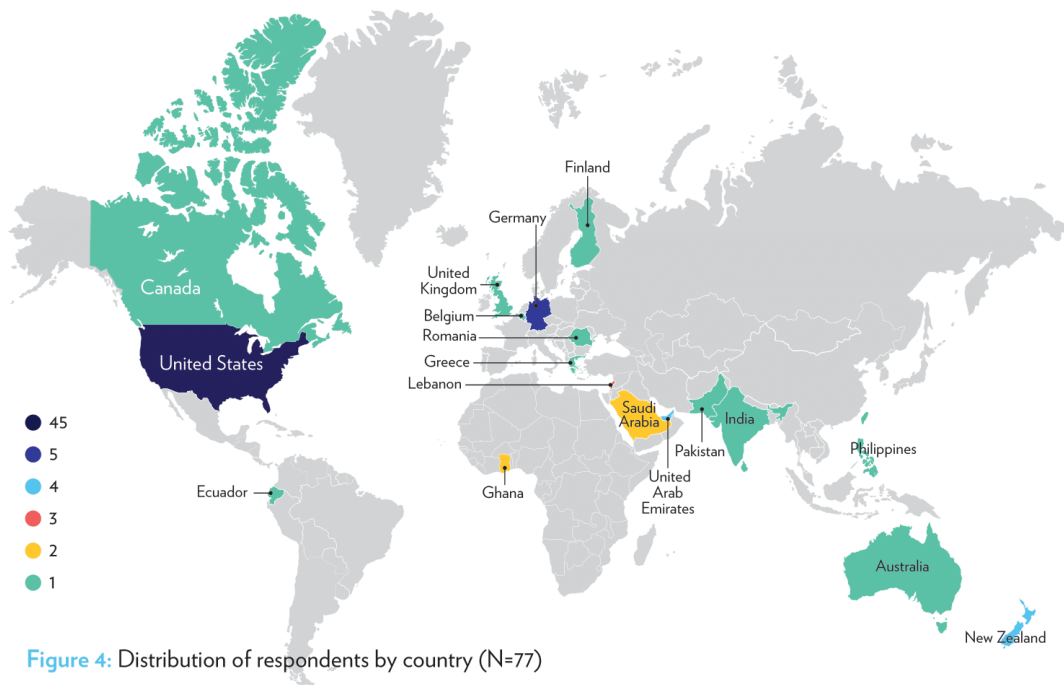


Figure 3: Years of teaching experience combined with clinical practice

Figure 3 indicates that most respondents had clinical practice before moving into academia. Almost 58% of the respondents spent more than 15 years in the clinical field compared to only 30% who have been teaching in academic institutions during the same duration.



The dataset reflects the opinion of respondents coming from 18 different countries outlined in Figure 4 with the most respondents located in the U.S.

Language and Resources Insight

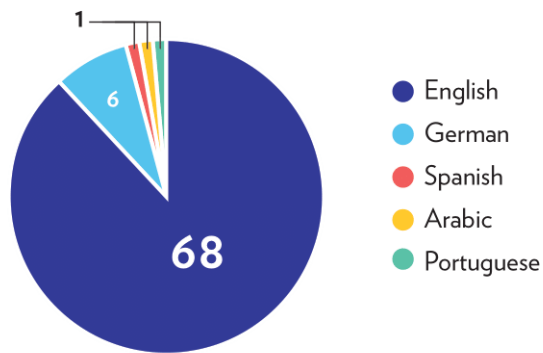


Figure 5: Languages used for teaching in medical and nursing schools

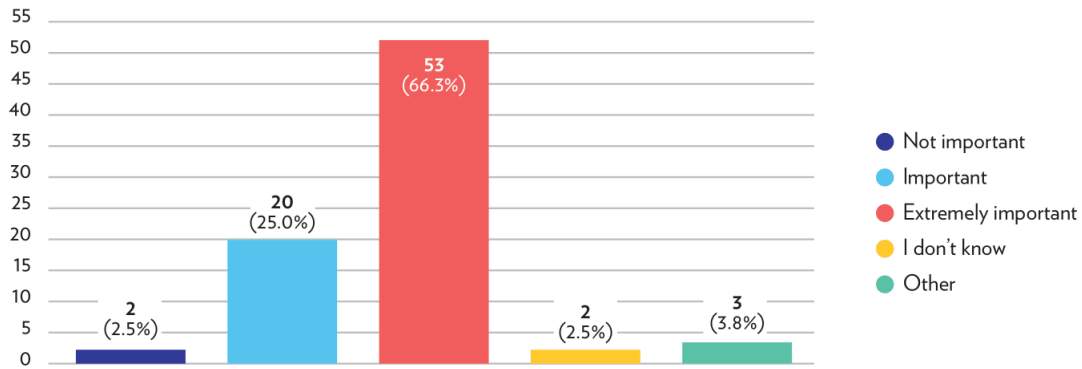


Figure 6: Importance of offering educational resources in the country's official language

The five languages identified by participants from 18 different countries indicate that the country's official language is not always the language used in teaching (see Figure 5). For example, English was recorded as the most common language used in medical or nursing schools. It is important to state, when referring to Figure 6 that 66% prefer to have informatics/eHealth resources in their native tongue as compared to only 3% who support adjusting resources to their country's official language. This question further validates one of the survey goals: the need to tailor resources to meet in-country needs, especially when it comes to local language (i.e., translate, adapt, and customize the available course content to fit in-country needs).

