Tampere University of Applied Sciences

DigiCare Model

– Digitalized Healthcare and Coaching of Patients in an Asian Context

A guide for teachers and students

Editors
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Katariina Kunnas
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Educating Students for Digitalized Health Care and Coaching of their Patients – DigiCare, Erasmus+ CBHE project

June 2023

Tampere University of Applied Sciences

Co-funded by the Erasmus+ Programme of the European Union

Tampere 2023

Layout
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Cover image
Adobe Stock

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Forewords

Dr. Le Quang Toan

The focus of healthcare is shifting from a mere reaction to diseases to disease prevention and health promotion. DigiCare resources help healthcare service providers and customers address the daily challenges related to symptom control and minimizing complications for patients with chronic diseases. Additionally, the increasing prevalence of mobile phones and other digital devices, even in rural areas, in Asia further facilitates advancements in healthcare.

Understanding the comprehensive development and description of the DigiCare Model in nursing will be particularly useful for students, educators, nurses, and healthcare service providers to embrace the integration of medical technology into the nursing profession. In this model, patients with chronic diseases are the ultimate target for student and nurse training or support, enabling them to improve their health knowledge, quality of life, and alleviate the burden of symptoms and complications.

> **Mobile phones and other digital devices, even in rural areas, in Asia further facilitates advancements in healthcare.**

To comprehend the role and effective application of the DigiCare model in various clinical contexts, the training program section outlines a holistic picture of educating healthcare service providers in digital health care and patient training. Various teaching materials are employed and divided into 5 cycles, involving both educators and students in utilizing digital tools. Different active learning methods have been experimented with during the pilot implementation of the DigiCare model in training healthcare experts in the Asian context. A notable feature of this book is the frequently asked questions and guidelines provided to effectively implement the book.

Overall, this book is a significant contribution to nursing scientific literature. The authors provide depth to our understanding of DigiCare and lay the groundwork for further nursing development in this field. Nursing students at all educational levels, practicing nurses, and ultimately, the beneficiaries of this book, the patients, will greatly benefit from it. It is time to carefully consider the global importance of DigiCare, and this impressive book offers just that. I am delighted to see the publication of a highly practical book that stimulates clinical thinking for future nurses.

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LỜI MỞ ĐẦU

TS. BS. Lê Quang Toàn

Trọng tâm của ngành chăm sóc sức khỏe đang chuyển từ phản ứng đơn thuần với bệnh tật sang ngăn ngừa bệnh tật và tăng cường sức khỏe. Các tài nguyên Digicare giúp các nhà cung cấp dịch vụ chăm sóc sức khỏe và khách hàng giải quyết những thách thức mà ngành chăm sóc sức khỏe phải đối mặt hàng ngày liên quan đến việc kiểm soát triệu chứng và giảm thiểu biến chứng cho người bệnh mạn tính. Đồng thời, nhu cầu về một cách tiếp cận linh hoạt và hiệu quả hơn đối với chi phí trong việc cung cấp dịch vụ chăm sóc sức khỏe cho các cộng đồng chịu thiệt thòi.

Cái nhìn toàn diện về quá trình phát triển và mô tả mô hình Digicare trong điều dưỡng sẽ đặc biệt hữu ích cho các sinh viên, giảng viên, các điều dưỡng và nhà cung cấp dịch vụ chăm sóc sức khỏe tư duy để giải quyết những thách thức trong việc áp dụng công nghệ y tế vào quan điểm ngành điều dưỡng. Trong mô hình này, người bệnh mạn tính là đích cuối cùng để sinh viên và điều dưỡng huấn luyện hoặc hỗ trợ để giúp họ cải thiện hiểu biết về sức khỏe, chất lượng cuộc sống, giảm gánh nặng triệu chứng và biến chứng.

Để hiểu được vai trò và ứng dụng hiệu quả mô hình Digicare trong các bối cảnh lâm sàng khác nhau, trong phần phát triển chương trình đào tạo đã phác thảo một bức tranh toàn cảnh về việc thực hiện giáo dục các nhà cung cấp dịch vụ chăm sóc sức khỏe về chăm sóc sức khỏe số hóa và huấn luyện người bệnh. Các tài liệu giảng dạy khác nhau được sử dụng và chia thành 5 chu kỳ, trong đó liên quan đến cả giảng viên và sinh viên trong việc áp dụng các công cụ kỹ thuật số. Nhiều phương pháp học tập tích cực khác nhau được thử nghiệm trong quá trình thí điểm ứng dụng mô hình DigiCare trong đào tạo các chuyên gia chăm sóc sức khỏe trong bối cảnh Châu Á. Một điểm nổi bật của cuốn sách này là các câu hỏi thường gặp và hướng dẫn để thực hiện cuốn sách một cách hiệu quả.

Nhìn chung, cuốn sách này là một đóng góp quan trọng cho tài liệu khoa học điều dưỡng. Các tác giả đã cung cấp chiều sâu cho những hiểu biết của chúng ta về Digicare và tạo tiền đề cho sự phát triển xa hơn của điều dưỡng trong lĩnh vực này. Các sinh viên điều dưỡng ở mọi trình độ học vấn, các điều dưỡng đang hành nghề và người hưởng lợi quan trọng cuối cùng thông qua cuốn sách này là người bệnh. Đã đến lúc xem xét kỹ lưỡng tầm quan trọng của Digicare trên toàn cầu và đây chính là điều mà cuốn sách ấn tượng này cung cấp. Tôi rất vui vì một cuốn sách có tính thực tiễn cao cùng khả năng kích thích tư duy lâm sàng cho các điều dưỡng tương lai đã được xuất bản.

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Forewords

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Over the years, the understanding of chronic disease management has evolved beyond mere medical treatments and interventions. In today's healthcare landscape, the prevalence and impact of chronic diseases have reached alarming levels, posing substantial challenges to healthcare providers, patients, and policymakers worldwide. I deeply appreciate and acknowledge the significance and expanding role of coaching and digital services in the effective management of chronic diseases. This topic holds immense relevance for healthcare providers, patients, and policymakers, given the substantial burden chronic diseases impose on the global healthcare landscape.

Chronic diseases, including heart disease, diabetes, and certain types of cancer, are enduring conditions that necessitate ongoing management and intervention. In this regard, coaching assumes a pivotal role in supporting patients with chronic illnesses. By empowering patients with the requisite knowledge and skills to take charge of their own health, coaches can contribute to reducing the severity of symptoms, enhancing their quality of life, and preventing complications.

Coaches, often comprising healthcare professionals or trained specialists such as doctors and nurses, provide personalized assistance to patients. They aid patients in comprehending their condition, adhering to treatment plans, and implementing lifestyle modifications. Serving as facilitators, mentors, and motivators, coaches possess the potential to make a profound difference in patient outcomes.

Digital services possess the capability to revolutionize the delivery of coaching for chronic disease management. Telemedicine, mobile health applications, remote monitoring systems, and AI-powered platforms offer personalized, convenient, and cost-effective healthcare services that can be availed by patients from the comfort of their own homes. Digital coaching facilitates real-time feedback, fosters seamless communication between patients and healthcare providers, and nurtures a sense of community among individuals facing similar health challenges.

> **Digital services possess the capability to revolutionize the delivery of coaching for chronic disease management.**

Nevertheless, to fully harness the advantages of digital coaching, it is imperative to address potential obstacles such as digital literacy, access to technology, and concerns pertaining to data privacy and security. Moreover, it is crucial to view digital services as a complementary component rather than a substitute for traditional face-to-face interactions between patients and healthcare providers.

As we move forward, the integration of coaching and digital services into chronic disease management necessitates meticulous planning, evidence-based strategies, and collaborative efforts among all stakeholders. The overarching objective is to establish a patient-centered, sustainable, and resilient healthcare system that effectively caters to the complex needs of chronic disease patients in Bangladesh.

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Md. Nahid Uz Zaman

বছরের পর বছর ধরে, দীর্ঘস্থায়ী রোগ ব্যবস্থাপনার বোঝা পড়া নিছক চিকিৎসা এবং হস্তক্ষেপের বাইরেও বিকশিত হয়েছে। আজকের স্বাস্থ্যসেবা ল্যান্ডস্কেপে, দীর্ঘস্থায়ী রোগের প্রকোপ এবং প্রভাব উদ্বেগজনক পর্যায়ে পৌঁছেছে, যা বিশ্বব্যাপী স্বাস্থ্যসেবা প্রদানকারী, রোগী এবং নীতি-নির্ধারকদের জন্য যথেষ্ট চ্যালেঞ্জ তৈরি করেছে। দীর্ঘস্থায়ী রোগের কার্যকর ব্যবস্থাপনায় কোচিং এবং ডিজিটাল পরিষেবাগুলির তাৎপর্য এবং প্রসারিত ভূমিকার আমি গভীরভাবে প্রশংসা করি এবং স্বীকার করি। এই বিষয়টি স্বাস্থ্যসেবা প্রদানকারী, রোগী এবং নীতি-নির্ধারকদের জন্য অত্যন্ত প্রাসঙ্গিকতা রাখে, বিশ্বব্যাপী স্বাস্থ্যসেবা ল্যান্ডস্কেপে দীর্ঘস্থায়ী রোগের যথেষ্ট বোঝা চাপিয়ে দেওয়া হয়।

হৃদরোগ, ডায়াবেটিস, এবং নির্দিষ্ট ধরণের ক্যান্সার সহ দীর্ঘস্থায়ী রোগগুলি এমন স্থায়ী অবস্থা যা চলমান ব্যবস্থাপনা এবং হস্তক্ষেপের প্রয়োজন। এই বিষয়ে, কোচিং দীর্ঘস্থায়ী অসুস্থ রোগীদের সহযোগিতা করার জন্য একটি গুরুত্বপূর্ণ ভূমিকা রাখতে পারে। রোগীদের তাদের নিজস্ব স্বাস্থ্যের দায়িত্ব নেওয়ার জন্য প্রয়োজনীয় জ্ঞান এবং দক্ষতার সাথে ক্ষমতায়নের মাধ্যমে, প্রশিক্ষকরা লক্ষণগুলির তীব্রতা হ্রাস করতে, তাদের জীবনযাত্রার মান উন্নত করতে এবং জটিলতা প্রতিরোধে অবদান রাখতে পারেন।

প্রশিক্ষক, প্রায়শই স্বাস্থ্যসেবা পেশাদার বা প্রশিক্ষিত বিশেষজ্ঞ যেমন ডাক্তার এবং নার্সদের সমন্বয়ে, রোগীদের ব্যক্তিগত সহায়তা প্রদান করে। তারা রোগীদের তাদের অবস্থা বুঝতে, চিকিৎসার পরিকল্পনা মেনে চলা এবং জীবনযাত্রার পরিবর্তনগুলি বাস্তবায়নে সহায়তা করে। সহায়তাকারী, পরামর্শদাতা এবং অনুপ্রেরণাকারী হিসাবে কাজ করা, প্রশিক্ষকদের রোগীর ফলাফলে গভীর পার্থক্য করার সম্ভাবনা রয়েছে।

ডজিটিাল পরষিবোগুলি দীর্ঘস্থায়ী রোগ ব্যবস্থাপনার জন্য প্রশক্ষিণ প্রদানে বপ্লিব ঘটানোর ক্ষমতা রাখে। টলেমিডেসিনি, মোবাইল হলেথ অ্যাপ্লকিশেন, রমিোট মনটিরিং সস্টিমে এবং এআই-চালতি প্ল্যাটফর্মগুলি ব্যক্তগিত, সুবধিাজনক এবং সাশ্রয়ী স্বাস্থ্যসবো প্রদান করে যা রোগীরা তাদরে নজিরে ঘরে বসে থকেে নতিে পারনে। ডজিটিাল কোচংি রয়িলে-টাইম ফডিব্যাক সহজতর কর,ে রোগী এবং স্বাস্থ্যসবো প্রদানকারীদরে মধ্যে নরিবচ্ছনি্ন যোগাযোগকে উৎসাহতি করে এবং একই ধরনরে স্বাস্থ্য চ্যালঞ্জেরে সম্মুখীন ব্যক্তদিরে মধ্যে সম্প্রদায়রে অনুভূতি লালন কর।ে

তবুও, ডজিটিাল কোচংি এর সুবধিাগুলকিে সম্পূর্ণরূপে কাজে লাগানোর জন্য, ডজিটিাল সাক্ষরতা, প্রযুক্ততিে অ্যাক্সসে এবং তথ্য গোপনীয়তা এবং সুরক্ষা সম্পর্কতি উদ্বগেরে মতো সম্ভাব্য বাধাগুলকিে মোকাবলো করা অপরহিার্য। অধকিন্তু, ডজিটিাল পরষিবোগুলকিে রোগী এবং স্বাস্থ্যসবো প্রদানকারীদরে মধ্যে প্রচলতি মুখোমুখি মথিস্ক্রয়িাগুলরি বকিল্পরে পরবির্তে একটি পরপিূরক উপাদান হসিাবে দখো অত্যন্ত গুরুত্বপূর্ণ।

আমরা এগয়িে যাওয়ার সাথে সাথ,ে দীর্ঘস্থায়ী রোগ ব্যবস্থাপনায় কোচংি এবং ডজিটিাল পরষিবোগুলরি একীকরণরে জন্য সমস্ত স্টকেহোল্ডারদরে মধ্যে সূক্ষ্ম পরকিল্পনা, প্রমাণ-ভত্তিকি কৌশল এবং সহযোগতিামূলক প্রচষ্টো প্রয়োজন। ব্যাপক উদ্দশ্যে হল একটি রোগী-কন্দ্রেকি, টকেসই এবং স্থতিস্থিাপক স্বাস্থ্যসবো ব্যবস্থা প্রতষ্ঠিা করা যা কার্যকরভাবে বাংলাদশেে দীর্ঘস্থায়ী রোগরে রোগীদরে জটলি চাহদিা পূরণ কর।ে

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1. Introduction

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The rising prevalence of chronic diseases worldwide poses significant challenges for healthcare systems. The DigiCare project, funded by the Erasmus+ program, addresses these challenges by developing a context-specific model for healthcare education. Partnering with universities in Bangladesh and Vietnam, the project integrates digitalization and coaching into the curriculum to enhance self-management support for chronic diseases. This e-book provides a comprehensive account of the project, aiming to inspire positive changes in healthcare practices and services. Through international cooperation, the DigiCare project facilitates knowledge exchange and skill development, contributing to transformative advancements in healthcare education and practice. In this chapter we introduce the DigiCare project and the outlines of the e-book.

The global rise in chronic diseases is a cause for alarm (WHO, 2014), as these conditions, such as diabetes and cardiovascular diseases, contribute significantly to the overall disease burden and premature mortality worldwide (Roser et al., 2021). Developed countries have long grappled with this issue (WHO, 2023), but low- and middle-income countries now face a disproportionate impact (Mustafa Zaman et al., 2020; WHO, 2016), leading to health disparities within these populations (UNICEF, n.d.). Factors like globalization, rapid urbanization, an ageing population, and unhealthy lifestyle choices contribute to the increasing prevalence of chronic conditions (WHO, 2014). Beyond the detrimental effects on individuals' quality of life, the diagnostics and treatment of chronic diseases pose substantial economic challenges for societies (Berkman et al., 2011). Additionally, limited healthcare infrastructure and a shortage of trained healthcare professionals compound the difficulties faced by individuals living with chronic diseases (Mustafa Zaman et al., 2020; WHO, 2016).

The escalating demand for global health resources has underscored the urgent need for viable solutions. This need has been acknowledged and emphasized in the United Nations' 17 sustainable development goals (SDGs). Within the SDG action areas for Good Health and Well-being, key objectives include enhancing access to essential healthcare services, significantly increasing the training of healthcare professionals, and reducing premature mortality rates through the implementation of improved prevention and treatment measures for chronic diseases. These goals reflect the recognition of the critical importance of addressing the challenges posed by chronic diseases and the commitment to creating a healthier and more sustainable future for all. (UN, n.d.)

Self-management support plays a crucial role in the management of chronic diseases, promoting active participation and responsibility in health-related decision-making, behaviour, and well-being. The term "self-management" encompasses the skills needed to effectively manage one's own health. Research has extensively documented the benefits of self-management in influencing disease progression. (Coulter & Collins, 2011.) However, many individuals, particularly in low- and middle-income countries, face challenges due to low health literacy, relying heavily on healthcare providers for guidance and disease management. This reliance increases the burden on healthcare systems. (Berkman et al., 2011.) Empowering individuals through self-management interventions not only improves their well-being but also reduces the strain on healthcare services (Nguyen et al., 2019; Seston et al., 2020). By equipping patients with the necessary skills and knowledge, self-management support enables them to take a more active role in their healthcare, leading to better health outcomes and improved overall quality of life.

Education plays a pivotal role in empowering healthcare professionals to support patients in self-management of chronic diseases. A high-quality healthcare education should produce competent and future-oriented professionals capable of addressing the evolving challenges in health-care delivery. These professionals need to possess the skills to empower patients, assess their self-care needs, provide guidance and support, and act as coaches. Emphasis should be placed on preventive measures and support groups. Effective communication skills are essential for healthcare professionals to provide clear and understandable information about chronic conditions, treatment options, and self-management strategies. By understanding their ability to influence their own well-being, patients can make informed choices and actively participate in their care. Individualized care plans, developed collaboratively with patients, consider their specific needs, preferences, and capabilities. Setting realistic and achievable goals helps patients comprehend how to manage their condition and improve overall well-being. (Nevelsteen & Vandenhoudt, 2021.) Additionally, as our world becomes increasingly digitalized, healthcare professionals must be educated on the role of technology and digital devices in healthcare delivery. Targeted education is essential to equip professionals with the necessary skills to meet future healthcare needs effectively.

The DigiCare Project

The Erasmus+ Capacity Building in Higher Education (CBHE) project, DigiCare: Educating Students for Digitalized Health Care and Coaching of their Patients, addressed current and future challenges in chronic disease self-management by developing a contextualized model to improve the competence of healthcare students in digital coaching. The DigiCare project was an international CBHE project aiming to embed digitalization and coaching in the healthcare curriculum in Asia, specifically in our partner countries Bangladesh and Vietnam. The three-year (extended by a year due to COVID-19 pandemic) project of seven Higher

Education Institution (HEI) partners started in June 2019 and was a continuum of the DigiNurse project (Strategic Partnership) and antecedent to SmartNurse project (CBHE).

The DigiCare project was coordinated by Tampere University of Applied Sciences (TAMK), Finland, and carried out in partnership with the Nursing School of Coimbra (ESEnfC) from Portugal, Hanoi Medical University (HMU) and Nam Dinh University of Nursing (NDUN) from Vietnam, Khulna City Medical College (KCMCH), City Medical College & Hospital (CiMCH) and Universal Medical College & Hospital Ltd (UMCH) from Bangladesh. The project was funded by Erasmus+ Capacity Building in Higher Education Programme.

The DigiCare project was carried out in the realm of healthcare student education, encompassing nursing and medical students in Asian partner universities. Our project's primary objective was to enhance the curricula of these universities through various initiatives. This included the development of the DigiCare Model, the creation of teaching materials for healthcare education, and the acquisition of expertise in utilizing effective teaching and research methods.

The DigiCare Model serves as a foundational framework for curriculum development, focusing on integrating digital healthcare practices into the educational programs. It aimed to equip healthcare students with the necessary knowledge and skills to navigate the digital landscape of healthcare effectively. The intention of the model is to help healthcare students learn how to offer support and empower patients to develop self-management skills using coaching models and digital devices. The DigiCare Model serves as a versatile framework that can be adapted and integrated into various local and regional healthcare teaching and working cultures. It encompasses specific learning objectives for digital healthcare in self-management, the necessary skills and knowledge in digital nursing and coaching, and best practices for teaching and training in digital tools and methods related to nursing and self-management coaching. In addition, as emphasized by experts from partner institutions, the model also underscores the significance of professional communication between health professionals and patients. This communication enables patients to improve their self-management skills and actively involve their significant others in their care.

> **The intention of the model is to help healthcare students learn how to offer support and empower patients to develop self-management skills using coaching models and digital devices.**

Healthcare curricula in European countries frequently include elements of health promotion and disease prevention in digital environments, and utilizing digital devices is care delivery (Mann et al., 2015; Mather & Cummings, 2019), but in Bangladesh and Vietnam, the concept of coaching barely exists in the healthcare context, and the role of digital tools in healthcare delivery is in its early stages. Moreover, the idea of considering patients as experts in their chronic disease is a foreign perspective in these countries. Based on insights shared by our project partners from these countries, delivering information about a patient's chronic disease or educating patients is conducted mainly, if at all, by medical professionals. Therefore, changing the healthcare education paradigm from healthcare professional -led care to patient- and family-centred care, and introducing health and wellness technologies as care delivery options, are important steps in developing and improving healthcare education and the healthcare service environment in Bangladesh and Vietnam.

The Content and Structure of the DigiCare e-Book

This e-book presents the phases of the project process, the project results, and the open-access materials. The content and structure aim to reflect the workflow of the project and the continuity of the development process. The chapters follow a consistent pattern: a short ingress describing the topic of the chapter, an introduction, content, recommendations for further reading and a list of references. The annexes to the e-book include summaries of literature reviews carried out by project partners and an example of the learning material produced as part of the project.

The e-book begins with forewords that introduce the theme of the publication from Bangladeshi and Vietnamese perspectives, respecting the visions, needs, and expertise of our Asian partners in the thematic areas of the project. The Bangladeshi perspective is written by the Honourable Md. Nahid Uz Zaman, and the Vietnamese perspective is produced by the Honourable Dr. Le Quang Toan.

Chapter 2 describes the starting point for the project, the project work process (2.1), and the different stages of the development process of the main project deliverable, the DigiCare Model (2.2). The project process is presented in a comprehensive format in Figure 1, which also integrates the elements of project facilitation. Chapter 2 similarly introduces the process involved in reviewing the evidence -basis underpinning the development of the DigiCare Model and the phases involved in conducting the literature reviews. The literature review summaries produced by our Bangladeshi and Vietnamese partners are presented in Annexes 1-6 of this publication.

The focus of chapter 3 is on the DigiCare Model. The chapter introduces the illustration of the model, which consists of four distinct, yet interrelated layers. The content of the model is based on the results of our literature reviews, empirical insights to current needs in education and training by experts from partner universities, and feedback from our project pilots. Through the ongoing process of online and in-person workshops, consortium members identified the main concepts to be included in the DigiCare Model. The consortium also gave careful consideration to the shape of the Model. A spinning top -like shape was chosen because it suits the Asian context and forms a dynamic, easily understandable model for healthcare teachers and students to use. The spinning top consists of four layers: 1. Person, 2. Family, 3. Community, and 4. Society. The key concepts associated with each layer are discussed in sub-chapters 3.2-3.5.

Chapter 4 focuses on the DigiCare Model -based educational program. Sub-chapter 4.1 describes the structure and content of the educational program which was developed and piloted during the project. It presents an example of implementing the program and provides information about the learning packages produced by the project (DigiCare Learning Packages 1-10). The DigiCare Learning Packages are openly accessible (The DigiCare Learning Packages are openly accessible in the SlideShare and the links to the learning packages can be found in the Appendix 7.). Furthermore, an example of the educational material can be found in Appendix 7. Sub-chapter 4.2 presents the teaching methods used in our pilots. These include Flipped Learning (4.2.1), Interactive Lecturing (4.2.2), Low-Fidelity Simulation (4.2.3), World Cafe (4.2.3), Learning Diaries (4.2.5.) and Peer-Reviewing (4.2.6). A concise description of these methods and rationale for their use along with suggestions for additional reading are included.

Chapter 5 presents the evaluation tools used to evaluate the programs that were implemented in partner universities in Bangladesh and Vietnam during the project. The chapter encompasses various evaluation instruments, including the Self-Efficacy and Performance in Self-management Support (SEPSS) scale (5.2) and the Technology Acceptance Model (TAM) scale (5.3 and 5.4), which were implemented by our Bangladeshi and Vietnamese partner universities. Furthermore, the chapter delves into the evaluation of the effectiveness of the Digi-

Care educational intervention on clinical coaching skills in Vietnam and Bangladesh (5.5). It examines the impact and outcomes of the program on enhancing participants' coaching abilities. Additionally, the chapter presents the feedback form utilized to gather participant feedback and experiences following the project pilots, aimed at refining the DigiCare Model. It offers insights into the participants' perspectives and allows for improvements based on their valuable input. An analysis of the feedback results is also provided within this section (5.6).

The e-book ends with chapter 6, a discussion, which reflects on the achievements of the DigiCare project, the success of its outputs, and the different stages of the project journey. The chapter also includes honest observations on some of the challenges of coming together from different cultures and contexts to work on a common project.

The content of the e-book represents the collective efforts of all partner higher education institutions and the goals we have accomplished.

This e-book is the outcome of four years of international cooperation among the DigiCare consortium. The content of the e-book represents the collective efforts of all partner higher education institutions and the goals we have accomplished. The editorial team has carefully modified and edited the content of the chapters to ensure completeness, coherence, and clarity. As a result of our multifaceted teamwork, this publication is now openly available to all healthcare teachers and students. We sincerely hope that it will contribute to curriculum development and facilitate the necessary changes in future healthcare practices and services.

The collaboration and networking among two European universities (TAMK and ESEnfC), three Bangladeshi universities (UMCH, KCMCH, CiMCH), and two Vietnamese universities (HMU, NDUN) have generated a wealth of knowledge, skills, understanding, and experience in project work. It has also fostered friendships and, most importantly, instilled a profound appreciation for the significance of international collaboration as a valuable resource for the advancement of future education.

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2. The DigiCare Project – Designing an Educational Model

In Bangladesh and Vietnam, there is a need for education in digitalization for coaching patients in self-management , given the prevalence of chronic diseases and aging populations. By integrating digitalization into healthcare education, both countries can enhance patient care, effectively manage chronic diseases, and improve access to care in remote areas. The DigiCare project contributes to the priority of contextualizing digitalization in the healthcare curriculum, thereby fostering improved education and practices in healthcare.

This chapter offers a concise overview of the DigiCare project. It provides insights into the background, objectives, and main goals of the project. Additionally, it outlines the project's work process and focuses on the design process of the DigiCare Model.

2.1 The DigiCare Project Process

Nina Smolander

The DigiCare project is in line with the goals of the Erasmus+ program to modernize curricula and develop innovative courses in the field of healthcare. It belongs to the category of methodologies and pedagogical approaches that utilize ICT-based practices. The project aims to enhance healthcare education in Asian partner institutions, focusing on self-management for individuals with chronic diseases and integrating digitalization into healthcare education. This chapter provides an overview of the DigiCare project (2019-2023) and its key processes. It includes the initial phase of idea generation, consortium building, and project scope definition. The chapter highlights the activities conducted throughout the project, which contributed to the expected results and impacts. Additionally, informative figures are included to enhance comprehension and provide a comprehensive overview of the project's actions.

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The Erasmus+ Capacity Building in Higher Education (CBHE) project, DigiCare: Educating Students for Digitalized Health Care and Coaching of their Patients project aligns with the Erasmus+ program's goal of modernizing curricula and developing innovative courses, particularly in the subject area of "Health." It falls under the category of "Methodologies and pedagogical approaches" that utilize ICT-based practices. (Erasmus+, n.d.) The DigiCare project, was launched to address the needs of our Asian partners in improving healthcare education, with a specific focus on self-management for individuals with chronic diseases and integrating digitalization into healthcare education and care delivery. In addition, the DigiCare project is a collaborative effort with the European DigiNurse project under the Erasmus+ Strategic Partnership, as well as the SmartNurse project under the Erasmus+ Capacity Building in Higher Education (CBHE) program. This highlights the significance of cooperation at both the EU and global levels and emphasizes the impact of knowledge exchange.

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The needs among Asian partner countries have emerged due to a substantial rise in chronic diseases, such as diabetes (WHO, 2023), in Bangladesh (Mostafa Zaman et al., 2020; WHO, 2014) and Vietnam (WHO, 2016). This increase has strained healthcare capacity and resulted in prolonged hospital stays (Roser et al., 2021). Additionally, the challenges of accessing healthcare services in rural areas (Sultana et al., 2019; Tran et al., 2016), the lack of digital skills for self-management in healthcare curricula (Nguyen et al., 2022), the necessity to transform healthcare education towards patient-centered care (Dang et al., 2021), and the utilization of active pedagogical methods (Ha & Nuntaboot, 2020) have further emphasized the need for addressing these issues (Read more in Chapter 1).

The DigiCare project aims, objectives and goals

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The DigiCare project aimed to address the above challenges by focusing on educating healthcare students and teachers in digitalized healthcare practices and providing coaching to patients with chronic diseases. By providing healthcare professionals with the requisite skills and knowledge, the project aimed to empower individuals with chronic diseases to effectively self-manage their conditions and alleviate the burden on healthcare systems. The project recognized the importance of adapting healthcare education to the digital era and leveraging technological advancements to improve patient care.

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The main objective of the DigiCare project was to enhance the digital and coaching skills of healthcare professionals and thereby provide quality care to patients in Asian partner countries. The project aimed to equip healthcare students with better abilities to meet patients' needs, both currently and in the future as digitalization advances in Bangladesh and Vietnam.

The specific goals of the project were to improve healthcare education programs by incorporating digital tools and practices as well as coaching education into healthcare curricula. Additionally, the project aimed to improve patient satisfaction by employing assistive digital tools for their cares. Asian universities were guided by the context specific DigiCare Model, which was collaboratively designed, developed, and piloted throughout the project. Additionally, the DigiCare Model encompasses pedagogical, technical, and sustainability guidelines that facilitate the integration of digitalization into the healthcare curriculum. It enables the acquisition of skills in utilizing digital devices and communication technologies to enhance patient care and promote patients' self-management competence through coaching.

Another parallel objective of the project was to expand the DigiNurse community, fostering knowledge exchange among healthcare and education professionals and ensuring the continued collaboration and sustainability of the initiative even after the project's completion and the conclusion of EU funding. The community was established by partners of the European DigiNurse project and welcomes all other educational experts interested in joining.

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Launching of the DigiCare project

The DigiCare project emerged as a result of successful brainstorming sessions that were facilitated through previous collaborations involving Bangladesh, Finland, Portugal, and Vietnam. These fruitful collaborations paved the way for the formation of a core team consisting of Tampere University of Applied Sciences (TAMK), Nursing School of Coimbra (ESEnfC), Hanoi Medical University (HMU), and City Medical College & Hospital (CiMC). To ensure an effective consortium that is both efficient and locally relevant, the remaining partners were selected based on their previous collaborations with the local partners.

However, the initiation of the DigiCare project faced some delays due to changes within the consortium. Nevertheless, the project officially commenced in June 2019. The modified consortium held its first transnational meeting in October 2019 in Hanoi, where project objectives were discussed, and work processes were initiated. The consortium's activities were guided by the project plan, which outlined the objectives, actions, activities, and key milestones (Figure 1).

The consortium's work was organized around regular transnational meetings, aiming to foster an active and innovative approach. These meetings were supplemented by monthly online consortium meetings, which were documented and recorded from the project's inception. However, the year 2020 brought unforeseen challenges in the form of the global COVID-19 pandemic, significantly impacting the DigiCare project for two years. All project activities had to be shifted to remote online work, leading to substantial hindrances and delays. Nevertheless, the project's early initiation of online work proved advantageous to some extent. Consortium members adapted to online meetings and events and acquired proficiency in online activities. They became skilled in utilizing the collaborative online platform for project work, staying updated on project activities, and collaboratively delivering project outcomes. It is important to note that some partner institutions actively participated in the project's practical work despite resource limitations caused by their pandemic work. Consequently, an extension of one year was necessary to fulfill the project's objectives.

> **The consortium's work was organized around regular transnational meetings, aiming to foster an active and innovative approach.**

To foster collaboration and avoid duplicative efforts, the DigiCare project leveraged outputs from the DigiNurse - Learning ICT Supported Nursing for Self-Management of Patients (2017-1-FI01-KA03-034761) project. This included utilizing the e-book published by the DigiNurse project and adopting their selected coaching models. DigiCare project partners joined the community established by the DigiNurse project, allowing for extended cooperation, result transfer, and exploitation between the projects.

Implementation of the DigiCare Project

The work of the DigiCare project was organized into six work packages, with five of them focusing on creating, testing, evaluating, refining, and disseminating the main project outputs. Each work package was led by one of the partner universities, with facilitation and guidance provided by the European partners. Figure 1 illustrates the project's objectives, goals, actions, facilitation, activities, key milestones and deliverables. It is worth noting that all consortium partners participated in facilitation and activity implementation based on their specific expertise and the new competence gained during the project.

The project started with a preparatory work package, consisting of three main parts: 1) The project partners adopted tools and procedures for collaboration. 2) The quality assurance plan was initiated, with plans for updating and implementing it. 3) The project's technical infrastructure for online collaboration within the consortium was established.

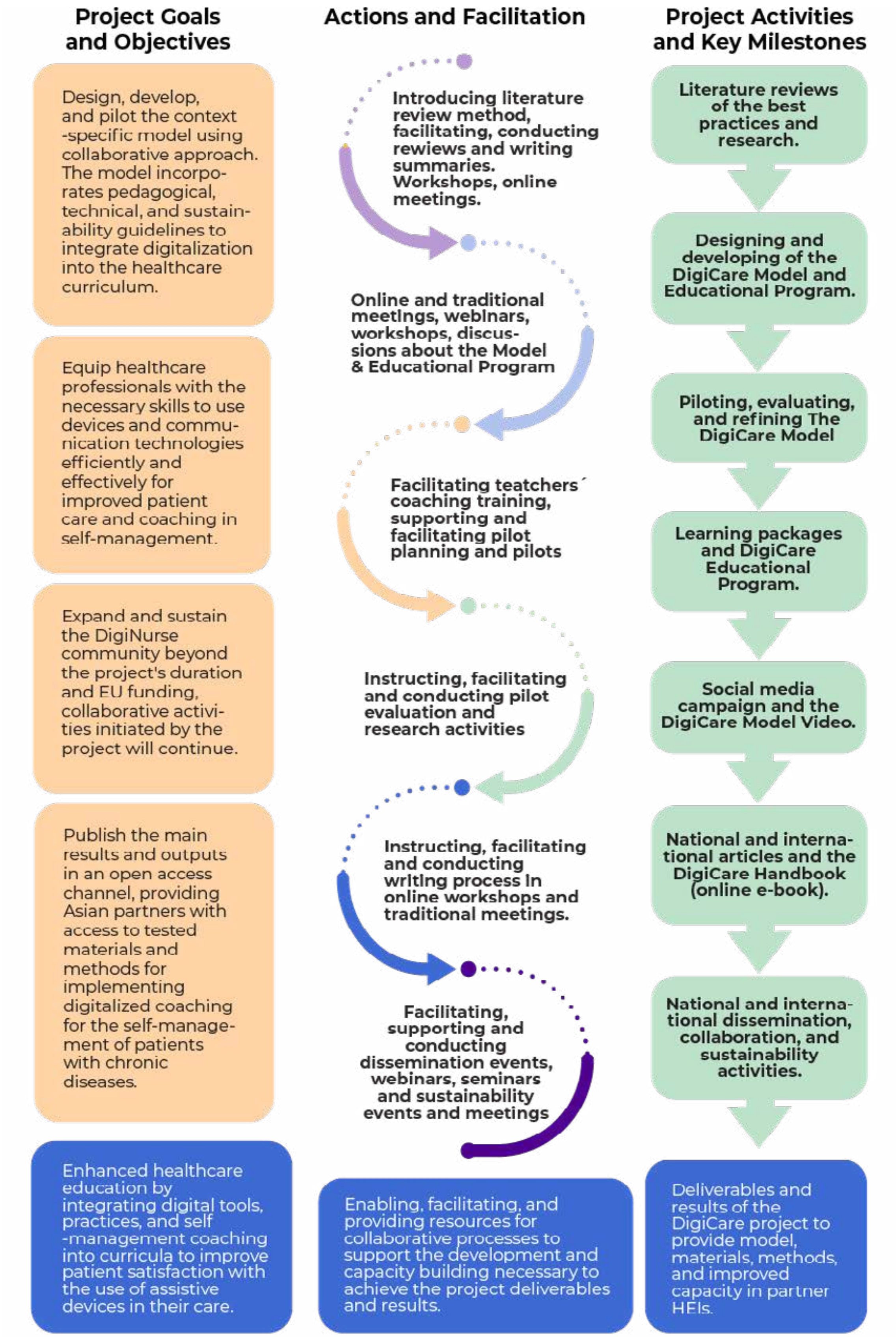

Figure 1. Goals and Objectives of the DigiCare project. Actions and Facilitation Activities provided for the Project Consortium to achieve Project Results and Key Milestones.

In the second work package, the DigiCare Model (Read more in Chapter 3) was designed to facilitate the learning of healthcare students students and educators in the use of modern digital devices and technologies for enhancing patient care and self-management coaching. The DigiCare Model focuses comprehensively on digital online support and self-management coaching for chronic diseases, aiming to empower patients and their families with more active, efficient, and diverse self-management skills. The development of the DigiCare Model relied on literature reviews, expert knowledge, and innovative collaboration among consortium members. The partners conducted literature reviews to explore best practices and research in the field, which played a significant role in shaping the main concepts of the DigiCare Model. It is important to highlight that the partner institutions dedicated extensive effort to the literature reviews, which was a relatively or entirely new research method for many of them

In the third work package, different components of the DigiCare Model were piloted in various courses at partner institutions. The piloting process was planned in collaboration with the partner institutions and began with the training of local teachers. The pilots within the DigiCare project were multi-faceted and demanding (Read more in Chapter 4.1) as the coaching of self-management using patient-centered and active methods was unfamiliar for the partners. The active teaching methods used in the pilots also challenged the teachers and students of the partner institutions since the use of active methods in teaching is relatively limited approach in partner countries (Read more in Chapter 4.2). The objective was to test the DigiCare Model and its associated Learning Packages in 18 different healthcare courses, involving a minimum of 60 teachers, 420 students, and 420 patients. The piloting process was divided into five separate pilots (Chapter 4.1, Figure 15), and each pilot included an evaluation phase where statistical and qualitative feedback was collected (Read more in Chapter 4.1 and 5.1). Based on this feedback and research results, the model was further developed. It is important to emphasize the effort made to translate (and back-translate) the evaluation tools into Bengali and Vietnamese. This was done to ensure that the tools are easily understandable by end-users and capable of accurately measuring and providing necessary and reliable feedback and research results. However, it is worth noting that the language used in the feedback form may still pose some difficulty for the responders, depending on their level of comprehension and their responses.

In the following work package, the quality of the DigiCare Model was further assessed. The entire model was piloted, and statistical and qualitative feedback was collected (Read more in Chapters 5.2-5.6). At this stage, the objective was to test the DigiCare Model and its associated Learning Packages in 12 different healthcare courses, involving a minimum of 60 teachers, 280 students, and 280 patients. The feedback and research results obtained from the piloting was used to fine-tune and finalize the DigiCare Model and Learning Packages. It is worth mentioning that specific questionnaires were utilized for assessing students' competencies and learning outcomes (Read more in Chapter 5.1). The analysis of the collected research data was a unfamiliar and challenging task for most partner institutions, necessitating substantial support and facilitation from the European institutions.

