

Evaluating the Design of a Comprehensive Nordic Hospital at Home Education – A Study Protocol

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Abstract: This study protocol outlines the test evaluation of the design of a comprehensive Nordic hospital at home (HaH) digital education program entitled “the Nordic Digital Health and Education” program (NorDigHE). The NorDigHE program aims to prepare healthcare professionals for healthcare provision in a HaH context. The program, developed by a Nordic consortium, spans five modules over 3.5 weeks of full-time study, equivalent to 5 ECTS, and employs various learning tools, eg, text, videos, learning games, and simulations. The design evaluation will involve 120 healthcare students and professionals across Denmark, Norway, and Sweden, focusing on their perceptions and experiences with the different educational tools utilized in the education. To be included in the study, the participants need to have completed at least four semesters of bachelor level studies in medicine, nursing or other registered healthcare professions. Each of the participants will test two of the five modules at their own pace during the design evaluation. Evaluation data will be collected through established instruments measuring student motivation, quiz functionality, videos’ effectiveness, and the educational platform’s usability assessments. The outcomes of this study will be used to refine the education and the learning tools employed. Ultimately, the results will help optimize the structure and contents of the NorDigHE education program, to better prepare healthcare professionals and students with essential skills to navigate the evolving landscape of digital health and remote patient healthcare effectively.

Keywords: care, digital, healthcare, professional, training, hospital at home

Introduction

The digitalization of our society in general is progressing exponentially, including our healthcare systems.¹ Increasingly, healthcare is provided digitally to patients living at home, for outpatients for example self-monitoring of pain and blood pressure, rehabilitation after injury, and palliative care. Advancing acute healthcare into the home, HaH is increasingly implemented. HaH entails caring for patients in their own homes, despite their continued need for the emergency hospital’s resources, such as specialist skills, diagnostics, and/or treatment.² Worldwide, many hospitals are in the process of digitizing workflows to handle HaH (and other e-health models), not the least considering the recent pandemic that has challenged the capacity of hospitals worldwide. The rapid development towards HaH is, however, not without problems. More specifically, there is a great unmet need within healthcare and among educational institutions to be able to quickly, easily, and scaleably develop the competencies of healthcare professionals in HaH solutions. Lack of familiarity with the digital form of treatment and insufficient digital skills among healthcare professionals are internationally described main barriers to the implementation and scaling of well-documented e-health solutions in clinical practice.^{3–6}

Background and Rationale

In Sweden, Norway and Denmark, the regions are responsible for providing healthcare. In Denmark there are five regions and in Norway four, whereas Sweden has eight.⁷ In each country, policy commissions such as “Helsepersonell-

kommissjonen” in Norway, “Robusthedskommissionen” in Denmark and “Socialstyrelsen” in Sweden point to enhanced digital health care delivery as a core component of mitigating systemic challenges. For example, regions should provide the option of contact over distance in healthcare. The competence to use digital tools to provide healthcare at a distance should be included as mandatory in relevant medical and health sciences educational programs and staff who meet patients via digital services must receive targeted training and introduction. However, that is not the case today.⁸ Consequently, there is an ever-increasing need to develop competencies in digital treatment and care for healthcare professionals, preferably starting already at the bachelor’s level.⁹ Important parts of such training would, according to the different healthcare authorities in the included countries, be how technology should be handled and how to maintain high information security, for example, when staff work remotely and meet patients via eg, chat or video conference. The staff also need to receive training in which care contacts can be processed digitally, and how they should act in cases of emergency.

In a recent systematic review on digital competencies among health care professionals, Longhini et al concludes that

Curricula embedding the development of technical skills, knowledge, and psychological and emotional aspects of digital technology are recommended (p.15)¹⁰

Today, the learning of digital skills takes place mainly through on-the-job experiences and the peer-to-peer post-graduate sharing of knowledge and know-how, master courses, or courses that are focused on one specific technology. Thus, there is no generic and comprehensive education or training for medical or healthcare professionals in interpersonal and technological skills required to provide digital treatment and care to patients hospitalized in their own homes.

Currently, however, a Nordic consortium including eight organizations from Denmark, Sweden, and Norway is developing just such a digital education program for healthcare professionals using digital tools to treat and care for future patients in their own homes,¹¹ the Nordic Digital Health Education, NorDigHE, project. NorDigHE includes two hospitals: Nordsjælland Hospital (NOH) and Sahlgrenska University Hospital (SU); two professional colleges: Copenhagen University College (KP), Østfold University College (HIØ); one university: Lund University (LU); and three private small companies focusing on online learning and simulation: Mount Visual (MO), Skillhabit (SH) and Copenhagen Game Lab (CGL). The program will ensure that the healthcare professionals acquire the necessary digital skills and psychological security to deliver digital healthcare in the home context.¹²

The NorDigHE Education

The NorDigHE program comprises 5 ECTS (European Credit Transfer and Accumulation System) (equivalent to 3,5 weeks fulltime studies). It consists of five modules, each of them using a variety of learning tools, such as lectures and scientific articles as well as games, quizzes, case videos and podcasts. The Skillhabit digital education platform is used.¹³

The five modules are: 1. Introduction to Hospital at Home (HAH); 2. Communication in Hospital at Home; 3. e-health competencies; 4. Data-driven Hospital at Home and the technological development; and 5. Quality assurance and patient safety.

Study Objectives

The objective of this study is to evaluate the design of the NorDigHE education, specifically concerning the different learning tools used. More specific aims are to:

- Evaluate the participants’ experiences of using simulations and games as learning tools
- Evaluate the participants’ perception of quizzes as learning tools
- Evaluate the participants’ perceptions of the content, implementation, and educational effectiveness of the instructional videos
- Evaluate the participants’ view of educational podcasts as learning tools

Materials and Methods

Study Design

This study is an evaluation of the design of the NorDigHE HaH digital education, applying quantitative data.¹⁴

Study Setting

The evaluation will involve healthcare students and healthcare professionals from Denmark, Norway, and Sweden.