Participants Profile

Professional Field

Respondents to both the professional field and degree questions revealed a predominance of two professions: 14% with affiliation to medical schools and 71% to the nursing. Within the remaining 14%, the specialities were identified as following: health informatics, digital health, technologies, physiology, research, health care administration, dentist, public health officer, scientist, allied health and informatics, management and Doctor of education and information specialities.

HIMSS Membership and Professional Development

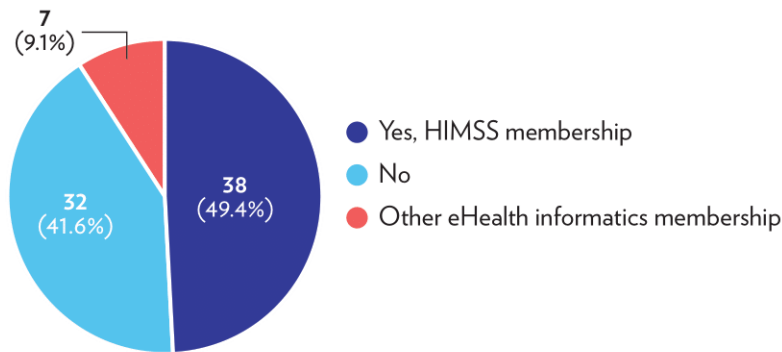


Figure 7: Professional organization membership

Almost half of the respondents were identified as [HIMSS](#) members, while 9% indicated being part of other eHealth/Informatics organizations such as the [American Health Information Management Association \(AHIMA\)](#), [Digital Health Canada](#), [Deutsche Gesellschaft für Medizinische Informatik, Biometrie und Epidemiologie \(GMDS\)](#), [Faculty of clinical informatics](#), [American Medical Informatics Association \(AMIA\)](#), [International Society for Telemedicine & eHealth \(ISfTeH\)](#), [American Mobile and Tele-dentistry Alliance](#).

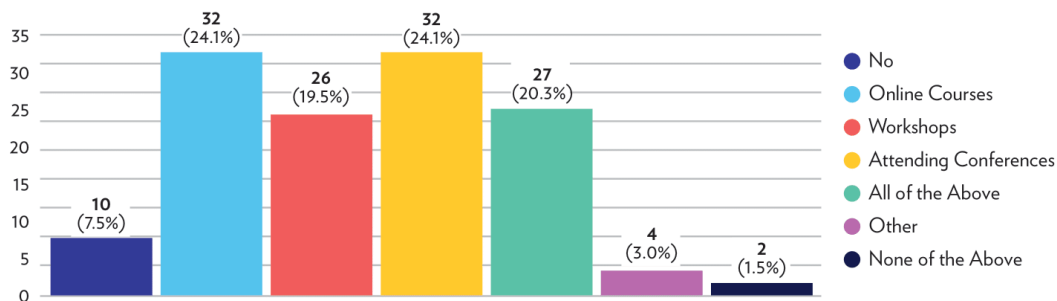


Figure 8: Continued Professional development in eHealth to expand knowledge and skillset

To gauge respondents' relevancy in professional organizations, 24 % choose online courses to expand their informatics knowledge and skillset. Attending conferences (24%) and workshops (20%) were favoured. 2% were yet to pursue any upskilling opportunities. Finally, 3% shared that their degree and/or certifications were the paths they took to obtain advanced knowledge and skills.

Challenges that affect the integration of Informatics/eHealth into medical/nursing curricula