In the Dissemination and Exploitation work package, efforts were made to raise awareness of the positive impacts of implementing the DigiCare Model in healthcare education at Asian universities. Throughout the project, a range of dissemination activities were carried out (Figure 1), with a specific focus on integrating the DigiCare outputs into curricula and ensuring the sustainability of the project outcomes (Read more in Chapter 6). Scientific and national articles were written to document the project outputs and outcomes, and local events as well as online webinars were organized to engage different stakeholders. The production of this DigiCare Handbook was a significant activity and outcome of the dissemination work package. The aim is for Asian partners to continue local training by utilizing the project outputs and deliverables, thereby training more teachers and facilitators in the implementation of the DigiCare Model in their teaching practices (Read more in Chapter 3.4). Additionally, online dissemination events were held during the project to showcase the project outputs to other ongoing Erasmus+ projects.

The Expectations of the Project Outcomes and Impact

The impacts of the project, both in the short-term and long-term, are based on the evaluations of the curricula in the partner countries and the results and outcomes of the project, which aimed to address these impact areas. The review of the curricula at the participating universities revealed a lack of or minimal integration of digital skills training in healthcare courses within the context of healthcare education. Importantly, there was a notable absence of content that focused on digital support for patient self-management, as the concept of coaching patients in this aspect was unfamiliar to the partner institutions. Therefore, laying the groundwork for introducing coaching as a method to support patients with chronic diseases was a crucial starting point.

The main result was the designing of the DigiCare Model, which serves as a general model easily adjustable for the use of various institutions (Read more in Chapter 3). The DigiCare Model comprises of two expected results: 1. Literature reviews and reports (O2.1) as a foundational work for the model designing and updating the partners' knowledge of the best practices and the research (Read more in Appendices 1-6), 2. The DigiCare Model (O3.1) illustration and description of its content (Read more in Chapters 3.1-3.5). Other expected results are related to improved digital skills of healthcare students and research reports of the DigiCare Model (O4.1, O4.2). As part of the pilots, students and teachers were using digital technology while practicing coaching (Read more in Chapter 4.1), and results of their progress were collected, analyzed, and reported as evidence of the level of mastery achieved and the evaluation of the DigiCare Model (Read more in Chapters 5.2-5.6).

The final outcomes of the project can also be classified as project deliverables and outputs, providing a summary of the expected outcomes and impacts of the project (Figure 2). Within the DigiCare project, six main results were identified. The primary output was the development of the DigiCare Model, which serves as a comprehensive model adaptable for use by various institutions (Read more in Chapter 3).

The DigiCare Model encompasses two expected outputs:

1. Literature reviews and reports (O2.1) that form the foundation for designing the model and update partners' knowledge on best practices and research (Refer to Appendices 1-6 for more information).

2. The DigiCare Model (O3.1), including its illustration and description of content (Read more in Chapters 3.1-3.5).

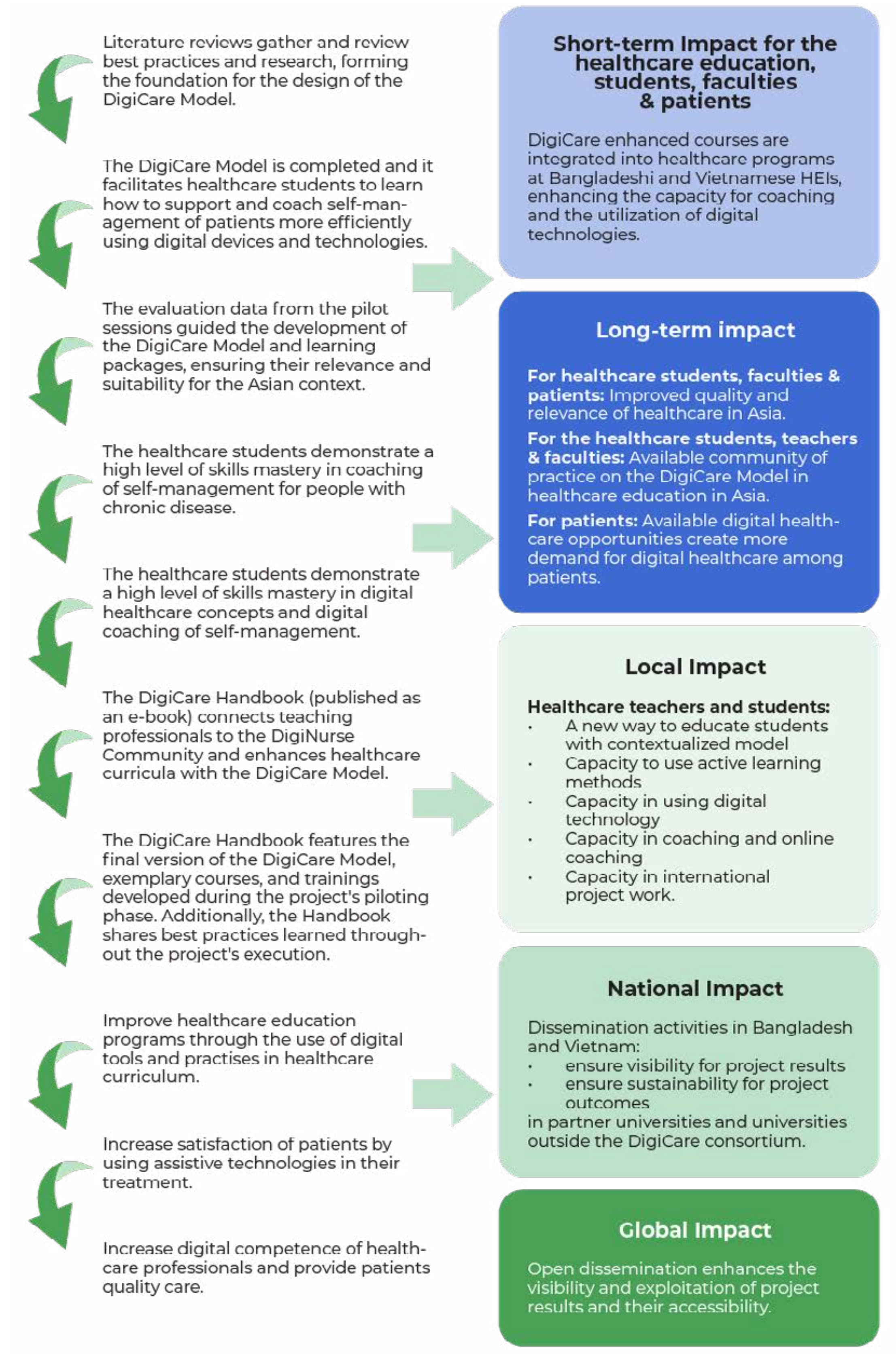

Figure 2. The expected project outcomes during and after the project implementation, short-term, long-term, local, national, and global impacts.

Other anticipated results are associated with the improvement of digital skills among healthcare students and research reports on the DigiCare Model (O4.1, O4.2). As part of the pilot phase, students and teachers utilized digital technology in their coaching practices (Read more in Chapter 4.1), and the outcomes of their progress were collected, analyzed, and reported as evidence of their achieved mastery level and evaluation of the DigiCare Model (Read more in Chapters 5.2-5.6).

Further outputs are related to dissemination and sustainability. This DigiCare Handbook (O5.1) aims to guide healthcare teaching professionals in the use of active pedagogical methods while utilizing digitalized healthcare and coaching education in their healthcare courses. In addition, expanding the DigiNurse Community (O5.2) will provide partners with access to international community and enable knowledge transfer, interoperability among healthcare and education professionals. Moreover, international collaboration among the Asian partners have been previously quite limited, and the involvement in the DigiCare project has provided a distinctive experience for many teachers and students.

In conclusion, a distinguished outcome in the Asian partner countries and impact it has generated is partners enthusiasm and competence to advocate project results and outcomes regionally and nationally through meetings, events and webinars with local and international stakeholders and local decision-makers (Read more in Chapter 6). This is a fundamental achievement for the sustainability of project results and outcomes beyond the project period.

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2.2 The Process of Designing the DigiCare Model

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Nguyen Thi Minh Chinh, Nguyen Thi Thanh Huong, Hoang Thi Minh Thai, Mai Thi Thanh Thu,
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In this chapter, we explore the captivating and exciting process of creating something innovative within a multicultural team. Our objective was to fulfil the expectations and requirements of health-care education concerning digitalized healthcare and coaching of patients, while integrating theoretical and empirical knowledge into a concise, practical, and applicable model designed specifically for the Asian context. The journey encompassed multiple stages, including workshops, extensive research, active listening, constructive discussions, brainstorming sessions, the utilization of post-it notes, online and in-person meetings and numerous cups of coffee. Within this chapter, we provide a brief overview of two preliminary versions of the model to illustrate the progression of the DigiCare Model.

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In the digital era, information technology permeates all aspects of society. Asia, in particular, has witnessed a widespread adoption of mobile phones and other digital devices, even in rural areas (Yanes, 2019). This trend has created new opportunities in the field of healthcare. In many developing countries, including Bangladesh (WHO, 2022) and Vietnam (WHO, n.d.), there are extensive healthcare service networks. However, despite these networks, disparities in access to healthcare continue to exist (Hamiduzzaman et al., 2018; Tran et al., 2016). One potential solution to reduce these disparities is through digitization. By leveraging digital technologies, individuals can enhance their ability to manage their own self-care, and outpatients can conveniently follow online recommendations provided by their healthcare providers to adopt a lifestyle that helps prevent common chronic diseases (Sultana et al., 2019; Ventura et al., 2019.)

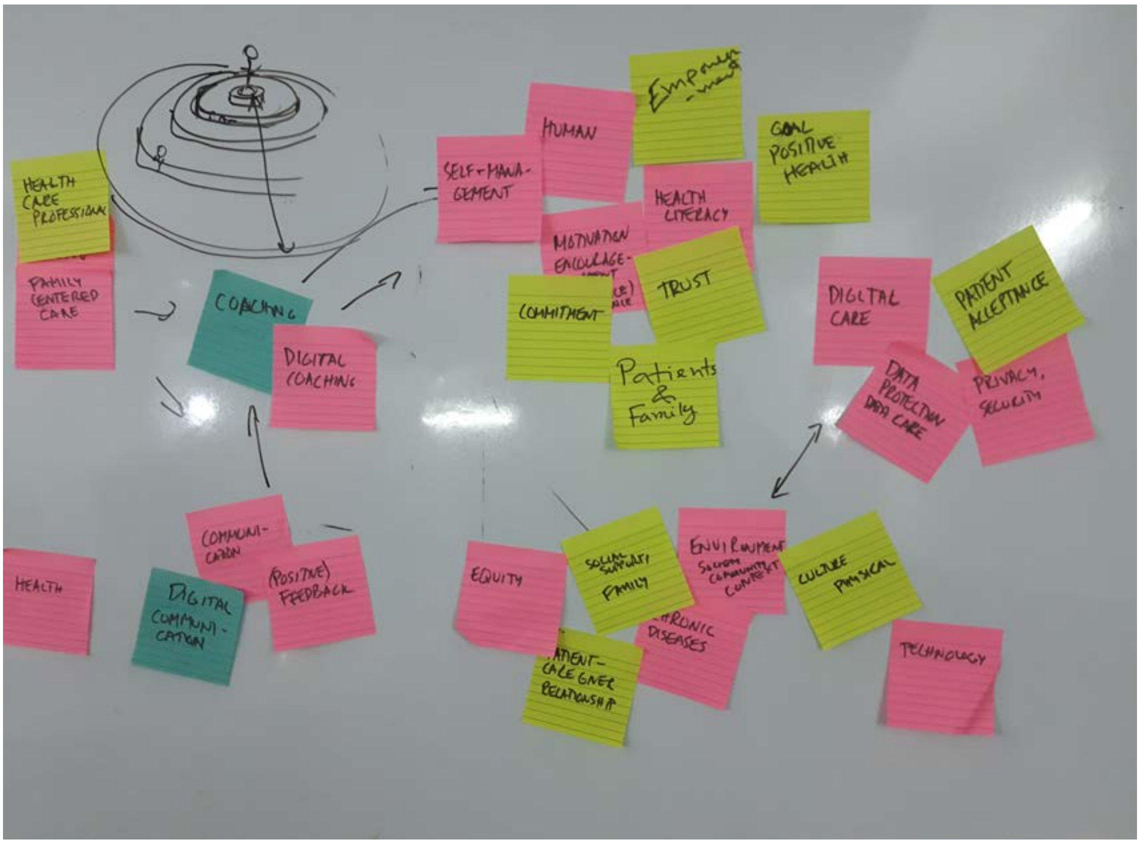
However, the healthcare sector often lacks digital skills (Brown et al.,2020; Isidori et al., 2022) and competencies to support self-management (Heggdal et al., 2021), both in the services provided (Donald et al., 2018; Howell et al., 2023) and in healthcare education programs (Danesh et al., 2019). Particularly in Asia, there is currently no formally designed concept for teaching healthcare students' digital skills to assist patients in self-management.

It is crucial for healthcare providers and students to receive training in using modern IT technologies in healthcare (Howell et al., 2023; Rani, 2022). Therefore, it was imperative to develop a model suitable for Asian contexts that integrates digitalization and patient coaching into healthcare curricula.

Initiation of the Designing Process

The design of the DigiCare Model was a dynamic and iterative process that involved several stages of development. It started with brainstorming workshop where the project team actively generated ideas and explored different possibilities. During this phase, the team extensively reviewed and drew upon existing theories and concepts from relevant literature (Appendices 1-6). They also incorporated valuable insights and lessons learned from the previous DigiNurse project (Kokko et al., 2021). Furthermore, the team actively sought out empirical knowledge and expertise provided by local specialists and researchers.

This approach enabled the DigiCare consortium to capitalise on existing knowledge and best practices in the field, drawing from the literature reviews conducted by each partner higher education institution (HEI).



Picture 1. Example of an online brainstorming result during the process of designing the DigiCare Model.

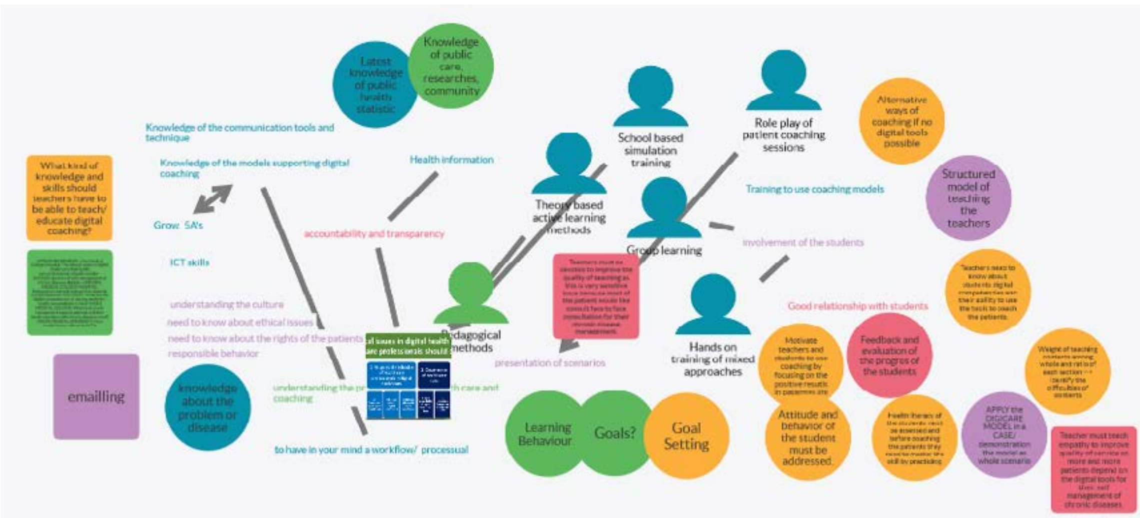
In addition to conducting literature reviews (Read more in Appendices 1-6), the DigiCare consortium organized a series of workshops to gather empirical experiences and cultural considerations that were crucial for shaping the model and including Asian context into the designing process. These workshops provided an opportunity for discussions, friendly debates and knowledge sharing among consortium members. Initially, some of these sessions were conducted through face-to-face meetings during Transnational Meetings, allowing for direct interaction and collaboration. However, as the Covid-19 pandemic unfolded, the consortium had to adapt to the changing circumstances.

To ensure the progress of the project, a significant portion of the design process was carried out through monthly online meetings and additional virtual workshops. Despite the challenges posed by remote collaboration, the consortium remained committed to fostering a collaborative environment and leveraging the expertise of all participants. The online meetings and workshops facilitated open discussions, idea generation, and the exchange of insights and perspectives, ensuring that the model was informed by diverse perspectives and relevant expertise.

> **To ensure the progress of the project, a significant portion of the design process was carried out through monthly online meetings and additional virtual workshops.**

The Drafts of the DigiCare Model

During transnational meetings, the initial draft of the DigiCare Model was developed, encompassing most of the main concepts (based on the literature reviews (Appendices 1-6) and expert knowledge) and ideas that the partners wanted to integrate into the curriculum (Picture 2). These concepts were organized into three categories: input, intervention, and output.



Picture 2. Brainstorming concepts for the DigiCare Model during the transnational meeting in Dhaka, Bangladesh. (Picture by Annukka Huuskonen, 2022.)

Under the input category, the focus was on providing lecturers with a pedagogical approach for patients with chronic diseases (Gagné et al., 2021) and preparing students to effectively use digital devices in patient care (Brown Wilson et al., 2020) and as resources in patient coaching (George et al., 2021). The Interventions named at this stage were various content topics and theories that were seen necessary for teaching the digital coaching (Barr & Tsai, 2021; Nevelsteen, 2021). The output category represented the desired outcomes, including the development of competencies in digital care (Nes et al., 2021) and coaching (Singh et al., 2022), increased satisfaction among students and patients (Heggdal et al., 2021; Rise et al., 2013), and the utilization of digital devices in the care of chronic disease patients and their families (Brown Wilson et al., 2020). The goals for the model were described at this stage.

Although subsequent versions of the model introduced structural changes, many of the terms and concepts from the initial draft remained visible in the final DigiCare Model (Read more in Chapter 3) and the accompanying learning packages (Read more in Chapter 4.1). The success of the model was measured by the increased knowledge, skills, and confidence of students and healthcare professionals in digital coaching, the alignment of nursing care plans for chronic disease patients with the DigiCare Model, the increased utilization of digital devices by patients and their families, and the adoption of the DigiCare Model by higher education institutions in their educational programs.

Second draft of the DigiCare Model used a metaphor of a bicycle (Figure 3). The idea was inspired by the DigiNurse Model (Vandenhoudt, 2021) formed in European context and presented in a shape of a bus or a coach. The DigiCare project consortium recognized that the bicycle metaphor was a fitting representation of the project's journey towards its goals. The bicycle symbolized the movement towards a destination and was found to be particularly suitable for capturing the adaptation to the local cultures of Bangladesh and Vietnam, where bicycles, rickshaws, and scooters are very popular. Additionally, the consortium saw the opportunity to connect the bicycle metaphor with the values of sustainable development.

As a result, the version of the DigiCare model that incorporated these aspects was named the “Green Model.” This designation reflected the consortium’s intention to align the model with sustainable development principles while embracing the local context and cultural practices associated with bicycles in Bangladesh and Vietnam.

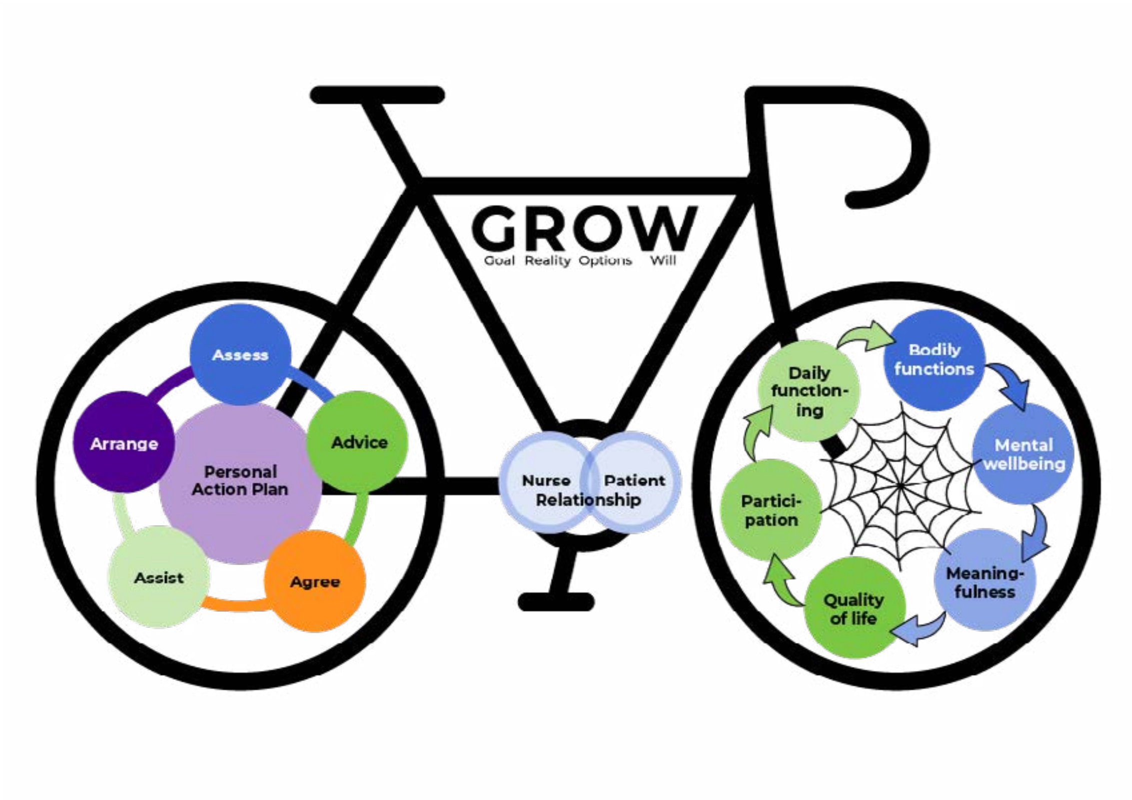


Figure 3. 2nd draft of the DigiCare Model. (Antonovsky, 1996; Hagerty et. al., 2017; Nevelsteen, 2021; WHO 2014, modified.)

This second draft model, known as the Green Model, incorporated several specific coaching models at this stage of development. These included the GROW and 5A’s coaching models (Read more in Chapter 5.1), as well as the Positive Health Model (Read More in Chapter 3.2) and Peplau’s theory of interpersonal relations in nursing (Read More in Chapter 4.1), which were depicted in the model illustration.

In this second draft of the model, the patient with chronic disease was assigned an active role, while students and healthcare professionals were responsible for training and supporting them to improve health literacy and quality of life. The focus during this phase of the model design process was on the concepts of self-management and coaching, which were prominently featured in the second draft (Figure 3). The theoretical and empirical basis of the DigiCare Model was enriched and further developed with the piloting experiences (Read more in Chapter 4.1 and Chapter 5).

The consortium recognized the importance of placing greater emphasis on the digital aspects of self-management support in the DigiCare Model. In developing countries such as Vietnam and Bangladesh, where digitalization is rapidly advancing, it has the potential to significantly impact healthcare, particularly for the growing elderly population (Sultana et al., 2019; Tran et al., 2016; Ventura et al., 2019). To fully harness the benefits of digitally enabled self-management of chronic conditions (Vassilev et al., 2015), there is a need to validate these technologies and address barriers by providing reliable and accurate information. This will enhance the cost-effectiveness and competency of digital health technologies.

It is crucial to implement multidimensional and multidisciplinary interventions to improve self-management among individuals with chronic diseases (Ahn et al., 2013). The value of online and virtual training to support nursing students and clinical nurses was acknowledged. In order to align with the developing environment of online, offline, and virtual training approaches, as well as future digital health services, it was deemed important for healthcare students to develop digital competences during their studies. This includes fostering knowledge, skills, and attitudes related to digital solutions.

The consortium acknowledged the importance of creating a versatile model that could accommodate various tools and models while remaining adaptable within the framework of the DigiCare Model. Additionally, it was recognized that individuals within the model exist within a broader context, encompassing their relationships with family, community, and society. As a result, the socio-ecological model (Bronfenbrenner, 1977) was incorporated into the DigiCare Model. This integration allowed for a comprehensive approach that considers the multifaceted influences on individuals' well-being and health outcomes. Additionally, the concept of a bicycle with just one active rider was considered problematic. In the DigiCare Model, not only the patient but also the student and the healthcare professional should be actively engaged. Various ideas, such as a rickshaw, tandem bicycle, and cycling team, were explored, but they were unable to fully capture the desired illustration as a whole.

> **The consortium acknowledged the importance of creating a versatile model that could accommodate various tools and models while remaining adaptable within the framework of the DigiCare Model.**

It became clear that the DigiCare Model, within the Asian context, needed to consider a broader perspective beyond the individual patient and their care provider. A systemic concept of interconnected layers with several key concepts began to take shape.

Although the thorough discussing, brainstorming, and debating on the key concepts led the consortium to neglect the illustration of bicycle, the ideas behind the "green model" stayed alive and are utilized in implementation of the model to some extent.

The finalization of the DigiCare Model was the result of collaborative learning, creative thinking, critical analysis, and the utilization of new active working methods (e.g., World Café). The process challenged and expanded the perspectives of all those involved in various ways, pushing them to enhance their digital, pedagogical, evidence-based argumentation, and critical thinking skills. Each step along the way contributed valuable insights that shaped the ultimate version of the model.

The final version of the DigiCare Model was agreed upon during a transnational meeting held in Dhaka, Bangladesh, in 2022. In Chapter 3, the DigiCare Model and its key concepts will be elaborated upon and described in detail.

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3. The DigiCare Model

The number of people affected by chronic diseases is growing rapidly in Asian countries, placing increasing pressure on healthcare systems. Diseases like diabetes mellitus, cardiovascular diseases, asthma, and chronic obstructive pulmonary disease, among others, require lifelong care and self-management. The DigiCare Model and its associated Learning Packages (Read more in Chapter 4) are designed to enhance the competences of healthcare professionals in enabling individuals with chronic diseases to self-manage their conditions.

« In this chapter, we provide a comprehensive description of the DigiCare Model developed within this project, including its various components and their interconnectedness. Additionally, we offer practical suggestions on integrating the DigiCare Model and its Learning Packages into existing curricula. »

3.1 Overview of the DigiCare Model

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To effectively manage chronic conditions, individuals need knowledge, skills, and competences to take care of their own health. The DigiCare Model has been developed to empower individuals in their self-management and equip healthcare professionals with the necessary competence. It encompasses multiple layers with key concepts that foster these skills. Serving as a structured framework for healthcare education, the DigiCare Model is designed to enhance the understanding and application of self-management principles. In this chapter, we provide a concise introduction to the background and foundational insights of the DigiCare Model. We also present the illustration of the DigiCare Model and its various layers.

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The DigiCare Model enables future healthcare professionals to leverage existing infrastructure (e.g., environment, technology, digitalization, support, culture, customs, economy, privacy, and politics) to integrate digital coaching into the delivery of health services (Barr & Tsai, 2021). Digital coaching emphasizes communication (Brandt et al., 2018), patient empowerment (Rutten et al., 2014), and a need for feedback to support patients (Early et al., 2017; Lindberg et al., 2017) with chronic diseases and their families to achieve self-management competence (Blackberry et al., 2013; Uhm & Kim, 2022), motivation (Komkova et al., 2019; Rutten et al., 2014), and improved health literacy, leading to a better quality of life (Hesseldal et al., 2022). It is important to note that this model may need to be adapted to diverse cultural and societal contexts, as the role and influence of families, communities, and societal factors can vary. Additionally, as digital health continues to evolve, it will be crucial to continue updating the model to incorporate modern technologies and understand their impact on chronic disease self-management.

The DigiCare Model is built upon the socio-ecological model, which recognizes the interplay between individuals and their surrounding environments throughout their lives, encompassing both formal and informal aspects. The ecological environments encompassed within this model include the microsystem (such as immediate relationships with parents or caretaker), mesosystem (interactions within peer groups and workplace), exosystem (interaction and influence within the neighbourhood and local community), and macrosystem (relation to broader social, economic, or political environments) (Bronfenbrenner, 1977). Despite being developed several decades ago, the socio-ecological model continues to be effectively utilized in various recent health programs and interventions. Examples include fostering community engagement in health programs (Caperon et al., 2022), promoting health through policy and environmental changes (Golden et al., 2015), and conducting research in health promotion (Wold & Mittelmark, 2018). The socio-ecological model provides a valuable framework for understanding the complex interrelationships between individuals and their environments, thereby informing the design and implementation of effective health interventions.

> **The DigiCare Model is based on the positive health paradigm and guided by sustainable and ethical principles, which encompass the rights and responsibilities of individuals, equity in digital healthcare, and robust governance of health data.**

In terms of health-related concepts, the DigiCare Model is based on the positive health paradigm and guided by sustainable and ethical principles, which encompass the rights and responsibilities of individuals, equity in digital healthcare, and robust governance of health data. The DigiCare Model aligns with the four domains of the nursing metaparadigm proposed by Fawcett (1984), namely person, environment, health, and nursing. These domains continue to serve as a foundational framework in nursing science and education, including in South-Asia. The DigiCare Model incorporates and interconnects these domains, emphasizing the interrelationships and relationality between the person, environment, health, and nursing or care. This integration is also reflected in the layers of the DigiCare Model, as described by Bender (2018).

The DigiCare Model is represented by the shape of a spinning top, as depicted in Figure 4. This analogy illustrates the dynamic and continuous nature of digital health coaching within the model. The focus of the DigiCare Model is centered around individuals who have one or more chronic conditions, with an emphasis on considering the involvement of their family, community, and society. Like a spinning top, an external force is required to initiate its movement. Similarly, motivating individuals to take responsibility for their actions and improve their quality of life necessitates external support. This motivation is fostered and sustained through a coaching relationship with a healthcare professional. Together, they collaborate to develop an individualized care plan that guides the patient and their family in self-management, ultimately working towards achieving the desired outcomes. (Nevelsteen, 2021.)

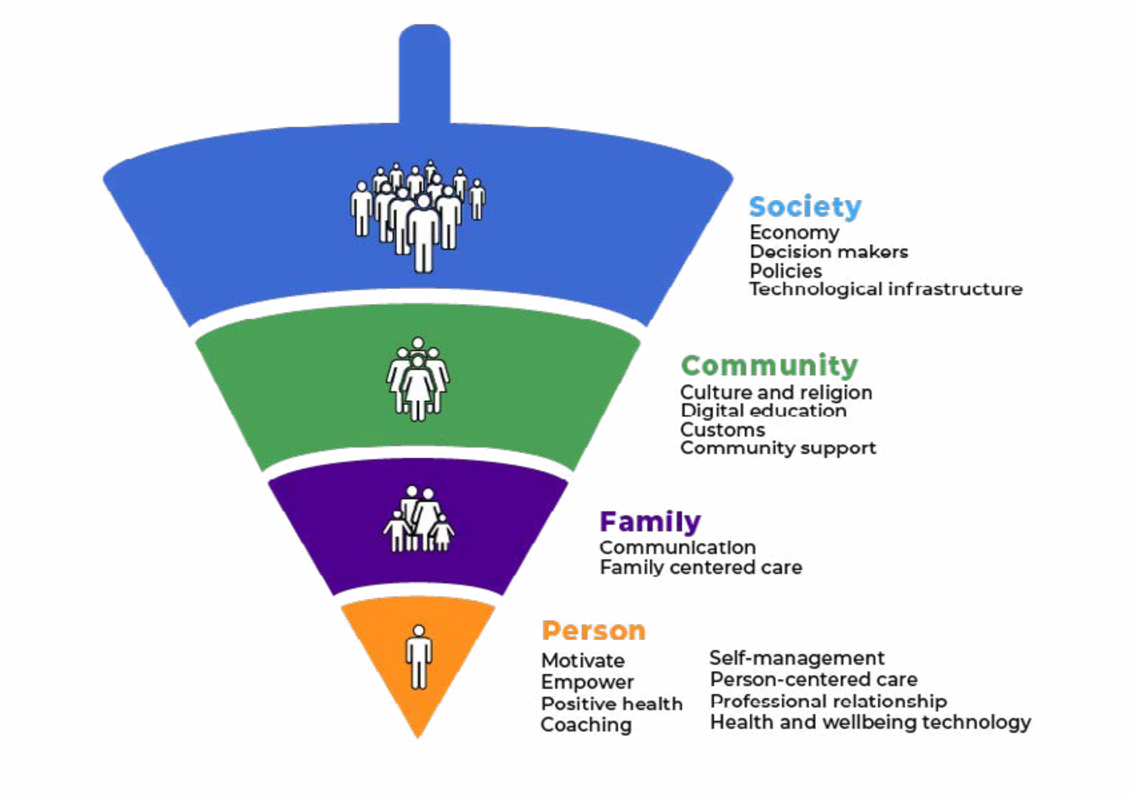

Figure 4. The DigiCare Model.

The DigiCare Model comprises of four layers. Each layer plays a vital role in delivering effective self-management support to individuals with chronic diseases. Within each layer, there are key concepts that are integral to its functioning, highlighting the unique characteristics and elements associated with that particular layer. It is important to note that while these key concepts are primarily associated with specific layers, there may be instances where they intersect and overlap with concepts from other layers, further emphasizing the interconnectedness of the model.

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3.2 The First Layer of the DigiCare Model: Person

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Chronic diseases like diabetes mellitus, cardiovascular diseases and asthma, among others, require knowledge and skills, competence for individuals to self-management their condition. In addition, healthcare professionals are required competences to support and coach people with chronic disease. For this purpose, the DigiCare Model provides a structured framework for healthcare education. In this chapter, we will delve into the first layer of the DigiCare Model, known as the person layer. We will explore the key concepts within this layer and examine their interconnections. Additionally, we will conclude this chapter by providing some recommended readings for further exploration of the topics discussed.

The core and foundation of the DigiCare Model is the relationship between the person with one or more chronic conditions and the Healthcare Professional. This central layer, located at the core of the spinning top illustration, focuses on these two key individuals - the person with the chronic condition and the healthcare professional (such as a nurse, doctor, medical practitioner, or future healthcare professional - student).

Within this layer, there are key concepts (Figure 5) that are essential in understanding the needs, goals, and strategies required for individuals to live well with their chronic disease. These concepts are examined from both the perspective of the person with the condition and the healthcare professional, considering their responsibilities, and contributions to the management and support of the chronic disease.

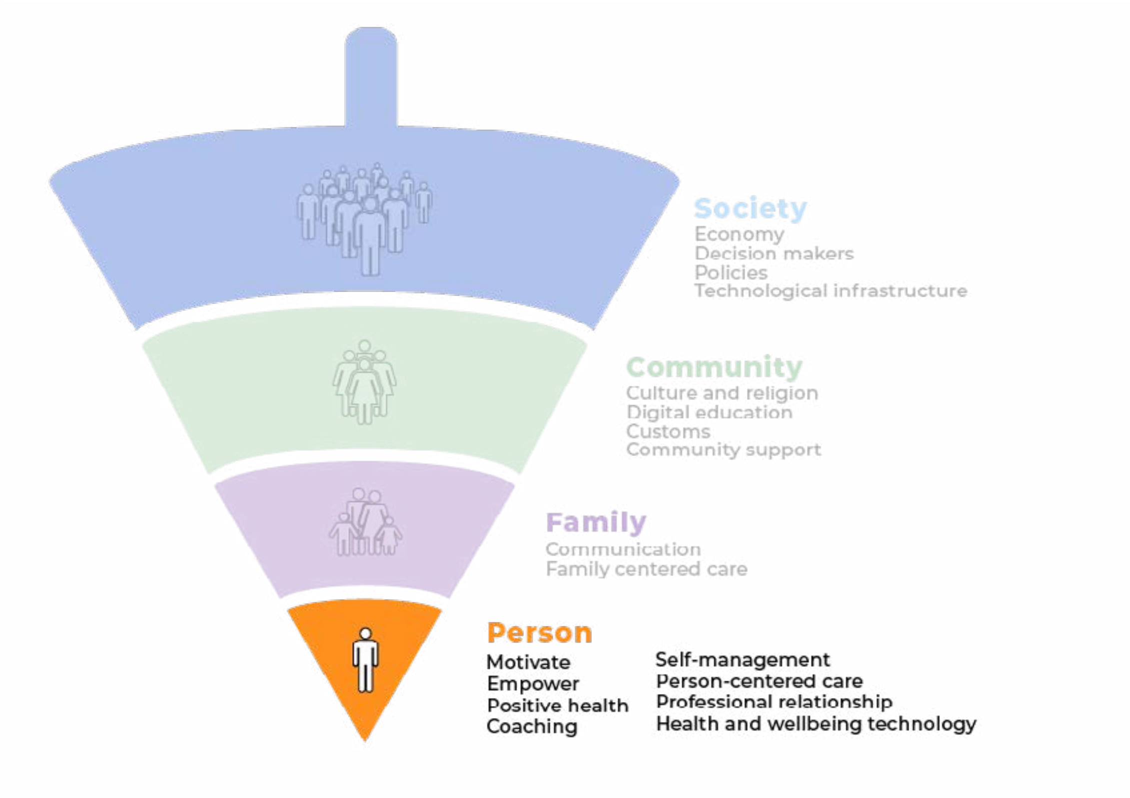

Figure 5. The first layer of the DigiCare Model: Person.

Positive health is a key concept that enables a holistic view of a person's health. Positive health emphasizes strengths as well as challenges. Health and digital literacy, self-management, motivation, and empowerment are key elements that a person with chronic disease needs. These can be strengthened with the support of a healthcare professional.

> **The core and foundation of the DigiCare Model is the relationship between the Person with one or more chronic conditions and the Healthcare Professional.**

There are also key concepts that describe the interaction between the person with a chronic disease and the healthcare professional. The healthcare professional builds a professional relationship and, through coaching, empowers the person with a chronic diseaseto manage their own health. Health and wellbeing technology must be used wisely and effectively in both patient-professional interactions and self-management.

Positive Health

Positive health offers a holistic and empowering approach to understanding and promoting well-being. Rather than focusing solely on health problems, positive health considers the entire person and emphasizes the protection of individual strengths and well-being. This concept is based on the salutogenesis paradigm introduced by Antonovsky (1996). He researched factors that contributed to the well-being of individuals who thrived in challenging circumstances.

The Institute for Positive Health defines health as the ability to adapt and manage oneself in the face of social, physical, and emotional challenges encountered in life (Huber et al., 2011). They have identified six pillars of positive health: body functioning, mental well-being, meaningfulness, quality of life, participation, and daily function. These pillars provide a framework for assessing and understanding an individual's health status. The spider web tool (Figure 3 in Chapter 2.2), which is based on these pillars, can be used in coaching individuals with chronic diseases to evaluate their own health. By adopting a positive health perspective, both patients and healthcare professionals gain valuable insights into self-management and support for chronic diseases. This approach recognizes the importance of focusing on strengths, well-being, and the ability to adapt in the face of challenges, ultimately enhancing the overall management of chronic conditions.

Read more about Positive health and Salutogenesis:

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Health and Digital Literacy

Health literacy refers to an individual's ability to obtain, comprehend, and utilize essential health information and services necessary for making appropriate health decisions (Ratzan et al., 2000). It plays a crucial role in the management of chronic diseases. Individuals with chronic conditions must be able to access, understand, evaluate, and apply health information in their daily lives (Milavec Kapun & Gogova, 2021).