Sample Size and Recruitment

In order to achieve enough statistical power for descriptive analysis, ie, a study population with more than a 5–1 ratio in relation to the survey with the largest number of items, a total of 120 students and professionals will be recruited.

Inclusion Criteria

The participants need to be students having passed at least four semesters of bachelor level studies in medicine, nursing or other authorized healthcare professions (such as physiotherapy, audiology, occupational therapy or speech therapy) or be authorized healthcare professionals.

Exclusion Criteria

Anyone who does not fulfill the inclusion criteria.

Data Collection

The design test involves three groups of participants, one group in each country. The participants will be informed about the study through official channels at each educational institution or clinical department. Those who express interest in participation will be asked to sign a written informed consent before inclusion into the study. Participants will be enrolled in the study until the stipulated number is reached. Given the extent of the education, ie equivalent to 140 hours, we have chosen to request the participants to test only two of the five included modules, each of them, however, encompassing all design elements.

The data will be collected through the REDCap (Research Electronic Data Capture) system. The REDCap system provides a secure and user-friendly web-based application for electronic data collection in research studies.^{15,16} When declaring interest to participate, all participants will be sent a link through Email from REDCap. This link will take them to the consent forms for the questionnaires. After signing the consent form, they will be sent a link to the test version of the NorDigHE HaH education system which is provided by Skillhabit. Questionnaire links will be sent automatically to each participant after completing the NorDigHE program, with two reminders one week apart.

Outcomes and Instruments

The design test uses the following instruments to evaluate the learning tools included in the NorDigHE HaH education and the best possible grounds for the full-scale education that will follow. The English version of each instrument will be used.

The following outcomes will be evaluated:

The use of simulations and games as learning aids: This outcome will be evaluated using The Students' motivation to study through game-based learning (GBL) experiences survey, consisting of 16 items about the usage of simulations and games in the education.¹⁷

Students' perception on quizzes as a learning tool: The Students' Quantitative Responses to the Online Quizzes instrument consists of 10 items focusing on evaluating the learning functionalities of the quizzes included.¹⁸

Students' perceptions of content, implementation and educational effectiveness of instructional videos: The Subjective Outcome Evaluation instrument for case videos will be used. The instrument consists of 14 items to evaluate students' perceptions of content, implementation and educational effectiveness of instructional videos. It has been validated in English.¹⁹

Students' view of educational podcasts: The Questionnaire for Assessing Educational Podcasts (QAEP) consists of 20 items to examine students' views on the following aspects of educational podcasts access/use, design/structure, content adequacy, and value as an aid to learning. It has been validated in English.²⁰

The usability of the education platform: The System Usability Scale (SUS) consisting of 10 items will be used to evaluate the usability of the educational platform. The SUS scale has been validated in English.²¹

Participant background and experiences: The participants will also answer a short respondent characteristics questionnaire with 8 items (gender, age, study subject, study level, work experiences and experiences of working with HaH solutions), constructed to capture participant background data and data about their previous experiences.

Data Analysis

Data will be analysed using descriptive statistics, which includes mean, median, and min-max values, as well as interquartile ranges. The results will be reported at group level and for the total sample.

Data Management

After the data collection is completed, all data will be stored and managed in Lund University's platform for storing, handling and securely analyzing data (LUSEC) and according to GDPR and Swedish data protection law. Only the PI for the project and a research administrator will have access to all data. Other researchers in the project will be provided with de-identified data, thus securing confidentiality for all participants in the project and making sure that no participant can be identified when reporting the results. When the research project is finalized, data is handled in accordance with the Lund University Faculty of Medicine's conservation plan for research documents.

Discussion

This study protocol outlines a study evaluating the design of a digital education program targeting HaH, the NorDigHE education. The education comprises five modules equalizing 140 hours of work; however, for this test, we have chosen to limit the number of modules for each participant to only two. We are aware that this approach will not enable us to evaluate the education as a whole, nor will we be able to evaluate the transitions between different modules. However, since the focus of the testing is to evaluate the individual learning tools used, we consider this to be sufficient. In the next step, not included in this study, the complete education will be evaluated on a larger group of healthcare students and professionals in Denmark, Norway, and Sweden.

The five instruments included have been selected to evaluate each learning tool separately, validly, and reliably. Thus, the evaluation of the learning tools included will be facilitated. Ultimately, learning tools considered of low value for the NorDigHE education can be eliminated or revised before the finalization of the education. All instruments have been psychometrically tested and are considered valid and reliable for use among healthcare students and professionals at the least at a bachelor's level.^{17–21}

We aim to include a total of 120 participants, based on the power calculations. We consider this number to be sufficient, as we are primarily evaluating the individual educational components and learning tools.

Ethics

Ethical approval has been sought from the Swedish Ethical Review Authority, DNR 2025-00221-01. The project will also be submitted to the Norwegian Agency for Shared Services in Education and Research (Sikt), and if deemed appropriate, approval will also be requested from the Danish counterpart. The research project is guided by the ethical principles of medical research according to the Declaration of Helsinki.^{22,23} The researchers will work carefully to generate valuable knowledge while minimizing harmful consequences. To respect the participants' autonomy, prior to the study, they will receive written and oral information, including their right to withdraw from the study at any time without any consequences. The participants will give their written informed consent before participating in the study.

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Disclosure

The author(s) report no conflicts of interest in this work. The European Union has no role in the design of the study, in the collection, analysis, and interpretation of data or in writing the manuscript.

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