Information in Healthcare – From Data to Knowledge: Improving Data Literacy Competencies

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Abstract. Digitalization in healthcare and the increasing availability of data demand data literacy competences of nurses and other healthcare professionals including technical, ethical and communication skills. The international Spring School 2023 "Information in Healthcare – From Date to Knowledge" aimed at these competences covering interoperability, data protection and security, data analytics and ethical issues. These topics were embedded in the overall case of data-driven quality improvement for diabetes patients in a region. The curriculum includes an online preparation-phase and a five-days attendance week, incorporating problem-based and group work approaches. According to the student´s evaluation, the awareness of the importance of the topics was raised and theoretical as well as practical application skills were improved. The Spring School enhanced data literacy competences, critical thinking, problem-solving, interprofessional und intercultural skills among healthcare professionals. Such course offering can contribute to meeting the increasing challenges of digitalization in healthcare.

Keywords. data literacy, health data, education, interoperability, data analytics, data protection and security

1. Introduction

Digitalization in healthcare, in particular the widespread use of electronic health records (EHR) and the resulting increase in data generation and availability, can have a positive impact on the quality of care [1]. In addition to the digital skills that healthcare professionals need as part of the digital transformation [2], the meaningful use of data and information, known as data literacy, will become increasingly important [3]. Data literacy is defined as „the ability to collect, manage, evaluate, and apply data, in a critical manner" [4]. It includes both technical and social aspects of data [5] and encompasses statistical and ethical skills [6]. Being data literate also means being able

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to generate and communicate meaningful and useful information from data [5]. Data literacy is also referred to as a key competence of the 21st century [7].

In order to fully exploit the potential of digital healthcare data within and across institutions, technical, syntactic and semantic access must be made possible through interoperable data and systems [8]. Since the personal and sensitive nature of most patient data requires a high level of protection, individuals planning to use data must be proficient in data protection and security [9] and knowledgeable about the ethical risks intrinsic to managing data [10]. Being able to generate information and knowledge from data and contribute to decision support require both statistical skills [11] and the communication skills to effectively share this knowledge [12].

Healthcare professionals therefore need a comprehensive skillset when it comes to processing and using data. This paper gives an overview of the structure and content of an international Spring School 2023 "Information in Healthcare – From Data to Knowledge", which was designed to improve graduate students' skills related to data literacy in healthcare. Based on conducting this Spring School, this study aimed at capturing the students´ assessment of the topics and value of the program.

2. Methods

2.1 Course development and content

The program of the international Spring School 2023 was developed based on the eHealth4all@EU Pipeline for Course Development [13] and the lessons learned from an interprofessional European Summer School in health informatics that was held at the University of Porto in 2022 [14]. The curriculum of this Summer School that had addressed the three topics "interoperability", "data protection and security" and "data analytics" was revised based on the evaluation results. Further topics to illustrate the meaning of data literacy, in particular electronic patient records and ethical challenges in health IT, were included. Real de-identified, inpatient health insurance discharge claims were one source of the analysis. All topics were embedded in an overarching clinical use case on sharing patient data in a region including different types of health organisations. The aim for data sharing was to gain a better understanding of the patient characteristics for improving the prevention of diabetes mellitus.

2.2 Spring School

The Spring School involved an online preparation phase, where participants had to familiarize themselves with the topics of the course, followed by a five-day attendance week, which took place from 8-12 May 2023 at Osnabrück University of Applied Sciences, Germany (workload 75 hours in total). The materials for the online preparation phase (22.4.-7.5.2023) were provided on the ILIAS learning management system and included texts, videos and quizzes. Teaching methods for competency development during the Spring School were based on a problem-based approach and a group work approach for practical exercises.

A total of 15 participants (9 female, 5 male, 1 diverse, mean age 29 years) attended the Spring School, 9 of whom came from Germany, 3 from Brazil and 1 each from the Netherlands, Ukraine and Austria (8 doctoral students, 2 Master's, 2 Bachelor's students, 2 research assistants and 1 post-doc researcher). It was an interprofessional

group with 4 participants from health sciences, 3 from physiotherapy, 2 each from management and computer sciences and 1 person from nursing. 3 participants did not provide any information. The lecturers came from Germany, Finland, Portugal and the USA.

At the end of the Spring School, an evaluation was conducted, which consisted of an online survey with 21 closed questions on the experience, motivation and interest regarding the Spring School, the personal benefit and practical relevance, the experience with the topics, an overall assessment and personal information, as well as an open discussion round.