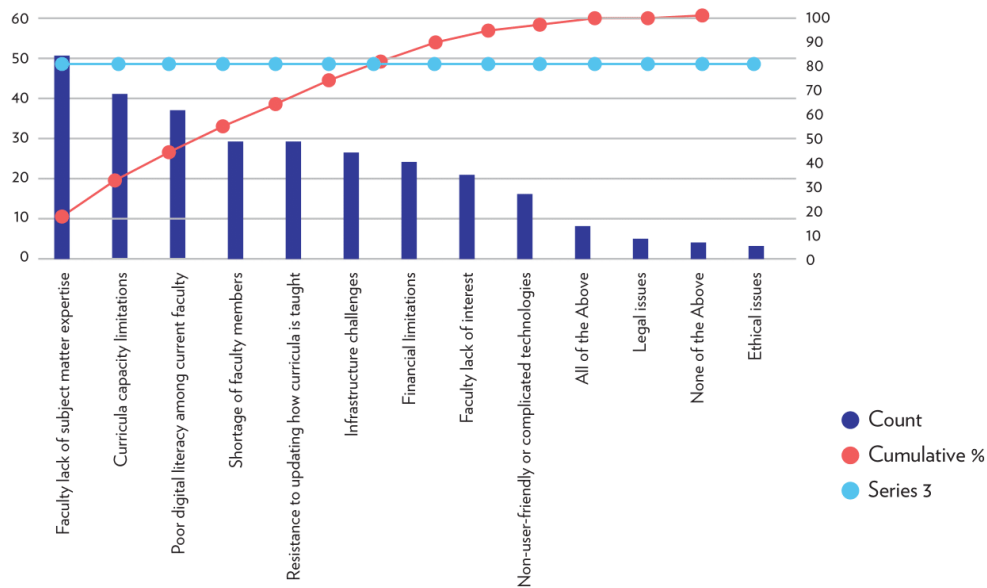


Figure 9: Demonstrates challenges that affect informatics/eHealth integration in curricula

The Figure 9 Pareto chart shows that 80% of the challenges recorded are depicted from 20% of the challenges listed on the survey. These “vital few” include faculty lack of SME, curricula capacity limitations, poor digital literacy and shortage of faculty members, resistance to update curricula and infrastructure plus financial limitations. As per the chart, barriers that fall under the 80% cut-off line warrant the most attention and call for imminent interventions. These findings are also congruent with a study conducted by Triola et al (2010) which highlights the lack of instructors as the main identified problem that cripples education reformation.

Informatics/eHealth courses integration into undergraduate curricula

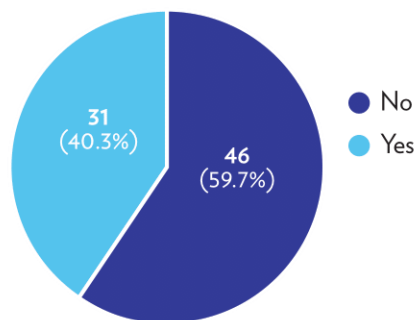


Figure 10: Offer Informatics/eHealth module and courses at undergraduate level

Figure 10 shows that 60% of faculty respondents in their associated institutions offer eHealth/informatics courses at undergraduate level compared to 40% that do not.

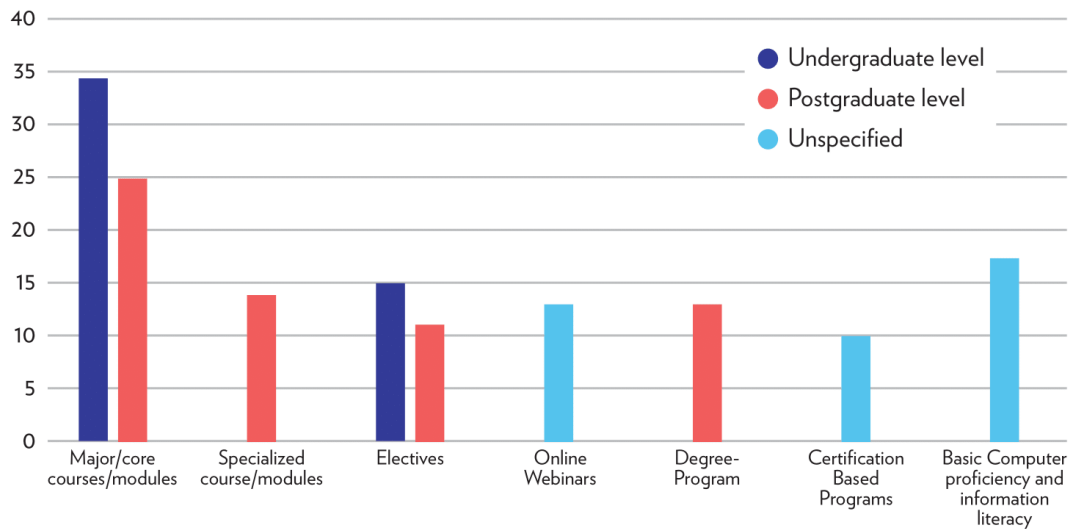


Figure 11: Types of Informatics/eHealth related courses offered in medical and nursing programs

However, the types of courses that are offered (Figure 11) demonstrates per respondent opinion, that not all represented organizations offer eHealth modules at the undergraduate level. Further responses revealed that these courses may be part of major courses or electives at graduate levels, within specialized modules (eHealth in radiology, cardiology, etc.), in post-graduate curricula, certification-based programs and online webinars.