However, health literacy is not solely an individual characteristic. It also depends on the communication clarity, health education provision, and empowerment by health services. Therefore, health literacy should be seen as a dynamic interaction between patients/citizens and healthcare systems, organizations, and professionals (van der Heide et al., 2018).

In today's digital era, achieving health literacy is closely tied to digital literacy. A wealth of information is available in digital formats, necessitating citizens to possess the technical skills to access, utilize, and critically evaluate the reliability of this information (Spurava & Kotilainen, 2023).

In the DigiCare Model, health literacy is emphasized at the same level as the individual (person), recognizing the collective efforts of community and society in promoting health literacy among its population. Health literacy of individuals is fostered through the professional relationship with healthcare professionals, as well as within the broader context of the education system, media, and politics. For more detailed information on the concept of health literacy, you can refer to an overview of health literacy in the self-management of non-communicable diseases, which was conducted as an exploratory screening of literature (Appendix 5).

Read more about Health and Digital Literacy:

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HHS. (n.d.). U.S. Department of Health and Human Services. Health Literacy in Healthy People 2030. https://health.gov/healthypeople/priority-areas/health-literacy-healthy-people-2030

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Milavec Kapun & Gogova (2021) Health Literacy. In Kokko, R., Smolander, N., & Isokoski, A (Eds.) DigiNurse Model – A New Approach to Digital Coaching for Nursing Students (pp.114–123). Tampere University of Applied Sciences. https://urn.fi/URN:ISBN:978-952-7266-56-4

Self-Management

Self-management encompasses a range of skills and knowledge related to disease management, understanding the disease and its treatment, motivation, adherence to treatment, and making necessary lifestyle changes (Read more in Appendix 6).

An analysis of the concept of self-management and its dimensions (Udlis, 2011) identified the essential preconditions for improving self-management and the outcomes associated with it (Figure 6). Self-management was conceptualized in three hierarchical dimensions: the foundation of knowledge and resources, followed by active participation and adherence to the plan, and ultimately informed decision-making.

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Figure 6. Self-management in chronic illness -model. (Udlis, 2011, modified)

Self-management refers to the skills and abilities that individuals acquire to effectively manage their lives while living with a chronic disease (Donald et al., 2018). This includes identifying and utilizing resources that support self-management, such as structured health-care services and social, emotional, and community support (Byrne et al., 2022; Noval et al., 2013). To access these resources, patients must establish and maintain relationships with healthcare providers and navigate the healthcare system (Byrne et al., 2022). Self-management also involves recognizing and addressing the emotional reactions associated with living with a chronic disease and developing strategies to incorporate the disease into daily life (Gonzalez-Zacarias et al., 2016).

Digital tools and technology can play a significant role in supporting self-management. However, there are various barriers that can hinder the effective use of technology. These barriers may arise from physical limitations, inadequate technological skills, low motivation to engage with technology, or poor usability of digital tools. It is crucial for healthcare professionals to be aware of these barriers and take them into consideration. Furthermore, healthcare professionals can help overcome these barriers by selecting appropriate tools and providing support in their utilization. (Read more in Appendix 1).

Read more about Self-management:

AHRQ. (n.d.). Agency for Healthcare Research and Quality. Self-Management Support. HHS. U.S. Department of Health and Human Services. https://www.ahrq.gov/ncepcr/tools/self-mgmt/self.html

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The DigiCare Learning Package 6. Self-management. Available: https://www.slideshare.net/NinaSmolander/selfmanagement-digicare-laerning-package-6pptx

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Motivation and Empowerment

As described in Figure 6 within the self-management section, several preconditions are necessary for effective self-management, including self-efficacy, intention, and mutual investment. These preconditions are underpinned by motivation, which plays a vital role in facilitating self-management. Healthcare professionals can assist patients in setting meaningful and motivating goals through coaching.

Self-management of a lifelong condition on requires strong motivation and commitment. The literature shows that self-management support provided by healthcare professionals increases patient motivation and adherence by empowering patients and reinforcing ownership of self-care (Read more in Appendix 6). However, there are many difficulties in motivating patients in the long term, which can frustrate caregivers

(Golay et al., 2007). To enhance patient motivation, health professionals should be aware of the types of motivation, including internal factors, fundamental needs (Heggdal et al.,2021), and external factors (e.g., society, family members and household living structure (Cramm & Nieboer, 2013); caregivers and learning and training environment (Danesh et al., 2019), and explore the source of motivation for each patient (Rise et al., 2013).

Patient empowerment plays a crucial role in facilitating successful self-management and maintaining motivation. The term “empowerment” can be defined in various ways, depending on the specific focus (Barr et al., 2015). However, within the DigiCare Model, empowerment is viewed as a multidimensional social process that enables individuals to gain control over their lives (Page & Czuba, 1999). Patient empowerment can significantly enhance confidence and commitment to self-management among individuals with chronic diseases (Wang et al., 2022).

Information and communication technologies (ICT) hold tremendous potential in promoting patient empowerment and providing support for self-management. For instance, ICT allows for remote access to personalized and reliable information, patient education, strengthening of the patient-healthcare professional relationship, ensuring privacy and confidentiality, and facilitating patient involvement in decision-making (Calvillo et al., 2015). An essential aspect of patient motivation and empowerment is the mindset of both the patient and the healthcare professional, recognizing the patient’s active role in their own care and health maintenance.

Professional Relationship and Coaching

The relationship between the patient and the healthcare professional within the DigiCare Model is unique and multifaceted, requiring healthcare professionals to possess a diverse range of skills. These skills include strong interpersonal abilities, ethical and social competencies, and professional conduct (Harder et al., 2021). Building trust and fostering a professional rapport with the patient are competencies that develop over time and require ongoing practice (Nevelsteen & Vandenhoudt, 2021; Timmermann et al., 2021). Effective interaction with patients and clients relies on healthcare professionals demonstrating empathy, clear communication, and active listening. These skills empower healthcare professionals to engage effectively with patients and provide them with the necessary support (Brandt et al., 2018; Hamurcu, 2018).

A professional relationship is established based on a shared commitment between the healthcare professional and the patient to work collaboratively towards achieving the goals of chronic care management. These goals extend beyond mere disease cure and prevention of complications; they encompass enhancing the patient's functional capacity, minimizing symptoms, prolonging lifespan, and improving overall quality of life (Mitsi et al., 2018).

A professional relationship is established based on a shared commitment between the healthcare professional and the patient to work collaboratively towards achieving the goals of chronic care management.

In essence, the relationship between the patient and the healthcare professional relies on the healthcare professional's ability to exhibit essential skills, including effective communication, active listening, empathy, and a commitment to the patient's well-being. By cultivating these skills, healthcare professionals can foster a positive and productive partnership with their patients, ultimately contributing to improved chronic disease management and enhanced patient outcomes and practice. (Nevelsteen & Vandenhoudt, 2021.)

Coaching plays a pivotal role in the DigiCare Model, and it is essential to clarify its meaning, especially within the Asian context. In Asia, the term “coaching” often conjures associations with paid tutoring outside of the educational context. However, in the DigiCare Model, “coaching” refers to health coaching, which aligns more closely with its usage in sports. In health coaching, the objective is to guide and facilitate individuals in their journey towards optimal performance and well-being, similar to how a sports coach supports and empowers athletes to reach their full potential. Extensive research has shown the effectiness of health coaching in improving chronic disease management, leading to positive outcomes such as weight management, increased physical activity levels, and improved physical and mental health (Kivelä et al., 2014). Therefore, within the context of the DigiCare Model, coaching refers to the practice of supporting individuals in making positive health choices and achieving their best possible health outcomes.

By providing support for self-management, healthcare professionals enhance the patient’s ability and motivation to take better care of their health, leading to improvements in their quality of life. Coaching serves as a means of interaction between the patient and the healthcare professional, empowering the patient to effectively manage their chronic condition. Health coaching has been widely acknowledged as an effective approach for patient education and has demonstrated positive outcomes in various areas, including physiological, behavioral, psychological, and social domains (Kivelä et al., 2014). Through a conceptual analysis of health coaching, seven key characteristics have been identified, forming the foundation for a functional definition. Health coaching is described as a goal-oriented and client-centered partnership that focuses on promoting health and is facilitated through a process of client empowerment and enlightenment (Olsen, 2014).

The digitalization of healthcare opens new possibilities for patient coaching, including online and hybrid sessions, electronic data collection, and remote monitoring options (Nevelsteen & Vandenhoudt, 2021). These technological advancements offer valuable tools for enhancing patient coaching and facilitating more efficient and accessible healthcare services (Brandt et al., 2018; Hesseldal et al., 2022).

Coaching models, such as the GROW model and the 5A's model, are useful tools for healthcare professionals to facilitate coaching sessions. The GROW model (Withmore, 1996) is widely used in various sectors, including business and management, and has also shown to be effective in health coaching (Nevelsteen, 2021). The GROW model consists of four steps: goal, reality, options, and will (Figure 7).

In the first step, the coach helps the patient identify the goal they want to achieve. The second step involves gaining insight into the patient's current situation and understanding the obstacles that prevent them from reaching their desired reality. In the third step, the coach assists the patient in exploring alternative options to achieve their goal, considering the advantages and disadvantages of each option. In the final step, the coach helps the patient make practical plans for moving forward and finding ways to strengthen and maintain their commitment to the goal. This model provides a structured framework for coaching sessions, guiding the interaction between the healthcare professional and the patient. (Clement, 2017.)

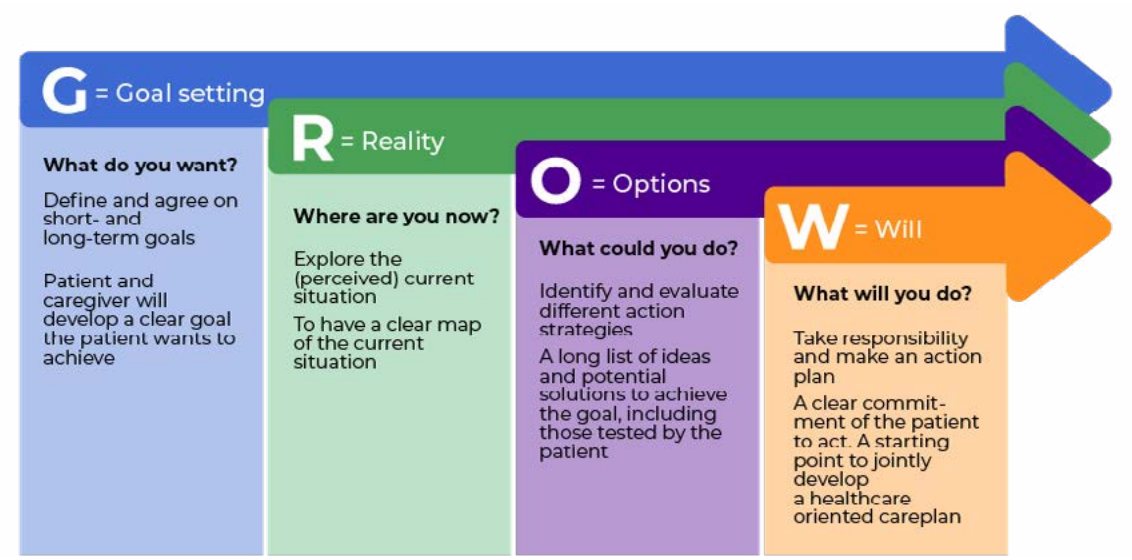

Figure 7. The 4 steps of the Grow Model. The goals and outcomes of the steps. (Clement 2017, modified)

The 5A's model (Glasgow et al., 2003) has been widely used in health education, including applications in the World Health Organization's smoking cessation toolkit (WHO, 2014), cancer screening discussions (Lafata et al., 2011), and weight loss counseling (Welsh et al., 2022, Washington Cole et al., 2017). As the name suggests, the 5A's model consists of five steps: Assess, Advise, Agree, Assist, and Arrange. These steps are followed in a sequential manner to help the patient develop their personalized action plan (Figure 8).

In the Assess phase, the coach gathers information about the patient's current situation and their perspective on the issue at hand. The Advice phase involves the healthcare professional providing relevant information and discussing how it can be applied or integrated into the patient's specific circumstances. The Agree phase focuses on collaboratively creating a plan and setting goals. It is essential that these goals are patient-centered, and the healthcare professional serves as a facilitator in the process. The Assist phase involves providing ongoing support to enable the patient's journey of change, including equipping them with the necessary skills to achieve their goals. (Nevelsteen, 2021.)

Lastly, the Arrange phase ensures continuity of care and may involve engaging multidisciplinary support as needed (Nevelsteen, 2021).
By following these sequential steps, healthcare professionals can effectively guide patients in developing their action plans and support them in making sustainable changes.

Figure 8. The 5 A's model of self-management support. (Glasgow et al., 2003, modified)

Read more about Coaching and Coaching Models

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The DigiCare Learning Package 7. Coaching. Available: https://www.slideshare.net/NinaSmolander/coaching-digicare-learning-package-7-pptx

The DigiCare Learning Package 8. 5A's. Available: https://www.slideshare.net/NinaSmolander/8-5as-coaching-modelpptx

The DigiCare Learning Packages 9 GROW model. Available: https://www.slideshare.net/NinaSmolander/grow-coachin-model-digicare-learning-package-9pptx

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Health and Well-being Technology

Health and well-being technologies are becoming increasingly accessible in Asian countries, providing opportunities to promote and support self-management of chronic diseases (Bhattacharyya et al., 2020; Prodham et al., 2017). More families are now able to afford and are willing to invest in digital tools that enable them to monitor their health or collect health data (McCool et al., 2022). These tools include digital blood pressure or blood glucose monitors, activity wristbands and other sensors for body functions, wearable technology and garments, and smartphones or watches with various health and well-being apps (Kumar et al., 2017; The Economist Impact, 2021).

Health and well-being technologies offer solutions for enhancing and measuring medication adherence, such as pill counting, electronic monitoring, and biochemical measurements (Lam & Fresco, 2015). It is essential for healthcare professionals in these countries to recognize the potential benefits of utilizing health and well-being technologies, apps, and digital tools in general to support their patients' self-management (Ahmed et al., 2020; Dang et al., 2021; Prodham et al., 2017).

> **Healthcare professionals can successfully integrate health and well-being technologies into their practice and deliver optimal support for their patients' self-management.**

Preparing healthcare professionals for the digital health landscape should involve ethical considerations concerning patients' rights, equity in digital healthcare, governance of healthcare data, and responsible behavior of healthcare professionals in the digital health domain (Konttila et al., 2018). By incorporating these considerations, healthcare professionals can successfully integrate health and well-being technologies into their practice and deliver optimal support for their patients' self-management.

Read more about Health and Well-being Technology

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3.3 The Second Layer of the DigiCare Model: Family

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In order to empower individuals in their self-management journey and equip healthcare professionals with the necessary competence, the DigiCare Model incorporates multiple layers with key concepts that foster these skills. The first layer, referred to as the person layer (Read more in Chapter 3.2), centers around the individual's active involvement in their own healthcare journey. It highlights the crucial role individuals play in their own care, while also recognizing the importance of their collaboration with healthcare professionals. In this chapter, however, our attention will shift to the second layer of the DigiCare Model, known as the family layer. We will explore the essential concepts within this layer, examining their significance and the ways in which they interrelate. To facilitate a deeper comprehension of the topic, we will conclude the chapter by providing a selection of recommended readings for further exploration.

The second layer of the DigiCare Model expands the scope of care to include the patient's family or significant others. Recognizing the crucial role of support in the patient's journey, the inclusion of the family or significant other in the coaching process is essential to promote the patient's overall well-being (Bennich et al., 2020; Chae et al., 2023). It is important to note that family structures can be diverse, and in the DigiCare Model, the term "family" encompasses individuals whom the patient considers part of their family, irrespective of genetic ties. Viewing the family as a unified entity, the model emphasizes that managing a chronic disease is a collective effort involving both the individual patient and their family (May & Dawson, 2018). Therefore, the success of self-management is not solely dependent on the individual but also relies on the active engagement of the entire family unit (Chae et al., 2023). Through fostering collaboration between healthcare professionals, the individual, and the family, the DigiCare Model aims to optimize patient care and support.

> **The whole family unit needs strong health and digital literacy skills, motivation, and empowerment to improve self-management outcomes and quality of life.**

The same key concepts discussed in the context of the person layer (Read more in Chapter 3.2) also apply to the family layer (Figure 9). The healthcare professional must build a professional relationship with the patient and his or her family or significant other to promote better self-management of the patient's chronic condition. The whole family unit needs strong health and digital literacy skills, motivation, and empowerment to improve self-management outcomes and quality of life. (Young et al., 2019.) By involving the entire family, there is an opportunity to leverage health and well-being technologies more effectively (Hui et al., 2022) and overcome any barriers that may arise (Fort et al., 2015) (Read more about Health and Well-being technology in Chapter 3.2).

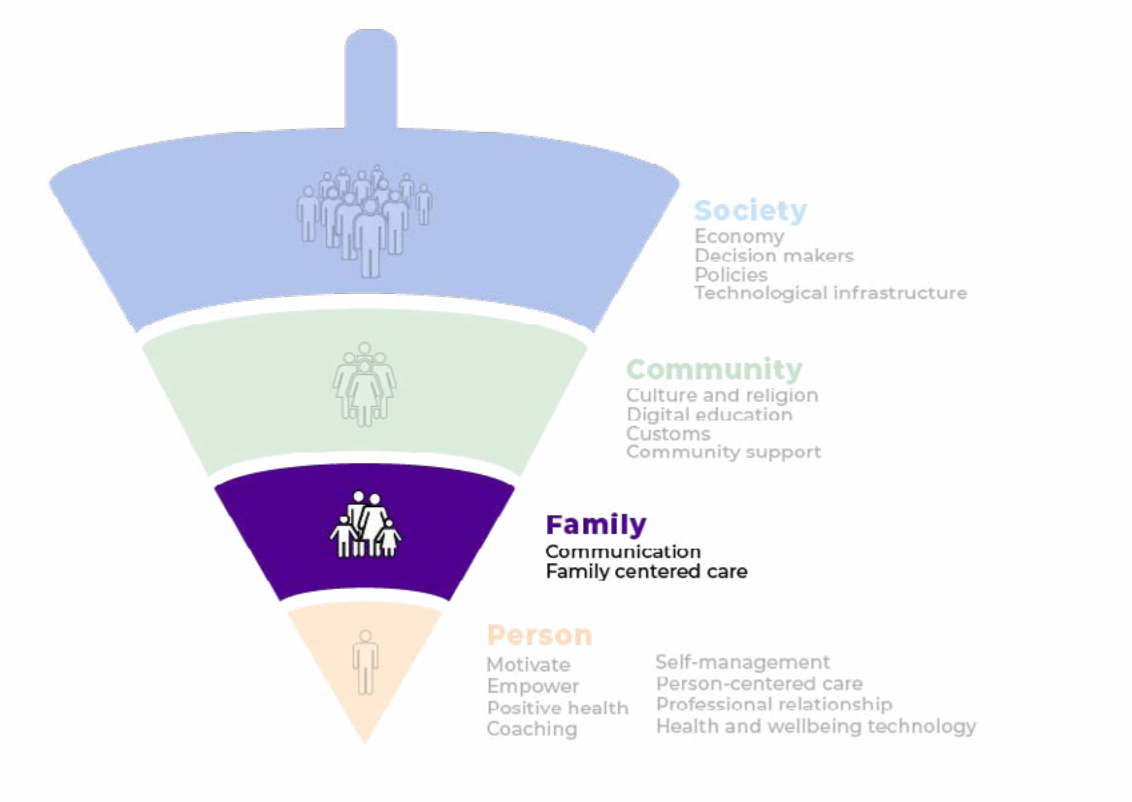

Figure 9. The second layer of DigiCare Model: Family.

In the literature, the concept of self-management has often been linked to family management. One notable example is the Self- and Family Management Framework developed by Grey et al. (2015) in 2009 and later revised in 2015. This framework (Figure 10) provides an overview of the facilitators and barriers, processes, and proximal and distal outcomes of self- and family management of chronic diseases. The Self- and Family Management Framework has been extensively utilized in self-management interventions that prioritize intentional family involvement in care, including studies that specifically concentrate on the development of e-health interventions (Schulman-Green, 2021).

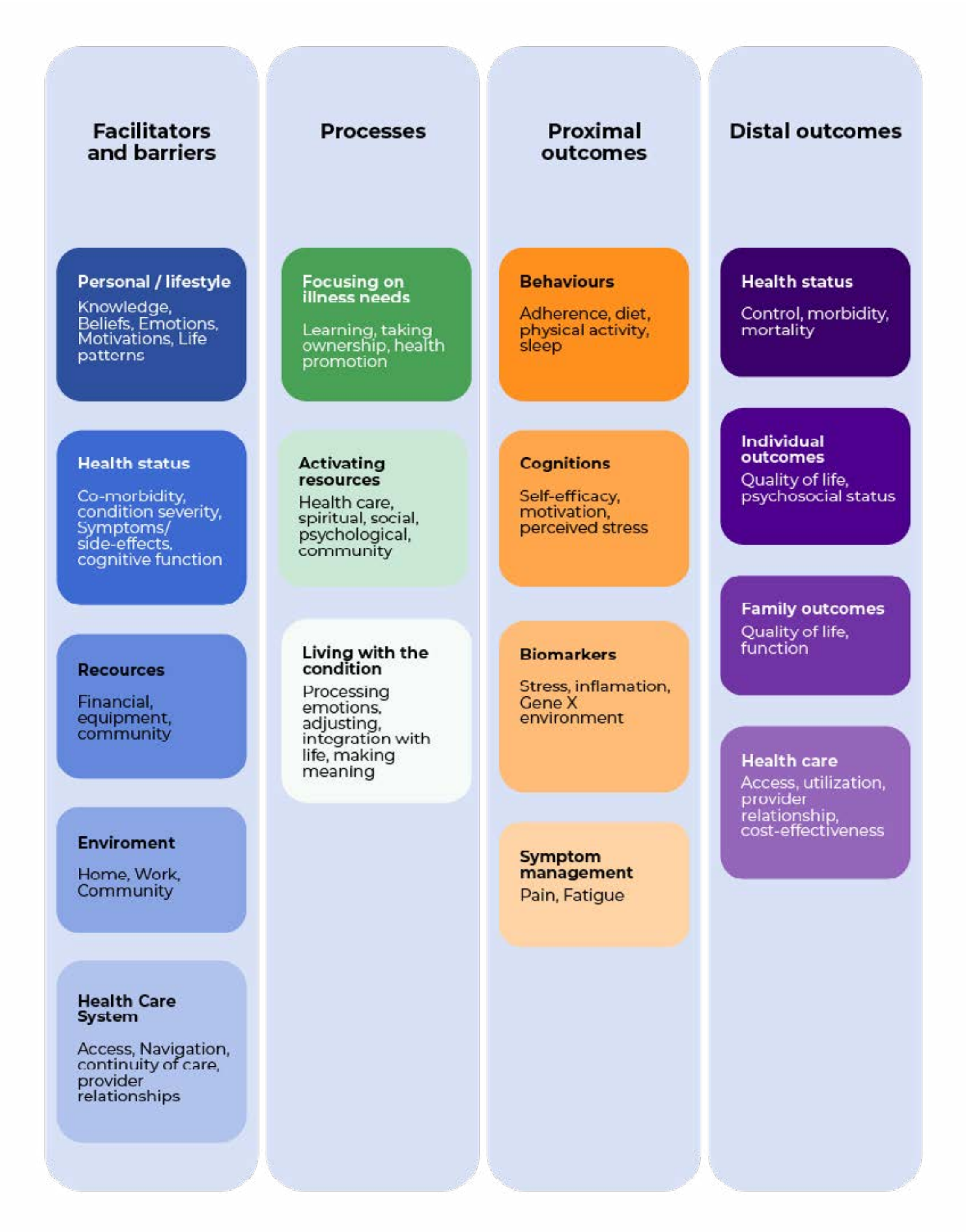

Figure 10. Revised Self and Family Management Framework (Grey et al., 2015, modified)

Family-Centered Care and Communication

Family-centred care is an essential approach in the DigiCare Model by involving significant others in the care of individuals with chronic condition. Effective communication is a fundamental element in the care of individuals with chronic conditions, both within the family and between the family and healthcare professionals (Oreja-Guevaraet al., 2019).

Healthcare frameworks commonly prioritize the patient or family as the central focus of care. Family-centred care emphasizes the involvement of the entire family unit rather than focusing solely on an individual member (Coyne et al., 2018). Its objective is to be flexible and adaptable, considering the unique needs and strengths of each family. Key elements of family-centred care include collaboration, communication, negotiation, and support (Coyne et al., 2018).

Traditionally, family-centred care has often been associated with families having a sick child (Coyne et al., 2018). However, due to the increasing prevalence of chronic conditions and the subsequent burden on healthcare services, the concept of family-centred care has expanded to include families as active partners in the delivery of care, even within the adult population (Deek et al., 2016).

The DigiCare Model places significant emphasis on adopting a family-centred approach to care, encompassing all families with a member living with a chronic disease, regardless of age. In Asian cultures, which generally exhibit a lower degree of individualism compared to European cultures, involving the family in care is both natural and crucial for the effective management of chronic conditions over the long term. The significance of the family unit is widely recognized, particularly in non-Western countries; however, the systematic implementation of a family-centred approach as a comprehensive framework appears to be less prevalent (Deek et al., 2016).

A family-centred approach to chronic disease management has been shown to be beneficial in reducing hospital re-admission rates, emergency department visits, and anxiety levels. In addition to a family-centred approach, effective self-care support interventions used active learning strategy, such as coaching, transitional care and suitable follow-up. (Deek et al., 2016.)

Patients with chronic diseases and their families must be involved in the care process, necessitating their active involvement in decision-making and various activities throughout the care process. Communication, especially within the healthcare sector, holds significant importance. Communication between patients, families and healthcare professionals has a profound impact on patient outcomes. It aids in emotional coping, improves adherence to care, promotes patient empowerment, instils confidence, and ultimately improves patient satisfaction and quality of life (Kourakos et al., 2018).

> **Healthcare professionals should have both theoretical knowledge of communication principles and an understanding of the factors that can influence the communication process.**

To ensure clear and accurate communication, healthcare professionals must adapt their communication to the needs of the patients and their families, considering, for example, their level of health literacy. It is also advisable to use questions to reinforce understanding.

Research conducted by Peyman et al. (2014) highlights the impact of low health literacy on patient interactions with healthcare professionals. Patients with limited health literacy skills often miss out on important information due to various factors, including the use of complex terminology, inadequate attention to patients' speech, insufficient attention to patients' concerns, speaking too quickly, inadequate use of visual aids, and a lack of opportunities to ask questions. These barriers can hinder effective communication and compromise patients' ability to fully comprehend and participate in their care. (Peyman et al., 2014.)

The concept of professional relationship discussed earlier is closely intertwined with the concept of communication. Effective communication skills form the basis of a trusting and therapeutic relationship with the patient and his or her family. Healthcare professionals should have both theoretical knowledge of communication principles and an understanding of the factors that can influence the communication process. It is vital for healthcare professionals to engage in deliberate practice of professional communication skills. This involves actively honing their communication abilities through practical application and seeking constructive feedback and engaging in self-reflection to further refine their skills. (Ammentorp et al., 2022.) Communication is a fundamental competence that should be practiced and developed intentionally throughout a healthcare professional's career (Read more about the DigiCare Educational Program in Chapter 4.1).

Read more about Professional Communication

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3.4 The Third Layer of the DigiCare Model: Community

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The DigiCare Model is based on a socio-ecological framework that includes individual, family, community, and societal levels. The first two layers focus on the person and family, emphasizing their roles in developing self-management skills for chronic disease care. The third layer extends to the community level, recognizing its impact on individuals' health. Community support, resources, and services play a vital role in promoting effective self-management and improving health outcomes. The DigiCare Model aims to create a comprehensive framework that considers the broader community context to enhance self-management and overall quality of care. In this chapter, we will explore the essential concepts within the community layer. To facilitate a deeper comprehension of the topic, we will conclude the chapter by providing a selection of recommended readings for further exploration.

At the third level of the DigiCare Model, the community is integrated into the framework, following the socio-ecological perspective (Figure 11). In this context, a community refers to individuals living in the same neighbourhood and being in close contact with each other, as defined by Bronfenbrenner (1977). However, the practical manifestation of a community can vary across different contexts. The DigiCare Model highlights the significant impact of the community on the well-being of individuals and their families. Since many chronic conditions require lifestyle changes, such as dietary modifications, exercise routines, and medication adherence, (Maini et al., 2020), the management of these conditions primarily takes place within the community setting (El Arifeen et al., 2013). This underscores the importance of community involvement in supporting and promoting effective self-management strategies (Ridell et al., 2016).

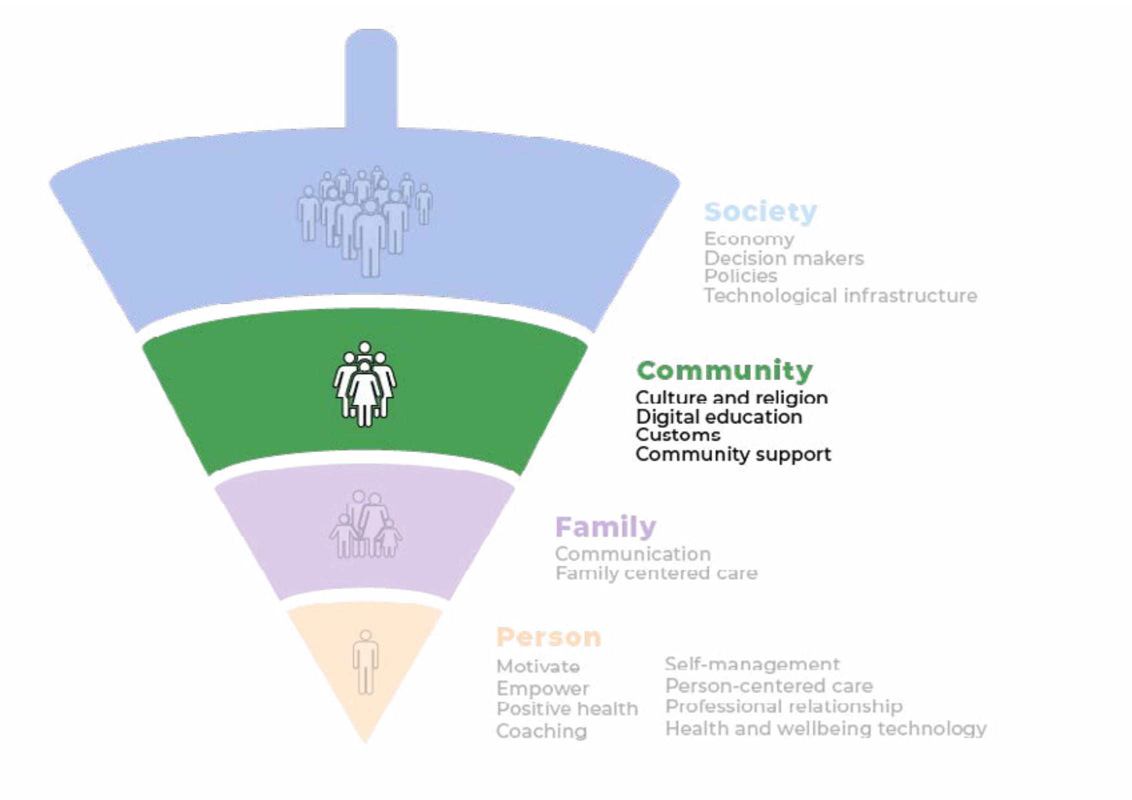

Figure 11. The third layer of the DigiCare Model: Community.

Culture, Religion, Customs

Within the DigiCare Model, the community plays a crucial role in the management of chronic diseases. This can be examined from various dimensions, including culture, religion, and customs, which have a significant impact on improving care for vulnerable individuals (Kim et al., 2016) and reducing the burden on healthcare systems (Anh et al., 2013). As we strive to promote self-management of chronic diseases, it is essential to consider the influence of culture.

Being part of a community typically entails sharing cultural and religious beliefs, customs, and traditions. Culture consists of multiple layers, with the outer layer encompassing visible aspects such as symbols, clothing, and behaviour. However, these observable elements are manifestations of deeper layers, including beliefs, attitudes, and values, which may be more challenging to discern (Trompenaars et al., 2021). Nonetheless, these cultural factors have a significant impact on individuals and their families as recipients of health services.

Cultural beliefs prevalent within a community have a significant impact on individuals' perceptions, attitudes, and behaviours regarding health and illness (McCallum et al., 2017). Attitudes and norms play a crucial role in influencing people's behaviour (Icek, 1991). For instance, an individual's beliefs about the causes of their disease or appropriate actions for treatment inevitably shape their attitude towards modern medicine and their health-related behaviours (Jones et al., 2014). Conversely, cultural misconceptions or stigma associated with certain conditions can pose barriers to effective self-management and hinder community acceptance. Therefore, it is essential to implement culturally sensitive and inclusive health practices and interventions (Khan et al., 2020). Understanding this layer of the DigiCare Model and respectfully exploring the deeper cultural layers is important to comprehend the underlying ideas that guide an individual's behaviour.

> **Barriers to lifestyle and health behaviour change often have a cultural dimension and manifest as attitudes or norms.**

Cultural barriers can significantly impact the coaching process. In the first layer of the DigiCare Model, coaching was introduced as a method to enhance patients' capacity and motivation for better health management and improved quality of life (Read more in Chapter 3.2). In both coaching models, such as the GROW and 5A's models, a crucial step involves identifying barriers to lifestyle and health behaviour change. These barriers often have a cultural dimension and manifest as attitudes or norms (Abel et al., 2018). Therefore, it is important to identify and understand these cultural barriers to address them effectively.

In addition to cultural factors, religious support and coping mechanisms play a significant role in creating an environment where individuals feel understood, respected, and supported in accepting and managing chronic conditions. Coping mechanisms rooted in religious beliefs can effectively enhance the care of chronic diseases (Celik et al., 2021). Likewise, spirituality has been found to reduce symptoms of depression and anxiety, thereby positively impacting the quality of life for individuals with chronic diseases. Consequently, acknowledging and understanding the religious aspects when coaching and supporting self-management can enhance long-term management of chronic diseases (Mendes et al., 2021).

Read more about Culture, Religion and Customs

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Community Support

Communities play a crucial role in providing support for individuals living with chronic diseases (Fisher et al., 2015). These support networks can assist individuals in dealing with the physical, emotional, and psychological challenges that come with chronic conditions (Callus & Pravettoni, 2018). In Asian cultures, there is a strong emphasis on community orientation, where individuals are viewed as integral parts of their families and communities, in contrast to the individual-centered approach commonly seen in Western societies. Within family-centered societies, the community serves as a source of support for individuals (Beitin & Aprahamian, 2014). In such contexts, a change in the health status of one family member affects the entire community (Ryan & Sawin, 2009). Furthermore, there may be financial implications when a family member becomes ill (Abel et al., 2018). Considering these factors is essential when delivering care to these populations.

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> **By actively engaging the community, we can foster a supportive environment that encourages and facilitates positive health behaviours.**

The main emphasis of self-management revolves around making lifestyle changes. Hence, when recommending interventions to patients, it is crucial to consider their community context. It is important to acknowledge that the attitudes of others within the community may not always align with official recommendations, potentially hindering an individual's willingness to take action (Smith et al., 2014). This underscores the significance of involving the community in health education initiatives (Kangovi et al., 2017). By actively engaging the community, we can foster a supportive environment that encourages and facilitates positive health behaviours.

Community support can be provided through a range of facilities and resources. Peer support groups (Callus & Pravettoni, 2018), local health clinics (Wang et al., 2017), recreational centers, and other community resources (Adams et al., 2019) play a vital role in offering social interaction, emotional support, and practical guidance. These community-based resources contribute to enhancing an individual's self-management skills and overall competence in managing their chronic condition (Anh et al., 2013). By leveraging these various support systems, individuals can receive the necessary assistance, encouragement, and knowledge to effectively navigate their self-management journey.

Digital Education

At this level of the DigiCare Model, the role of digital devices and technologies in promoting self-management is examined within a broader context. As global access to digital devices and the internet continues to improve (International Telecommunication Union, 2022), it becomes increasingly important to integrate these technologies into healthcare delivery. This requires ongoing education and awareness of the benefits of digital healthcare (Mensah et al., 2023), as well as sufficient competence among healthcare professionals to utilize digital technology in both hospital settings (Konttila et al., 2018) and remote healthcare settings for both professionals and patients (Prodhan et al., 2018).

One approach to facilitate the shift from in-person to online and remote care for chronic diseases is to combine two different methods of supporting the individual's self-management abilities. An intervention that involves both guidance from a healthcare professional and participation in online coaching helps enhance the patient's knowledge and awareness of their condition, reduces anxiety, and increases their motivation to improve their well-being (Early et al., 2017).

Decision-makers need to be supported in recognizing the potential of digitalization to shift the burden of chronic disease management from healthcare services, such as hospitals and healthcare centers, to the community by utilizing digital tools for healthcare delivery (Uddin et al., 2017). This necessitates additional training for healthcare professionals in the use and acceptance of technology, as well as the ability to advocate for and support patients in utilizing digital healthcare services (Nguyen et al., 2022). Furthermore, it requires significant investments in resources, particularly in low-income countries (Alam et al., 2020). It is important to note that the design of a digital healthcare platform necessitates a thorough understanding of its benefits, values, and potential risks, including considerations related to interfaces, infrastructure, users, data security, and local regulations (Ruokolainen et al., 2023).

The use of technology in healthcare and self-management of chronic diseases can save time, reduce the need for travel to healthcare facilities, improve communication and involvement among families and healthcare providers, and enhance safety in care.

Integrating technology into healthcare services can lead to improvements, although it may present certain barriers. Technology integration directly impacts patient care and related tasks, such as equipment use and service, while also requiring individuals to acquire new skills and potentially enhancing their daily work activities. The use of technology in healthcare and self-management of chronic diseases can save time, reduce the need for travel to healthcare facilities, improve communication and involvement among families and healthcare providers, and enhance safety in care. However, it is important to note that the use of technology can also evoke feelings of anxiety, stress, and a sense of reduced personal control for patients, families, and healthcare professionals (Bayramzadeh & Aghaei, 2021).

Digital education aimed at developing skills in using digital tools and accessing additional support for managing chronic diseases should be considered a future goal in many low- and middle-income countries. This is crucial for increasing access to care and promoting equity in healthcare services (WHO, 2022; WHO, 2023). Digital platforms offer opportunities to raise awareness about chronic diseases, share self-management strategies (Frith et al., 2021), and combat stigma at the community level (Hao et al., 2022; Livesey et al., 2022). Furthermore, these platforms can provide online forums where individuals can connect with others facing similar health challenges, fostering virtual support communities (Hao et al., 2022).

In conclusion, the community in the DigiCare Model is not just a backdrop against which individual chronic disease management occurs; it is an active and dynamic entity that can both facilitate and hinder self-management. Engaging with communities to improve understanding, reduce stigma, foster supportive environments, and leverage local resources can be a powerful approach to enhance chronic disease self-management competence.

