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Technology-Based Healthcare for Nursing Education Within The Netherlands: Past, Present and Future

Ybranda KOSTER MSc,^a and Cornelis T.M. van HOUWELINGEN MSc, RN^b

^a*Faculty of Nursing, University of Applied Sciences Inholland Amsterdam, The Netherlands*

^b*Research Center for Innovations in Health Care, Faculty of Health Care, Utrecht University of Applied Sciences, The Netherlands*

Abstract. At the present time, nearly all Dutch nursing schools are searching for suitable ways to implement technology-based healthcare in their curriculum. Some Universities chose elective education, others a mandatory solution. Several studies were executed to determine competencies needed by nurses in order to work with technology-based healthcare. In 2016 a nationwide new curriculum for nurses has been published. Providing technology-based healthcare is included under the core competencies of this new curriculum. All baccalaureate nursing educational institutes must implement this new curriculum at the start of 2016 which will have a huge impact on the implementation of technology-based healthcare in the education programs. In the future, technology centers from Universities will collaborate and specialize, partner with technology companies and crossovers between information and communication technology and healthcare education will be expanded.

Keywords. Technology-based healthcare, curriculum, education, mandatory education, elective education, ICT, information, communication, technology

1. Introduction

Beginning in the fall of 2016, all nursing schools will offer education about technology-based healthcare. This chapter describes the history of how it got to where it is today. It begins by exploring the past education of technology-based healthcare in The Netherlands based on several examples of projects and programs.

Afterward we will elaborate on the present implementation of technology-based healthcare within the Dutch education system. Examples from the Universities of Applied Science of Nursing, the Master Advanced Health Informatics Practice, the platform of Nursing and Healthcare Informatics (VZI) of the Dutch Professional Association of Nurses and Carers (V&VN) will be explored. The role of technology-based healthcare in the new nationwide curriculum of “Bachelor Nursing 2020” will also be discussed.

The chapter will end with a view on the future of technology-based healthcare within the Dutch education system. This will include the future plans on Nursing Informatics from multiple Colleges of Nursing and the ambitions of VZI will be elaborated.

In this chapter the abbreviation ICT will be used. ICT stand for Information and Communication Technology. This term is used for the branch of Information Technology related to digital devices that are used to communicate or interact with digital information. The Dutch national institute for technology in healthcare is NICTIZ (National ICT Institute Healthcare). Since ICT is used in the name of the national institute and is commonly used in Dutch healthcare, the abbreviation ICT will be used in this article.

2. The Past: 1983-2013

The importance of attention for technology-based healthcare within the Dutch education system started early. One of the first publications about technology-based healthcare in the Netherlands is the article of Pluyter (1983) [1] in which early experiences in using a digitally integrated Hospital Information System are discussed. Pluyter indicates that it is important for the nurses who are involved in the construction of computer programs to orientate in the field of informatics, as well as the need for those involved in informatics to orientate in the field of nursing. This laid the groundwork for nursing education to implement technology content in the curriculum. The article ends with the statement: "To all appearances it is not the question whether nurses will use computer facilities, but the manner and extent to which this should be done. Obviously, it is the job of the nurses themselves to give to the desired result and the line of march."

2.1 Local initiatives

Since 1983 there have been several local projects on technology-based healthcare in education. For example, in 1989 at the Noordelijke Hogeschool Leeuwarden, University of Applied Sciences, the development and implementation of Nursing Informatics courses started. A structured approach was used to develop Nurses Informatics education in four different courses. A modified framework was used, based on the framework of Ronald and Skiba (1987) [2]. With the use of this framework courses were developed for the Nurse Teacher program of the Noordelijke Hogeschool Leeuwarden, baccalaureate program of the Noordelijke Hogeschool Leeuwarden and the Nurse Scientist Program of Groningen University. This included one module on how to use the framework and one on education of Nursing Informatics. Learning contents were based on learning objectives and content was based on IMIA guidelines and existing courses [3].

Seven years later, in 1996, the courses had changed. In the course for nursing instructors the focus became more and more on the specialized nursing informatics skills, since the computer knowledge of the students appeared to be sufficient in most cases. Instead new topics were included about integrated electronic patient records, information management and processing, classification and terminology issues, nursing minimum data sets, innovation of care and use of technology to support this. In the baccalaureate program, Nursing Informatics was integrated in the program [4]. But this remained a local development.