3. Results

A total of 14 out of the 15 participants responded to the survey and took part in the discussion round. Figure 1 shows the main results with regard to the course expectations and the three main topics: interoperability, data protection and security and data analytics. The participants stated that taking part in the Spring School increased their understanding, provided theoretical knowledge (background information) and made them able to apply methods and tools appropriately. Upon finishing the Spring School, awareness of the importance of the three main topics was raised, their meaning for practice became clear and the ability to apply analytical methods was built up - as stated by the participants (Fig. 1).
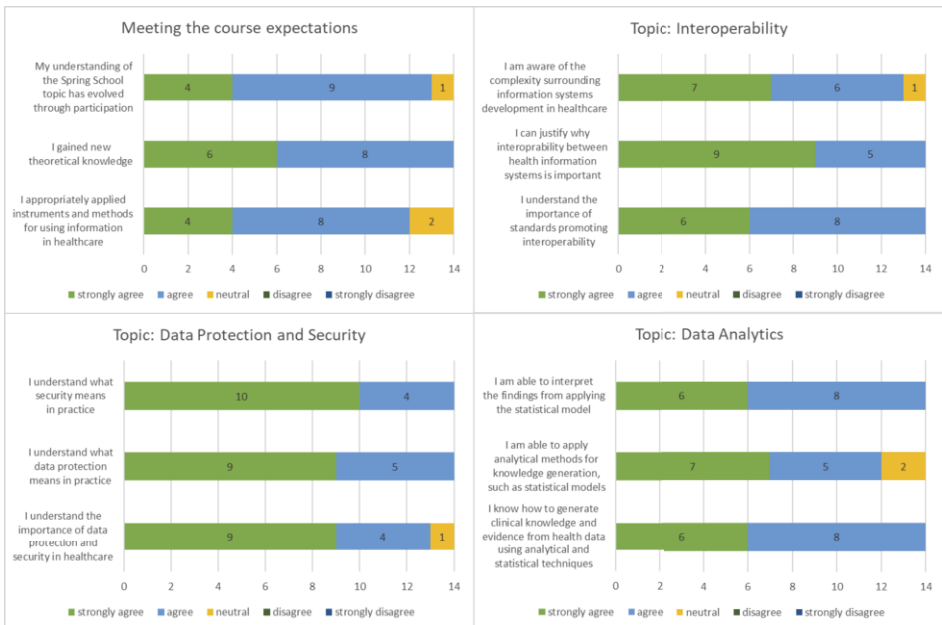
Figure 1. Main results from the online survey for the course expectations and achievement of the learning objectives after completion of the course for the topics Interoperability, Data Protection and Security and Data Analytics [n=14].

Twelve of the 14 participants (86%) agreed that working in small groups contributed to a better understanding of the topics and working with case reports was rated positively by 11 participants (79%). Desire for (international) exchange with other students, interest of learning new knowledge and/or new methods and personal development were reported as the main reasons for participating in the Spring School (93% agreement). 10 of the participants already had previous experience of working in inter-professional groups with nurses and other health professionals.

In the open discussion round, it was emphasized that the exchange with each other and the work in groups was perceived as particularly enriching. Overall, the topics were rated as quite demanding and the topics should be better interconnected. One additional suggestion was to include the topic of artificial intelligence.

4. Discussion

This Spring School illustrated how major data literacy competencies for health professionals can be translated into an educational activity. The results of the survey revealed that topics offered in the Spring School could be successfully covered by the curriculum and courses. Despite their diverse backgrounds, most of the participants seemed to develop a deeper understanding of what it takes to generate knowledge from data.

Besides data literacy competencies, the Spring School addressed other important topics that are relevant to the future of healthcare. In particular, critical thinking, which is especially important when it comes to analysing data in the context of patient care [15]. The problem-based teaching method also addressed problem-solving skills, as well as collaboration and communication competencies which are regarded as 21st century skills and are necessary for successfully evolving in a digital working world [16]. This was additionally supported by the international focus of the course that, at the same time, addressed intercultural competencies, considered one of the key competencies in medicine and nursing [17].

The topics of the course were challenging as the participants reported. With a course duration of 75 hours in total, the topics could not be covered in complete depth and in some cases the link between the topics was not clear for all of them. In future Schools, the courses should be therefore even more intertwined. In addition, specific follow-up courses should be offered that build on such Schools, integrate the new understanding and abilities gained, take them to a deeper degree of understanding and further develop practical application skills.

5. Conclusions

Healthcare professionals need adequate data literacy skills to deal with the increasing amounts of digital data and to meet the challenges of the 21st century. Courses of the type offered in this Spring School can serve as a door opener to further develop these skills.

Acknowledgements

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