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3.5 The Fourth Layer of the DigiCare Model: Society

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The DigiCare Model encompasses various concepts across its different layers, aiming to empower individuals in their self-management journey and equip healthcare professionals with the necessary skills. The initial three layers of the model emphasize the importance of the individual, family, and community in developing self-management competences for chronic disease care. The fourth and final layer expands the scope to the level of society, acknowledging its significant impact on individuals' health and well-being. Society plays a vital role in providing the necessary infrastructure and resources to promote effective healthcare and improve health outcomes. In this chapter, we will delve into the key concepts within the society layer. To enhance understanding of the topic, we will conclude the chapter by recommending additional readings for further exploration.

The final and most encompassing layer of the DigiCare Model is the society layer. Within this layer, various concepts come into play, including leadership, policy development, laws and regulations, technological infrastructure, socio-economic factors, and the overall structure of healthcare delivery systems (Figure 12).

Every individual is influenced by the society they belong to, and the advancements of digitalization within that society, particularly in the field of digital healthcare. This encompasses the infrastructure of healthcare services, key stakeholders in information technology, and decision-makers at the national levels. (Natakusumah et al., 2022.) Conversely, the impact also works in the opposite direction: individuals with good health literacy skills and good health status can have a positive influence on society. A healthier population contributes to the benefits of society. Individuals who are in good health, including those with well-managed chronic conditions, can actively participate in the workforce, provide for their families, and contribute to the overall well-being of their communities (WHO, n.d.). Therefore, the societal level holds significant importance within the DigiCare Model.

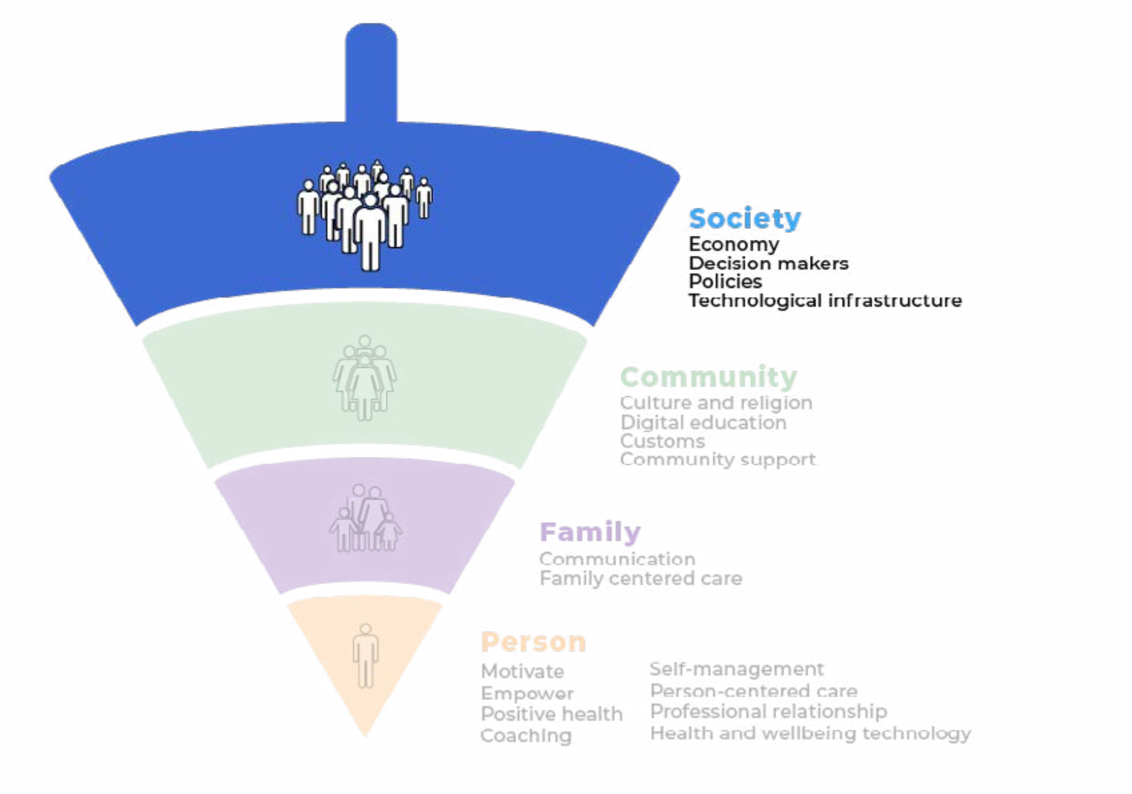

Figure 12. The fourth layer of the DigiCare Model: Society.

At this society layer, various factors come into play, including policy and decision-makers, the economy, and technological infrastructure. It is important to recognize that certain factors may currently hinder the full utilization of digital solutions to support self-management and patient coaching. However, it is also crucial to identify the reasons that highlight the necessity of harnessing digital solutions more effectively in healthcare delivery (McCool et al., 2022). The economic development of Asian countries is evident in the significant rise in the number of families owning smartphones (Uddin et al., 2017), as well as the increasing traffic congestion resulting from a higher number of cars competing for road space (Xia et al., 2022). These factors underscore the importance of exploring alternative means of interacting with healthcare providers, rather than solely relying on physical visits to healthcare facilities.

Policies and Decision-Makers

Policies and decision-makers in various sectors of society have a significant influence over the support provided to individuals managing chronic diseases. These decision-makers possess the authority to establish and enforce policies that uphold the well-being of people with chronic diseases. This includes ensuring equal access to healthcare, safeguarding patients' rights, and promoting the integration of digital health solutions. Policies serve as guidelines for resource allocation in the healthcare sector and inform the implementation of different interventions, including digital innovations (WHO, 2022).

> **Decision-makers possess the authority to establish and enforce policies that uphold the well-being of people with chronic diseases.**

Policy makers and influencers hold a crucial role in transforming the cultural perspectives surrounding healthcare. In several Asian countries, such as Vietnam and Bangladesh, policy makers have recognized the potential of digital solutions in addressing diverse societal challenges. They have developed strategies and policies to foster digital transformation across various sectors (Chuc et al., 2023; Sharker et al., 2021).

Findings from a policy content analysis conducted in Bangladesh on the implementation of a digital human resources management tool underscore the significance of national commitment in integrating information and communication technology (ICT) in healthcare services. A well-defined strategy for policy implementation monitoring and effective coordination among and between different ministries are also vital factors for achieving success in this endeavour (Sharker et al., 2021).

Health policies play a crucial role in shaping self-management support by influencing various aspects, including the promotion of digital services and solutions in healthcare, prioritization of long-term illness care, and enhancement of community-based services and structures that ensure continuous care. The establishment of effective primary and community care services is essential for a high-quality health system, benefiting the overall health and well-being of the population while also being cost-effective for society (Jones, 2010).

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In the literature review (Appendix 2) conducted during the design of the DigiCare Model (Read more in Chapter 2.2), several ethical perspectives from individual, community, and societal viewpoints emerged in relation to digital healthcare. From an individual's perspective, certain rights are associated with digital healthcare, including the autonomy to choose healthcare services, which can impact the cost of healthcare and environmental factors (Wang et al., 2019). Additionally, maintaining confidentiality, security, and privacy of personal health information are responsibilities of service providers and society as a whole (Altameem et al., 2022; Pool et al., 2022).

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Healthcare professionals, on the other hand, carry the responsibility of acquiring and maintaining competence in the field of digital healthcare, while upholding high ethical standards. This entails staying up-to-date with advancements in technology and digital tools, as well as acquiring the necessary skills and knowledge to effectively navigate the digital healthcare landscape. To support healthcare professionals in fulfilling this responsibility, society must provide the required infrastructure that ensures trust and transparency in digital healthcare practices. (Konttila et al., 2019.) Moreover, a fundamental value in this context is the governance of healthcare data, including data privacy and responsible management (Suhail et al., 2021), which is influenced by laws and regulations (Sarabdeen & Moonesar, 2018), as well as societal structures and policy goals (Alam et al., 2020).

> **Healthcare professionals carry the responsibility of acquiring and maintaining competence in the field of digital healthcare, while upholding high ethical standards.**

Society and its leaders play a pivotal role in achieving equity in digital healthcare, encompassing principles of non-discrimination, non-stigmatization, and promoting environmental and societal well-being (WHO, 2022).

Read more about Digital Health Policies

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Resilience Development Initiative & Aly, D (2023). ASEAN Socio-Cultural Community. Transforming the digital health landscape in Asean. Retrieved 30.4 from https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=0CAIQw7AJahcKEwjA8ueP5uX_AhUAAAAAHQAAAAAQAw&url=https%3A%2F%2Fasean.org%2Fwp-content%2Fuploads%2F2023%2F02%2FASCC_Policy-Brief_Issue_6_Jan2023.pdf&psig=AOvVaw3nfezjpXk2mULAsh41DX-8Y&ust=1688035959584948&opi=89978449 .

Economy and Technological Infrastructuree

Society influences the broader structural factors that impact chronic disease management. Economic factors, policies, and the technological infrastructure can either facilitate or hinder effective disease management and the delivery of healthcare services in both physical and online environments. The economic situation of a society has implications for the overall quality of life, including individuals living with chronic diseases (The Economist Impact, 2021). Economic factors can influence access to healthcare services, and cost-effectiveness is crucial for the sustainable financing of healthcare services at the societal level. Effective self-management of chronic diseases has been demonstrated to significantly reduce unnecessary utilization of healthcare services at both primary and secondary care levels (Barker et al., 2018).

The economic benefits of digital healthcare stem from improved and cost-effective monitoring systems for health status and disparities, efficient care management, and the ability to easily disseminate health-related information, thereby promoting healthy lifestyle choices. Additionally, the prevention and management of the increasing burden of chronic diseases have a significant impact on society, affecting healthcare costs and the number of productive working years lost. By investing in digital healthcare, society can provide flexible access points to healthcare, overcome geographical barriers, and enable comprehensive healthcare services within an ecosystem (The Economist Impact, 2021).

Society plays a vital role in providing the necessary infrastructure for the use of technology in healthcare and self-management. The technological infrastructure within society is crucial, as it can either facilitate or hinder the adoption and utilization of digital health technologies for disease management (Bayramzadeh & Aghaei, 2021). A robust technological infrastructure enables efficient information delivery between patients and healthcare professionals, leading to a heightened sense of empowerment and active participation in one's own care. Additionally, it provides essential support for healthcare professionals, such as built-in alerts and the ability to allocate time and resources effectively within the already burdened healthcare sector. (The Economist Impact, 2021.)

However, it should be noted that a substantial economic investment is required to improve the technological infrastructure, particularly in low- and middle-income countries (Alam et al., 2020). In Asian countries, for instance, internet access can pose challenges due to developing infrastructure and the rapid increase in the number of users. Despite these challenges, technological infrastructure is progressing rapidly in certain Asian societies. (Ahmed et al., 2020.) Furthermore, healthcare education programs are facing the challenges of adequately preparing future healthcare professionals for a rapidly evolving technological society. It is essential for educational institutions to adapt their curricula to incorporate digital healthcare advancements and ensure that future healthcare professionals are well-prepared to navigate and leverage technological innovations in their practice. (Konttila et al., 2019.)

The DigiCare Model aims to equip healthcare students with the necessary tools and skills to facilitate future-oriented healthcare within a digitalized healthcare ecosystem. By doing so, it empowers patients with chronic diseases to harness the opportunities provided by available technologies.

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3.6 Implementation of the DigiCare Model in the Curriculum

Nina Smolander

The DigiCare project has developed the DigiCare Model and Learning Packages, which have been tested in higher education institutions within the project consortium. These outputs can be utilized in healthcare education wherever they are deemed useful. Although originally designed for the Asian context, the DigiCare project outputs are adaptable and flexible for use in different settings. In this chapter, we will provide a brief description of the areas where we have implemented the DigiCare project outputs and offer ideas on how they can be integrated into diverse curricula. By sharing our suggestions, we aim to inspire healthcare educators and professionals to explore the potential application of the DigiCare Model and its Learning Packages in their own educational programs.

The DigiCare Model (Read more in Chapters 3.1-3.6) and Learning Packages (Read more in Chapter 4.1) relevant to its use are part of our main outputs. These outcomes can be utilized by all educational institutions interested in the subject area, with a need to enhance their own education in the areas of digital skills for healthcare students and coaching in self-management for patients with chronic diseases.

Our model and learning packages have been designed to be highly adaptable to the specific needs of each educational institution. They can be utilized in theory classes, clinical training, or placements as they are, with partial modifications, or by adding additional content based on the institution's and student groups' needs. They can be seamlessly integrated into existing curricula as a complete set or as individual sections tailored to the requirements and curriculum of different institutions. All the outputs we have generated are freely available for download and use (Available at Appendix 7).

> **The DigiCare Model and its Learning Packages can be integrated into the teaching of any course or subject area where patients' lifestyle choices have an impact on care and prognosis of the disease.**

In the design of the DigiCare Model and its Learning Packages, significant emphasis is placed on pedagogical aspects that revolve around active learning methods, e-learning, and the utilization of digital solutions in both teaching and healthcare contexts. These components aim to enhance the competency of healthcare teachers and foster a student-centered learning approach, in addition to addressing subject-specific content (Read more in Chapter 4.2).

The DigiCare Model and its Learning Packages can be integrated into the teaching of any course or subject area where patients' lifestyle choices have an impact on care and prognosis of the disease. Coaching (Rutten et al., 2014) and positive and professional communication (Russell et al., 2023) have the potential to motivate patients to make changes in their health habits and maintain a healthier lifestyle (Rutten et al., 2014).

The utilization of in-person, online, or hybrid coaching has demonstrated positive results in various contexts, including:

- Facilitating lifestyle changes for patients with diabetes (Rise et al., 2013).
- Providing weight control coaching for individuals with diabetes (Komkova et al., 2019).
- Supporting hypertension coaching (Nguyen-Huynh et al., 2022).

- Reducing cardiovascular risk through coaching in smoking cessation, weight control, and managing hypercholesterolemia (Yousuf et al., 2018).
- Encouraging physical activity through coaching interventions (Rutten et al., 2014).
- Increasing general health awareness, such as blood pressure and blood glucose monitoring, for patients with chronic diseases (Lindberg et al., 2017).

During the DigiCare project, the DigiCare Model and Learning Packages were implemented in Bachelor and Master level courses in Vietnam and Bangladesh. These courses aim to prepare students for their professional careers and further studies, facilitating their ongoing professional development. The integration of the DigiCare Model and Learning Packages was carried out in existing courses, both mandatory and elective, and they were also offered as standalone courses for post-graduate studies.

The DigiCare Model and its Learning Packages have been used in various courses, including:

- Community Health Nursing
- Caregiving for diabetes patients
- Caregiving for hypertension patients
- Caregiving for Chronic heart failure patients
- Nursing care for patients with chronic diseases
- Self-management education for patients with chronic diseases
- Medical and Surgical nursing
- Nutrition and dietic.

At the initial stages of implementing the DigiCare Model and Learning Packages, it is important to prioritize the familiarization and training of healthcare teachers. This ensures that they are well acquainted with the materials, coaching models, and active teaching methods (Read more in Chapters 4.1 and 4.2). Equally important is the introduction of the topic and methods to healthcare students, particularly if active learning methods are not commonly utilized in their higher education institution. By providing comprehensive training and guidance, both teachers and students can effectively utilize these outputs and maximize their learning experience.

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4. The DigiCare Educational Program

There was a clear and evident need to enhance the healthcare education curricula in the Asian partner institutions, encompassing both educational content and pedagogical structure. The design of the DigiCare Educational Program emerged as a collaborative effort involving the DigiCare consortium and all relevant stakeholders. This educational program serves as the foundation where the DigiCare Model and its Learning Packages have been utilized, further developed, and refined to reach their final form. Furthermore, the valuable results and feedback obtained from the participants involved in the pilot phase (refer to Chapters 5.2-5.6) were extensively gathered throughout the process of creating the educational program.

This chapter presents a comprehensive overview of the educational program, which was designed and implemented as an integral part of the DigiCare project. It also highlights the pedagogical methods employed during the project.

4.1 Structure and Content of the Educational Program

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The design of the DigiCare Educational Program is of utmost importance within the overall scope of the DigiCare project. It forms the foundation upon which the project's objectives and outcomes are built. To create an educational program, which can be implemented in Asian Higher Education Institutions (HEI), the DigiCare consortium drew upon the findings of literature reviews conducted by each Asian partner HEI, empirical expertise provided by the national DigiCare project specialists and theoretical framework of the program development through implementation research. Moreover, the results and feedback obtained from the DigiCare pilots contributed to the development of the educational program. In this chapter we introduce the educational program developed and piloted as part of the DigiCare project.

The DigiCare Educational Program is a structured program that combines the teaching of substance-specific knowledge related to coaching for self-management in people with chronic diseases with digital competence in healthcare (Read more in Chapters 3.1-3.5) and the use of active pedagogical methods in teaching (Read more in Chapter 4.2). A structured educational model has a significant impact on healthcare learning, improving students' understanding and competence in healthcare practice (Musallam et al., 2021) and promoting continuous learning among healthcare professionals (Holskey & Rivera, 2020). It enhances students' clinical skills, critical thinking, boosts their self-efficacy and confidence as well as their teamwork and collaborative skills, which ultimately leads to valuable competence in delivering clinical care (Musallam et al., 2021; Rusch et al., 2018). Furthermore, structured educational programs enhance student satisfaction, which plays a crucial role in evaluating their clinical experiences and performance (Musallam et al., 2021).

Integrating digital technologies into healthcare education is essential as it prepares students for the use of technology in healthcare practice, aligning with the ongoing digitalization trends in society (Morze & Strutynska, 2021). It also facilitates the transition from theory-based teaching to more active and student-centered teaching methods, promoting self-directed learning (Mingorance Estrada et al., 2019; Nguyen et al., 2016). The digitalization of education goes beyond mere tool and platform utilization; it requires a fundamental transformation in learning and teaching activities, methods, and the roles of teachers and students in the educational process (Díaz-García et al., 2022). Additionally, it highlights the importance of digital health literacy and its development during healthcare education (George et al., 2021).

The DigiCare Educational Program integrates active pedagogical methods into its structured learning model, along with substance-specific content and digitalization in education.

The DigiCare Educational Program integrates active pedagogical methods into its structured learning model, along with substance-specific content and digitalization in education. Active pedagogical methods have a significant impact on improving students' learning outcomes (Mingorance Estrada et al., 2019) and enhancing their satisfaction with the learning process, both individually and in group settings (Hyun et al., 2017). However, implementing these methods requires teacher training and acceptance, confidence in technological skills, and careful preparation in designing class activities (Colomo Magaña et al., 2022; Hao & Lee, 2016; Kim et al., 2021). These active pedagogical methods also contribute positively to teachers' competence and their ability to facilitate active knowledge construction and collaborative learning (Niemi et al., 2016).

Competence-based and conceptually designed educational programs have the potential to facilitate effective transformative learning. Particularly, when combined with active learning methods that prioritize students' experiences, discussions, and activities, these programs create an environment for students to construct knowledge and enhance their professional capabilities (Peterson & Lundquist, 2021). This forms the foundation of the DigiCare Educational Program.

Furthermore, when integrating a new competence area like coaching into the curriculum, it is essential to consider the involvement and influence of institutional leadership, as well as allocate adequate time for the implementation of this change (Calzone et al., 2018).

« What does the DigiCare Educational Program offer? »

The DigiCare Educational Program offers flexibility, allowing for adaptation and customization to suit different curricula, even beyond the Asian context. While initially implemented in Asian partner universities, its principles and components can be applied to healthcare education programs worldwide. The core concepts of self-management, motivation, positive health, professional and social-economic relationships, digital care, and coaching are relevant in various healthcare settings. This program is a critical aspect of the DigiCare project, serving as the foundation for educating healthcare students on digitalized healthcare and empowering them to effectively coach patients both in-person and online. To achieve this, a diverse range of teaching methods and materials were employed, and the program was structured into six cycles.

Healthcare teachers and institutions in and outside the Asian context have the opportunity to utilize the DigiCare Educational Program as a framework, making necessary adjustments and additions to align with their unique curriculum requirements, local healthcare practices, and student needs. The program's adaptability ensures its relevance and effectiveness in various educational settings.

Developing the Educational Program

The design of the educational program was based on the Consolidated Framework for Implementation Research (CFIR) (Figure 13). The CFIR offers a comprehensive framework for comprehending the various factors that influence the implementation of interventions. It encompasses team-level influences and determinants at the system level (Means et al., 2020.) This framework proves particularly valuable when planning and assessing multiple implementation initiatives aimed at changing practices (Keith et al., 2017).

The CFIR framework consists of five domains that cover different aspects of intervention implementation (Keith et al., 2017; Means et al., 2020).

- **Domain 1:** focuses on the characteristics of the intervention itself, including its source, evidence strength, relative advantage, adaptability, trialability, complexity, design quality, and cost.
- **Domain 2:** explores the outer setting, considering factors such as needs and resources of the university, cosmopolitanism, peer pressure, and external policies and incentives.
- **Domain 3:** delves into the inner setting of the organization or university, examining its structural characteristics, networks and communication, culture, implementation climate, and readiness for implementation.
- **Domain 4:** centers on the individuals involved, including their knowledge, beliefs, self-efficacy, state of change, and identifica tion with the organization.
- **Domain 5:** addresses the implementation process, covering planning, stakeholder engagement, execution, and reflection and evaluation. (Keith et al., 2017; Means et al., 2020)

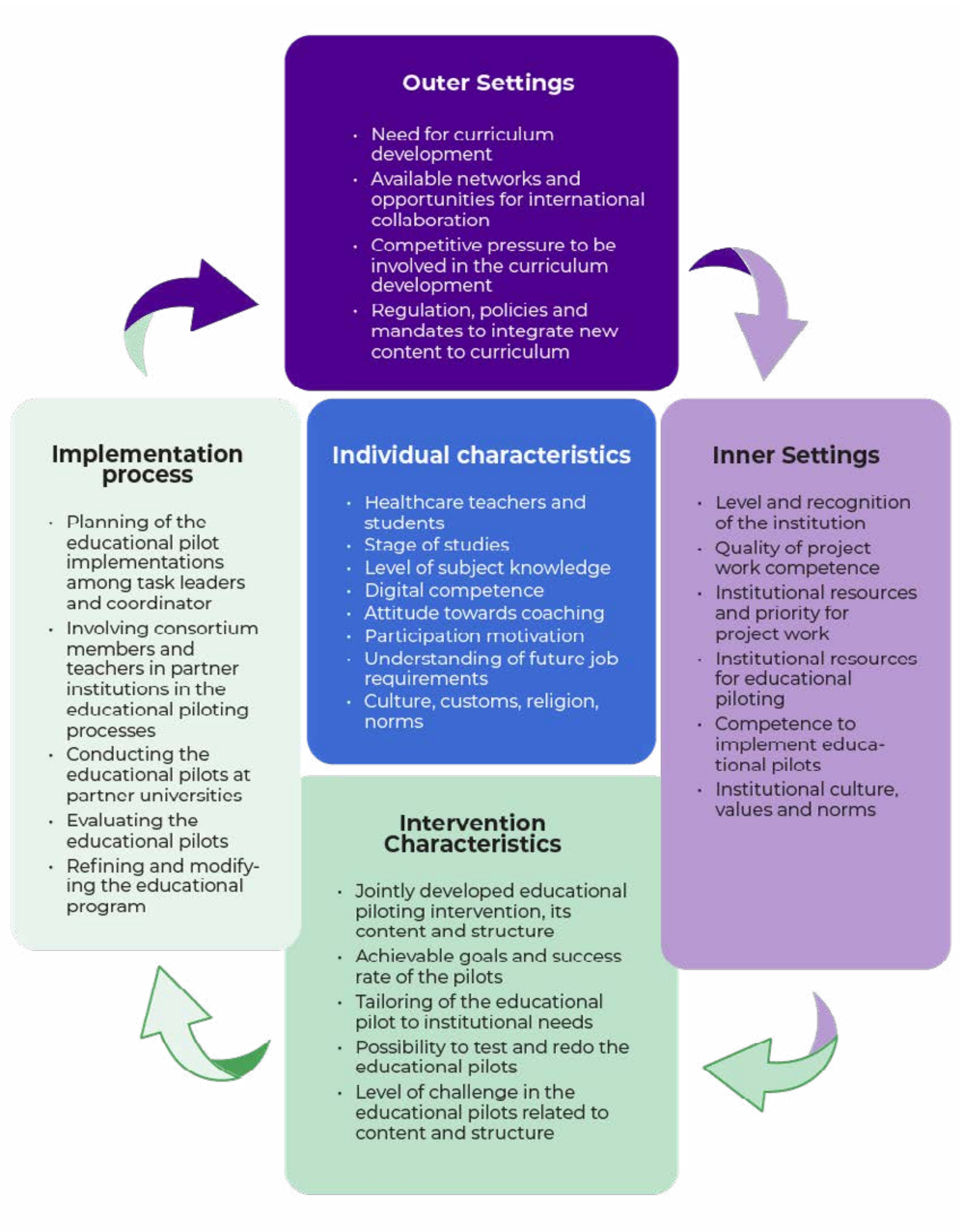

Figure 13. The Characteristics of the Developing Process of the DigiCare Educational Program. (Keith et al., 2017; Means et al., 2020, modified)

The DigiCare Educational program was developed collaboratively, involving a wide range of stakeholders, including consortium members, educators, researchers, and healthcare students. Through active participation, feedback, and iterative improvements throughout the pilot cycles, the program was tailored to meet the specific needs of the Asian context, benefiting from the collective knowledge of the diverse group involved (Russell et al., 2023). This collaborative approach fostered a sense of ownership and commitment among stakeholders, ensuring that the program's content, methodologies, and strategies aligned with educational goals. Collaborative approach promotes inclusivity, diversity, and co-creation (Joughin et al., 2022), resulting in a program that reflects the collective expertise and insights of those involved (Charli-Joseph et al., 2016).

The development process was initiated by conducting a needs assessment among consortium members, which was informed by the findings of the literature reviews (Read more in Appendices 1-6). The needs assessment aimed to identify the specific requirements and challenges faced in healthcare education by the partner institutions. Through this assessment, valuable insights were obtained, enabling the identification of focus areas and priorities for the educational program.

The evidence informed DigiCare educational program aims to enhance the quality and effectiveness of healthcare education. It integrates successful active teaching methods and interventions that have demonstrated positive outcomes in healthcare education (Farokhzadian et al., 2022). The DigiCare educational program integrates innovative active pedagogical approaches (Gagné et al., 2021) and utilizes digital technologies in both healthcare coaching (George et al., 2021) and education. These innovative approaches and technologies have the potential to enhance learning experiences and outcomes for healthcare students (Mingorance Estrada et al., 2019). By strategically incorporating technology, the program facilitates interactive and engaging educational activities, supports student-centered and self-paced learning, and provides access to resources and support (Mingorance Estrada et al., 2019).

A key focus of the program is student-centered learning, empowering students, promoting active engagement, and nurturing critical thinking and problem-solving skills. The program creates a supportive learning environment that encourages student participation and autonomy (Hyun et al., 2017).

The development process followed an iterative approach, incorporating stakeholder feedback, pilot testing, and evaluation to continuously improve the program. Furthermore, to suit the characteristics of the Asian context, the program underwent crucial adaptations, guided by the collaboration and expertise of local specialists (Sánchez-Franco et al., 2021). Their insights ensured the program's relevance and effectiveness for Asian students and healthcare professionals, bridging the gap between global best practices and local needs. By doing so, the program aims to enhance healthcare education in Bangladesh and Vietnam, providing a meaningful and impactful learning experience for healthcare professionals and students (Chowdhury, 2016).

A key focus of the program is student-centered learning, empowering students, promoting active engagement, and nurturing critical thinking and problem-solving skills.

Training of the Healthcare Teachers

Training the healthcare teachers was a fundamental and essential step in the implementation of the DigiCare Educational Program. Acknowledging the significant role that teachers play in effectively delivering the new educational program (Wighus & Bjørk, 2018), specific attention was given to their preparation and professional growth. To ensure effective delivery of the educational program and its components, it is vital for teachers to possess a thorough understanding of the DigiCare Model (Read more in Chapter 3), the relevant learning packages, and the recommended active pedagogical methods (Read more in Chapter 4.2). It is recommended that teachers undergo training using the same protocol and materials as the students, excluding the patient-focused training (Table 1). Furthermore, it is encouraged for teachers to familiarize themselves with the theoretical foundations of the various active teaching methods and integrate them into their instructional practices.

Adopting a "learning-by-doing" approach, which is a classic active learning method discussed by John Dewey (Shank, 1997), is highly suitable for teacher training. This approach enables teachers to engage in hands-on experiences, actively participating in the learning process while gaining practical insights and skills. By immersing themselves in the training activities and exercises, teachers can effectively internalize the concepts, content, and methods of the DigiCare Model, enhancing their ability to effectively deliver the program to their students.

The DigiCare Implementation Plan for Healthcare Students

The training of healthcare students follows the implementation plan specified in Table 1, along with its corresponding explanations below the table. Similar to teachers, student training should span at least three separate days to accommodate the completion of initial tasks.

However, the theoretical component can be divided into multiple teaching sessions, as required. An example PowerPoint presentation is provided in Appendix 7, which can be customized by teachers to align with the students' level of understanding on the topic.

Given that the DigiCare Model can be implemented as an independent course, integrated into an existing curriculum, or used in separate components, the assessment should align with the requirements set by your university. When evaluating students' learning outcomes, it is recommended to assess students' learning diaries through either peer assessment exclusively or a combination of peer and teacher assessment At a minimum, students should receive feedback on their learning diaries based on the provided criteria.

Table 1. Implementation Plan of the DigiCare Model for students' Theoretical Classes and Training Sessions.

Learning Package content	Learning goals Students...	Preliminary tasks	Peda-gogical methods	Resources & Materials	Pre-limi-nary tasks (min)	Class (min)	Additional tasks for student's own devel-opment
1. Introduction	Know the components of the learn-ing pac kages and how to use the differ-ent parts of the package.		Inter-active lec-ture.	Power Point presenta-tion no: 1.		15	
2. DigiCare Model	Know the elements of the DigiCare Model.		Inter-active lec-ture.	Power Point presenta-tion no: 2.		30	
3. Professional communica-tion	Know general principles of professional communica-tion.		Inter-active lec-ture.	Power Point presenta-tion no: 3.		30	Dig-iNurse e-book perma-nent link
4. Motivating to lifestyle changes	Know general principles of how to motivate patients for life change.		Inter-active lec-ture.	Power Point presenta-tion no: 4.		30	
5. Positive health	Understand the concepts of positive health a nd salutogen-esis and their relation to self -manage-ment.		Inter-active lec-ture.	Power Point presenta-tion no: 5.		30	
6. Self-management	Know general principles of the concept of the self-management.	Read DigiNurse e-book, Chapter 5.4 Self-man-agement, pp. 124-133 Write down 5 bullet points. Why is self-manage-ment important in the man-agement of chronic conditions? Teacher will check students' notes before the lesson	Inter-active lecture	Power Point presenta-tion no: 6. Flinga or some other interac-tive wall.	30-60 min	30	Dig-iNurse e-book perma-nent link.

Learning Package content	Learning goals Students...	Preliminary tasks	Peda-gogical methods	Resources & Materials	Pre-limi-nary tasks (min)	Class (min)	Additional tasks for student's own devel-opment
7. Coaching	Know general principals of coaching.	Read DigiNurse e-book, Chapter 5.6 Coaching, pp. 148-160. Write down 5 to 10 bullet points: What does coaching mean in the healthcare context according to the chapter? Teacher will check students' notes before the lesson		Power Point presenta-tion no: 7.	30 min	15	Dig-iNurse e-book perma-nent link.
8. 5A's coach-ing model	Know general principles of 5A's coaching model.	Read DigiNurse e-book, Chapter 5.7 Coaching models, pp. 161-173. Watch vid-eos of 5A's Model e.g.: The 5 A's and Tobacco Cessation, The 5As of Obesity Manage-ment™, Write down 5 to 10 bullet points: How the dis-cussion and interaction between patient and healthcare provider on the video differs from your own experience? Teacher will check students' notes before the lesson		Power Point presenta-tion no: 8 Flinga or some other inter-ac-tive wall.	30 min	30	Dig-iNurse e-book perma-nent link.

Learning Package content	Learning goals Students...	Preliminary tasks	Peda-gogical methods	Resources & Materials	Pre-limi-nary tasks (min)	Class (min)	Additional tasks for student's own devel-opment
9. GROW coaching model	Know general principles of GROW coach-ing model.	Read DigiNurse e-book, Chapter 5.7 Coaching models, pp. 161-173. Watch vide-os of GROW Model e.g.: The GROW Coaching Model The GROW Model Write down 5 to 10 bullet points: How the discussion and interac-tion between patient and healthcare provider on the video differs from your own experience? Teacher will check students' notes before the lesson		Power Point presenta-tion no: 9. Flinga or some other inter-ac-tive wall.	30 min	30-45	
10. Integrating digital tools into coaching	Know the basics of dig-ital coaching, understand the potential of digital-ization in self-manage-ment		Inter-active lec-ture. World café.			30-45	

Learning Package content	Learning goals Students...	Preliminary tasks	Peda-gogical methods	Resources & Materials	Pre-limi-nary tasks (min)	Class (min)	Additional tasks for student's own devel-opment
Training session: Patient coaching and professional interaction Skills practice with peer students	Learn to perform professional communica-tion skills. Apply GROW and 5 A's coaching model in coaching practice.	Revise and watch the videos of Grow model and 5A's model. Write a short starting point story of yourself acting as a coachee: What is your imaginary or real health issue you want to discuss about, prob-lem caused by NCD?	Low fidelity simu-lation (1)		60-120 min	90	
Clinical Train-ing: Patient coaching and professional interaction skills practice with patient	Are able to perform professional communica-tion skills. Are able to apply GROW coaching model and 5 A's coaching model in coaching practice.	Revise and watch the videos of Grow model and 5A's model.	Clinical prac-tice (3)	Instruc-tions for writing learning diary (4) Instruc-tions for peer review (5)	30 min	60	

Explanations of the table

1. Three-participant groups: coach, coachee and observer; total 3 cycle of practice for 1 group. Each student practices the role of a patient/coachee, coach and ob-server. Reflection discussion in the three-participant group after each cycle about coaching and professional communication, general reflection at the end of the session and wrap up with the teacher.

2. Instructions and orientation to the task 15 minutes, group role plays and reflec-tion 20 minutes per session, general reflection, and wrap-up 15 minutes.

3. Each student selects 3 patients or relatives with NCD and agrees separate coach-ing sessions with them. Student agrees a topic for coaching related to patient's or relative's NCD (not the whole disease), e.g., weight management with diabetic patient, salt restrictions for cardiac insufficiency patients etc. Coaching sessions can vary in length. Patient's real-life topic related to a NCD is the starting point of coaching. Student chooses suitable coaching method, GROW or 5 A's, and follows the structure and instructions of the chosen coaching method when coaching the patient or relative.

4. The aim of the learning diary is to make students own learning and reflective thinking process transparent. Students aim to combine their previous knowledge and experiences of coaching into the coaching sessions. The learning diary is not a summary of actions. Students discuss and review the coaching process critically in their learning diary. They present their own thoughts, experiences, and arguments. Anonymity must be considered in the learning diary so that the reader does not recognize the patient.

   Questions and ideas to think and answer in learning diary:
   - What did you learn during the coaching sessions?
   - Was there something you didn't understand?
   - What was new or surprising?
   - Do you want or need to find out more information on some areas related to coaching patients?
   - How this coaching experience benefit you in your future work?
   - How could coaching benefit you in your future work?
   - What kind of feedback did you get from the patients - how the patients experienced coaching?

   Writing:
   - Start your learning diary already before the first coaching session and describe your preparations to the clinical session.
   - After each coaching session:
   - Ponder and reflect on your coaching session.
   - Describe shortly the coaching sessions.
   - Write your diary entry after each coaching session by utilizing the questions above.
   - Finish your learning diary by reflecting your own learning process while participating clinical session.

5. Students will evaluate each other's Learning Diaries. Each student review one learning diary.

   Areas of assessment:
   1. Reflection
      - Has the student genuinely considered the issues covered in the coaching session.
      - Has the student genuinely considered the issues covered in their significance in their future work.
      - Reflection also includes expressing and narrating things that remain unclear even if they were later resolved.
      - All elements of Grow/ 5A's model are used in coaching session.

   2. Criticism
      - Critical attitude to the issues presented and justified by their own opinions.

   3. Evaluation
      - How does the student plan to act in the future to advance her/his skills in coaching long-term patients.

4. Extent
    - It is natural that there are no entries for all the topics covered in coaching sessions. As a rule of thumb, about 3/4 or 75% of the topics discussed have been covered.

    At least a few sentences on each topic mean about ½ A4 pages of text, making the length of the learning diary a minimum of four pages.

The DigiCare Learning Packages

The DigiCare Educational Program is built upon the concepts and content of the DigiCare Model (Read more in Chapter 3) and incorporates relevant Learning Packages. These learning packages (Figure 14) are developed by combining insights from literature reviews (Read more in Appendices 1-6), needs analysis conducted by Asian experts, empirical expertise, and research findings obtained throughout the project. The set of Learning Packages consists of an Introduction presentation and 9 subject-specific presentations.

« Professional communication has been incorporated into the learning packages based on the needs analysis and supported by relevant literature. Recognizing the significance of effective communication in healthcare education, it is given even greater emphasis and dedicated training. The healthcare professional-patient relationship is complex, and the inclusion of communication education as a lifelong professional skill is crucial. This involves utilizing peer feedback and fostering changes in the communication culture to enhance communication competence (Ammentorp et al., 2022). The coaching models within the educational program are informed by the outcomes of the European DigiNurse project, as outlined in the project application. An important enhancement to the learning packages is the integration of digital tools and application into coaching, which stems from valuable insights gained during the pilot phases. »

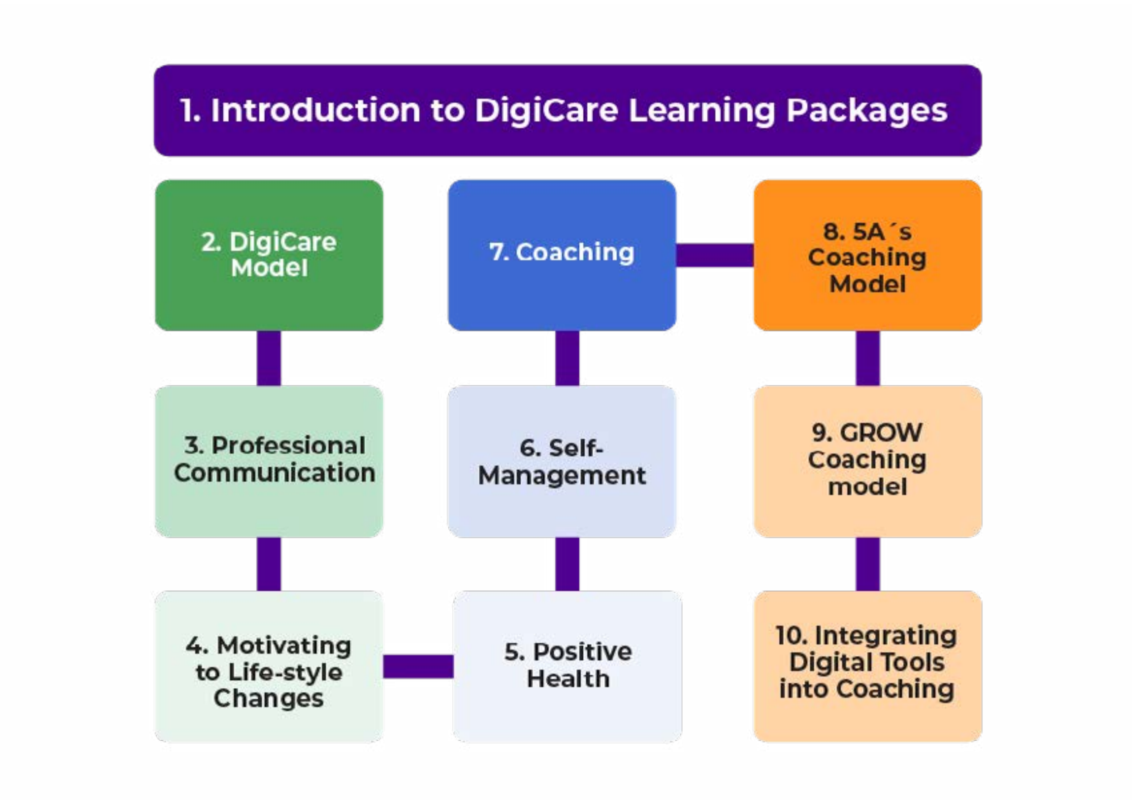

Figure 14. The DigiCare Learning Packages

The learning packages are designed to be adaptable to the specific needs of each Higher Education Institution (HEI) and healthcare student group. While they provide essential information, they are not exhaustive in their coverage. Active pedagogical tools are incorporated into the packages, including low-threshold methods like debates and small group discussions, which can be employed during theory lessons. Each PowerPoint presentation includes a Notes section below the slides, offering ideas for teachers and recommendations for further reading.