The University of Applied Sciences Inholland started with a course in 1991: "Hogere Opleiding voor Verpleegkundige Informatica" (Higher Education of Nursing Informatics), HOVIF for short. This course focused on promoting user-friendly use of

health informatics in primary care processes and in organizational levels. Since this was an open course, professionals from all over the country attended and spread the knowledge. Graduates from this course have contributed, in several ways, to the innovative use of ICT in several domains and activities in healthcare. The developments of this course have been intertwined with the developments in Dutch healthcare [5]. Yet it still remained a local initiative.

Dutch nurses can graduate at one of three levels: intermediate vocational education, bachelor's degree level education and master's level education. Nurses can graduate at the intermediate vocational education level at ROC's (Regional Education Centers). ROC's were also searching how to implement technology into their nursing education. In Twente (a province in the eastern part of the Netherlands) one of the ROC's started with a course "Care and Technology" in 2006. In this course nursing students and students of the application developers program of the same ROC worked together. The module included "special learning objects" such as the development of a Care Information Model (reusable building blocks for an EHR) and the development of functional requirements for EHR systems for continuity of care. [6]. Again, this was a local initiative of only one ROC.

2.2 *National initiatives*

In an attempt to nationalize the use of technology-based healthcare within the education system, the Dutch Association of Higher Healthcare Education (HGZO) started with an ICT project in 2002. Due to changes in the profession, a greater need emerged to develop specific ICT competencies and educational material for non-ICT courses, like nursing. The focus on this project was on Electronic Health Records. Three goals were established: identifying the professional competencies related to information processing and ICT, the development of educational tools to obtain those competencies and the support of the implementation of ICT related education.

The project used key issues and results from previous work, including (among others) the Nightingale Project and Project Eductra, to determine the competencies needed. A start was made with competencies on five levels of skill: recognizing, using, evaluating, applying and integrating. For these levels a proposal for educational tools was made. The competencies that were developed ended up being less about ICT and more about healthcare than anticipated. Attempts to establish an Electronic Health Record for education failed due to high costs. An alternative was found by making simulations using screens of existing systems [7]. Though this initiative was national, it was free for the educational institutes to implement these competencies into their education. However, only a few Universities of Applied Sciences used these recommendations in their curriculum.

In 2012 another push for a national curriculum for nurses was given by the V&VN, who published an advisory for the professional profile of the nurses in 2020 [8]. In the advisory the V&VN stated that ICT can mean a valuable step forward for direct care and in administrative tasks. The nurses of the future should be aware of technological developments like Electronic Health Records, screen-to-screen care and electronic monitoring. One of the important issues is standardization of both language and practice. In an increasing dependency of technology, the V&VN claimed, it is important that nurses (and their professional organization) have a clear role in the development. The advisory also laid the foundation for the "Bachelor Nursing 2020" profile, published in 2016, which will be described in the next section.

3. The Present: 2014-2016

For many Dutch Universities of Applied Science in Nursing and other healthcare educational institutes the advisory from V&VN was a wakeup call to start technology in their educational program. As a result, more nationwide and local initiatives on technology-based healthcare emerged. Several institutes explored the required competencies on technology-based healthcare for nurses. Educational institutes still had different approaches to technology implementation in their curriculum. Some institutes choose for elective education while others integrate the technology into their core curriculum, thus making technology a mandatory element of the nurses' education.

3.1 *Exploring required competencies for technology-based healthcare*

On December 10th 2014 a symposium was held on healthcare technology within the Dutch healthcare education system. This symposium was necessary because the current education taught too little on technology. Even more, there seemed to be an anti-technology attitude within the Dutch healthcare education system. Traditional healthcare was often described as “warm care” while healthcare technology was described as “cold care”. Nurses tended to fill in the needs of their patients with comments such as “my patient isn’t capable of using technology, that is too difficult”. Important in the education was to learn about developments and possibilities of technology, learning ethical, social and social issues concerning technology. Change in the educational environment needed to start with a change in the teachers. Students had to develop an innovative attitude as well as a critical attitude, not every change is an improvement. Therefore an international minor “care and technology” was developed at Hogeschool Zuyd for bachelor-prepared individuals with at least two years of working experience to train them to become leaders in the use of technology in healthcare [9].