Topics of Informatics/eHealth related course

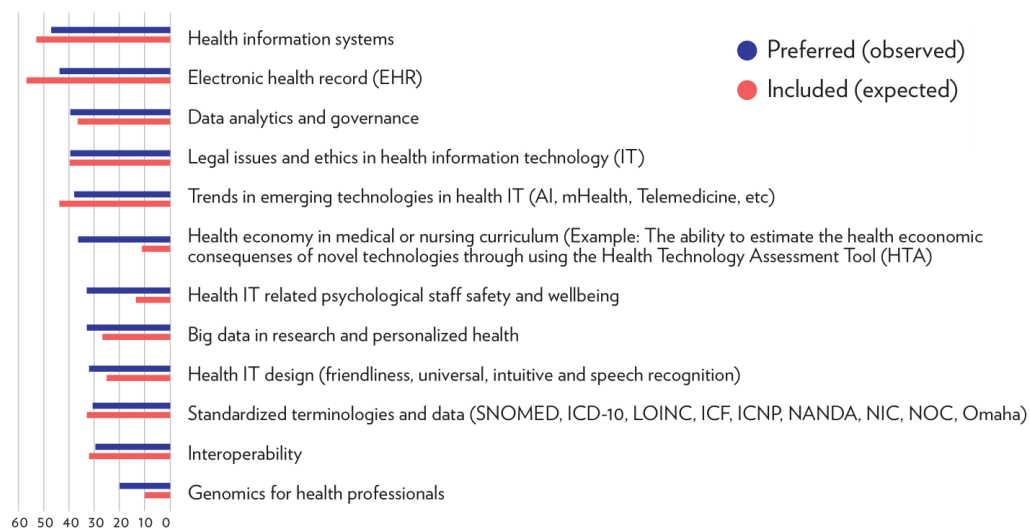


Figure 12: Importance of eHealth/Informatics topics included (expected) compared to preferred (observed) in eHealth courses or modules

Pearson's Chi-Square Test (Sample size= 100 and degree of freedom (df)= 11) was used to test the difference between the topics included (expected) in the

informatics/eHealth courseware in relation to the topics respondents *feel should be included (observed)*.

The null hypothesis indicates the eHealth topics preferred order (*observed*) is the same as the order of the topics included (*expected*) in the modules. Chi-Square Test = 107.25 > value for 0.05 probability (alpha = 19.675) so therefore, the null hypothesis is rejected. This means that there is a statistically significant difference between the *expected* and *observed* frequencies in the topics offered. These findings, as illustrated in the below charts, confirm these conclusion. *Figures 13.1-2* below display the topics included (*expected*) vs. preferred (*observed*) to be integrated in eHealth/informatics courses and modules.

Remarkable observations are:

- Health Information Systems (HIS) and EHR are front runners on both sides (in expected and observed), just swapping the rank one (1) and two (2).
- “Data analytics and governance” and “Trends in emerging technologies in health IT” where the latter goes two ranks up the expectations.
- “Legal issues and ethics in health IT”, “Big data in research and personalized health”, “Health IT design (friendliness, universal, intuitive and speech recognition)” and “Genomics for health professionals” hold same rank of importance in both expected and observed findings.
- A bold move for “Health economy in medical/nursing curricula”, occupying rank six (6) in observed compared to rank 11 in expected findings.
- Both “Standardized terminologies and data” and “Interoperability” both move three ranks up the expectations.

Therefore, participants overall support the integration of topics ordered based on their importance: HIS, EHR, data analytics and governance, legal issues and ethics in health IT, trends in emerging technologies in health IT (AI, mHealth, telemedicine, etc.), health economy, health IT related psychological staff safety and wellbeing, big data in research and personalized health, health IT design, standardized terminologies and data, interoperability and bioinformatics.

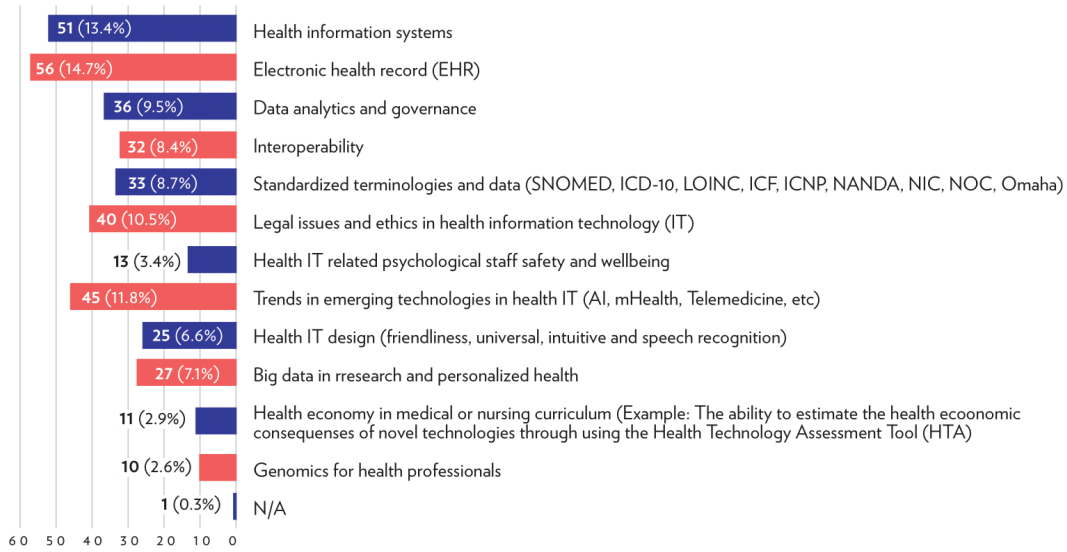


Figure 13.1: eHealth/Informatics topics included (expected)