The learning packages are freely available for download on the website and SlideShare (See the Appendix 7).. They can be translated, edited, and supplemented with additional content as desired. The packages can be used as a complete set or individually, based on the specific requirements of users. Each learning package is accompanied by an introductory by introductory slides and the final slide provides information about the subsequent package in the series.

Piloting of the DigiCare Model and Learning Packages

The piloting phase of the educational program was a crucial step in its development and refinement. This phase provided an opportunity to test the program's content, structure, and teaching methodologies in a real-world educational setting. Through the active participation of students and teachers in the Asian partner HEIs, valuable feedback and insights were gathered (Read more in Chapter 5), allowing for iterative improvements and adjustments.

During the piloting phase, the content and structure of the educational program were evaluated, ensuring its alignment with the project objectives and the needs of the target audience. Lessons learned from the pilot implementation were invaluable in fine-tuning the program, making it more effective, engaging, and relevant.

The DigiCare piloting protocol (Figure 15) consisted of six distinct pilot cycles. The initial cycles focused on training healthcare teachers, while subsequent cycles (3-4) involved students testing sections of the DigiCare Model and its Learning packages. The fifth cycle took place in an international online setting, and the final cycle encompassed the full implementation of the DigiCare Model. The content and evaluation activities associated with each pilot cycle are detailed in Figure 15.

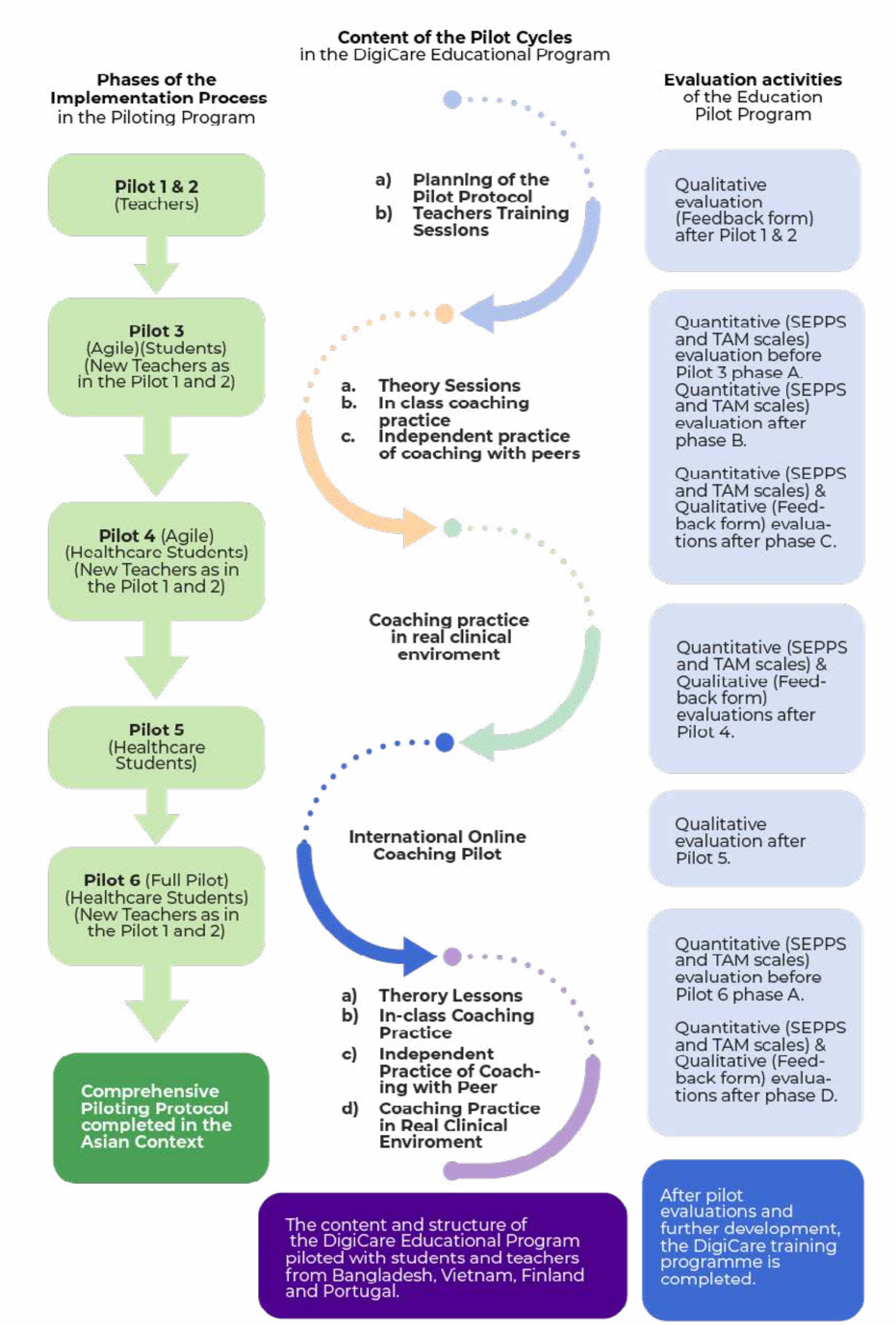

Figure 15. The DigiCare Piloting Protocol

During the implementation of the program, active engagement from both healthcare teachers and students was a priority. Teachers played a crucial role in guiding and facilitating the learning process by integrating coaching models and digital tools, creating interactive and engaging learning environments. Students actively participated by utilizing digital tools to gain practical experience and proficiency in communication, coaching practices, self-management support, and patient care.

The design and piloting of the educational program were essential components of the DigiCare project. The process of conducting literature reviews, coupled with the expertise of national project specialists, served as the foundation for developing a robust and evidence-based educational program suitable for curriculum integration. The piloting phase provided an opportunity to validate and refine the program through real-world testing and valuable feedback. By leveraging these processes, the DigiCare project aimed to develop an educational program that effectively equips healthcare students with the knowledge and skills necessary to navigate the self-management coaching and digital landscape of healthcare.

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4.2 Pedagogical Methods

Nandita Islam Pia, Annukka Huuskonen, Katariina Kunnas, Md Ridwanur Rahman, Farhana Manzoor, Essi Ylistalo and Nina Smolander

The pedagogical choices made by teachers play a crucial role in shaping the learning experience of students. Thoughtfully selected pedagogical methods have the potential to facilitate deeper learning, foster critical thinking, and promote professional growth. This chapter introduces the main pedagogical methods employed in the DigiCare Educational Program. These active learning approaches have been implemented in the DigiCare project pilots conducted in Bangladesh and Vietnam as part of healthcare professional education programs (Read more in Chapter 4.1). The chapter provides a concise overview of the following active learning approaches and their associated pedagogical methods: flipped learning, interactive lectures, simulation, world café, learning diaries, and peer review. Each method is briefly described, offering insights into their application within the DigiCare training context. Additionally, supplementary resources are provided to further explore these methods and gain a deeper understanding of how they can be effectively utilized in DigiCare training.

The term “pedagogical method” refers to the techniques, systems, and approaches employed by teachers to facilitate the learning process (Wright-Maley, 2016). Various types of pedagogical methods exist, including active learning methods and more traditional lecture-based methods. The choice of pedagogical method is influenced by variables such as the subject matter, learning objectives, student needs and abilities, and the learning environment (Chaibate et al., 2021). A lecture-based approach may be appropriate for introducing new concepts and imparting basic knowledge, while active learning methods also foster deeper critical thinking, conceptualization, and applied understanding. Traditional lectures offer a wealth of information, but it can be challenging for teachers to gauge the extent to which students grasp the subject matter. (Kozanitis & Nenciovici, 2022.)

Active learning place a strong emphasis on student participation and engagement in the learning process (Hartikainen et al., 2019). This learner-centred approach is based on constructivism, which means that students actively construct their own knowledge, while the teacher plays the role of facilitator or coach (Gagné, 2021). Various teaching methods can be employed to implement active learning (Falconer, 2016). Interactive lectures, flipped learning, world cafés, problem-based learning, and case-based learning are among the techniques that promote critical thinking and a deep understanding of the course material. When students are actively engaged in their learning, they are more likely to take ownership of their education and become fully immersed in the subject matter (Michel et al., 2009; Quinlan & Fogel, 2014). By fostering student engagement and critical thinking, active learning equip students with the skills necessary to succeed in a rapidly changing and evolving workforce.

Researchers argue that stimulation and motivation are often more crucial than intelligence for memory (Kumar, 2003). Multimedia, which combines various forms of media such as text, symbols, pictures, images, audio, video, and animations, can be utilized, typically with the aid of technology, to enhance comprehension or recall (Guan et al., 2018).

> **By equipping teachers with the necessary skills and support, active learning can be implemented to foster student engagement, critical thinking, and deeper learning experiences.**

Active teaching methods have proven to be an effective approach for enhancing education even in resource-constrained settings. These methods offer the potential to elevate educational standards in Bangladesh and other Asian countries, and they are already gaining traction in the region. In Bangladesh, teachers have recognized that the traditional teaching style often relegates students to passive roles. To introduce active learning in higher education institutions in Bangladesh, it is essential to provide existing teachers with training and appropriate guidance on integrating active teaching methods into their teaching practices (Chowdhury, 2016).

By equipping teachers with the necessary skills and support, active learning can be implemented to foster student engagement, critical thinking, and deeper learning experiences. These methods include flipped learning, interactive lecturing, low-fidelity simulation, the World Café method, and learning diaries (Figure 16).

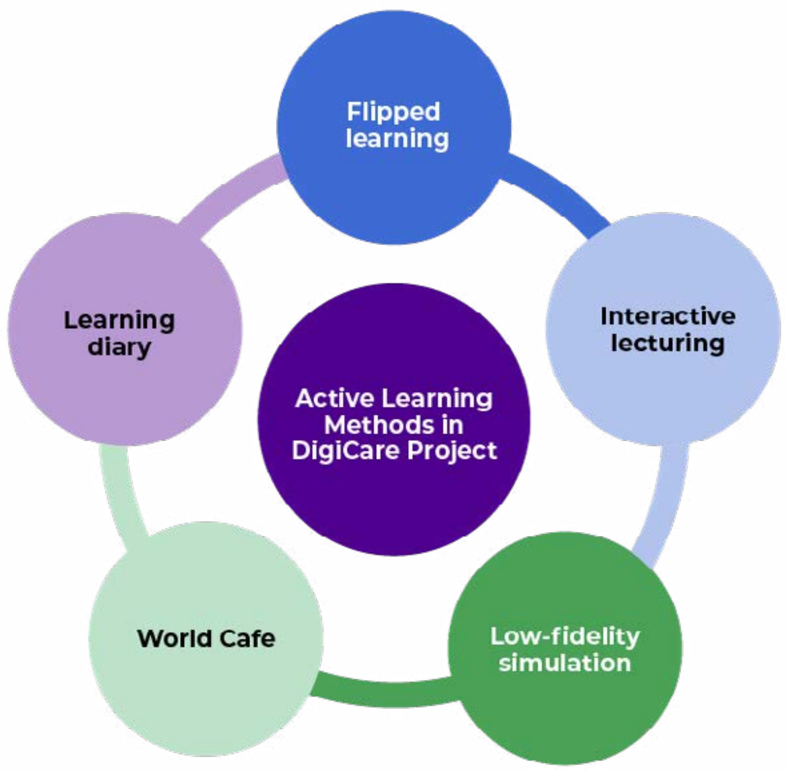

Figure 16. Different Active Teaching Methods used during the DigiCare Pilots

A brief description of the methods introduced tn the DigiCare project is provided in Chapters 4.2.1-4.2.6 and intended to serve as a starting guide for healthcare teachers.

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4.2.1 Flipped Learning

Nandita Islam Pia, Annukka Huuskonen, Katariina Kunnas, Md Ridwanur Rahman, Farhana Manzoor, Essi Ylistalo and Nina Smolander

Flipped learning is an instructional approach that flips the traditional classroom model. In this method, students are assigned pre-learning materials to review before attending class. This allows the in-class time to be dedicated to interactive activities, discussions, and practical exercises, where students can apply their knowledge, ask questions, and engage in collaborative learning. By shifting the delivery of content outside the classroom, flipped learning promotes active engagement and deeper understanding of the subject matter. In this chapter, we will explore the basics of the flipped classroom method, its key principles, benefits, and strategies for implementation. Additionally, we will provide a selection of recommended reading materials for those interested in further exploring this pedagogical approach.

Flipped learning, also known as the flipped classroom, is a pedagogical method that flips the traditional approach to teaching and learning. In this method, students take on an active role in their learning, while teacher-led instruction is delivered in a different way (Figure 16). In a flipped learning environment, students engage with the course material independently before attending the face-to-face class. They prepare for the class by studying the assigned materials provided by the teacher, gaining familiarity with the subject matter (Jensen et al., 2015; McLean et al., 2016; Sun & Wu, 2016). This approach allows for more interactive and engaging in-class activities that promote deeper understanding and application of knowledge.

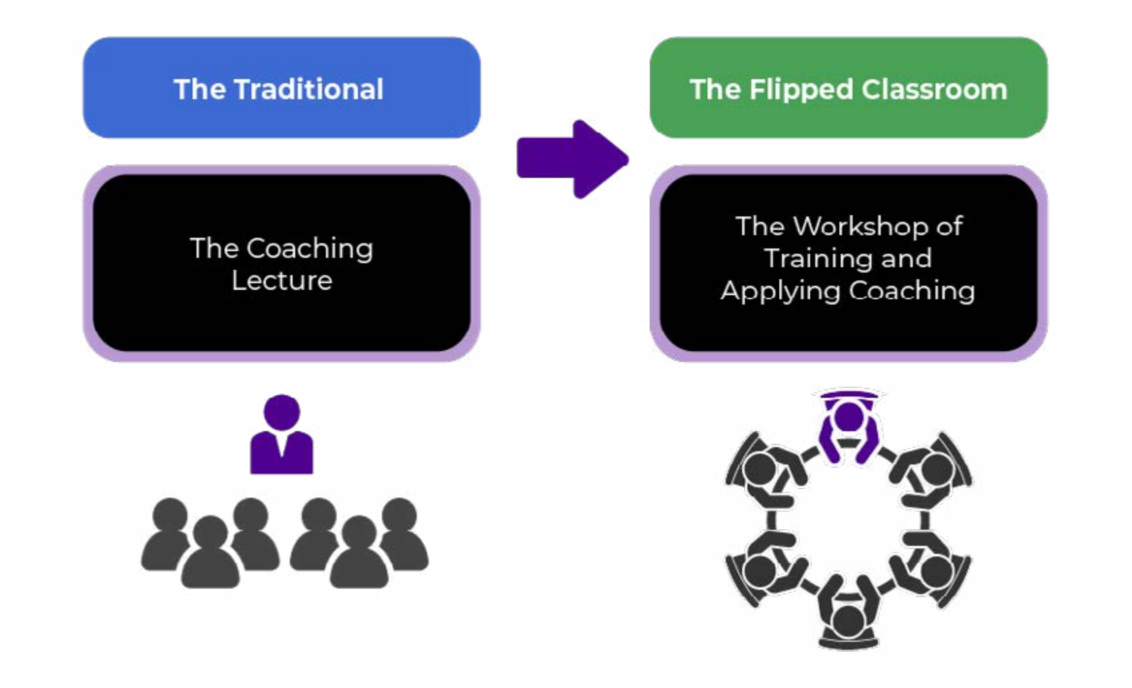

Figure 17. The shift from the Traditional Learning to the Flipped Learning.

Flipped learning utilizes technology-based resources, such as pre-recorded lectures, instructional videos, or reading materials, as ideal pre-learning materials (Sultan, 2018). Additionally, students can engage in short tests or quizzes prior to attending classes to assess their understanding of the topic and receive valuable feedback (Kim et al., 2021). This method empowers students to be active and self-directed in their learning. By providing pre-learning materials in advance, students can immerse themselves in the content at their convenience, in any location, and as frequently as needed to grasp the concepts (McDonald & Smith, 2013). This approach allows students more time to absorb new information, which contrasts with the traditional lecture format where immediate application of concepts is often expected (Cotta et al., 2016).

With the flipped learning approach, students can leverage their existing familiarity with the content during face-to-face teaching sessions, whether working independently or in small groups, to reinforce their understanding and apply the concepts in practical activities (Jensen et al., 2015; Missildine et al., 2013; Vajravelu, 2020). Classroom activities in the flipped model can involve engaging in case discussions, diagnostics, and dispositions (Riddell et al., 2017), where the teacher may ask questions for students to discuss and vice versa. It can also include watching videos (Chyr et al., 2017) and utilizing clickers for interactive participation (He et al., 2016). Essentially, the role of the teacher in flipped learning is to facilitate and encourage students to actively engage with the topic (Sun & Wu, 2016).

> **Flipped learning allows students more time to absorb new information, which contrasts with the traditional lecture format where immediate application of concepts is often expected.**

Flipped learning represents a shift in pedagogical approach and presents various requirements for teachers. From the teacher's perspective, implementing flipped learning necessitates a grasp of the pedagogical principles underpinning the approach and the teacher's role as a facilitator and educator (Hao & Lee, 2015). Creating a successful flipped learning course demands meticulous planning. It is essential for the course design to incorporate a well-structured course plan that outlines the sequence of activities, and for the teacher to actively foster interaction throughout the course. (Colomo Magaña et al., 2022.)

Flipped learning has demonstrated significant benefits compared to traditional teacher-led lectures. While the level of knowledge acquired may be similar regardless of the method used (Riddell et al. 2017, Smallhorn, 2017), flipped learning has been shown to improve students' grades (Cotta et al., 2016; Estrada et al., 2019; Ferreri & O'Connor, 2013; Kim et al., 2021; Kiviniemi et al., 2014; Vajravelu et al., 2020). However, despite the similarity in learning outcomes, the benefits of flipped learning are well documented. Students engaged in flipped learning exhibit higher levels of engagement, benefit from peer interaction, and receive more guidance and support from teachers (Smallhorn, 2017; Sun & Wu, 2016). Flipped learning also positively impacts attendance in class (Chyr et al., 2017) and enhances students' self-confidence (Estrada et al., 2019; Smallhorn, 2017).

However, while flipped learning has shown numerous benefits, it is important to acknowledge that not all students are equally satisfied with this teaching method. Some students express a preference for traditional lectures (Missildine et al., 2013; He et al., 2016), as they do not require additional time for pre-assignments (Missildine et al., 2013, Simpson & Richards, 2015). Difficulty in adapting to the new teaching method and a lack of understanding of its benefits can also contribute to student dissatisfaction. Furthermore, some students may struggle with independent studying of pre-reading material. (Missildine et al., 2013; Simpson & Richards, 2015.) However, research indicates that teachers can positively influence students' attitudes towards flipped learning by providing clear explanations of the methodology and facilitating engaging activities throughout the course (He et al., 2016). Despite these challenges, flipped learning has potential to offer enriching educational experiences for both students and teachers. In general, students have found traditional classroom lectures less attractive and engaging compared to active learning methods. (Hyun et al., 2017.)

In the DigiCare project, we implemented the flipped learning methodology in our pilot programs. We introduced online pre-reading materials and video content on the 5A's and GROW coaching models, which were new concepts for Asian healthcare students and teachers. By allowing students to familiarize themselves with these concepts before class, they were able to make the most of their classroom time for further exploration and refinement of the concepts with the guidance of their teachers and collaboration with their peers.

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4.2.2 Interactive Lecturing

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Interactive lectures are a teaching approach where the teacher incorporates elements to actively engage students during the lecture. These lectures involve breaking the flow of the lecture at least once to involve students in activities directly related to the topic being discussed. Various techniques and attention-grabbing activities are employed to promote student engagement and participation in the learning process. These activities serve as triggers to capture students' attention and facilitate their interaction with the lecture material. In this chapter, we will explore the basics of the interactive lecturing and provide a selection of recommended reading materials for those interested in further exploring this pedagogical approach.

The interactive lecture method is an evolution of traditional teacher-led lectures, integrating engaging presentation techniques with carefully designed elements of active learning facilitated by either the teacher or the students themselves (Cochrane & Rutgers University School of Health Professions, 2021). The content of the lecture is intentionally structured to activate students' thinking, promote meaningful discussions, and foster collaborative knowledge construction. Interactive lectures employ various strategies to generate interest, including adjusting the pace of the lecture and employing diverse techniques and triggers to captivate students' attention (Steinert & Snell, 1999). Examples of interactive lecture activities encompass group discussions (Kumar, 2003; Steinert & Snell, 1999), incorporating moments to brainstorm ideas related to the topic, utilizing flashcards for voting to ascertain correct answers, utilizing clinical case studies to illustrate lecture topics, and incorporating videos and online surveys (Steinert & Snell, 1999). When effectively implemented, interactive lecturing encourages students to actively participate by responding to or posing thought-provoking questions, fostering critical thinking, and facilitating the exchange of knowledge (Kumar, 2003; Steinert & Snell, 1999).

The implementation of interactive lectures has been shown to enhance students' active participation, increase engagement in the learning process, and contribute to the development of their professional identity (Watkins & Mazur, 2013). Active involvement in learning activities has been demonstrated to be more effective than passive reception of information, leading to enhanced learning outcomes (Butler, 1992; Feden, 1994; Kraft, 2012; Murray, 1991), as well as motivating students to further explore and seek additional information on the topic. Moreover, the interactive lecture approach fosters student interaction, teamwork, and the cultivation of critical thinking skills (Yakovleva & Yakovlev, 2014).

> **It is essential to review the lesson content to incorporate activities that promote student interaction, thereby facilitating discussions and collaborative knowledge construction.**

The use of interactive lectures necessitates a shift in the teacher's approach to lecturing. Teachers must incorporate activities within their lectures that actively encourage student participation. Furthermore, they need to assume the roles of both a tutor and facilitator in addition to their existing responsibilities. It is essential to review the lesson content to incorporate activities that promote student interaction, thereby facilitating discussions and collaborative knowledge construction. Even a brief discussion or student-initiated questioning can greatly enhance student engagement and ownership of learning. However, this requires teachers to attentively observe and interpret the classroom dynamics, allowing them to adapt the lesson plan accordingly.

By doing so, teachers support individual students in developing their abilities to manage and take responsibility for collective learning within the classroom environment (Yakovleva & Yakovlev, 2014).

In the theoretical training sessions (Read more in Chapter 4.1) of the DigiCare project pilots, we utilized interactive lecturing methods. Our primary objective was to encourage active participation from the students during these sessions, which in turn facilitated the practical application of their acquired knowledge. To enhance their understanding, we incorporated multimedia elements, including PowerPoint presentations and videos, into both the teacher and student training sessions. To provide teachers with guidance on incorporating interactivity into their theoretical lectures, we have created a set of slide presentations known as the DigiCare Learning Packages (Read more in Chapter 4.1). These packages offer practical strategies, techniques, and ideas to make lectures more engaging and interactive for students and are accessible at www. xxxxxxx. An example of the DigiCare Learning Packages can be found in the Appendix 7.

Read more about Interactive Lecturing

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4.2.3 Low-Fidelity Simulation

Nandita Islam Pia, Annukka Huuskonen, Katariina Kunnas, Md Ridwanur Rahman, Farhana Manzoor, Essi Ylistalo and Nina Smolander

In the DigiCare project, low-fidelity simulation was used as a fundamental component of the learning methods. Low-fidelity simulation offers students a wide range of training and learning experiences at a relatively low cost compared to high-fidelity simulation, which requires specialized environments and equipment. With low-fidelity simulation, students can practice and refine their skills and performance before applying them to real-life situations. This type of simulation allows for training in various essential skills, including technical expertise and effective communication. In this chapter, we will discuss the essentials of low-fidelity simulation and provide a selection of recommended reading materials for individuals who wish to explore this pedagogical approach further.

Simulation is a widely utilized and effective learning method in healthcare education, encompassing the development of both technical skills (such as nursing procedures and clinical competencies) and non-technical skills (including teamwork, communication, leadership, and ethical judgment). The foundation of simulation learning is rooted in Kolb's model of experiential learning, which emphasizes the interaction between practical experience and theoretical knowledge. Through this model, learning progresses through stages, where existing knowledge and skills are put into action, generating new experiences that are then reflected upon to deepen and broaden understanding (Kolb, 1984).

The simulation learning process typically involves preliminary discussions, active participation and observation, and a collaborative debriefing session (INACSL Standards Committee et al., 2021a). Simulation provides students with the opportunity to apply their knowledge in a realistic setting, simulating real-life scenarios while ensuring a safe and controlled environment that eliminates any potential harm to patients. This form of clinical teaching employs various tools and techniques, including manikins, patient simulators, role-playing by healthcare professionals and actors, student involvement, realistic simulated environments, and virtual platforms (INACSL Standards Committee et al., 2021b).

Various types of simulations exist, often categorized based on their fidelity levels, which indicate their resemblance to real healthcare situations. High-fidelity simulators, for instance, are computer-based mannequins equipped with realistic features such as simulated heart and lung sounds, blood pressure responses, and more (Massoth et al., 2019). On the other hand, low-fidelity simulation, which employs fewer technical tools, is equally effective for training in real-life scenarios. It can involve the use of basic manikins or role-playing by healthcare students, where unscripted dramatizations simulate healthcare interactions (Goldenberg et al., 2005). In healthcare education, low-fidelity simulation is gaining popularity as a teaching strategy. It provides students with opportunities to practice their clinical skills and decision-making abilities through a variety of simulated real-life experiences (Kim et al., 2016).

> **Simulation provides students with the opportunity to apply their knowledge in a realistic setting, simulating real-life scenarios while ensuring a safe and controlled environment that eliminates any potential harm to patients.**

Each level of simulation training can serve different teaching and learning purposes effectively. High-fidelity simulation has demonstrated its potential to enhance student learning outcomes (Bowling

& Underwood, 2016). However, it is important to note that the level of simulation, whether high or low-fidelity, does not necessarily correlate with improved learning outcomes or student satisfaction (Massoth et al., 2019; Tosterud, 2013). Therefore, simulation as a learning method can be effective even without high-tech equipment (Tosterud, 2013).

From a pedagogical perspective, simulation provides teachers with the flexibility to adjust the level of difficulty, personalize learning based on desired objectives, and offer immediate feedback to students when necessary (Kim et al., 2016). This adaptability allows for a tailored and interactive learning experience that can effectively support student development and competence in healthcare education across different countries and educational institutions.

Simulation as a learning method has been extensively researched, and numerous positive learning outcomes have been documented. Engaging in simulation-based learning empowers healthcare students to gain greater confidence in various aspects of the clinical decision-making process, enhances satisfaction with learning, and improves critical thinking skills (Al Gharibi et al., 2020; Cioffi et al., 2005). Furthermore, participation in sequential simulations fosters the development of interprofessional teamwork and communication skills (Tervajärvi et al., 2021) as well as technical competencies (Bowling & Underwood, 2016). Simulation-based teaching proves effective in training complex and interconnected skills, such as teaching skills (Goldenberg et al., 2005), and leadership skills (Pollard & Wild, 2014). It also serves as a valuable tool for cultivating ethical conflict management and negotiation skills (Buxton et al., 2015). Moreover, simulation usage facilitates the promotion of empathy and professional values as students assume various roles within simulation scenarios (Goldenberg et al., 2005).

The implementation of simulation methods necessitates teachers to possess pedagogical expertise and a strong grasp of the subject matter (INACSL Standards Committee et al., 2021c). The International

Nursing Association for Clinical Simulation and Learning (INACSL) has established Healthcare Simulation Standards of Best Practice, which encompass ten essential elements of simulation (Figure 18). Each element of simulation is accompanied by evidence-based standards and criteria that serve as guiding principles for the integration of simulation in healthcare education (INACSL Standards Committee et al., 2021a).

Figure 18. Healthcare Simulation Standards of Best Practice by INACSL (Watts et al., 2021, modified)

During the pre-briefing phase, the teacher undertakes the task of preparing and briefing students prior to the commencement of the simulation scenario. Creating a comfortable and non-threatening learning environment is one of the primary objectives at this stage. By adequately preparing the students, any hesitations, or reservations about engaging in role-playing can be addressed, contributing to a successful simulation experience (Goldenberg et al., 2005). During this phase, the teacher provides all students with relevant information about the case, assigns roles to the participating students, and assigns technical and non-technical tasks to those observing the simulation. Thoughtful and well-planned preparation and pre-briefing, aligned with the learning objectives, are crucial to ensure an optimal balance of cognitive and emotional demands for the students, ultimately facilitating an effective learning experience (INACSL Standards Committee et al., 2021c).

During the activity phase, the teacher assumes the role of a guide and observer. Some students actively participate in the role-play, while others take on the role of observers based on their assigned tasks from the pre-briefing phase. As the activity unfolds, the teacher may provide cues or prompts to redirect students, assisting them in attaining the intended learning outcomes (INACSL Standards Committee et al., 2021b). The teacher's presence and guidance during this phase help ensure that the simulation progresses smoothly and that students are effectively engaged in the learning process.

The debriefing session that follows the action phase is a crucial component of the simulation learning process. It serves as a period of reflection and feedback, acknowledging the strengths and competencies of the students. Moreover, it plays a pivotal role in the learning process by enabling the teacher to help students recognize and address any gaps in their knowledge and skills, while also providing additional information related to the scenario. Conscious reflection serves as the foundation of simulation learning, and all participants actively engage in the debriefing process, which can be facilitated by the teacher or conducted through guided reflection in small groups (INACSL Standards Committee et al., 2021d). The teacher must possess adequate skills to formulate open-ended questions and guide the discussion during the debriefing (Goldenberg et al., 2005). Furthermore, it is essential for the teacher to foster a safe and confidential learning environment throughout the debriefing session. A well-designed debriefing process utilizes theoretical frameworks that assist the teacher in providing a clear structure for the session (INACSL Standards Committee et al., 2021d).

In the DigiCare project pilots, we incorporated low-fidelity simulation techniques, specifically role-playing exercises conducted in small groups. Both students and teachers actively utilized this method to gain a deeper understanding of coaching techniques and their application in supporting patients with non-communicable diseases in self-care. The teacher training sessions involved active participation in role-plays as a preparatory step prior to training the students. A briefing session was conducted with the entire group. Subsequently, the action and debriefing phases took place within small groups. In these groups, one member assumed the role of a patient, another played the part of a health professional practicing coaching skills, and a third member took on the role of an observer. The simulations were conducted using both face-to-face and online formats to accommodate different learning environments. Finally, a collective reflection discussion was conducted in the larger group (Read more in Chapter 4.1).

Read more about Low-Fidelity Simulation

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4.2.4 World Café

Nandita Islam Pia, Annukka Huuskonen, Katariina Kunnas, Md Ridwanur Rahman, Farhana Manzoor, Essi Ylistalo and Nina Smolander

Based on seven principles, the World Café method offers a versatile and powerful format for facilitating large group dialogue. Each component of the method serves a distinct purpose and aligns with other design principles. The flexibility of the World Café allows for customization to suit diverse requirements and contexts. Whether used in educational, organizational, or community settings, the World Café can be modified to effectively engage participants and foster meaningful conversations that lead to collective learning and collaborative action. In this chapter, we will describe the basics of the World Café method and provide a selection of recommended reading materials for those interested in further exploring this pedagogical approach.

The World Café method is a pedagogical approach that fosters collaborative and social learning, leading to the creation of collective intelligence. It serves as an effective tool for promoting mutual understanding by establishing an inclusive and collaborative network of conversations. The method facilitates discussions on a single topic from multiple perspectives through successive rounds of conversation. This iterative process allows for diverse viewpoints to be shared, explored, and integrated (Brown & Isaacs, 2005.).

> **The World Café fosters collaborative and social learning, leading to the creation of collective intelligence.**

The World Café method is structured as a series of brief, typically 20–30-minute, small group discussions that involve rotating participants between different tables, each focusing on a specific topic or question within a broader theme. Throughout the activity, each table has a designated host who welcomes the group, provides an overview of the topic, and summarizes key points raised by previous participants. The groups spend a limited amount of time at each table, and there is no expectation for a group to completely clear the table for the next group. Instead, the subsequent group builds upon the notes and ideas left by the previous group, adding their own insights and expanding on the discussion (Brown & Isaacs, 2005.)

To conclude the World Café session, a wrap-up discussion, also known as the "harvest," takes place at the end of the session. The host takes responsibility for reporting the outcomes of the activity, although all participants are encouraged to share the insights they gained from the discussions (Ropes et al., 2020; Brown & Isaacs, 2005). The World Café method is flexible in its implementation but relies on seven key principles (Figure 19) (Brown & Isaacs, 2005).

Figure 19. The seven principles of the World Café method.
(Brown & Isaacs, 2005, modified).

The first principle of the World Café method is to create a welcoming and pleasant atmosphere by setting up the physical space in a café-style arrangement with chairs around tables. This helps create a comfortable and informal environment for participants to engage in discussions. The second principle of the World Café method involves setting the context for the discussion by providing relevant background information. The third principle emphasizes the importance of framing questions that prompt meaningful exploration of the topic, e.g., “What does this mean?”, or “What do you think about this?” These questions should encourage participants to delve deeper into the subject matter, reflect on their own perspectives, and generate insightful discussions. (Brown & Isaacs, 2005.)

The next principle emphasizes the importance of encouraging active participation from everyone around the table. Strategies to achieve this may include creating space and opportunities for all participants to speak, actively encouraging quieter individuals to express their opinions, and fostering an environment of active listening and respect for different viewpoints. The World Café method also aims to bring together diverse perspectives and foster the cross-pollination of ideas. Participants rotate between tables, allowing for the integration of ideas and perspectives from different groups. By actively listening to others, participants can identify patterns, gain insights, and explore deeper questions that may emerge from the collective conversation (Brown & Isaacs, 2005.)

Finally, the work produced by each table is shared with all participants, providing a comprehensive view of the topic. This collective sharing ensures that valuable insights, ideas, and discoveries from each group are disseminated, contributing to a broader understanding of the subject matter (Brown & Isaacs, 2005.)

There are several advantages to using the World Café method. Firstly, it allows the teacher to facilitate dialogue in a large group by breaking it into smaller groups, without the participants having to prepare in advance. (Brown & Isaacs, 2005). Additionally, the World Café method has been found to be effective in nursing and medical education. It provides an opportunity for students to explore different areas of interest in greater depth, fostering communication, relationship-building, and collaborative learning skills (van Wyngaarden et al., 2018.) Through reflection and meaningful conversations, the method enables participants to gain a deeper understanding of the topic and generate new insights. It also extends networks and serves as a catalyst for future action and motivation (Ropes et al., 2020.)

In the DigiCare project, we employed the World Café method during workshops with teachers to develop the DigiCare Model and learning packages. By creating a friendly and welcoming atmosphere, we fostered an open discussion that encouraged participants to freely share their perspectives and expertise. The World Café method played a pivotal role in stimulating innovative thinking and encouraging participants to explore new ideas and approaches. It allowed us to break away from traditional modes of thinking and generate fresh insights and perspectives.

The DigiCare Learning Packages (Appendix 7) contain some ideas for implementing the World Café method in DigiCare training and in healthcare education in general.

Read more about the World Café

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4.2.5 Learning Diary

Nandita Islam Pia, Annukka Huuskonen, Katariina Kunnas, Md Ridwanur Rahman, Farhana Manzoor, Essi Ylistalo and Nina Smolander

In the DigiCare project, the learning diary was utilized as a reflective learning method. The learning diary facilitates a reflective process in which students document their learning experiences, discussions, readings, and observations. It offers a space for personal reflections and insights, allowing students to gain a deeper understanding of their own learning journey. Additionally, the learning diary provides valuable insights to teachers, enabling them to gain a better understanding of their students' learning processes and tailor their future learning goals accordingly. In this chapter, we will outline the basic principles of writing a learning diary and provide a list of recommended reading materials for those who wish to delve further into this pedagogical approach.

Reflection is a deliberate and purposeful process that involves contemplating one's actions, whether during performing them or after they have been completed (Schön, 1991). Through reflective thinking, students can analyze and evaluate their learning process (Hoa & Tuan, 2021), which aids in monitoring their growth from being novices to becoming experienced learners on their path towards achieving professional competence (Moon, 2008). Moreover, reflective thinking skills have been found to correlate with student learning outcomes (Ghanizadeh, 2017).

> **A learning diary serves as a tool for personal reflective thinking for students.**

A learning diary serves as a tool for personal reflective thinking for students (Reyes-Santander & Ramos-Rodríguez, 2015). By using a learning diary regularly, students can enhance their reflective skills and cognitive processes (Reyes-Santander & Ramos-Rodríguez, 2015). While reflection typically focuses on learning specific content, a learning diary encompasses more than just reflection. It is at its best when strongly linked to and supporting the learning of content knowledge (Murtonen, 2013).

Before implementing a learning diary, it is essential for the teacher to establish clear objectives, determine appropriate content, and define the assessment criteria aligned with the course objectives and the learning group (Murtonen, 2013). Instructions in the use of a learning diary is necessary to ensure that students understand its purpose (Murtonen, 2013) and how to utilize it as a reflective tool through its various phases (Figure 20) (Gibbs, 1988). While some students may naturally produce detailed descriptions of their learning process, others may require more structured instructions regarding the goals of reflection (Hoa & Tuan, 2021). However, it is important to note that there are no universal guidelines that apply to all situations when it comes to using a learning diary. The task instructions provided by the teacher are crucial for both students and teachers alike. Insufficient guidance or unclear instructions regarding the writing of a learning diary can present challenges, particularly when it comes to assessing and grading the diary entries (Murtonen, 2013).