The symposium in December started with a view on the changes health education had to make on behalf of the report on health professions in 2030. During interactive sessions the participants were asked to reflect on which level a healthcare professional should master the competencies as were developed by Hogeschool Zuyd (completed with competencies from several publications). Most participants reflected soft skills concerning healthcare ICT where missing in the list of competencies. The symposium did manage to achieve that healthcare educators needed to start thinking about how they could implement ICT in their education together [10]. The “letter of inspiration, Technology in Healthcare” of the HGZO, a publication of this symposium, stated that 22 competencies were defined as generic after at least 2/3 of the (120) participants stated these were the competencies every healthcare professional should achieve [11]. This showed that the question on how to implement technology into healthcare education is not just an issue for the nursing education but is a topic for every level of health education. This letter of inspiration intended to give a boost to the implementation of technology within the Dutch healthcare education.

Meanwhile Utrecht University of Applied Science investigated which professional activities nurses can perform using telemonitoring devices, video conferencing and personal alarming and what competencies nurses need to possess in order to perform these activities effectively. In this research a panel of experts discussed the activities on relevance for nurses and discussed which competencies would be needed to execute these activities. Fourteen activities were identified and fifty-two competencies were

considered to be required for nurses to be able to execute these activities. Of the fifty-two competencies, thirty-two were specifically for telehealth and were new competencies. Home care organizations and healthcare educational institutes benefit from this research by using the activities and the corresponding competencies as a starting point for their curriculum and education [12].

3.2 *Elective courses about technology-based healthcare*

Some Universities of Applied Science chose to develop a minor or a separate course on technology-based healthcare instead of making it a mandatory part of their curriculum. The Fontys University of Applied Science of nursing founded an Expert Centre Health and Technology (EGT) in order to embed the technology in the education. In this center, students from different educational directions work together in a minor to design and develop solutions that improve the quality of life for people with health limitations or problems. In the third year of the education, students from nursing, ICT, design and other courses participate in a project. Usable prototypes are developed like a special click-lock brake system on walkers of hemiplegic patients or a robot dog with a ball to motivate elderly people to move [13].

Another development in the elective programs is the HOVIF, discussed in the previous section. It evolved into a Master of Science program. The new program, Master of Advanced Health Informatics Practice (MAHIP), covers the professional roles of the Health Care Informatics: the information analyst, the designer, the adviser, the implementation manager and the project manager [14]. Students come from various settings of healthcare and welfare. Some are already working on the area of ICT and want to expand their knowledge others have interest or ambitions to work the area of health, welfare and technology. During the two years, the master's students work on projects related to their own setting, so employers already see and benefit from the effects of the master during the program. One of the assignments is to develop an eHealth application in a patient centred design. In 2015 a pilot started where the eHealth applications designed, on paper, by students of the MAHIP were used in an assignment for the Informatics students of Hogeschool Inholland. The students made a working prototype of the application. One of these designs was so successful, it is now implemented in the intensive care unit where the MAHIP student who designed the application works. The implementation and evaluation of this application will be the theme of his thesis. After this success, more collaboration between the two educational directions will be explored.

Nursing students from the Hogeschool Inholland have been working on a project to create a structured overview of available eHealth interventions organized by health problems which resulted in a table with brief information on the intervention, the name of the eHealth product and a document with further information on the eHealth intervention. A student from the MAHIP is making a database design which will be developed by informatics students. When the database is available, more project assignments will be given to nursing students to generate more input for the database. The plan is to publish this database online so that it can be used by healthcare professionals, patients, students and teachers.

Most Dutch nursing schools have integrated nursing informatics in their existing curriculum, to a lesser or greater extent, by a minor or integrated in the curriculum. Saxion Hogeschool decided on another, creative approach. They started with a combined bachelor degree. The 4 year course of Health and Technology (Gezondheid

en Technologie) matches for 60% with the curriculum of the bachelor of nursing while the remaining 40% focuses on technology and innovation. A graduate receives a bachelor of nursing with expertise on health technology. In the curriculum health technology in the home environment, online aid and other technology use in healthcare are discussed. The students that graduate from this program are professionals that use modern technology and are able to contribute to the innovation of healthcare [15].