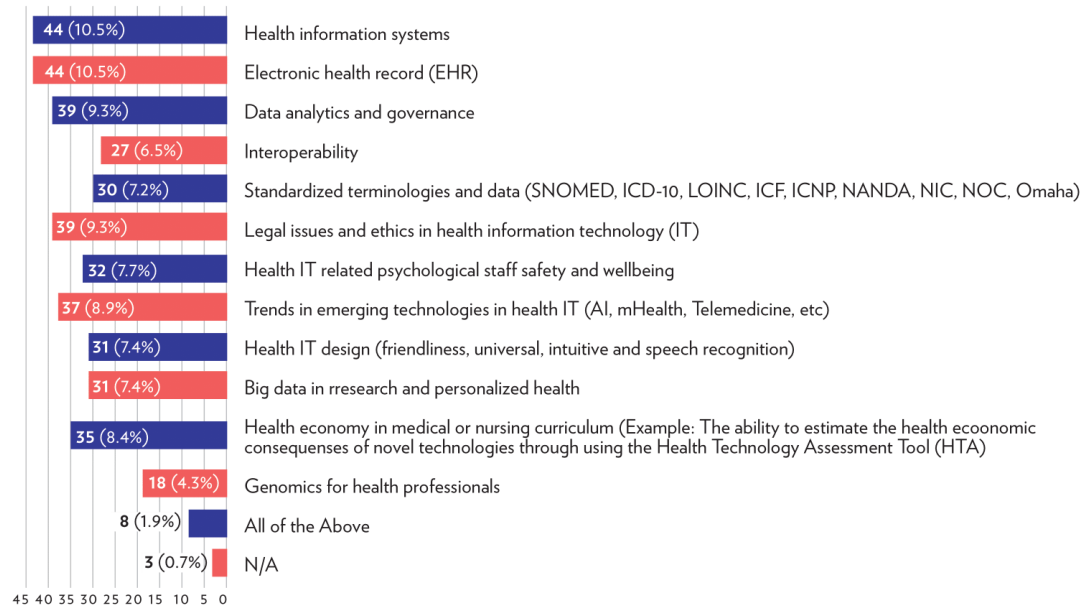


Figure 13.2: eHealth/Informatics topics preferred (observed)

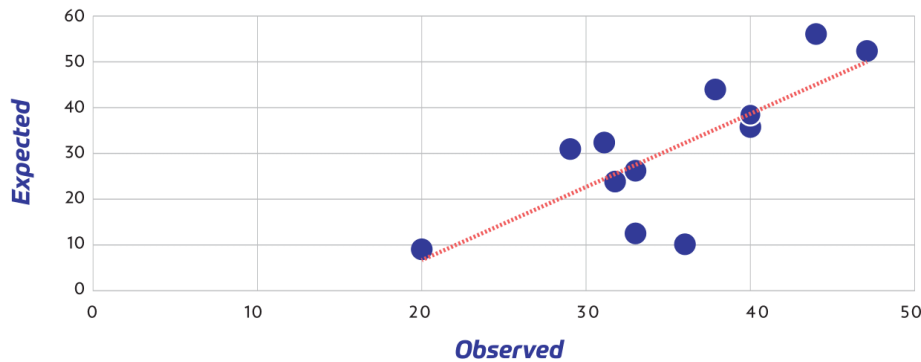


Figure 14: Correlation between eHealth/Informatics topics included (expected) compared to preferred (observed) in eHealth courses or modules

On the other hand, the Scatter Plot further emphasizes the significant difference proved using Chi-Square Test. The diagram shows a significant deviation for the overall distribution of topics on left vs. right. The tendencies observed being the bulleted list above.

In 2015, the [Office of the National Coordinator for Health Information Technology](#) (ONC) encouraged institutions to update their curricula and endorsed comparable topics which included interoperable health IT systems, care coordination, healthcare data analytics, new care delivery and payment model, patient-centered care, and population health. These findings further emphasize the relevancy of the aforementioned topics to be intergrated in the current healthcare-related curricula.

Integration of Informatics/eHealth simulation experience

To immerse, engage and prepare medical and nursing students for reality-based healthcare settings, simulation is a crucial component of their curricular studies. Providing hands-on experience allows students to test their skills in real time. Traditionally, a simulation lab aims to train nurses on basic procedures such as administering injections intravenously, addressing critical care scenarios, etc. In 2011, Pierce et al., suggested that effective simulation scenarios should be designed by medical professionals and IT personnel together. In the survey findings, 34% offer training on a demo EHR. Other respondents referred to a variety of market brands such as: AHIMA Virtual Lab (VLab), EHRgo, KbPort, EPIC, Cerner, Docucare, Lippincott, Open lab.

For the same purpose, 51% of the respondents integrate IT simulation learning opportunities. The technologies leveraged vary between practices units on smart implants and wearables, symptom checker apps, tele-consultation and mixed reality-assisted surgery and others (virtual digital patients, demo EHR, Health Informatics and Information Management project, mixed reality simulation and virtual simulation gaming and high fidelity interprofessional sims).