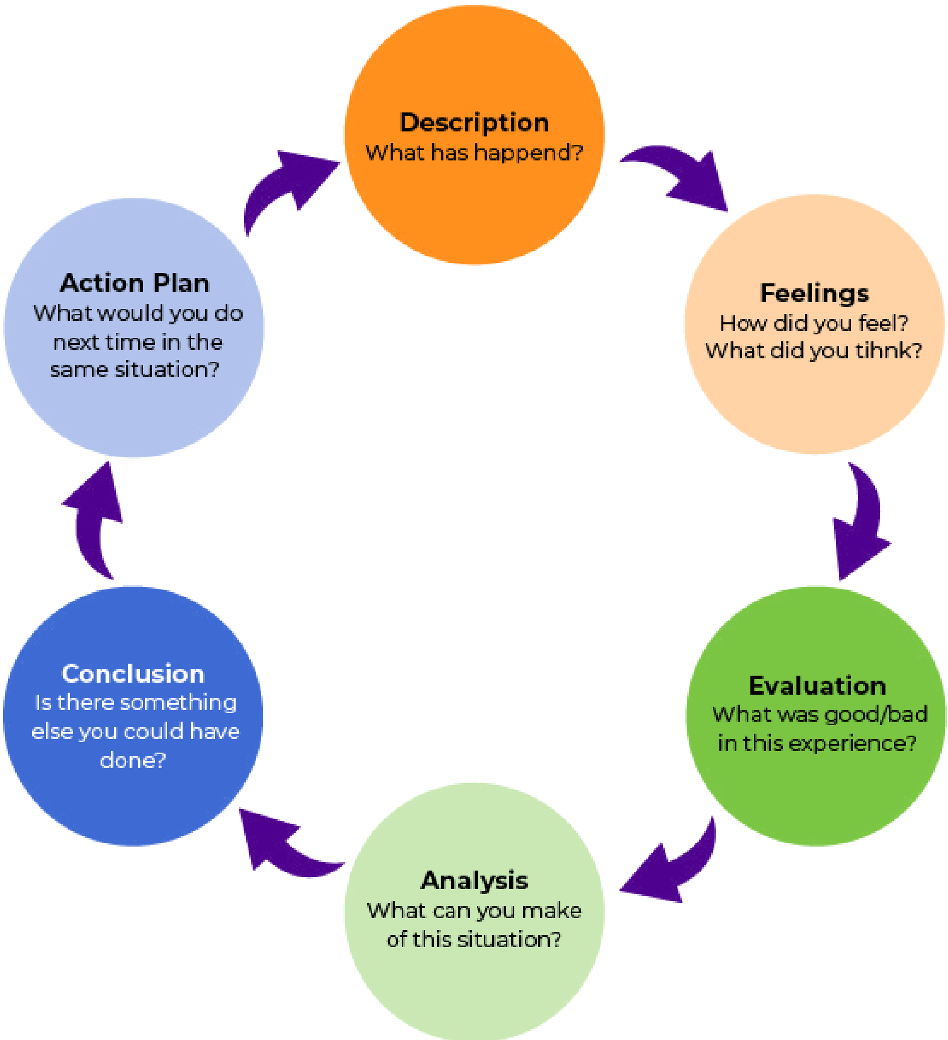

Figure 20. Reflective Cycle (Gibbs, 1988, modified)

Assessing learning diaries can indeed pose challenges (Murtonen, 2013). However, providing feedback is crucial for the learning process, and it can be divided into two types: summative and formative assessment (Tekian, 2017). Clear instructions for the learning diary enable easier numerical assessment since the connection between reflection and content knowledge becomes clearer (Murtonen, 2013). Nevertheless, unlike formal assessments, a numerical score alone may not provide accurate information on the strengths and weaknesses of a student's reflective abilities (Tekian, 2017). When designing assessment criteria for learning diaries, it is essential to determine the extent to which content knowledge, the ability to articulate one's learning process, and the development of competence in these areas contribute to the overall assessment. Peer assessment can also be utilized as a method for evaluating learning diaries (Murtonen, 2013.)

In a review examining the level of student reflection in learning diaries used in higher education, it was found that primarily students provided descriptions of events, while only two studies achieved a higher standard of reflection (Dyment & O'Connell, 2011). The level of reflection in learning diaries can be assessed using various assessment tools. Many of these tools encompass assessment areas related to the number of perspectives students consider regarding their actions, the influence of the learning context (e.g., learning environment) on students' thinking and activities, the impact of students' own thoughts and emotions on the situation at hand, the influence of students' prior knowledge and experiences, self-recognition of one's own learning capacity, and reflective deliberation on different alternatives for one's actions in the learning situation (Préfontaine et al., 2022.) Reflection competence can also be categorized into three areas: the knowledge attained by students, discussions on patients' attitudes, and students' ability to apply flexible skills (Hoa & Tuan, 2021).

In the DigiCare project pilots, students were engaged in writing a learning diary while practicing coaching with real clients or relatives outside the classroom, utilizing coaching models such as GROW or 5A (Read more in Chapter 4.1). The students were provided with comprehensive instructions and guidance on the purpose and objectives of writing a learning diary during the orientation class. The guidelines emphasized the importance of reflection on their own activities and experiences rather than simply describing their actions during coaching sessions. Furthermore, students were instructed to maintain patient confidentiality and anonymity in their learning diaries.

To facilitate the reflection process, students were given supporting questions and ideas to stimulate and guide their reflection. They were encouraged to reflect on their overall learning process throughout the pilot. In the DigiCare pilot, the learning diaries written by the students were assessed using peer review methods (Read more in Chapter 4.2.6). This involved exchanging and reviewing each other's learning diaries among the participating students. Through this peer review process, students had the opportunity to share their experiences and learn from the experiences of their peers during the coaching pilot.

It is important to note that the use of learning diaries as an assessment method in the study course varied among the partner universities in the DigiCare project. As a result, a common set of evaluation criteria was not established.

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Read mor about Learning Diary

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4.2.6 Peer-Reviewing

Nandita Islam Pia, Annukka Huuskonen, Katariina Kunnas, Md Ridwanur Rahman, Farhana Manzoor, Essi Ylistalo and Nina Smolander

Peer review is an effective learning strategy where students assess their peers' work and provide constructive feedback on its quality. This process actively engages students, enhancing their critical thinking and evaluation skills while exposing them to diverse perspectives and approaches. Peer review fosters a collaborative learning environment, allowing students to learn from one another, develop effective communication skills, and improve their own work based on received feedback. In this chapter, we will delve into the fundamentals of peer review and offer a list of recommended reading materials for those who wish to delve deeper into this pedagogical approach.

The constructivist approach emphasizes the importance of assessment in promoting learning and fostering active student participation in the assessment process (Ion et al., 2018). Peer assessment is a method where students assess the work of their peers and provide feedback, grades, or both, based on predefined assessment criteria (Falchikov, 2007). This approach allows students to engage in the reflective building of knowledge by actively evaluating the work of their peers. Moreover, students can also be actively involved in defining the assessment criteria, further enhancing their understanding of the learning objectives, and promoting their ownership of the assessment process (Falchikov, 2007).

According to the existing literature, peer assessment has been found to positively impact students' learning and performance, both during their studies (Falchikov, 2007; Ion et al., 2018; Mercader et al., 2020) and after completion (Falchikov, 2007). Engaging in peer feedback benefits students in both the role of providing feedback and receiving it. Receiving peer feedback has shown to support students in integrating subject knowledge and enhancing their ability to accept and learn from their mistakes. (Ion et al., 2018.) On the other hand, providing peer feedback has been associated with improvements in students' critical thinking skills (Hogg, 2018), self-confidence (Ion et al., 2018), teamwork, communication skills (Hogg, 2018; Mercader et al., 2020), and problem-solving abilities (Hogg, 2018). Additionally, delivering peer feedback has been linked to increased acceptance of one's own mistakes (Mercader et al., 2020). It is important to note that the emotional experience of receiving peer feedback varies among students, with some perceiving it as a neutral experience while others may find it distressing (Ion et al., 2018).

Engaging in peer feedback benefits students in both the role of providing feedback and receiving it.

Students are motivated to give and receive peer feedback due to the recognition that it positively influences the recipient's competence in future work. Additionally, in the context of nursing education, students are driven by the importance of ensuring safe and high-quality patient care when providing peer feedback. However, a key barrier to providing peer feedback is the perception of time constraints. Students may be hesitant to invest time in giving feedback if they feel that their peers do not appreciate or value the feedback. Moreover, concerns about potential negative emotions triggered by the feedback or its potential impact on grading further discourage students from actively participating in peer feedback processes. (Tornwall et al., 2022.)

In the DigiCare pilots, we implemented a learning diary as a tool to facilitate student assessment of their own learning and that of their peers. Each student was assigned to read, evaluate, and provide feedback on the learning diary of one of their peers. To ensure consistency and clarity in the assessment process, students were provided with written instructions in advance, outlining specific criteria to consider during the peer assessment. These criteria encompassed aspects such as reflective writing, critical thinking, forward-thinking, and the overall comprehensiveness of the work. Additionally, detailed guidance was provided for each area of assessment to assist students in providing constructive feedback effectively.

Read more about Peer Review

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5. Pilot Results of the DigiCare Educational Program

« The DigiCare project had a key focus on improving healthcare education curricula in Asian partner institutions. Through collaboration between local experts and European partners, the project aimed to bring about a change and shift towards modern, innovative, and student-centered education. However, it was essential to evaluate the effectiveness and feasibility of the designed educational program as part of the project's educational development intervention. Therefore, the interventions in the DigiCare project underwent thorough assessment at various stages. »

In this chapter, we provide an overview of the evaluation tools used and describe the efforts made by project partners to develop a standardized and reliable instrument for assessing health professionals' performance and perceived capacity to provide self-management support to patients. Additionally, we discuss the process and outcomes of the cultural adaptation and validation of the Usability Evaluation Questionnaire, as well as reflect on the experiences and feedback of pilot participants regarding the concept of coaching and their different roles during coaching training.

5.1 Evaluation Tools

Masood Mohammad Abdul Aziz, Farhana Ferdaus, Nahida Sultana, Pedro Parreira, João Graveto, Anabela Salgueiro-Oliveira, Paulo Santos-Costa, João Pardal, Annukka Huuskonen, Katariina Kunnas, Essi Ylistalo and Nina Smolander

To enable healthcare professionals to offer effective self-management support to patients, a transformation in the mindset of healthcare practitioners from being experts to becoming coaches is essential. This transition necessitates healthcare professionals to assume a new role and acquire new competencies. This chapter outlines the assessment tools utilized to evaluate the educational programs implemented among healthcare students at partner universities in Bangladesh and Vietnam.

«

Self-Management Support encompasses the provision of education and assistance to individuals with chronic health conditions, as well as their families and significant others. Its goal is to help them understand their crucial role in managing their disease, make informed decisions regarding their well-being, and engage in behaviors that promote health. (Beck et al., 2017; Powers et al., 2017; Taylor et al., 2014.) While it is acknowledged that patients often face multiple self-management needs simultaneously, such as diet, exercise, stress, and substance use, certain aspects of self-management support are often addressed in isolation (e.g., nutrition or exercise), rather than being prioritized comprehensively. Additionally, healthcare professionals may be unaware of patients' priorities and available resources, which can hinder the alignment of patients' needs with healthcare professionals' preferences. (Krist et al., 2017; Barry et al., 2012.) Therefore, effective self-management support requires healthcare professionals to possess the skills necessary to educate, support, and communicate with patients throughout the entire support process.

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The 5A's model is a recommended approach for supporting self-management, comprising five essential phases: Assess, Advise, Agree, Assist, and Arrange (Fiore et al., 2008). In the Assess phase, healthcare professionals need to evaluate patients' motivation, beliefs, and their perception of their current situation in managing their chronic condition to personalize the support provided. During the Advice phase, healthcare professionals should offer evidence-based, detailed information about the relevant chronic condition, including its symptoms and treatment options. Health education plays a crucial role in empowering patients to make informed decisions and take care of themselves. In the Agree phase, healthcare professionals and patients collaboratively determine goals to pursue, taking into account the patient's preferences and previous positive experiences. The Assist phase involves healthcare professionals utilizing their competences to support patients in making health behavior changes within their daily routines. This may also involve seeking assistance from other healthcare professionals when appropriate. In the Arrange phase, follow-up care is organized to ensure continuity of support. Supporting self-management requires a multidisciplinary approach that emphasizes effective communication and care coordination. Accountability plans should be developed to monitor progress towards goals. (Nevelsteen, 2021, pp. 168–172.)

Another widely used coaching model is the GROW Model, which comprises four phases: Goal, Reality, Options, and Will (Whitmore, 1996). In this model, the healthcare professional takes on the role of the coach, while the patient becomes the coachee. In the Goal phase, the patient is encouraged to identify their desired goals in relation to their situation, encompassing both short-term and long-term objectives. Once the goal is established, the healthcare professional proceeds to the Reality phase, where the patient assesses their current health situation. This phase aims to foster awareness of the present reality and identify any potential barriers to change. Subsequently, in the Options phase, the patient is guided to explore different possibilities and actions that can be taken to achieve their goals. Through questioning and discussion, the healthcare professional assists the patient in considering available options. Additionally, the patient is supported in identifying the necessary actions to be taken. The final step in the coaching process using the GROW model is the Will phase, where an action plan is tailored. The patient is encouraged to take responsibility and commit to the actions identified. Throughout each phase, the healthcare professional plays a supportive role, empowering the patient to take ownership and responsibility of their situation. (Nevelsteen, 2021, pp. 161 –167.)

Assessment of Student's Competences

The DigiCare Model equips healthcare students with the necessary knowledge and skills to effectively support and coach patients in self-managing their chronic conditions, utilizing health and wellbeing technology. To evaluate students' proficiency in the DigiCare educational intervention, teachers are provided with three assessment tools (Figure 21).

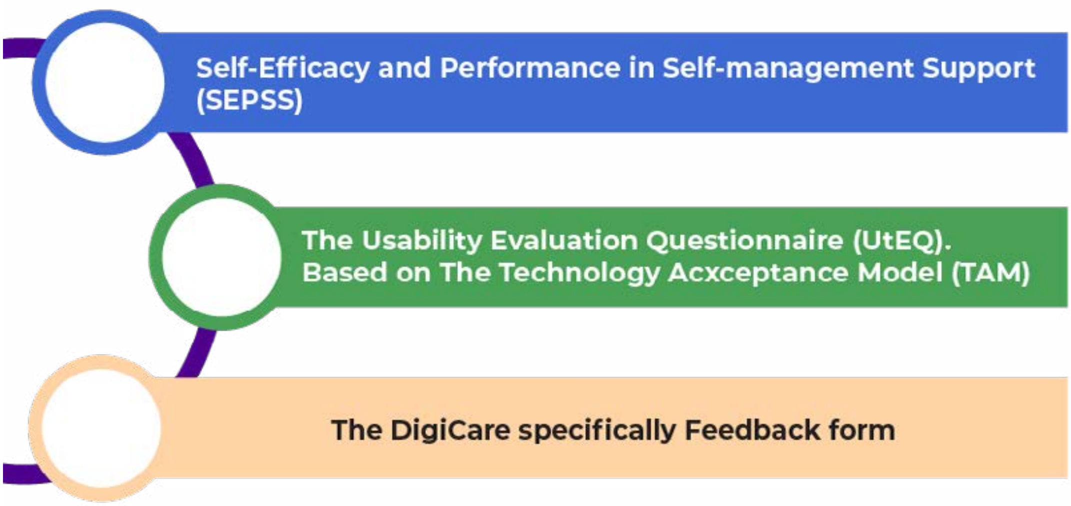

Figure 21. The evaluation tools used in the DigiCare project.

The SEPSS and TAM have been accepted as valid and reliable instruments after being cross-sectionally adapted and psychometrically validated among healthcare students in the project's partner institutions in Bangladesh and Vietnam. This chapter presents both instruments in more detail. Additionally, a feedback form tailored to the DigiCare project was designed to gather participants' feedback and insights on their experiences and perceptions of using the GROW model, as well as their views on coaching, digital tools, and digital coaching.

The Self-Efficacy and Performance in Self-management Support (SEPSS) Instrument

Supporting patient self-care necessitates healthcare professionals to adopt a new role and acquire additional skills. The Self-Efficacy and Performance in Self-management Support (SEPSS) scale provides a reliable and valid tool for evaluating current practices, educational needs, and the effectiveness of self-management support training, particularly based on the 5A's model. Evaluating the self-efficacy of healthcare providers is crucial in the context of self-management support, as it strongly correlates with behaviour prediction. (Duprez et al., 2016.) Within the framework of the DigiCare Project, the SEPSS has been employed to assess the self-efficacy and self-management support performance of nursing and medical students.

> **Evaluating the self-efficacy of healthcare providers is crucial in the context of self-management support.**

The Use of SEPPS

The SEPSS instrument is a 36-item questionnaire that employs a 5-point Likert scale to measure self-efficacy and performance in relation to self-management support, based on the 5A's model. The instrument consists of six subscales, each comprising six items. Each item is assessed using two questions. The first question gauges the participant's confidence in their ability to perform the task (self-efficacy). Participants are asked to rate their agreement with the statement "I think I can do this" on a scale from 0 to 4, ['Not at all'(0), 'Not sufficient' (1), 'More or less' (2), 'Sufficient' (3), 'Good' (4)]. The second question assesses the frequency with which the participant engages in the task (performance). Participants indicate their response to the statement "I do this" using a scale from 0 to 4, ['Never' (0), 'Rarely' (1), 'Occasionally' (2), 'Frequently' (3)- 'Always' (4). (Duprez et al., 2016.)

The total score is calculated by summing the mean scores for self-efficacy and performance, both of which range from 0 to 24. High scores on the SEPSS instrument reflect high levels of self-efficacy and a greater performance in supporting self-management. The self-reported scores obtained through the SEPSS serve as outcome measures for self-management support practices in clinical and research settings, aid in identifying educational needs, and facilitate the assessment of personal growth. (Duprez et al., 2016.)

The SEPSS instrument was used as part of the DigiCare project (Read More in Chapter 5.2).

The Technology Acceptance Model Scale (TAM)

The Technology Acceptance Model (TAM) scale is designed to assess the utilization of digital technologies and tools. The model is based on the theory of reasoned action, which posits that intention precedes action, and has been proven to be an effective predictive model (King & He, 2006, Rafique at al., 2018).

The questionnaire utilized in this study was developed using the TAM model, which initially consists of 45 items categorized into four factors (Figure 22).

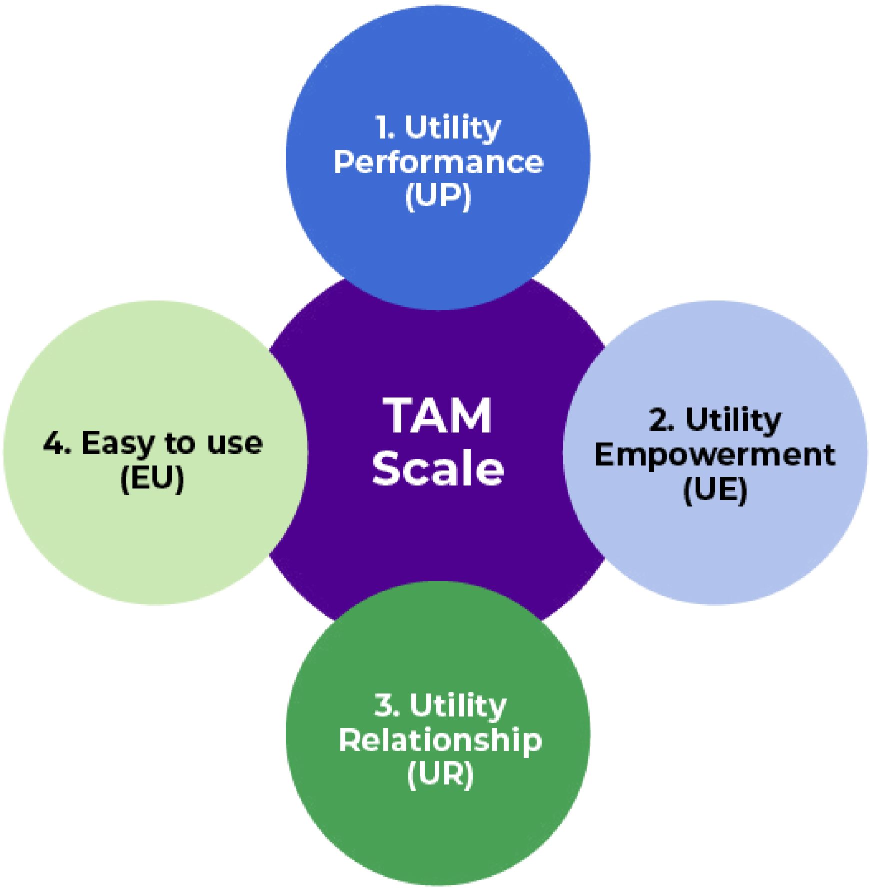

Figure 22. The sections of the TAM Scale (King & He, 2006, modified)

The User-Relationship (UR) factor of the scale assesses students' perceptions of how technology aligns with their workflow, integrates into existing clinical processes, and improves communication and collaboration with patients and healthcare professionals. This factor consists of 10 items that specifically evaluate the impact of technology on fostering a positive and effective relationship between healthcare professionals and patients. These items collectively measure the extent to which technology is perceived to support meaningful interactions, empathy, and rapport within the context of patient care. (Parreira et al., 2020.)

The Utility-Performance (UP) factor of the scale assesses the perceived performance-enhancing aspects of technology in healthcare settings. This factor comprises nine items that collectively measure students' perceptions of how technology contributes to their efficiency, effectiveness, and control in performing various tasks related to patient care. By evaluating the utility of technology in terms of performance, this factor provides insights into the extent to which technology enables students to streamline their workflow, manage tasks efficiently, and have greater control over their work processes. (Parreira et al., 2020.)

The User Empowerment (UE) factor of the scale consists of six items that assess the role of technology in empowering patients to take an active role in managing their own health. These items capture the perceived utility of technology in promoting patient empowerment and engagement in their healthcare journey. This factor highlights the potential of technology to support patients in developing self-management skills, fostering motivation, and encouraging a proactive approach towards their own health. (Parreira et al., 2020.)

The Ease of Use (EU) factor of the scale focuses on the perceived ease of use and user-friendliness of technology in the clinical care of patients. It evaluates students' perceptions of the ease of learning and navigating the technology, as well as the intuitiveness of its interface and features. (Parreira et al., 2020.) The eight items of the factor assess various aspects, such as the requirement of a short learning period, the need for prior knowledge, and the demand for minimal mental effort.

Respondents rate each item on a Likert scale ranging from 1 (Strongly disagree) to 7 (Strongly agree), with higher scores indicating a greater inclination to incorporate technology into their clinical practice due to its perceived benefits (Parreira et al., 2021). The data collection instrument also includes a brief section that gathers information on participants' sociodemographic characteristics (e.g., age, gender) and academic details (e.g., course year, enrolment status).

Ideally, the TAM questionnaire should be administered both before and after implementing an educational program. The TAM questionnaire provides valuable insights into students' comfort levels with using relevant technology. It aims to assess various dimensions related to the utilization of digital technologies and tools within a specific environment.

In the DigiCare project, we applied the TAM questionnaire to assess healthcare students' perceptions of using digital technology and tools in the context of coaching patients with chronic diseases (Read more in Chapters 5.3 and 5.4).

Feedback Form

The DigiCare feedback form was specifically developed and utilized to gather valuable insights regarding students' experiences with the implementation of self-management support and coaching tools in the DigiCare project. This form was designed to cater to the feedback collection needs within the context of the DigiCare project. The main purpose of gathering feedback is to bridge any existing gaps between the current understanding or performance and the desired goal (Sadler, 1989). In the context of the DigiCare Project, we gathered user feedback to obtain objective information about the user experience. This valuable feedback allowed us to make necessary refinements and improvements to our overarching objective—the DigiCare Model, including its Learning Packages, and ultimately the Educational Program as a whole.

A feedback questionnaire was distributed to participants after each pilot cycle (Read more in Chapter 4.1) with the aim of gathering feedback to improve the DigiCare Model (Read more in Chapter 3) and its Learning Packages (Read more in Chapter 4.1). The pilots provided an opportunity to collect valuable insights from healthcare teachers and students. Initially, the feedback form was sent out in English and Vietnamese. However, due to low response rates during the initial phase, we decided to include questions in Bangla as well. This approach allowed us to cater to the language preferences of participants, ensuring inclusivity. Consequently, the feedback form consisted of instructions and questions presented in three languages: English, Vietnamese, and Bangla. Respondents had the option to utilize any of these languages in their responses. Prior to completing the form, participants were provided with a clear explanation of the purpose of the feedback and how it would be utilized. The instructions also emphasized that the responses would remain anonymous and would not identify the respondents. Responding to the feedback form was considered as providing informed consent to participate in the evaluation process.

The questionnaire comprised a total of 24 questions. The first seven questions focused on gathering sociodemographic information, such as age and organizational affiliation, as well as academic details, including the area of study. The remaining questions consisted of a combination of 5-point Likert scale items and open-ended questions. Participants were asked to indicate their level of agreement with the provided statements regarding the use of the GROW model during coaching, both as a coach and as a coachee, using a rating scale ranging from 1 to 5, ['Not at all or very badly' (1), 'Few times or little' (2), 'Average or neutral' (3), 'Mostly or well' (4), and 'Many times' (5)]. The open-ended questions sought to inquire about respondents' experiences in both the role of a coach and a coachee, their experiences with in-person and online coaching, and their interactions with the coach, focusing on their experiences related to professional communication. Additionally, participants were asked about their preparation for the coaching training and their perceptions of the education provided. These Likert scale statements, and open-ended questions were purposefully crafted to capture participants' experiences during the coaching session and gather valuable insights into their perspectives (Read more in Chapter 5.6).

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5.2 Cultural Adaptation and Psychometric Validation of the Self Efficiency and Performance in Self-Management Support (SEPSS) Questionnaire in Undergraduate Nursing and Medical Students of Bangladesh

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This chapter describes the work undertaken by project partners in Bangladesh to develop a standardized and reliable instrument to assess health professionals' performance and their perceived capacity to provide self-management support to patients. The article presented below is an exact replica of the manuscript published in the JIM - Jornal de Investigação Médica. However, adjustments have been made to the referencing style, table and figure numbering, and format to align with this e-book.

Abstract

In an aging society, healthcare professionals and students face increasing demands to actively involve patients in the decision-making process regarding their health conditions. Self-management support is considered a best practice that aligns with the patient-centered care paradigm in Bangladesh. However, there is currently no instrument available to assess healthcare professionals' competencies in this field, particularly during their early education and training period. The aim of this study was to translate the Self Efficiency and Performance in Self-management Support (SEPSS) instrument into Bangla and validate its psychometric properties in a sample of undergraduate healthcare students in Bangladeshi higher education institutions. A cross-sectional study was conducted to assess the reliability, validity, and cultural appropriateness of the Bangla version of SEPSS-36 among 486 nursing and medical students. Confirmatory factor analysis was carried out using the chi-square model fit index (CMIN), comparative fit index (CFI), and Root Mean Square Error of Approximation (RMSEA) as fit indices. The internal consistency was estimated by the Cronbach alpha coefficient. The results indicate that the CMIN (2.658) and RMSEA (.058) values suggest that the sample data and hypothetical model are an acceptable fit in the analysis, with satisfactory CFI values (.895). The reliability for all SEPSS dimensions was acceptable. The Bangla version of the SEPSS questionnaire is a valid and reliable instrument that can assist healthcare educators and researchers in determining students' competencies within this domain.

Keywords: self-management; nursing students; medical students; self-efficacy; performance; scale

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Introduction

In the current era, there is a rapid expansion of new interventions for the management of noncommunicable diseases (NCDs) (WHO, 2022a). The Centers for Disease Control and Prevention report that about 85% of elderly people have at least one NCD and around 60% have at least two (Center for Global Health, US, 2021). NCDs pose a significant global health burden and represent a substantial threat to public health. These diseases not only hinder social and economic development worldwide but also contribute to growing inequalities between nations and within populations (WHO, 2021), particularly in Low and Low Middle-Income Countries (LMICs) (Allen et al., 2017).

Bangladesh, a densely populated developing nation in South Asia, is undergoing significant economic transition and experiencing rapid demographic shifts. The current population of Bangladesh stands at approximately 167.4 million people (United Nations, n.d.). Over the years, there has been an improvement in life expectancy at birth, rising from 65.6 years in 2000 to 74.3 years in 2019 (United Nations, n.d.). However, the healthy life expectancy at birth remains around 64.3 years, posing significant challenges for both the citizens of Bangladesh and the country's healthcare and social systems. (United Nations, n.d.). Notably, recent studies have revealed that the escalating rates of non-communicable diseases (NCDs) in the country can be attributed to prevailing lifestyle practices among both adults and children. Factors such as inadequate diet, poor sleeping patterns, tobacco consumption, and low levels of physical activity have been identified as contributing to the exponential growth of NCDs in Bangladesh. (Biswas et al., 2022; Hossain et al., 2022.) These findings underscore the urgent need for interventions and preventive measures to address these lifestyle-related issues and mitigate the burden on public health and society at large.

To address this challenge, the World Health Organization encourages self-management support as a worldwide preference to improve population health and sustain healthcare systems in response to the increasing number of individuals with NCDs (WHO, 2022b) across high, middle, and low-income countries. Self-management education should be an integral part of high-quality health care as it aims to manage NCDs individually (Silver, 2018). In a systematic review of 157 studies, Reynolds et al. (2018) found that self-management support interventions most frequently resulted in improvements in patient-level outcomes compared to others. Thus, healthcare professionals must take on a new role and develop new skills to support their patients' self-management, establishing a proactive, personalized, and dynamic partnership with their patients, families, and communities (Byrne et al., 2022; Galdas et al., 2015).

The most commonly reported framework in the literature is the Five A's model, which outlines the five essential stages to support patients in managing their NCDs by identifying, planning, and taking action towards new healthy lifestyle goals (Assess, Advise, Agree, Assist, and Arrange) (Glasgow, 2006). Healthcare professionals must evaluate patients' motivation and beliefs about living with NCDs to personalize the support provided. The advise phase's crucial component is information regarding the health condition and its impact on the patients' health and well-being. Education is necessary to make evidence-based decisions about new health and lifestyle goals (Glasgow, 2006). During the agree phase, healthcare professionals and patients should jointly decide on the goals to pursue, guided by positive experiences. The assist phase requires healthcare professionals to have the necessary skills to help patients implement and maintain their new lifestyle routines. The arrange phase involves healthcare professionals and patients comparing initial expectations with actual achievements and discussing the need for any changes, initiating a new cycle (Glasgow, 2006).

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Self-management support should involve an interdisciplinary personalized approach to care delivery, where each member of the healthcare team displays core competencies in recognizing ethical quandaries, reflecting on their own behavior, and respecting patients' autonomy in shared decision-making (WHO 2022b). Therefore, it is essential to have standardized and reliable tools to assess healthcare professionals' competencies that can enhance their role in this domain, particularly during their formal education and training stages (Kostova et al., 2021). The emphasis on students as the healthcare professionals of tomorrow is particularly crucial, considering the growing body of evidence highlighting their challenges in applying theoretical knowledge to practical settings (Gudgeon et al., 2023). Moreover, students often encounter conflicting values between their formal education and clinical internships, further underscoring the importance of addressing their needs and concerns (Lam et al., 2021; Lauder et al., 2008, Pols et al., 2009; Van Hooft et al., 2018). In alignment with this requirement, the Self-Efficacy and Performance in Self-Management Support (SEPSS) instrument (Duprez et al., 2016) emerges as a promising tool to measure healthcare professionals and students' self-efficacy and performance in providing self-management support to patients with NCDs.

In Bangladesh, an instrument that can validly and reliably measure healthcare professionals' performance and their perceived capacity to perform self-management support is needed to evaluate the current practice and training in in this field. Thus, we aimed to translate the SEPSS instrument into Bangla, culturally adapt it, and validate its psychometric properties in a sample of undergraduate nursing and medical students from Bangladesh.

2. Materials and Methods

2.1 Study Design

This study was conducted in two main phases: i) translation and cross-cultural adaptation of the SEPSS questionnaire to Bangla; ii) assessment of the scale's psychometric properties with a sample of undergraduate healthcare students from Bangladesh.

During phase one, the original version of the SEPSS questionnaire (in English) was translated and adapted to Bangla during phase one (April to September 2021) using the six stages proposed by Beaton et al. (2000). Stage I involved two independent reviewers who were fluent in written and spoken English translating the questionnaire forward. The resulting translations were analyzed and discussed by the research team and reviewers, and a Bangla α version of the SEPSS questionnaire (Duprez et al., 2016) was developed in stage II.

In stage III, two official translators with native English proficiency back-translated the α version into English. The research team and translators reviewed the back-translations, and the original SEPSS questionnaire and the Bangla α version were deemed linguistically equivalent.

An Expert Committee consisting of one member from Khulna City Medical College Hospital (Khulna, Bangladesh), two members from City Medical College & Hospital (Khulna, Bangladesh), and two members from Universal Medical College and Hospital (Dhaka, Bangladesh) was formed in stage IV to review the Bangla version of the SEPSS questionnaire. After rounds of discussion and synthesis of individual contributions, a final consensus on each component of the scale was achieved. In a final round, the experts unanimously deemed the scale as a valuable contribution to the current undergraduate training of healthcare professionals in Bangladesh.

In the final stage, a pre-test of the pre-final version was conducted, and nursing and medical students (n = 38) found the items of the SEPSS questionnaire (Bangla version) clear and easily scored. The research team deemed the average response time of 30 minutes appropriate based on their experience with previous instruments. The original authors of the questionnaire approved the conducted process after reviewing the results gathered from the previous phases (stage VI).

Concerning phase two, the psychometric validation of the SEPSS questionnaire (Bangla version) was conducted between September and November 2021, in the three higher education institutions of Bangladesh.

2.2. Settings and Participants

Three higher education institutions in Bangladesh, namely City Medical College and Hospital, Gazipur, Bangladesh (CIMCH), Khulna City Medical College, Khulna, Bangladesh (KCMCH), and Universal Medical College, Dhaka, Bangladesh (UMCH), were selected for the initial validation process of the SEPSS questionnaire due to their role as partner institutions of the Erasmus+ DIGICARE project.

During phase two of the study, student recruitment followed a non-probability, consecutive sampling approach (Marôco, 2018), with senior researchers approaching students between classes and informing them about the study goals. Interested students who were age 18 years or above, enrolled in a Bachelor of Nursing or medicine degree at one of the institutions, and willing to participate in the study were asked to sign an informed consent form. Students who had previous formal training on clinical self-management support or were enrolled in these institutions as part of a short-term mobility action were excluded from the study. After signing the consent form, students were instructed to independently score the SEPSS questionnaire and place it in a sealed box when finished to be considered eligible for study inclusion.

2.3. Instruments and Variables

Data were collected using the translated and culturally adapted version of the SEPSS to Bangla. The SEPSS questionnaire is based on the Five A's models and includes an additional category for "generic" self-management support skills that are not covered by the model (Duprez et al., 2016). The questionnaire comprises six dimensions, each containing six items: (i) Assessment, (ii) Advise, (iii) Agree, (iv) Assist, (v) Arrange, and (vi) Overall Competency. Respondents score their self-efficacy and performance on a five-point Likert scale, with 0 representing the lowest score and 4 representing the highest score. The six subscales allow for a more detailed analysis of specific aspects of self-management support, while the total score provides an overall view (Duprez et al., 2016). Scores range from 0 to 4 for the subscales and from 0 to 24 for the total score, with higher scores indicating better self-efficacy and performance in self-management support. Mean scores need to be calculated for each subscale (range 0-4).

2.5 Statistical Analysis

A two-step maximum likelihood structural equation modeling procedure was conducted using AMOS 23.0 (SPSS Inc, Chicago, IL). Firstly, a confirmatory factor analysis (CFA) was performed to validate the measurement model. The reliability of the constructs was evaluated using Cronbach's α coefficients, and values above the 0.70 criterion were considered reliable (Nunnally & Berstein, 1994). Secondly, the structural model estimation was carried out to test the research hypothesis. The suitability of the data for both the measurement and structural models was assessed using a variety of Goodness-of-Fit indices (GFIs). In particular, a good model fit was considered when the chi-square (x2) was less than 3.0, and the comparative fit index (CFI) and GFI were greater than 0.90 (Nunnally & Berstein, 1994). A root mean square error of approximation (RMSEA) value less than 0.06 indicated a good fit, while values between 0.08 and 0.10 were deemed acceptable (Nunnally & Berstein, 1994).

2.7 Ethical Considerations

The research proposal was approved by the Ethics Committee of the Health Sciences Research Unit: Nursing of the Nursing School of Coimbra with number P781-5/2021. Informed consent was obtained to ensure that the subjects voluntarily participated in this study. The students participating in the study were provided with full information about the study including the purpose, research methods, and rights when participating study. Students were informed of their right to withdraw from the study at any time without consequences.

3. Results

A total of 486 nursing (n = 312, 64.2%) and medical (n = 174, 35.8%) students from three higher education institutions in Bangladesh voluntarily participated in the study. These institutions were CIMCH (n = 184, 37.9%), KCMCH (n = 152, 31.2%), and UMCH (n = 150, 30.9%). Female students (n = 371, 76.3%) outnumbered male students (n = 115, 23.7%) by three to one. Most participants (n = 457, 94%) were full-time students, with only a small proportion (n = 29, 6%) being part-time students. The students' mean age was 22.4 years (±2.35), with the youngest student being 19 and the oldest 36 years old. In terms of the results of phase two, healthcare students scored their potential performance in higher than their self-efficacy perception (Table 2).

Concerning phase two of this study, healthcare students' scoring of their potential performance in the self-management support of patients with NCDs was higher than their perception of self-efficacy (Table 1).

Table 2. Total and subscale mean and SD in Self-efficiency and performance of SEPSS instrument.

SEPSS dimension	Self-Efficacy (Min and Max)	Performance (Min and Max)
Assess	2.83 ± 0.83 (0 and 4)	2.99 ± 0.77 (0 and 4)
Advise	2.85 ± 0.74 (0 and 4)	2.99 ± 0.74 (0 and 4)
Agree	2.84 ± 0.80 (0 and 4)	2.97 ± 0.76 (0 and 4)
Assist	2.87 ± 0.78 (0 and 4)	2.99 ± 0.70 (0 and 4)
Arrange	2.82 ± 0.82 (0 and 4)	2.88 ± 0.86 (0 and 4)
Overall competency	2.87 ± 0.78 (0 and 4)	3.00 ± 0.78 (0 and 4)
Total Score (0-24)	17.08	17.82

The reliability of the SEPSS dimensions for self-efficacy and performance was estimated using Cronbach's alpha (Table 2). All values for self-efficacy and performance were equal to or greater than 0.75, indicating acceptable reliability.

Table 3. Cronbach alpha values of 6 dimensions of SEPSS.