At Hogeschool Zuyd a special day “Technology in Healthcare” has been held for several years now. In this day all students of the faculty of Healthcare: occupational therapy, speech therapy, physical therapy, nursing and midwifery participate. The day is opened by a lecturer and after that all students start working on assignments in mixed study groups. A market with participation of several vendors is held where the newest technology is shown and the students can try everything.

3.3 *Mandatory courses about technology-based healthcare*

At Utrecht University of Applied Science, lessons that were learned from a course on home telehealth for care professionals were applied to the curriculum of the nursing education. One of the lessons was that nurses are most interested in the question: “what does this technology add to the care of my patient?” In the lectures on technology-based healthcare, this has become the leading question. Students are motivated by examples told by a patient or a nurse. During the curriculum, lectures on technology-based healthcare are provided in courses on psychiatry, youth healthcare and chronic illness. In each lecture an aspect of technology-based healthcare is covered in class, such as privacy, self-management, laws and regulations and the influence of the role of the nurses. Learning to work with remote healthcare is also integrated in the curriculum in the form of a practicum and during their internship [16].

Research on Assisted Living Technology (ALT: telecare, digital participation services and wellness services) showed not all Universities of Applied science pay attention to this technology. ALT could support healthcare for (especially) elderly people in order for them to be able to stay in their own environment for a longer period. In a study by van Houwelingen [17] a conclusion is drawn that lack of education could have caused the insufficient motivation of healthcare professionals to deploy ALT. The study has focused on two elements of ALT: personal alarming and telecare (screen-to-screen care). Nursing universities from four countries in Europe (Spain, The Netherlands, Germany and The United Kingdom) were questioned on the education of personal alarming and screen-to-screen care in their educational program. Education on social alarming was first offered in 2013. Education on screen-to-screen care started a few years earlier, in 2011. In this short period a lot has happened, since today respectively 30% and 16% of the Dutch nursing schools are offering social alarming and/or screen-to-screen care. For the near future 40% of Dutch nursing schools are planning to offer education on social alarming. 33% of the Dutch nursing schools have plans to offer screen-to-screen care education in the near future. These amounts are very promising for the future of Nursing Technology within the Dutch education system.

One of the institutes that uses ALT in their curriculum is the University of Applied Science Windesheim. Windesheim is one of the Dutch nursing schools who have incorporated screen- to-screen care in their curriculum; a skills lab is used for education on screen-to-screen care. In cooperation with the lectureship “ICT innovation in Healthcare” two classrooms have been designed to create the skills lab. One of these

classrooms is fitted with a one-way mirror and is used for observation. The other room is used as a technology care centre. Further on the campus another room is furnished as a living room. Both rooms are equipped with cameras and microphones to record sound and visual for analysis and evaluation. Also both rooms have iPads equipped with an app that can accomplish a save connection between the two settings, the same app is used in home care settings. The use of this skills lab has been intertwined in the curriculum along with practicums on Electronic Health Record and sensor technology [18].

In 2016 the complete edition of the educational profile has been published. This profile is named “Bachelor Nursing 2020, a future ready educational profile” or BN2020 for short. This profile has been developed by LOOV in cooperation with all of the 17 Dutch Universities of applied sciences that offer nursing education. This profile creates the outline of the educational profile and is a firm base for the future. It prepares for the changes in healthcare that are already happening and the changes yet to come. This curriculum ensures that technology-based healthcare will become a mandatory part of the curriculum of all bachelor’s of nursing educational institutes. The universities themselves create their own curriculum based on these outlines.