On the other hand, 66% of respondents' programs do not offer a demo EHR and 48% declared IT related simulation experience was not integrated for students in medical or nursing disciplines.

Social determinants of eHealth Integration in Academic Programs

External factors affecting eHealth integration in Healthcare educational programs

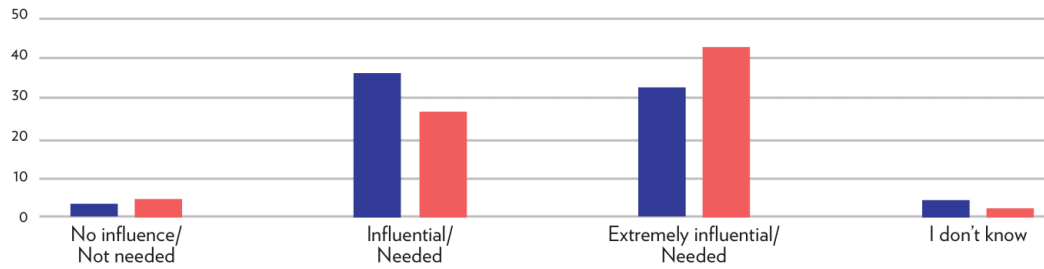


Figure 15: Influence of country's technological advancement and the impact of interdisciplinary approach.

As evident in Figure 15, the level of technological advancement that the respondents' country has reached coupled with an interdisciplinary approach to teaching informatics related courses, are highly regarded as influential and needed by the respondents. The impacts of these efforts on global healthcare systems make the case for further investigation possibilities.

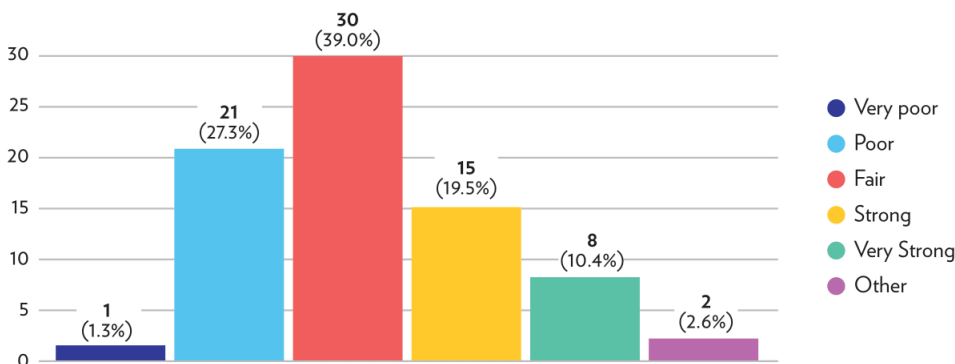


Figure 16: Awareness of medical and nursing programs on legislations and policies that regulate the use of information and communication technologies (IT) in healthcare settings.

Figure 16 proposes another topic of interest that should be considered as elective in the health-related curricula, ranging between very strong to poor awareness of healthcare workforce on policies and legislations governing IT practice.

Evaluation of informatics/eHealth Skills

Respondents were asked to rank Informatics/eHealth skills and knowledge base for themselves, fellow faculty and their medical/nursing students using a 5-point Likert scale ranging from 1 = "Very Poor" to 5 = "Very Strong".

Evaluation of Informatics/eHealth Knowledge and skillset

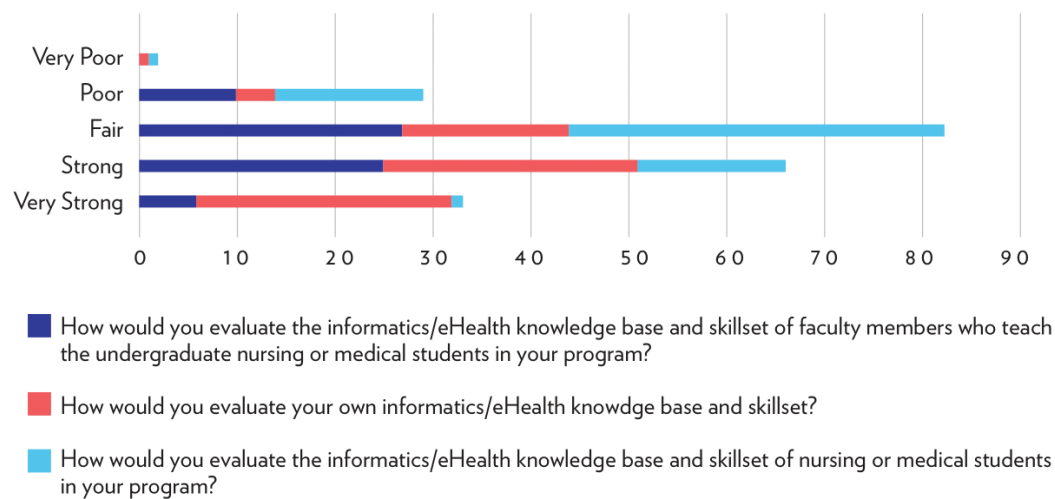


Figure 17: Types of Informatics/eHealth related courses offered by medical/nursing programs.