SEPSS dimension	Self-efficacy subscale	Performance subscale	SEPSS scale (global)
Assess	0.84	0.82	0.85
Advise	0.76	0.75	0.78
Agree	0.82	0.78	0.83
Assist	0.83	0.75	0.82
Arrange	0.83	0.84	0.86
Overall competency	0.82	0.80	0.83

Regarding the CFA performed on the final model (Figure 23), the results showed a good fit according to the normal fit index (NFI), which had a value of .842. The comparative fit index (CFI) also indicated an adequate fit, with a value of .895. The Root Mean Square Error of Approximation (RMSEA) was .058 (with a 90% confidence interval between .055 and .062), suggesting that the observed data and the proposed model fit reasonably well. Additionally, the CMIN/DF fit index for the default model was 2.658, which is less than 3, indicating an acceptable fit according to Kline (1998).

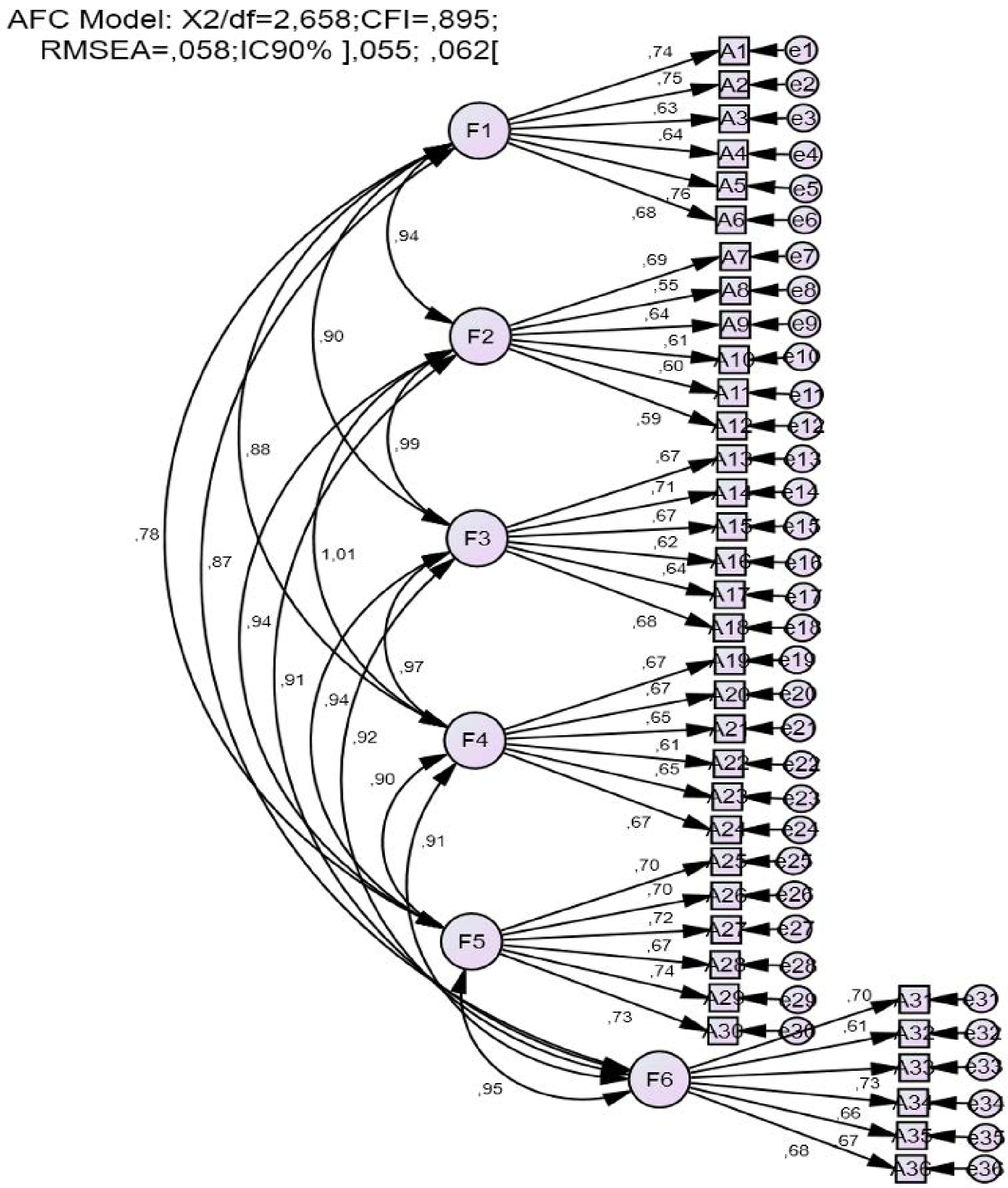

Figure 23. SEPSS model and goodness of fit indexes obtained by confirmatory factor analysis.

4. Implications for Nursing and Medical Education

Self-management is the dominant paradigm for delivering care for NCDs in many countries. Developing and implementing educational interventions to enhance self-management support competencies for future healthcare professionals is therefore critical (Dineen-Griffin et al., 2019; Duprez et al., 2017; Wuyts et al., 2021). In this study, we aimed to evaluate the construct validity of the SEPSS instrument using CFA. The proposed structural equation model evidenced satisfactory goodness-of-fit indices. The CMIN/DF value for the default model was 2.658, indicating a reasonable fit. The sample data and hypothetical model were an acceptable fit, as indicated by RMSEA values ≤ 0.05. The instrument and its subscales demonstrated strong internal consistency, as evidenced by high Cronbach's alpha values ranging from 0.75 to 0.96. The test-retest procedure indicated good stability of the instrument.

The performance of Bangladeshi nursing and medical students was found to be higher than their self-efficacy scores across all subscales and in total. Since self-efficacy is a critical precursor to behavior, it is recommended that performance and self-efficacy items be assessed in an integrated manner. These preliminary findings suggest that Bangladeshi nursing and medical students are actively engaged in supporting patients' self-management of NCDs in different stages but may lack confidence in their level of proficiency and competency to provide efficient, safe, and timely care. These initial findings can provide insight to nursing and medical educators in the selected higher education institutes on the significance of designing and implementing specific educational interventions that concentrate on enhancing students' competencies in crucial aspects of self-management support, including patient-centered communication and counseling, shared decision-making, information provision, innovative thinking, and cultural, religious, and spiritual awareness (Dineen-Griffin et al., 2019; Duprez et al., 2017; Wuyts et al., 2021).

However, it is important to consider the limitations of our study. Firstly, we recruited participants from only three non-randomized universities, which may limit the generalizability of our findings. Additionally, our model analysis did not account for the potential differences in undergraduate students' scoring of the SEPSS instrument based on their scientific background and year of study. Therefore, further validation studies are required to ensure the instrument's reliability and construct validity for specific undergraduate healthcare courses and to assess whether students' progression through the course affects their perception and scoring of the instrument. Furthermore, given the interdisciplinary nature of self-management support, it is recommended that the translated and culturally adapted version of the SEPSS instrument be validated with other key stakeholders, such as physiotherapy, pharmacy, and nutrition students.

Secondly, although our selection of undergraduate students was intentional, we believe that the Bangla version of the SEPSS instrument could also be a reliable tool to assess self-management support competencies among post-graduate students and licensed healthcare professionals. In Bangladesh, these groups face increasing pressure to plan and deliver care in increasingly demanding scenarios due to the exponential growth in citizens requiring care and the increasing complexity of their health conditions and needs.

In conclusion, the Bangla version of the SEPSS instrument demonstrated both semantic and linguistic equivalence to the original version and was positively received by academic experts and undergraduate nursing and medical students in Bangladesh. The instrument also displayed favorable psychometric properties, suggesting its potential for evaluating the self-efficacy and performance of undergraduate healthcare students in supporting patients' self-management of NCDs. Future studies with a more diverse and inclusive sample, including students with varying scientific backgrounds, post-graduate students, and healthcare professionals, are necessary to further refine the instrument.

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5.3 How do medical and nursing students view healthcare technology? A psycho-metric validation study of the Usability Evaluation Questionnaire in Bangladesh

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This chapter presents the process and results of culturally adapting and validating the psychometric properties of The Usability Evaluation Questionnaire (UtEQ) among Bangladeshi undergraduate medical and nursing students. The article presented below is an exact replica of **the manuscript published in the JIM - Jornal de Investigação Médica**. However, adjustments have been made to the referencing style, table and figure numbering, and format to align with this e-book.

Abstract

The modernization of healthcare delivery is a reality in various international settings. To ensure efficient and safe use of the diverse forms of healthcare technology available, professionals and students must be receptive to incorporating such tools into their practice. Currently, there is no instrument in Bangladesh to assess healthcare students' technology acceptance. Objective: To translate, culturally adapt, and validate the Usability Evaluation Questionnaire (UtEQ) among Bangladeshi healthcare students. Method: A cross-sectional study with a methodological approach was conducted in two phases. The first phase involved the translation of the UtEQ questionnaire to Bengali, following the six stages proposed by Beaton et al. In the second phase, the psychometric properties of the questionnaire were evaluated using a non-probability sample of 486 undergraduate healthcare students from three higher education institutions in Bangladesh. Confirmatory factor analysis was performed, and the Cronbach's alpha coefficient was estimated to find out the internal consistency. Results: Internal consistency was found to be excellent for all scale dimensions, ranging from 0.88 to 0.92, while confirmatory factor analysis showed adequate goodness-of-fit indicators. Conclusion: The UtEQ-B provides a reliable and valid method for healthcare educators and researchers to assess technology acceptance among healthcare students during clinical training in Bangladesh.

Keywords: Technology acceptance; medical students; nursing students; scale; Bangladesh

Background

In recent years, Bangladesh has made significant strides in healthcare outcomes. However, the country is currently undergoing sociodemographic and epidemiological transitions characterized by increasing longevity, decreasing fertility, and a shift in disease epidemiology (Kabir et al., 2021). Non-communicable diseases (NCDs) have been on the rise across different geographic locations (both rural and urban settings), age groups, sexes, and ethnicities (Kabir et al., 2021). A national study conducted in Bangladesh on NCD risk factors revealed that a majority of adults aged 18-69 (70.9%) had at least one risk factor, while 26.2% had three or more risk factors (WHO, 2018). These risk factors included inadequate fruit and vegetable intake, tobacco use, low physical activity, obesity (particularly central obesity), high blood pressure, diabetes mellitus, excessive salt intake, dyslipidemia, and binge drinking. Recognizing the importance of addressing this situation, the Country Office for Bangladesh of the World Health Organization emphasized the need for effective strategies to enhance accessibility to healthcare services (WHO, 2018). Therefore, it is crucial to proactively take steps to tackle this emerging health challenge and ensure that comprehensive care delivery is accessible to all.

The increasing adoption of information and communication technology (ICT) in private and public healthcare settings is playing a crucial role in bridging the gap between citizens and healthcare providers in Bangladesh (Bhattacharyya et al., 2020; Prodhan et al., 2018; Uddin et al., 2017), mirroring efforts made in the recent years by other countries (Bayramzadeh & Aghaei, 2021). However, progress in Bangladesh lags that of other countries in Southeast Asia (Hoque & Bao, 2015; Islam & Tabassum, 2015). In a scoping review conducted by Ahmed et al. (2014) on eHealth and mHealth initiatives in Bangladesh, the authors emphasized the absence of fundamental medical training, specifically hands-on sessions focusing on the utilization of technical materials and technological platforms. A similar viewpoint was shared by Islam

(2015), who conducted interviews with 68 healthcare professionals in Bangladesh. The study findings suggested that healthcare staff should receive technology training to enhance service efficiency and promote transparency in health services (Islam, 2015).

The use of such technologies is crucial to increase the work efficiency and effectiveness of healthcare professionals and students, leading to better care outcomes for patients and their families (Alam et al., 2020; Bhattacharyya et al., 2020; Prodhan et al., 2018; Uddin et al., 2017). Electronic patient health records, internet-based health websites, digital applications, and telemedicine software are some of the information technologies and applications that healthcare professionals and students will use in their daily clinical work. Before deciding to use a specific technological device, users evaluate its advantages and limitations. It is, therefore, essential to understand how these individuals react to new technologies (Plch, 2020).

« Low levels of technology acceptance can lead to failure or delay in implementing a specific technology in daily clinical practice, which can negatively impact healthcare objectives and hinder the quality and safety of care delivery (Ketikidis et al., 2012; Parreira et al., 2021). Technology acceptance refers to users' willingness to use technology for the tasks it is designed to support (Nasal et al., 2020). Healthcare professionals and students' knowledge and beliefs influence the evaluation process and contribute to their adoption, not just during its design phase or immediately after its implementation in a clinical setting (Arkorful et al., 2020). Changes are expected to occur in information systems, their designs, working environments, potential users, and social and cultural factors, which can affect healthcare professionals and students' needs and acceptance of technology (Mensah et al., 2023; Nasal et al., 2020). »

Current literature references the existence of several technology acceptance models and theories which can assist researchers understand users' behaviors towards technology by examining the underlying factors (Mensah et al., 2023). Identifying these factors can improve the effectiveness of healthcare technologies by allowing researchers to investigate technical, social, and cultural aspects and understand the correlation between those factors and users' readiness to use such innovation (Ammenwerth, 2019; Plch, 2020; Teo, 2011). The Technology Acceptance Model (TAM) is widely accepted in literature for understanding predictors of user intention towards technology usage (Ammenwerth, 2019). It is considered the common ground theory in this field. According to TAM, an individual's intention to use new technology is influenced by two primary factors: perceived ease of use and perceived usefulness. Building on the TAM model, a group of researchers developed the Usability Evaluation Questionnaire (UtEQ) to assess end-users' assessment of medical devices and technology' efficacy, performance, and safety (Parreira et al., 2020). The UtEQ has been adapted by healthcare educators and researchers in various countries, including Portugal, Belgium, Finland, Slovenia, and Vietnam, to assess healthcare students' acceptance of different technologies during their clinical training, with positive results (Parreira et al., 2019; Parreira et al., 2021).

As there is currently no such instrument available in Bangladesh, we aim to culturally adapt and validate the psychometric properties of the UtEQ among Bangladeshi undergraduate medical and nursing students.

What Have We Done?

We conducted this study in two main phases. The first phase involved the translation and adaptation of the UtEQ questionnaire into Bengali, as well as the assessment of its psychometric properties among undergraduate healthcare students in three universities in Bangladesh. The second phase focused on the validation of the translated and culturally adapted version of the UtEQ-B in three higher education institutions in Bangladesh.

During the initial phase, in stage I, the questionnaire was translated from English to Bengali through a rigorous process following the methodology proposed by Beaton et al. (2000). Two independent healthcare reviewers proficient in both English and Bengali performed the forward translation. In the synthesis stage (stage II), the translations were thoroughly analyzed and discussed by the research team and reviewers, resulting in the development of the Bengali version of the UtEQ (UtEQ-B). In stage III, two official translators with native English proficiency back-translated the initial Bengali version into English. The back-translations were then reviewed by the research team and translators to ensure linguistic correspondence between the original UtEQ and the Bengali version.

During stage IV, an Expert Committee (n = 6) consisting of PhD researchers and professors from three medical colleges and hospitals in Bangladesh was formed to review the UtEQ-B. After several rounds of discussion, a final consensus was reached, and the experts unanimously approved the questionnaire as a valuable tool the assessment of technology acceptance by medical and nursing students in Bangladesh. A pre-test involving 78 students from the three institutions was conducted to assess the suitability and average response time of the instrument, with a predetermined average response time of 20 minutes. The original authors of the questionnaire reviewed the results from the previous phases and approved the process.

In the second phase of the study, the UtEQ-B was administered to a convenience sample of students from three higher education institutions in Bangladesh. The participants were asked to complete the questionnaire, and their responses were collected between November 2021 and February 2022. The collected data were then subjected to statistical analysis to evaluate the psychometric properties of the UtEQ-B.

Sample Size, Study Recruitment and Data Collection

The participants of the study were recruited among the healthcare students from City Medical College and Hospital, Gazipur (CIMCH), Khulna City Medical College, Khulna (KCMCH) and Universal Medical College, Dhaka (UMCH). To be included in the study, a participant was required to be a bachelor level nursing or medical student and interested to participate and be available during data collection. Students who were not available nor interested to participate during data collection time were excluded from the study.

The sample size was defined ensuring a minimum of 10 individuals per questionnaire item according to Terwee and collaborators (2007). A sample of 486 students participated in the study, considering the number of parameters and dimensions present in the questionnaire, to ensure an adequate stability of the variance/covariance matrix, when performing a Confirmatory Factor Analysis (CFA).

Instruments and Variables

Parreira et al. (2020) developed the UtEQ questionnaire based on the TAM model, which originally comprises 45 items divided into four factors: Utility Performance (UP), Utility Empowerment (UE), Utility Relationship (UR), and Easy to use (EU). The UR factor of the scale evaluates students' perceptions regarding how technology aligns with their workflow, integrates with existing clinical processes, and enhances communication and collaboration with patients and healthcare professionals (Parreira et al., 2020). This factor comprises 10 items that specifically assess the role of technology in facilitating a positive and effective relationship between healthcare professionals and patients (Parreira et al., 2020). These items, such as "Facilitates an empathic relationship with a patient" (item 20), "Enhances my understanding of a patient's experience" (item 21), "Establishes a true relationship with the patient" (item 23), and "Builds an effective relationship with the patient" (item 32), collectively measure the extent to which technology is perceived to support meaningful interactions, empathy, and rapport in the context of patient care (Parreira et al., 2020).

The UP factor within the scale assesses the perceived performance-enhancing aspects of technology in healthcare settings (Parreira et al., 2020). This factor consists of nine items, including examples such as "Supports my recordkeeping" (item 5), "Allows me to complete task(s) quickly" (item 9), and "Allows me to control the task(s) to be performed" (item 14). These items collectively capture students' perceptions of how technology contributes to their efficiency, effectiveness, and control in performing various tasks related to patient care (Parreira et al., 2020). By evaluating the utility of technology in terms of performance, this factor provides insights into the extent to which technology enables students to streamline their workflow, manage tasks efficiently, and have greater control over their work processes (Parreira et al., 2020).

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The UE factor in the scale consists of six items that assess the role of technology in empowering patients to take an active role in managing their own health. These items, including "Supports the patient's self-management skills" (item 33), "Motivates the patient to take control of his/her own health" (item 35), and "Motivates the patient's interest in his/her own health" (item 38), capture the perceived utility of technology in promoting patient empowerment and engagement in their healthcare journey. This factor emphasizes the potential of technology to support patients in developing self-management skills, fostering motivation, and encouraging a proactive approach towards their own health (Parreira et al., 2020).

The EU factor focuses on the perceived ease of use and user-friendliness of technology in the clinical care of patients. It evaluates students' perceptions of the simplicity of learning and navigating the technology, as well as the intuitiveness of its interface and features (Parreira et al., 2020). The factor's eight items assess various aspects such as the requirement of a short learning period (e.g., item 17), the need for previous knowledge (e.g., item 19), and the demand for minimal mental effort (e.g., item 3).

Respondents rate each item on a scale of 1 (Strongly disagree) to 7 (Strongly agree), with higher scores indicating a greater inclination to incorporate technology into their clinical practice due to its perceived benefits (Parreira et al., 2021). Additionally, the data collection instrument includes a brief section that asks about participants' sociodemographic characteristics (e.g., age, gender) and academic information (e.g., course year, enrollment status).

Statistical Analysis

We employed the AMOS software (SPSS Inc, Chicago IL) to conduct CFA and estimate the structural model. Internal consistency of the constructs in the study was assessed using Cronbach's alpha (α), where a value of greater than 0.70 was considered to indicate adequate reliability (Hu & Bentler, 2009). To evaluate the goodness of fit of the data to the model, we employed a range of goodness of fit indices, along with their acceptable thresholds. These thresholds were derived from Hu and Bentler (1999). The evaluation of the proposed structures' goodness of fit to the correlational structure of the data was based on measures such as χ^2/df, comparative fit index (CFI), Tucker–Lewis index (TLI), Standardized Root Mean Squared Residual (SRMR), root means square error of approximation (RMSEA), and the 90% confidence interval for RMSEA. To determine a good fit, we set the threshold of chi-square/degrees of freedom to be less than 5.0. A CFI greater than .97 was considered a good adjustment, and a CFI between .95 and < .97 was considered an acceptable fit. Concerning the goodness of fit (GFI) index, we regarded a value greater than .95 as indicative of a good fit, and a value between .90 and < .95 as acceptable. We deemed a root means square error of approximation (RMSEA) value of less than .05 as indicative of a good fit, and a value between .05 and .08 as acceptable. We assumed a statistical significance level of .05.

Ethical Considerations

The research proposal bearing number P781-5/2021 was authorized by the Ethics Committee of the Health Sciences Research Unit of the Nursing School of Coimbra. Prior to participating in the study, participants voluntarily provided informed consent. Participants were provided with comprehensive information about the study's objectives, as well as data collection and analysis methods. To ensure participant confidentiality and anonymity, the data collection instruments used in the study were coded randomly. This coding process was designed to prevent the research team from accessing any personal identification details of the participants, promoting a secure and ethical research environment. Additionally, they were informed of their right to withdraw from the study at any time without fear of academic or personal repercussions.

What Have We Found?

A total of 486 nursing (n = 274, 61.2%) and medical (n = 174, 38.8%) students from three higher education institutions in Bangladesh participated in the study. These institutions were CIMCH (n = 172, 38.4%), KCMCH (n = 140, 31.3%), and UMCH (n = 136, 30.4%). Female students (n = 349, 77.9%) outnumbered male students (n = 99, 22.1%) by almost four to one. Most participants (n = 418, 93.3%) were full-time students, with only a small proportion (n = 30, 6.7%) being part-time students. In terms of age, most students were between 19 and 25 years (n = 404, 90.2%), followed by students ages 26 to 30 (n = 36, 8%) and ages between 31 and 36 years (n = 8, 1.8%). Concerning their academic course year, most participants were in their third year (n = 206, 46%), followed by second (n = 200, 44.6%), fourth (n = 37, 8.3%), and first-year students (n = 5, 1.1%).

In terms of the results of phase two, the descriptive statistics of the UtEQ-B can be found in Table 4.

Table 4. Descriptive statistical analysis of UtEQ-B factors (n = 486).

Factor	Min.	Max.	Mean	SD
Utility relationship (UR)	1	7	5.34	1.18
Utility Performance (UP)	2.11	7	5.50	1.05
Utility Empowerment (UE)	1	7	5.40	1.15
Ease to use (EU)	1	7	5.40	1.15

Min. = minimum value; Max. = maximum value; SD = standard deviation.

Reliability analysis revealed that the EU factor of the UtEQ-B had an α value of 0.88, indicating adequate reliability. Similarly, the UR factor with 10 items presented an α value of 0.92, indicating good reliability. The UP factor with 9 items (α = 0.90) was deemed good. The UE factor with 6 items was also deemed adequate (α = 0.88).

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Concerning the EU factor, we first explored its confirmatory structure analysis as a single model (Table 5). All the eight items of EU factor showed positive and significant impact with p < .001.

Table 5. Confirmatory structure analysis of the UtEQ-B's EU factor.

Item	Estimates	SE	t-value	Sig.
1. Is intuitive	1.000	.053		.000
3. Requires minimal mental effort	.781	.057	14.77	.000
4. Meets my expectations	.819	.054	14.31	.000
14. Allows me to control the task(s) to be performed	.794	.058	14.67	.000
15. Requires formal instructions to use them	.896	.057	15.55	.000
17. Requires a short learning period to use them	.808	.055	14.18	.000
18. Allows me to complete the task(s) according to the patient's needs	.803	.055	14.69	.000
18. Allows me to complete the task(s) according to the patient's needs	.741	.053	13.54	.000

SE = Standard Error; Sig. = Statistical significance (p ≤ .05).

The fit indices for the EU factor fell within the acceptable range (Figure 24), considering the found results for CMIN/df = 2.583, GFI = .977, CFI= .982, RMSEA = .057 [LO90 = .037; HI90 = .078], and a TLI = .973.

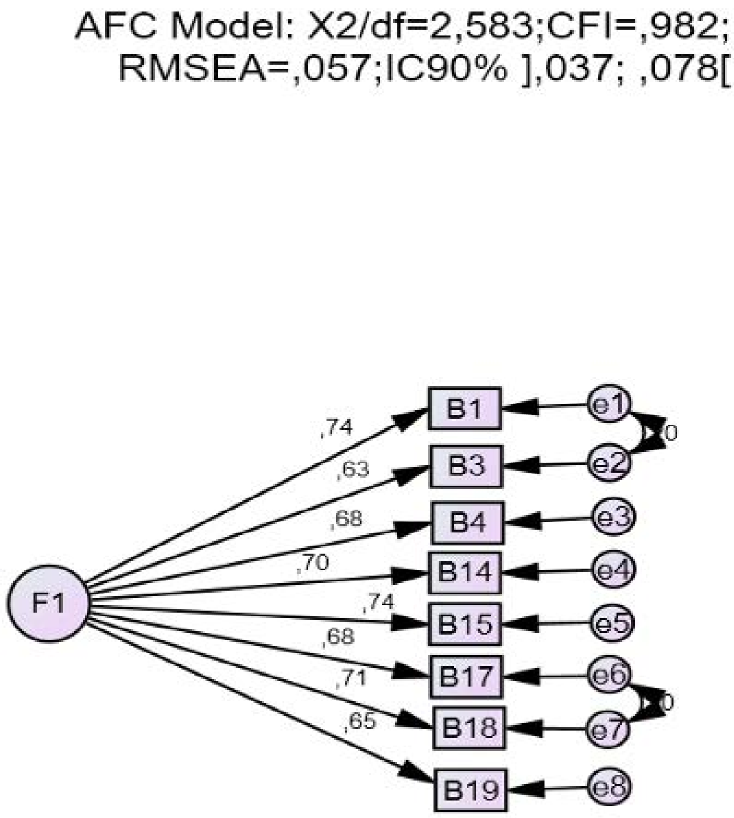

Figure 24. Confirmation factor analysis of the EU factor (UtEQ-B).

We performed CFA on a joint model that combines all utility-related aspects of professional performance, relationship, and empowerment. The fit indices for the model focusing on “Utility” (Figure 25), with CMIN/df = 2.386, GFI = .902, TLI = .940, CFI = .982, and RMSEA = .053 [LO90 = .048; HI90 = .059], were also considered acceptable.

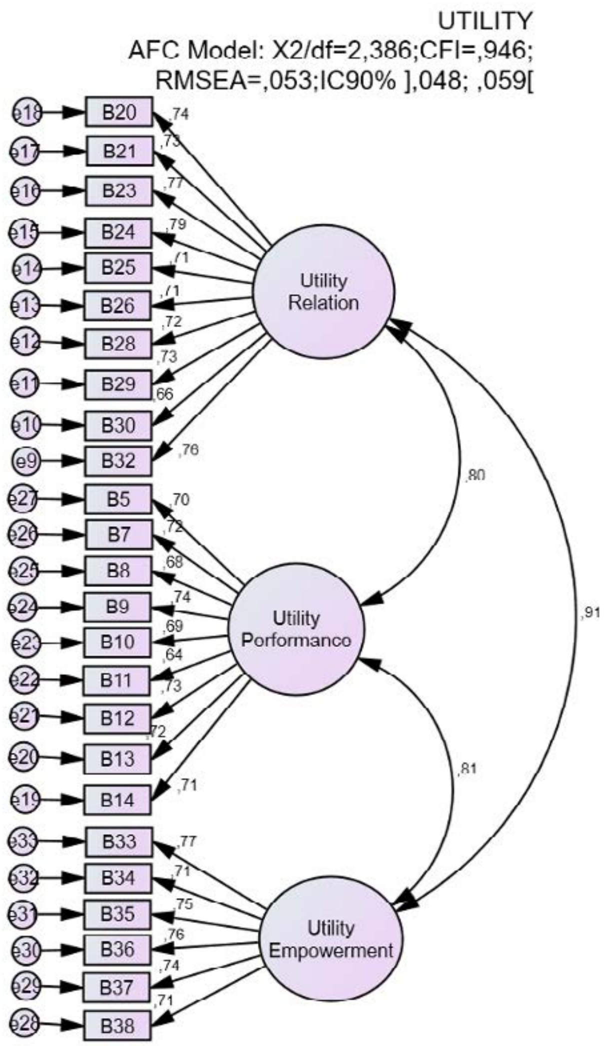

Figure 25. Confirmation factor analysis of the utility combined factors (UtEQ-B).

Implications for Nursing and Medical Education

In Bangladesh, a country with a low socio-economic status, patients encounter significant obstacles in accessing essential healthcare services, both in community settings and hospitals (WHO, 2022). The country's population-nurse ratio of 5000:1, bed-nurse ratio of 13:1, and doctor-nurse ratio of 2.5:1, are significantly lower than international standards (Ahmed et al., 2011; Baroi et al., 2017). Consequently, doctors and nurses struggle to deliver quality care and improve patient's experience. To address this issue, the Ministry of Health and Family Welfare (MOHFW), supported by WHO Bangladesh, has launched the development of a national digital health strategy. The primary aim of this strategy is to improve the accessibility, quality, and affordability of health services, considering the low access to healthcare services in Bangladesh and the potential of technological advances to enhance people's health (WHO, 2022). Digital health technology provides an opportunity to transform inadequate healthcare systems into more appropriate ones by offering cost-effective, faster, and more effective solutions for treating chronic diseases (Ahmed et al., 2020).

Additionally, digital technology can level the playing field between patients and healthcare professionals, allowing patients to access healthcare services more efficiently and enable healthcare professionals to deliver care more effectively. However, there is a risk that care quality may be compromised due to poor technology acceptance by both patients and healthcare professionals. In a recent multicenter study conducted in Swiss psychiatric hospitals, it was found that physicians and nurses who have greater interaction with digital technologies tend to report higher levels of stress and lower levels of digital competence compared to individuals in other professions (Golz et al., 2021). Another multicenter cross-sectional study conducted by Kasemi et al. (2022) examined the relationship between technology-related stress and various outcomes among Egyptian medical staff members and students. The study revealed that participants reported moderate-to-high levels of stress, which were associated with increased burnout, strain, and cortisol levels. Additionally, high levels of technology-related stress were found to be associated with decreased work engagement and lower CoQ10 enzyme levels (Kasemy et al., 2022). To address this, targeted interventions should be conducted during formal education to enhance students' perceptions of the role and utility of technology in care delivery (Arkorful et al., 2020.

However, a valid measurement scale is necessary to predict user technology acceptance in Bangladeshi healthcare education. Our findings suggest that the UtEQ-B is a reliable and well-suited tool for assessing technology acceptance among healthcare students in Bangladesh. Its "Easy to Use" factor, composed of eight items, showed a positive and significant impact ($p < .001$) on overall technology acceptance. These results are a surprising addition to the ones by Hoque and Bao (2015), who found that perceived usefulness was a significant indicator of e-health adoption decisions, whereas Perceived Ease of Use was an insignificant predictor of e-health adoption among 146 respondents from private and public hospitals in Dhaka.

Overall, the Cronbach's alpha values were within normal limits, confirming the reliability of the questionnaire. The goodness of fit indexes of the final model proposal were found to be adequate, indicating that the original model proposed by Parreira and colleagues (2021) is appropriate for evaluating technology acceptance among healthcare students in Bangladesh. Therefore, the UtEQ-B is a valid and comprehensive measurement tool that can be utilized by healthcare educators and researchers in Bangladesh to accurately assess students' technology acceptance during their academic journey, prior to their entry into the job market. Utilizing such measurement tool is vital in addressing existing challenges in Bangladesh, where healthcare staff are often considered ill-prepared to navigate technologically advanced care environments (Hui et al., 2022).

Our study findings show that medical and nursing students in Bangladesh exhibit a moderate level of acceptance towards the technology utilized in patient care. This is evident from the average scores ranging from 5.34 (Utility Relationship factor) to 5.50 (Utility Performance factor) across the different factors of the UtEQ-B scale. While young adults are generally proficient in technology, our findings indicate that there is still room for improvement and further acceptance among medical and nursing students.

The understanding of this moderate level of acceptance among students holds significance for the development of educational curricula and policymaking in Bangladesh. Medical and nurse educators should consider incorporating electronic health records (EHRs), wearable technologies, big data and data analytics, and increased patient engagement as crucial areas in curriculum development (Briscoe et al., 2006; Risling, 2017). Additionally, clinical supervisors and tutors involved in student training should be mindful of the potential impact of technology on students' professional development during clinical placements. This includes areas where technology is employed in care delivery, such as communication with patients and their families, and updating patients' healthcare plans in EHRs. Such unpreparedness can lead to unfavorable outcomes for both students and professionals (e.g., technostress (Califf, 2022; Lucena et al., 2021)), as well as patients (e.g., occurrence of adverse events, low-quality care experience (Carayon & Hoonakker, 2019; Konttila et al., 2019)).

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To equip both current and future medical and nursing professionals with a comprehensive set of technological and informatics skills, ongoing educational opportunities should be made available (Arkorful et al., 2020; Ayatollahi et al., 2022; Ketidis et al., 2012). As the healthcare landscape evolves, it is imperative for clinicians in Bangladesh to be well-prepared for the prominent role technology will play in transforming healthcare practices. Therefore, medical and nurse educators need to proactively prepare themselves to guide these practitioners into the future (Briscoe et al., 2006; Risling, 2017). By recognizing the current acceptance level and addressing the evolving technological needs of medical and nursing students, we can foster a more adept national healthcare workforce that embraces and effectively utilizes technology to enhance patient care and outcomes.

While our study provides valuable insights into technology acceptance among medical and nursing students in Bangladesh, it is important to acknowledge its limitations. Although we followed established recommendations for sample size in initial validation studies, the total number of participants (n = 486) may not provide a comprehensive representation of the entire student population in Bangladesh. In addition, our sample selection process did not include defining the students' course year as an inclusion criterion, which may introduce potential biases. Clinical practice and experience can vary significantly throughout the course completion, and this variability was not accounted for in our study. To address these limitations, future research should aim to include specific inclusion criteria related to the students' course year or level, as well as more representative samples that can better capture the diversity of the undergraduate and postgraduate healthcare student population in Bangladesh. Such efforts would enhance the generalizability of our findings and provide a more complete understanding of technology acceptance among medical and nursing students in the country.

Another significant limitation of our study is that it did not specifically focus on doctors and nurses, who are key populations within the context of technology acceptance in healthcare. While our research provides valuable insights into the perceptions of medical and nursing students, it does not fully capture the experiences and perspectives of practicing healthcare professionals in Bangladesh. Including both clinicians and students in future studies would have several advantages. Firstly, incorporating clinicians in the study would allow for a more comprehensive understanding of technology acceptance across different professional roles and levels of experience. Clinicians bring their unique perspectives, practical insights, and real-world challenges to the table. Their involvement would provide a deeper understanding of how technology impacts clinical workflows, patient care, and outcomes. Secondly, having a sample that includes both clinicians and students would enable a more robust evaluation of the psychometric properties of the UtEQ-B. By including a diverse range of participants, we could gather a broader range of responses, allowing for a thorough examination of its reliability, validity, and factor structure. This would further refine the questionnaire and enhance its applicability across various healthcare contexts in the country.

In conclusion, the UtEQ-B showed semantic and idiomatic equivalence to the original version and was well-received by academic experts and undergraduate healthcare students in Bangladesh. The questionnaire demonstrated satisfactory reliability properties, indicating that it is a useful tool for assessing healthcare students' technology acceptance during their formal education. A structured evaluation of this domain could be advantageous for higher education teachers and researchers in Bangladesh, enabling targeted interventions to enhance students' perceptions of the role of technology in care delivery, as well as its ease of use and utility. Nevertheless, future research endeavors should consider expanding the sample size to include students and professionals from various healthcare disciplines to further validate these findings and ensure the instrument's applicability across a broader context.

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5.4 How do nursing students perceive healthcare technology? A psychometric validation study of the Usability Evaluation Questionnaire in Vietnam

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« This chapter provides an overview of the process and outcomes regarding the cultural adaptation and validation of the psychometric properties of the Usability Evaluation Questionnaire (UtEQ) among undergraduate nursing students in Vietnam. The article presented below is an exact replica of **the manuscript published in the JIM - Jornal de Investigação Médica**. However, adjustments have been made to the referencing style, table and figure numbering, and format to align with this e-book. »

Abstract

The rapid advancement of technology has transformed the role of nurses and nursing students in patient care, making it an integral component of healthcare delivery. The use of innovative technologies has become commonplace in healthcare settings, creating a high-tech environment that can enhance nursing care quality and patient experience. It is essential for nursing staff and students to be receptive to incorporating such tools into their practice to ensure safe and efficient use of various forms of healthcare technology. Objective: Given the absence of an existing tool in Vietnam to evaluate healthcare students' technology acceptance, the aim of our research was to culturally adapt, translate, and validate the Usability Evaluation Questionnaire (UtEQ) among nursing students in Vietnam. Method: We conducted a methodological and cross-sectional study in two phases: translation of the UtEQ to Vietnamese (UtEQ-V) following six stages proposed by Beaton and collaborators, and assessment of its psychometric properties in a non-probability sample of 295 Vietnamese nursing students. Results: The UtEQ-V's reliability was found to be above 0.8 for all factors (.88–.95), while confirmatory factor analysis showed adequate goodness-of-fit indicators. Conclusion: The UtEQ-V is a reliable and valid instrument that can support nursing educators and researchers to assess students' technology acceptance during their clinical training.

Keywords: Technology acceptance, nursing students, Vietnam

Background

In Vietnam, nursing staff and students commonly use information and communication technologies such as electronic patient health records, internet-based health websites, digital applications, and telemedicine software in their daily clinical performance (Crow et al., 2014; Huang, 2020; Lim et al., 2021). According to Barchielli et al. (2021), there is a harmonious coexistence between technological competence and nursing care for nurses. Technological innovations enable nurses to establish closer connections with individuals by facilitating a more profound understanding of their patients. When nurses proactively embrace and purposefully adopt technological innovations, they can be viewed as successful innovators (Barchielli et al., 2021). Nurses must recognize the potential opportunities presented by these innovations and strive to minimize direct risks for both themselves and the patients under their care.

However, before implementing a new technology, it is crucial to evaluate its advantages and limitations. Low levels of technology acceptance can negatively impact the adoption and implementation of new technologies in daily clinical practice, leading to delayed or failed attempts at integrating these technologies into healthcare delivery (Ammenwerth, 2019; Carayon & Hoonakker, 2019). This can hinder the quality and safety of nursing care delivery and negatively impact healthcare objectives (Huang, 2020).

Technology acceptance refers to users' willingness to use technology for the tasks it is designed to support (Lim et al., 2021). Understanding how nursing professionals and students react to new technologies is therefore crucial in ensuring their successful implementation and adoption in daily clinical practice (Huang, 2020). Nursing professionals and students' knowledge and beliefs influence the evaluation process and contribute to their adoption of technology (Lim et al., 2021). Social and cultural factors, as well as changes in information systems, designs, working environments, and potential users, can affect nursing professionals and students' needs and acceptance of technology (Lim et al., 2021).

In their scoping review on technology literacy in nursing education, Nes et al. (2021) identified a significant gap in pedagogical models that comprehensively address the acquisition, measurement, and maintenance of technological literacy among nursing students. According to the authors, nursing universities and colleges bear the responsibility of equipping future nurses with the necessary technological literacy knowledge to thrive in an increasingly technology-driven healthcare environment (Nes et al., 2021).