The new profile is based on the CanMEDS (Canadian Medical Education Directions for Specialists) roles: caregiver, communicator, collaborator, reflective EBP-professional, health advocate, organizer and professional and quality enhancer. The CanMEDS is a framework to deepen and describe the complex competencies. For every CanMEDS role, the concerning competencies and key concepts are described. These competencies and key concepts form the core of the profile. The knowledge and skills that operationalize these key concepts and competencies are described in a Body of Knowledge and Skills (BoKS). Even though eHealth can be integrated in (almost) every aspect of the profession in the BN202, the role of communicator specifically focuses on the use of technology with the key concept “the use of information and communication technology”. The knowledge that is necessary for this key concept is divided into knowledge, skills and attitude and are:

Knowledge:

- Knows the latest ICT applications aimed at improving and supporting communication in healthcare
- Knows the latest information and communication technologies to organize and execute healthcare

Skills:

- Can use digital skills and available ICT applications to support the professional and personalized communication
- Can adequately use ICT tools and e-health such as remote care
- Can handle and use electronic nurse and multidisciplinary patient records (EHR)
- Can find information on the internet and in professional nursing databases (national and international) fast and competent
- Can use social media and eHealth programs

Attitude:

- Uses the potential of ICT in an integer and professional manner

- Shows an open attitude towards ICT innovations in healthcare [19].

Every university of applied science in the Netherlands will have to use the BN2020 curriculum guidelines to create their curriculum; and all nursing graduates after 2020 should have the knowledge, skills and attitude as described. It is up to the universities as to how they make sure their students reach these competencies at school and/or during their internship.

4. The Future 2017-...

In the years to come, the University of Applied Sciences of Inholland will start with the “Inholland Health and Technology Centre” (IHTC), a collaboration between the domain of the education for Technology, Design and Informatics and the domain of the education for Health, Sports and Welfare. The IHTC creates synergy in the triangle of education between the Education – Research – Professional fields, due to its central position. There is much to learn and research in the field of eHealth. Most knowledge still has to be placed in education. In the field there are many questions on acceptance, implementation and ethics. The IHTC want to link the field of healthcare and technology to the education of healthcare and technology and provide expertise to enhance a crossover of health and technology both in education and field. They will intermediate between field and students to execute projects from which will produce knowledge from which all involved will benefit. In this collaboration a minor eHealth will be developed, it will start out as an eHealth minor for the informatics students but the other educational directions will start to participate later on [20]. The IHTC will cooperate with the Vrije Universiteit Amsterdam (University of Amsterdam) and the technology centre of Hogeschool Zuyd to ensure progress in technology based healthcare. More cooperation and collaboration with other organizations are expected.

Another development at Inholland is that the MAHIP course has attracted attention from professionals who work in the ICT business with a focus on healthcare. Therefore a special pre master’s program is being developed to familiarize the ICT-trained professionals with the ins and outs of healthcare so that they are able to follow the same programme as the students who already work in the health or welfare sector. This will further integrate the knowledge of both healthcare and ICT professionals.

A thesis for the MAHIP research will be conducted to explore the expectations of the home care organization concerning eHealth competencies of graduate nursing students. With this information and an analysis of the current curriculum an advisory will be given to the education of nurses of the Hogeschool Inholland. Also, based on the advisory, an innovation project will be started to implement an eHealth application in the curriculum that will help students obtain these competencies.

In 2017 the University of Applied Science Hogeschool Zuyd will set up an app café at their “Technology in Healthcare” day. There will be a challenge for the students to find the best app for a special target audience. Clarification of the criteria of quality will play an important role in this process.

To give nursing the possibility to practice real life scenarios, the University of Applied Science of Utrecht started a collaboration with Verklizan, a European company offering telecare/telehealth services. Together they started with the creation of a simulated alarm and monitoring center and simulated home environment. In these settings several scenarios can be trained and healthcare technology can be tested and

experienced by the students (e.g. Google Glass, devices for self-measurement, videoconferencing, and personal alarming). The benefits for the company are publication and testing of their technology. The University benefits from this collaboration because the company supplies their newest technology for both settings and will replace this technology when new systems are available. Collaborations like these can make it possible for Universities to have up to date technology without having to purchase new equipment regularly.

5. Conclusion

Due to Bachelor Nursing 2020, the new Dutch nursing standard, all nursing Universities of Applied Science will have education on technology based healthcare in their curriculum beginning in the fall of 2016. Some universities will start with the first year students and evolve the curriculum for senior students during that year; others will start with a completely changed curriculum. This means that technology based healthcare will be part of every nursing school providing bachelor's degree education. In the cooperation of knowledge centers, lectureships, healthcare practices and technology companies, technology-based healthcare will play an even bigger role in nursing education in the future.

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