In Figure 17, participants identified their informatics/eHealth knowledge and skillset as “very strong” and “strong” with identical percentages (34%) compared to the student evaluation and knowledge base which were evaluated strong (20%) and fair (49%). The competence of faculty members reflected as strong (33%) and fair (35%).

Discussion

A study which measured the digital health literacy of nursing students found that more than 25% of nursing students have poor eHealth literacy (Zajc et. al., 2020). Another report by the European Health Parliament (2016) shared about the insufficiency of digital training for health professionals to deal with the digital revolution. These studies are in line with the key results reflected in the survey section on informatics/eHealth skills.

Hypotheses Discussion

Using logistic regression model, a significant correlation between the level of eHealth/informatics knowledge of the experts who took part in the survey and their tendency to leverage their professional development ($P= 0.004$) was prevalent. The survey showed that the participants with lower levels of eHealth/informatics knowledge (evaluated their own skillset and knowledge as “poor” and “very poor”) are less likely to leverage their professional development which takes different forms including attending conferences, online courses, workshops, etc. Another sub-hypothesis that falls into the same category is the correlation between PhD, or other doctorate/terminal degree, holders and those attending conferences. There is a common notion that conferences are an eye opening for prospective plans and innovative ideas. Peering with like-minded people and exchanging experiences is what experts look for in the career ladder.

Several alternative correlations could be derived from our dataset, but statistical power was undetected. Though the survey achieved a good global

outreach (survey accessed by 175 users), the participation rate is acceptable. This could be attributed to the narrow target audiences and the specific academic institution fields.

Nevertheless, the rate of incomplete responses was low (27 compared to 77 full responses), which reflects the interest of participants in the subject matter. It also shows a high willingness to express observations and views on informatics related content, rate the relevant topics to be integrated in the medical/nursing curricula, share about challenges, and evaluate personal skillset and the influence of the global ecosystem on the healthcare field's progression.

Conclusion

Findings from the *Global eHealth/Informatics Survey* provide valuable insights and a comparable baseline for informatics/eHealth integration into medical schools and nursing undergraduate curricula post pandemic. Despite the flexibility that medical schools and nursing programs showed during the pandemic through adoption of new pedagogical approaches, a well-built, inclusive and integrated health informatics/eHealth curricula is lacking.

The information provided in this report shows the involvement of medical and nursing faculty in eHealth/informatics organizations, which suggests their readiness to revolutionize the way care is delivered and instructed. Also remarkable, is the absence of a unified type of informatics/eHealth course taught in medical schools and nursing programs. This lack of standardization reveals that accreditation institutions do not yet mandate the integration of informatics courses as part of the medical and nursing curricula.

The wide array of technology related topics requires a robust assessment on which are essential to urgently add to the curricula, as compared to that offered as electives. This is due to the curricula capacity limitation which was identified as a barrier by 41 of the respondents depicting this correlation. Financial limitations have also been significantly recorded as a challenge, aligning with experts highly rating the influence of a country's technological advancement on healthcare evolution. Consequently, governmental funding and endorsement in healthcare related institutions' development contribute hugely to this effort.

Recommendations

- The survey design can be replicated on an in-country level yielding evidence to support reality based interventions and curricula reformation.
- Supply the industry and market with outcomes to invest in curricula reformation initiatives towards preparing the global health workforce with innovative informatics/eHealth resources.
- The need for healthcare professionals to upskill in data science and other digital health topics to ensure emerging technologies such as AI are developed equitably, appropriately and safely for medicine and nursing practice and patient care.

- This offers an impetus for change that nurses, doctors, and allied healthcare professionals and educators should embrace.
- This calls for collaborative and multi-interdisciplinary action to optimize academic institutions in keeping pace with the rapidly evolving world of technology and global needs in education.

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The Status of Informatics/eHealth Integration in Medical and Nursing Curricula from a Global Perspective

The survey is no longer than 5-10 minutes in duration

Definition of Terms

- *SNOMED*: Systematized Nomenclature of Medicine
- *ICD*: International Classification of Diseases
- *LOINC*: Logic Observation Identifiers Names and Codes
- *ICNP*: International Classification of Nursing Practice
- *NANDA*: North American Nursing Diagnostic Association
- *NIC*: Nursing Interventions Classification
- *NOC*: Nursing Outcomes Classification
- *Omaha*: Standardized health care terminology

Section I: Demographic Data

1. Please indicate your age group:
2. Please indicate your gender:
3. In which country are you teaching or you have taught?
4. What is/was the language of teaching in your nursing/medical school?
5. Please select your professional field:
6. Please provide the name of your medical/nursing institution:
7. Please indicate the years of your teaching experience:
8. Please indicate the years of your clinical practice:
9. Please indicate your degree:
10. Do you have HIMSS membership?
11. Does your medical/nursing school offer informatics/eHealth courses/modules at undergraduate level?

Section II: Content Related Questions

12. What type of Informatics/eHealth-related courses does your medical or nursing school offer? (You may select more than one answer)
 - Major/core/pre-requisite courses/modules at Undergraduate level
 - Major/core/pre-requisite courses/modules at Post-graduate level
 - Post-graduate specialised courses/modules (eHealth in radiology, cardiology, etc.)
 - Electives at undergraduate level
 - Electives at post-graduate level
 - Online webinars and workshops
 - Post-graduate degree program
 - Certification based program
 - Basic computer proficiency and information literacy courses/modules
13. Which of the following topics does Informatics/eHealth courses/modules in your medical or nursing school include?
 - Health information systems
 - Electronic health record (EHR)
 - Data analytics and governance
 - Interoperability

- Standardized terminologies and data (SNOMED, ICD-10, LOINC, ICF, ICNP, NANDA, NIC, NOC, Omaha)
 - Legal issues and ethics in health information technology (IT)
 - Health IT related psychological staff safety and wellbeing
 - Trends in emerging technologies in health IT (AI, mHealth, Telemedicine, etc.)
 - Health IT design (friendliness, universal, intuitive and speech recognition)
 - Big data in research and personalized health
 - Health economy in medical or nursing curriculum (Example: The ability to estimate the health economic consequences of novel technologies through using the Health Technology Assessment Tool (HTA))
 - Genomics for health professionals
14. Which of the following topics of the Informatics/eHealth courses/modules you feel should be included in your medical or nursing school?
- Health information systems
 - Electronic health record (EHR)
 - Data analytics and governance
 - Interoperability
 - Standardized terminologies and data (SNOMED, ICD-10, LOINC, ICF, ICNP, NANDA, NIC, NOC, Omaha)
 - Legal issues and ethics in health information technology (IT)
 - Health IT related psychological staff safety and wellbeing
 - Trends in emerging technologies in health IT (AI, mHealth, Telemedicine, etc.)
 - Health IT design (friendliness, universal, intuitive and speech recognition)
 - Big data in research and personalized health
 - Health economy in medical or nursing curriculum (Example: The ability to estimate the health economic consequences of novel technologies through using the Health Technology Assessment Tool (HTA))
 - Genomics for health professionals
15. Have you ever upskilled or continued your professional development in informatics/eHealth to expand your knowledge base/skillset as a faculty member?
- No
 - Online Courses
 - Workshops
 - Attending Conferences
 - All of the above
16. Does your program integrate simulation learning opportunities for students focused on informatics/eHealth technologies?
- Practice units on smart implants and wearables
 - Symptom checker apps
 - Tele-consultations
 - Mixed reality-assisted surgery
17. Does your program leverage an open EHR to provide the students with hands-on practice before they graduate?

18. Select the challenges that may affect the integration of informatics/eHealth courses in medical/nursing curricula:

- Shortage of faculty members
- Faculty lack of subject matter expertise
- Poor digital literacy among current faculty members
- Curricula capacity limitations
- Resistance to updating how curricula is taught
- Faculty lack of interest
- Non-user-friendly or complicated technologies
- Financial limitations
- Ethical issues
- Legal issues
- Infrastructure challenges
- All of the Above

Section III: Rating Scale Questions

In the following section, please rate the questions based on the provided rating scale:

19. How would you evaluate the informatics/eHealth knowledge base and skillset of Faculty members who teach the undergraduate nursing or medical students in your program?

(1= Very Poor, 2= Poor, 3= Fair, 4= Strong, 5= Very Strong, 6= Very Strong, not applicable)

20. How would you evaluate your informatics/eHealth knowledge base and skillset?

(1= Very Poor, 2= Poor, 3= Fair, 4= Strong, 5= Very Strong, 6= Very Strong, 6=not applicable)

21. How would you evaluate the informatics/eHealth knowledge base and skillset of nursing or medical students in your program?

(1= Very Poor, 2= Poor, 3= Fair, 4= Strong, 5= Very Strong, 6= Very Strong, 6=not applicable)

22. How would you rate the importance of having informatics/eHealth resources available in your county's official language?

(1=Not Important, 2=Important, 3=Extremely Important, 4= I don't know, 5=not applicable)

23. How influential do you think your country's technological advancements have on how students are taught in healthcare focused program at academic institutions in-country?

(1=No Influence, 2= Influential, 3=Extremely Influential, 4=I don't know, 5=not applicable)

24. How would you rate the need to involve other professionals when teaching informatics related courses such as industry, law, data protection, technology developers, administration, etc.?

(1= Not Needed, 2= Needed, 3= Highly Needed, 4= I don't know, 5= Not Applicable)

25. How would you rate the awareness of medical and nursing focused legislation and policies that regulate the use of information and communication technologies (ICT) in healthcare settings?

(1= Very Poor, 2= Poor, 3= Fair, 4= Strong, 5= Very Strong, 6= Very Strong, not applicable)