To achieve this, nursing educators and researchers can use several technology acceptance models and theories to identify underlying factors that affect users' behaviors towards technology. The Technology Acceptance Model (TAM) is widely accepted in existing literature for understanding predictors of user intention towards technology usage (Ammenwerth, 2019; Nadal et al., 2021; Teo, 2011). According to TAM, perceived ease of use and perceived usefulness are two primary factors that influence an individual's intention to use new technology. The Usability Evaluation Questionnaire (UtEQ) has been developed based on TAM to assess end-users' assessment of medical devices' efficacy, performance, and safety (Parreira et al., 2020). Healthcare educators and researchers in several countries, including Portugal, Belgium, Finland, Slovenia, and Vietnam, have used the UtEQ to assess healthcare students' acceptance of different technologies during their clinical training, with positive results (Parreira et al., 2021a; Parreira et al., 2021b).

As no instrument is available to assess nursing students' technology acceptance in Vietnam, during the DigiCare Project, we aimed to culturally adapt and validate the psychometric properties of the UtEQ among undergraduate medical and nursing students.

What Have We Done?

We conducted this study in two main phases: i) translation and cross-cultural adaptation of the UtEQ questionnaire to Vietnamese; ii) assessment of the scale's psychometric properties with a sample of undergraduate nursing students from Vietnam.

Phase 1: Translation and Cultural Adaptation

The UtEQ was translated into Vietnamese following the guidelines for the process of cross-cultural adaptation of self-report measures of Beaton and collaborators (Beaton et al., 2000), in six stages. In stage I (Translation), two reviewers with a background in nursing were invited to independently assess and translate the UtEQ into Vietnamese. All the invited reviewers were fluent in written and spoken English and had integrated the language into their professional activities, with high knowledge of scientific and technical terms.

In Stage II, the research team and the reviewers analyzed and discussed the two resulting translations, which were synthesized, and resulted in the development of a new version in Vietnamese (UtEQ-V). In stage III, two official translators whose native language was English back-translated the new version from Vietnamese to English. Both back-translations were reviewed by the research team in collaboration with the translators. To proceed with the translation process, an Expert Committee was formed (stage IV). Each expert from each University was invited to assess the UtEQ-V. After reviewing all feedback provided by the experts, the research team deemed that the original UtEQ and the developed new version of the instrument in Vietnamese (UtEQ-V) had linguistic equivalence.

In stage V (Pretest), 68 students from Vietnamese three Higher Education Institutions (Hanoi Medical College, Hanoi Medical University, and NamDinh University of Nursing) were requested to score the UtEQ-V.

In general, the students considered that the items on the UtEQ-V were clear and easily scored, alluding to the fact that no deviations from were needed to answer the scale. In terms of questionnaire completion, the mean time required by the student participants was 15 minutes. With regards to the questionnaire's content, no issues were reported by the students regarding the comprehension of the questions.

Phase 2: Psychometric Validation of the UtEQ-V Instrument

The psychometric validation of the UtEQ-V was conducted between Hanoi Medical University and Nam Dinh University of Nursing in Vietnam. The selected HEIs are members of a consortium financed by the European Union Erasmus + Capacity Building initiative.

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Instruments

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The UtEQ was developed by Parreira and collaborators (2020) based on the TAM model and includes 45 items divided into four factors: Utility Performance (UP), Utility Empowerment (UE), Utility Relationship (UR), Easy to use (EU). The UtEQ items can be scored between 1 (Strongly disagree) and 7 (Strongly agree) points. As the respondent's score increases, their inclination towards incorporating technology in their daily clinical practice becomes more apparent, as they perceive it as a beneficial tool for delivering care (Teo, 2011). A succinct segment containing inquiries regarding the sociodemographic characteristics of participants (e.g., age, sex) and their academic information (e.g., course year, enrollment status) was also included at the end of the data collection instrument.

Sample Size, Study Recruitment and Data Collection

Hair and colleagues (2010) recommend using confirmatory factor analysis if the scale has already undergone exploratory factor analysis, and they suggest having at least five respondents per item. Kline (1998), on the other hand, proposes a sample size of at least 200 participants for such assessments. Based on these assumptions, recruitment and data collection for this study were conducted at Hanoi Medical University and Nam Dinh University of Nursing from May to August 2021, using a non-probability convenience sampling method. A senior research team member approached students between classes, explained the study's objectives, and asked if they would like to participate in completing the UtEQ-V. Once completed, the students were instructed to place the scale form in a sealed box.

Inclusion criteria for the study required that students were at least 18 years old, enrolled in a bachelor's degree program in nursing science, and proficient in written Vietnamese. Exclusion criteria included students who did not want to participate in the study and international students who were enrolled in the selected Higher Education Institutions for a brief mobility period.

Data Analysis

The data were synthesized by using SPSS 20.0 and AMOS 20.0 software. Descriptive statistics including mean, percentage, the standard deviation were used to describe the variables of the study. We conducted a confirmatory factor analysis (CFA) using AMOS (SPSS Inc, Chicago IL) to estimate the structural model. Cronbach's alpha was used to estimate the reliability of the factors. A variety of goodness of fit indices was used to assess the data's fit of the model. There were specific measures that can be calculated to determine goodness of fit along with their acceptable. Hu and Bentler (1999) suggested that the goodness of fit of the proposed structures to the correlational structure of the data was evaluated with χ2/df, CFI, GFI, TLI, SRMR, RMSEA, and the 90% confidence interval for RMSEA. It is assumed that a good fit occurred when the chi-square/degrees of freedom should be less than 5.0. When CFI is greater than .97 we considered good adjustment, when between .95 ≤ CFI < .97 we considered acceptable fit. About GFI we considered a good fit when is greater than .95 and an acceptable fit when .90 ≤ GFI < .95. A root means a square error of approximation (RMSEA) value of less than .05 was considered to indicate a good fit, while values between .05 and .08 were considered acceptable. The statistical significance was assumed at a .05 level (Marôco, 2018).

Ethical Considerations

The research proposal was approved by the Ethics Committee of the Health Sciences Research Unit: Nursing of the Nursing School of Coimbra with number P781-5/2021. Informed consent was obtained to ensure that the subjects voluntarily participated in this study. The students participating in the study were provided with full information about the study including the purpose, data collection and treatment procedures, and rights when participating study. Students were informed of their right to withdraw from the study at any time without consequences.

What Have We Found?

A total of 295 nursing students participated voluntarily in the study. Most of the participants were female students (n = 267, 90.5%), which is representative of the gender distribution in the nursing workforce in Vietnam. Most of the participants (n = 239, 81%) were full-time students, with only a small proportion being part-time students (n = 56, 19%). The average age of the respondents was 22.7 years (± 5.69). The descriptive statistics of the UtEQ-V for phase two can be found in Table 6.

Table 6. Descriptive statistic of the UtEQ-V (n = 295)

Subscales	Min. value	Max. value	Mean ± SD
Utility - Performance (UP)	2.67	7.00	5.51 ± .81
Utility - Empowerment (UE)	2.00	7.00	5.38 ± .96
Utility - Relationship (UR)	2.80	7.00	5.29 ± .95
Ease to use (EU)	1.86	7.00	5.08 ± .87

The Cronbach's Alpha values for the factors were respectively adequate: Utility-Performance (UP) with α = .95, Utility-Empowerment (UE) with α = .88, Utility-Relationship (UR) with α= .94, and Ease of Use (EU) with α = .94.

Confirmatory factor analysis was performed (Figure 26). The results showed that the goodness-of-fit indexes (CMIN/DF = 2.511, which is less than 3; GFI = 0.975, which is greater than .9; CFI = .991, which is greater than .9; TLI = .983, which is greater than .9; RMSEA = .072, which is less than 0.08; and PCLOSE = .127, which is greater than .05) are adequate, supporting the factor of Ease of Use (α = .94), as depicted in Figure 1. Additionally, all observed variables in the model are significant (p-values < .05), and all normalized weights are greater than .5, indicating a high degree of agreement among the observed variables. Moreover, the CR values are greater than .7, and AVE is greater than .5, demonstrating convergence.

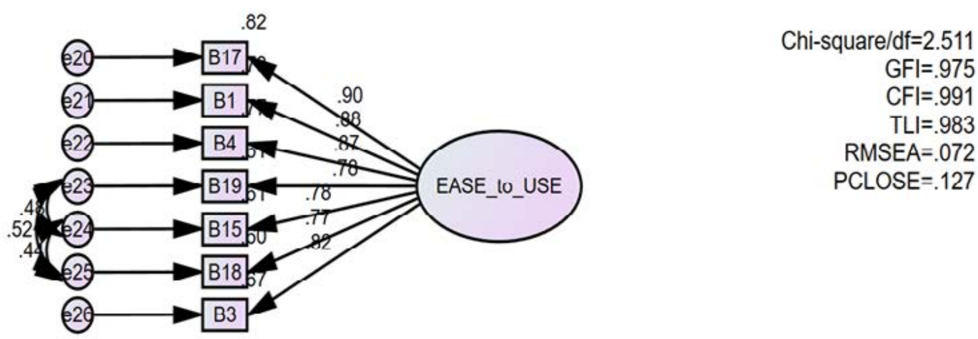

Figure 26. Confirmatory Factor Analysis of the UtEQ-V's EU factor.

Confirmatory factor analysis was conducted based on the proposed model shown in Figure 27. The results indicated good model fit with the following goodness-of-fit indexes: CMIN/DF = 1.370 (less than 3), GFI = .907 (greater than .9), CFI = .981 (greater than .9), TLI = .979 (greater than .9), RMSEA = .035 (less than .08), and PCLOSE = .998 (greater than .05). All observed variables in the model were found to be significant, with p-values less than .05. Additionally, all normalized weights were greater than 0.5, indicating a high degree of agreement among the observed variables. The CR values were greater than .7, and AVE was greater than .5, confirming the UtEQ-V's convergence.

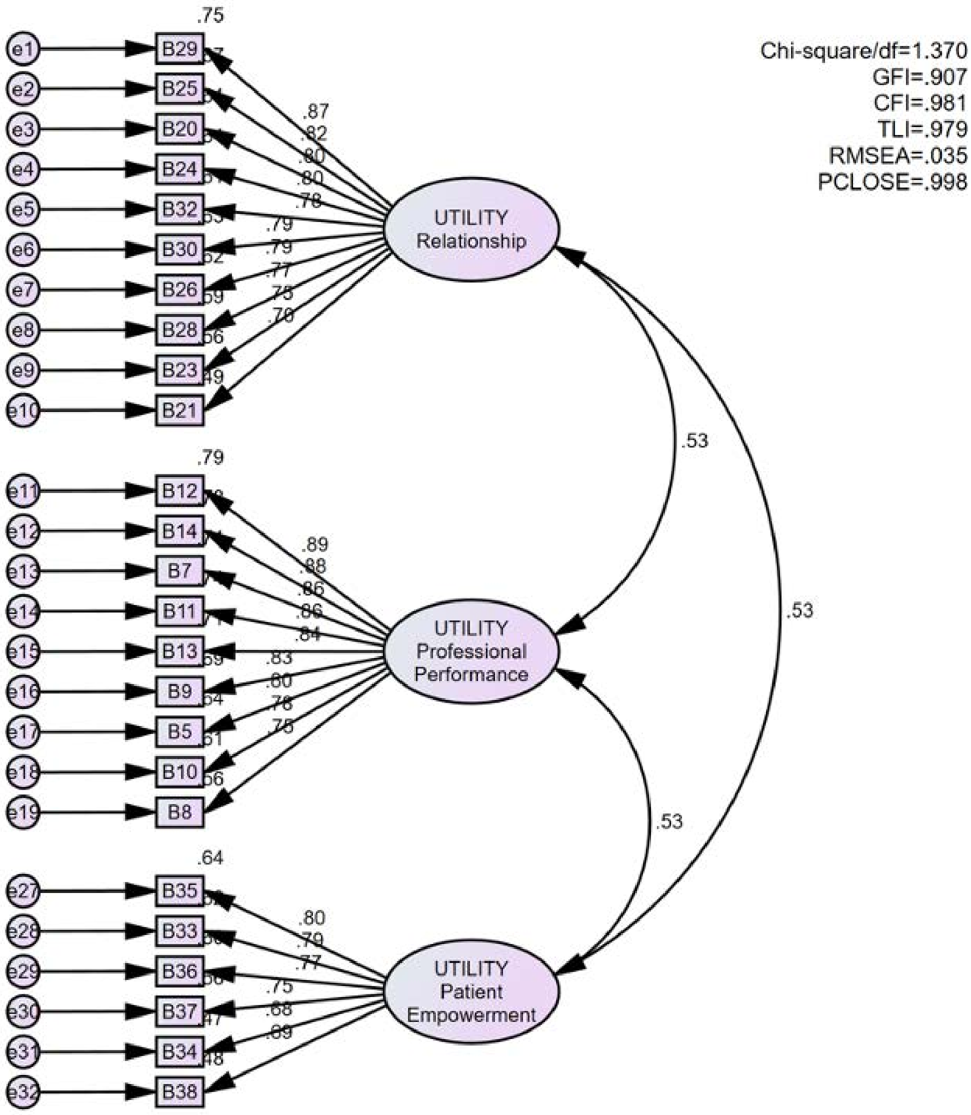

Figure 27. Confirmatory factor analysis for the factors UP, UE, and UR.

We attempted a third model proposal that integrated all the factors of the original UtEQ (Figure 28). The model fit showed an improvement in RMSEA, with the following goodness-of-fit indexes: CMIN/DF = 1.504 (less than 3), GFI = .877 (greater than .8), CFI = .969 (greater than .9), TLI = .967 (greater than .9), RMSEA = .041 (less than .08), and PCLOSE = .989 (greater than .05), indicating a good model fit (Figure 28). All subscales of UTILITY were found to be significant, with p-values less than .05. The results showed that the order of explanation for the UTILITY variable, from strong to weak, is UTILITY_Patient_Empowerment > UTILITY_Professional_Performance > UTILITY_Relationship. The CR values were greater than .7, and AVE was greater than .5, indicating that the scales were convergent. Additionally, the square root of AVE was larger than the correlations between latent variables, and MSV was less than AVE, indicating that the discriminant was guaranteed. The correlation analysis indicated a significant positive correlation between EASE_to_USE and UTILITY, with a p-value of .000 (less than .05) and a high correlation coefficient of .692, suggesting a strong correlation between these two factors.

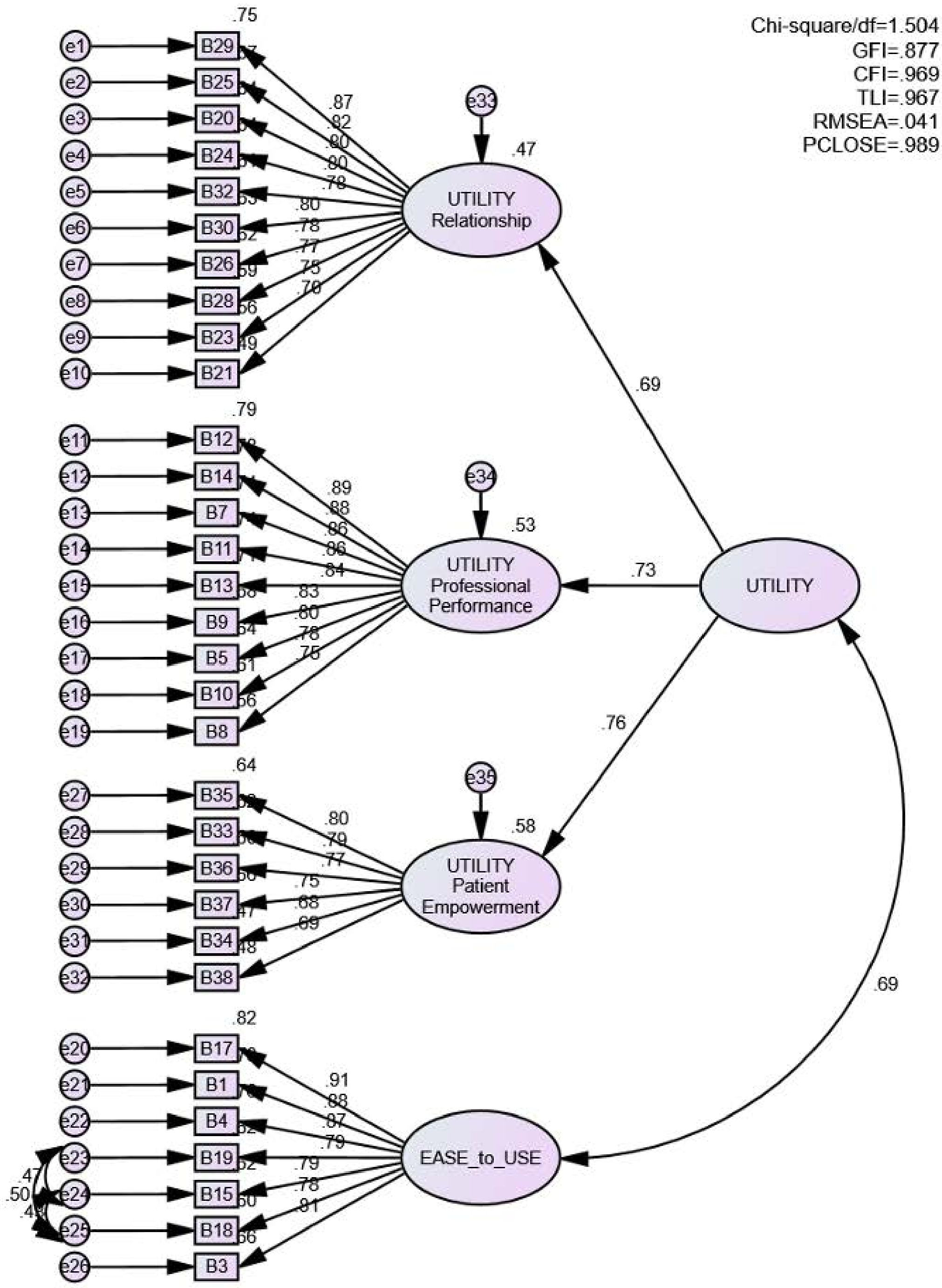

Figure 28. Goodness of fit indexes obtained in Confirmatory Factor Analysis of all the factors of the UtEQ-V.

Implications for Nursing Education in Vietnam

This study aimed to translate the UtEQ from English to Vietnamese and evaluate its psychometric properties among nursing students in Vietnam. The Vietnamese version of the UtEQ was assessed for internal consistency, construct validity, and external validity. The Cronbach's alpha coefficients for all items were above .80 for the four factors measured (Utility Performance, Utility Empowerment, Utility Relationship, and Ease of use), indicating high internal consistency.

The final model proposal showed adequate goodness of fit, suggesting that the original model proposed by Parreira et al. (2020) could be used in Vietnamese nursing student population. However, correlating the error of items 23, 24, and 25 was necessary to improve the goodness of fit, indicating the need for further research to explain the unexplained variability in the sample. The results also revealed a high positive correlation between Ease to use and Utility, consistent with previous studies (Barchielli et al., 2021, Hogue & Bao, 2015; Husin et al., 2022; Silvestre et al., 2022).

Regarding construct validity, the factor of Utility Relationship in the Vietnamese version was interpreted by items B20, B21, B23-B26, B28-B30, and B32 (factor loadings .75–.88); Utility Performance by items B5 and B7-B14 (factor loadings .72–.91); Utility Empowerment by items B33-B38 (factor loadings .82–.89), and Ease to use by items B1, B3, B4, B15, and B17-B19 (factor loadings .69–.83). It is important to note that the factor loadings and factors themselves vary depending on the national culture of each study population (Husin et al., 2022; Silvestre et al., 2022).

This study has several limitations that need to be addressed. Firstly, the participants were recruited from only two universities in a non-randomized manner, which could limit the generalizability of the findings. Likewise, our model analysis did not consider the potential differences in undergraduate students' perceptions of healthcare technology during the advancement of their studies. As an example, first-year students may have more reservations with some forms of healthcare technology than last-year students, who have more experience in a real-life clinical setting. Therefore, further testing of the instrument is necessary to ensure its reliability and construct validity. Secondly, although the selection of undergraduate nursing students was intentional, we believe that the UtEQ-V may also be a reliable instrument to assess technology acceptance among post-graduate nursing students and nursing staff. These groups are constantly under pressure to plan and deliver care in increasingly technological clinical environments. Moreover, given its structure, content, and nature, future researchers may want to explore the UtEQ-V's applicability and reliability in assessing technology acceptance among other healthcare professionals and students from different backgrounds, such as medicine, physiotherapy, and pharmacy.

In conclusion, the UtEQ-V was found to have semantic equivalence to the original version and was positively received by academic experts and undergraduate nursing students. The UtEQ-V demonstrated satisfactory reliability properties, rendering it a useful tool for evaluating nursing students' technology acceptance during their formal education. Structured evaluation of this domain could be advantageous for nursing educators and researchers, enabling targeted interventions to enhance students' perceptions of the role of technology in care delivery, as well as its ease of use and utility.

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5.5 Effectiveness of the DigiCare Educational Intervention in Improve Nursing and Medical Students' Clinical Coaching Skills in Vietnam and Bangladesh: An exploratory pre-post study

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This chapter describes an exploratory study that evaluated the effectiveness of the DigiCare educational intervention in improving the clinical coaching skills of nursing and medical students in Vietnam and Bangladesh. The article presented below is an exact replica of the manuscript published in the JIM - Jornal de Investigação Médica. However, adjustments have been made to the referencing style, table and figure numbering, and format to align with this e-book.

Abstract

Coaching has become an important approach to support self-management of patients with non-communicable diseases (NCDs) in healthcare education. Studies have emphasized the significance of formal coaching training in enhancing the competencies of healthcare students. In Southeast Asia, there is a lack of such training opportunities. To address this issue, an exploratory pre and post study was conducted to evaluate the effectiveness of the DigiCare educational intervention in improving clinical coaching skills. Nursing and medical students from six universities in Vietnam and Bangladesh were invited to participate. The intervention included both theoretical and practical classes with interactive methods and home assignments, with a total duration of over 10 contact hours. Pre and post-intervention assessments were conducted using the Self-Efficacy and Performance in Self-management Support instrument, which was translated and culturally adapted to both countries. Statistical analysis showed a significant improvement in students' overall competence scores from before ($M = 2.6$, $SD = .67$) to after the intervention ($M = 3.05$, $SD = .55$), with a medium effect size ($p < .001$; $d = .73$). The DigiCare educational intervention appears to be a low-cost and meaningful addition to the curriculum of both nursing and medical universities across countries, with potential benefits in the development of students' clinical coaching competencies.

Keywords: clinical coaching; self-management support; nursing students; medical students

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Background

The prevalence of NCDs has been steadily increasing in Asian countries due to various factors such as aging populations, unhealthy lifestyles, and urbanization. According to the World Health Organization, NCDs account for 9 million deaths in the Southeast Asia region alone, almost half of them premature, in people's prime productive years (WHO, 2002a; WHO, 2022c). In addition to the health consequences, NCDs also impose a significant economic burden on Asian countries. The cost of healthcare, lost productivity, and premature deaths due to NCDs is estimated to reach trillions of dollars in the coming decades (WHO, 2022a; WHO, 2022b).

To address the growing burden of NCDs in Southeast Asian countries, various initiatives have been implemented, including policies to promote healthy lifestyles, public health campaigns and restructuring of existing healthcare systems to prioritize early detection and management of NCDs (WHO, 202a).

Despite these efforts, there are still challenges to addressing NCDs in Southeast Asian countries, including limited resources and inadequate healthcare infrastructure. However, one of the most referenced challenges concerns cultural attitudes towards health and the self-management of existing conditions. Self-management involves taking responsibility for one's health and wellbeing, including making lifestyle changes, adhering to treatment plans, and making informed decisions about one's health (Bartlett et al., 2020; Dineen-Griffin et al., 2019). While self-management is critical for improving health outcomes and reducing healthcare costs, many patients struggle to manage their health effectively.

Coaching is a relatively new concept that has its roots in sports, psychology, and business (Grant & Jopling, 2020; Lowel, 2018). The role of a coach is to assist clients in leveraging their own resources and overcoming obstacles to achieve mutually agreed-upon goals. Recently, coaching has gained popularity in the healthcare sector in the form of clinical coaching. Numerous studies have shown that clinical coaching can be effective in helping patients adopt healthy behaviors that can prevent and manage lifelong NCDs, such as arterial hypertension, diabetes, hyperlipidemia, or asthma (Kelton, 2014; Singh et al., 2022).

However, managing NCDs can be challenging for most individuals, as they often lack an understanding of disease progression and self-management techniques. Clinical coaching is distinct from other forms of lifestyle improvement services. Counselling provided by healthcare professionals is often fast-paced and focuses on providing clinical advice and guidance (Bartlett et al., 2020). This approach can be rigid and may not consider the patient's personal goals, available resources, and capacity for change (Pols et al., 2009). While these professionals are skilled in discussing complex treatment and care issues with patients, time constraints often limit the counseling that can be provided. Thus, clinical coaching provided by trained healthcare professionals is a collaborative approach to enhance patients' self-management of their NCDs (Duprez et al., 2017; Parreira et al., 2021b). The health coach acts as a partner in the change process, actively listening and empowering the patient in a non-judgmental manner based on their concerns (Parreira et al., 2019). The health coach's role is to ensure that patients are educated about their health and guided towards setting realistic health goals, improving patient health literacy through patient-centred communication, educational materials, and reinforcement (Grant & Jopling, 2020; Lowel, 2018). It is essential for healthcare professionals to practice both roles concurrently to ensure optimal outcomes for patients (Howell et al., 2023).

While clinical coaching has garnered significant attention from educators in nursing and medicine (Grant & Jopling, 2020; Lowel, 2018; Kelton, 2014; Parreira et al., 2019; Parreira et al., 2021a; Parreira et al., 2021b), there is a dearth of evidence on how to effectively introduce clinical coaching skills into their training curricula, particularly in low-resource countries.

As a result, we sought to assess the effectiveness of the DigiCare educational intervention in improving the clinical coaching skills of nursing and medical students in Vietnam and Bangladesh.

What Have We Done?

An exploratory study with a pre- and post-intervention design was carried out simultaneously in the partner higher education institutions from Vietnam and Bangladesh. From Vietnam, data collection was undertaken at Hanoi Medical University (HMU), Hanoi Medical College (HMC), and Nam Dinh University of Nursing (NDUN). In Bangladesh, the educational intervention was conducted in City Medical College and Hospital (CMCH), Khulna City Medical College (KCMC), and Universal Medical College (UMC). The educational intervention was developed by the DigiCare Project consortium, as part of its activities funded by the Erasmus+ Agency, through its Strategic Partnerships for higher education Programme (grant number 598267-EPP-1-2018-1-FI-EPPKA2-CBHE-JP). The study was carried out between July and December 2022, with a baseline (T0) and post-intervention assessment (T1).

Sample and Recruitment

Recruitment was conducted simultaneously at all sties between June and July 2022. The target population for the study included undergraduate nursing and medical students who voluntarily wanted to participate in the ongoing study and were affiliated with one of the partner universities. The inclusion criteria were an ability to understand Vietnamese or Bangla, age over 18 years, no formal training in clinical coaching, and provision of signed informed consent. Undergraduate students who were affiliated with the participating universities under a short-term mobility action were excluded from this study. First-year students and those who had participated in previous activities conducted under the DigiCare project were excluded from the study.

However, they were provided access to all existing guiding materials and exercises after T1 was completed.

Intervention

The educational intervention was simultaneously conducted across all partner universities between July and December 2022. The intervention focused on developing clinical coaching skills among nursing and medical students, using a structured pedagogical approach developed by the project consortium partners. This approach was built upon existing literature reviewed by the research team and included modules and guiding materials that had been previously piloted for their significance and meaningfulness by both teachers and students. One senior professor from each partner team conducted the educational intervention outside of regular degree modules. The participating professors had previously taken part in piloting rounds of the educational intervention and guiding materials for an entire year. This experience enabled them to become well-acquainted with the intervention's dynamics and discuss potential methods and strategies to be employed.

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Study Variables and Instruments

Data was collected at T0 (baseline, pre-educational intervention) and T1 (last class, immediately after completing group discussion). Students completed the encoded instruments on paper and submitted them by placing them in a sealed box upon completion. Data were collected using two questionnaires: i) a demographic questionnaire (e.g., age, sex, country and university, degree background, and satisfaction with the course); and ii) the Self-Efficacy and Performance in Self-management Support (SEPSS) instrument.

Duprez and colleagues (2016) developed the SEPSS instrument based on the Five A's framework for professional behavior in self-management support (2017). The instrument consists of six subscales, namely

Assessment, Advise, Agree, Assist, Arrange, and Overall Competency, with six items in each subscale. Students rate their perceptions of self-efficacy and performance in each subscale on a five-point Likert scale, ranging from 0 (lowest) to 4 (highest) score. The six subscales allow for the measurement of outcomes on a subscale level, enabling a focus on specific aspects of the self-management process, while the total score provides an overall view of how support is provided. The scores range from 0 to 4 for the subscales and 0 to 24 at the total scale level, with higher scores indicating higher levels of self-efficacy or performance in self-management support.

The original instrument demonstrated high internal consistency with a Cronbach's alpha of .96 (Duprez et al., 2016). The SEPSS instrument has been translated and adapted for use with Vietnamese and Bangladeshi nursing and medical students, with validation studies currently under review for publication elsewhere. Table 7 presents the internal consistency of the SEPSS scale in this study.

Table 7. Internal consistency of the SEPSS scale adapted for Vietnam and Bangladesh.

SEPSS subscales	SEPSS - Vietnamese version			SEPSS - Bangla version		
	Mean	SD	α	Mean	SD	α
Assess	2.50	.399	.68	3.00	.68	.83
Advise	2.66	.451	.74	3.01	.65	.78
Agree	2.59	.420	.75	3.00	.69	.82
Assist	2.57	.427	.75	3.00	.64	.81
Arrange	2.59	.424	.76	2.97	.72	.85
Overall competency	2.57	.379	.76	3.04	.67	.83

*SD = Standard deviation; □ = Cronbach's Alpha.

Ethics

The Ethics Committee of the Health Sciences Research Unit: Nursing (UICISA: E) at the Nursing School of Coimbra granted approval for the research proposal under the identification code P781-5/2021. Prior to participation, informed consent was obtained from all students to ensure their voluntary participation in the study. The students received comprehensive information regarding the study's objectives, educational methods, and their rights as participants. They were also informed of their right to withdraw from the study at any point without academic repercussions. To prevent any potential identification of individual students, all data collection instruments were coded.

Statistical Analysis

All statistical analyses were performed using SPSS 26.0 for Windows (SPSS Inc., Chicago, IL, USA). Descriptive statistics including mean, percentage, the standard deviation was used to describe the variables of the study. The Kolmogorov Smirnov test showed that the data followed a normal distribution. To verify the effectiveness of the intervention, we measured students' coaching skills from baseline (T0) to the end of educational intervention (T1) using Student's t-test for related samples (Marôco, 2018). Effect sizes were estimated using Cohen's d (Cohen, 1988). The significance level was set at ≤ .05.

What Have We Found?

Globally, 424 students enrolled in this study, with the following distribution: 52 from HMU (Vietnam), 35 from HMC (Vietnam), 93 from NDUN (Vietnam), 98 from CMCH (Bangladesh), 82 from KCMC (Bangladesh), and 64 from UMC (Bangladesh). Overall, 352 students were female (83%), with an average age of 22.4 ± 3.8 years. Most students were enrolled in a nursing course (n = 336, 79.2%), and attended their course as full-time students (n = 349, 82.3%).

At T1, 336 of the 424 (79.2%) students attended the final class and completed the final assessment. Nonetheless, no statistical difference was found between pre- and post-intervention groups concerning their gender ($X2(1) = 3.676$; $p = 0.16$) or their average age ($Z = .445$; $p = .505$). Concerning their academic characteristics, both groups were similar when focusing on their degree background ($X2(1) = 5.163$; $p = 0.08$) and type of enrollment ($X2(1) = 1.748$; $p = 0.114$).

Between T0 and T1, statistical analysis revealed significant differences across the SEPSS instrument subscale scores in the global study sample (Table 8). The effect size, as measured by Cohen's d, indicated a medium effect for all differences found.

Table 8. Pre- and post-intervention differences found in students' coaching skills (global).

SEPSS subscales	Assess-ment	n	Mean	SD	Sig.	Cohen's d	Effect size r
Assess	**After**	336	3.01	.57	.000	0.65	0.31
	Before	424	2.60	.69			
Advise	**After**	336	3.04	.52	.000	0.62	0.30
	Before	424	2.67	.66			
Agree	**After**	336	3.05	.54	.000	0.78	0.36
	Before	424	2.57	.68			
Assist	**After**	336	3.04	.53	.000	0.62	0.30
	Before	424	2.67	.66			
Arrange	**After**	336	3.03	.55	.000	0.76	0.35
	Before	424	2.54	.73			
Overall competence	**After**	336	3.05	.55	.000	0.73	0.34
	Before	424	2.6	.67			

* SD = Standard deviation; Sig. = statistical significance ($p \leq .05$).

A separate analysis was performed for each country, and for the Bangladeshi partner universities, independent samples t-tests were conducted to examine differences in SEPSS instrument subscale scores (Table 9). The results indicated significant differences, with large effect sizes (Cohen's d > 0.8) found for the Agree and Arrange subscales, as well as for students' Overall Competence.

Table 9. Pre- and post-intervention differences found in Bangladeshi students.

SEPSS subscales	Assess-ment	n	Mean	SD	Sig.	Cohen's d	Effect size r
Assess	**After**	242	3.71	.54	.000	0.73	0.34
	Before	244	2.66	.82			
Advise	**After**	242	3.15	.49	.000	0.72	0.34
	Before	244	2.69	.76			
Agree	**After**	242	3.20	.49	.000	0.91	0.42
	Before	244	2.61	.77			
Assist	**After**	242	3.16	.51	.000	0.68	0.32
	Before	244	2.73	.74			
Arrange	**After**	242	3.17	.53	.000	0.90	0.41
	Before	244	2.53	.85			
Overall competence	**After**	242	3.21	.53	.000	0.83	0.38
	Before	244	2.66	.77			

*SD = Standard deviation; Sig. = statistical significance ($p \leq .05$).

In Vietnam's partner universities, statistically significant differences were found between T0 and T1, with an increase in students' average scores for all SEPSS subscales (Table 10). The effect size, as measured by Cohen's d, indicated a small effect for all differences found.

Table 10. Pre- and post-intervention differences found in Vietnamese nursing students.

SEPSS subscales	Assess-ment	n	Mean	SD	Sig.	Cohen's d	Effect size r
Assess	**After**	94	2.61	.43	.000	0.20	0.10
	Before	180	2.52	.45			
Advise	**After**	94	2.75	.46	.000	0.23	0.11
	Before	180	2.64	.51			
Agree	**After**	94	2.67	.44	.000	0.31	0.15
	Before	180	2.52	.53			
Assist	**After**	94	2.72	.48	.000	0.24	0.12
	Before	180	2.60	.52			
Arrange	**After**	94	2.65	.42	.000	0.22	0.11
	Before	180	2.54	.55			
Overall competence	**After**	94	2.64	.37	.000	0.18	0.09
	Before	180	2.56	.52			

*SD = Standard deviation; Sig. = statistical significance ($p \leq .05$).

At T0 and T1, students were requested to indicate their current satisfaction with their nursing or medical course. Following the educational intervention, a significant increase in overall students' satisfaction was observed (Z = 18.47; p = .017). This result was further confirmed when examining data specifically for nursing (Z = 8.015; p < .01) and medical students (Z = .131; p = .001).

Implications for Nursing and Medical Education in the Partner Countries

To our knowledge, this is the first study conducted in both countries on this topic. The DigiCare educational intervention shares some similarities with a study conducted by Maini et al. in England (2020) and Wuyts et al. (2021) in Belgium. In the study by Maini et al. (2020), 48 third-year medical students participated in four half-day campus-based small group sessions on coaching over four consecutive weeks. While some initial teaching and learning methods were similar, such as interactive learning, group discussions, and role-playing between students, the authors encouraged students to use their coaching skills during primary care clinical placements with patients. On the other hand, the INTENSS training intervention proposed by Wuyts et al. (2021) consisted of a basic training module and a video-interaction guidance module. The DigiCare project intervention combines two approaches by incorporating group discussions and instructional materials (in both text and video formats). However, unlike in Maini et al. (2020), the practical assignments were conducted by the students with their relatives to create a ”safe” training environment for their initial attempts as health coaches. This approach enables students to build confidence and competence in their skills before implementing them in real-world clinical settings.

Statistically significant differences were found at T1, with students evidencing higher average scores across the different subscales of the SEPSS instrument. In both countries, the students' scores on the different subscales of the SEPSS were above the average score of 2.0, indicating a positive perception of their self-efficacy and performance competences in patient self-management support before the intervention.

Interestingly, despite the differences in scores and effect sizes observed between nursing and medical students in Vietnam and Bangladesh, the SEPSS subscale with the highest development was similar. This subscale pertained to collaborative goal setting (Agree), where nursing and medical students work with patients to achieve a consensus on the goals to aim for. To do so, students must help the patient identify earlier positive experiences with achieving past health goals and develop a joint plan of action (Duprez et al., 2017; Glasgow, 2006). The patient's priorities must be considered, with support from healthcare professionals in making decisions about treatment options. The established goals and agreements must then be documented in the patient's record to ensure care continuity (Duprez et al., 2017; Glasgow, 2006).

Previous studies have suggested that clinical coaching training in nursing and medical education is a disruptive approach to self-management support compared to traditional training (Grant & Jopling, 2021; Kelton, 2014; Singh et al., 2022). In the study by Maini et al. (2020), medical students perceived clinical coaching training as a positive addition to their traditional training, describing it as a meaningful contribution to patient care. They reported changes in their mindset to a non-judgmental and solution-oriented approach, and the development of skills such as self-reflection, active listening, and person-centered communication (Maini et al., 2020). Although these educational approaches are well-perceived by students, there are contextual tension factors that affect their implementation during clinical placements, including lack of time, traditional learning and teaching experiences conducted by tutors (Vijn et al., 2017), and patients' expectations when they approach healthcare professionals about their NCDs.

« Our findings indicate that it is crucial to focus on developing nursing and medical students' competencies in collaborative goal setting, shared decision making, and organizing follow-up care. We observed that Bangladeshi students had lower self-assessed efficacy and performance in the Assist subscale, whereas Vietnamese students scored lowest in the Assess subscale. The Assess phase requires students to explore patients' beliefs and motivation about living with chronic conditions and personalize the support provided (Duprez et al., 2016; Glasgow, 2006). In the Assist phase, students need competencies to help patients adapt their daily activities, monitor their health and progress, and encourage them to seek professional help when necessary (Duprez et al., 2016; Glasgow, 2006). Interestingly, these results differ somewhat from those of previous studies with nursing students and nurses from Europe, which found that the most room for improvement was associated with competencies explored in the Agree and Arrange subscales (Duprez et al., 2017; Van Hoof et al., 2016). »

Nonetheless, the implemented educational intervention has the potential to enhance students' competencies in clinical coaching and enable them to provide patient-centered self-management support to patients with NCDs. The low-cost approach to both theoretical and practical classes make this intervention a potentially valuable addition to the current nursing and medical curriculum in both Bangladesh and Vietnam.

Nevertheless, our findings must be analyzed considering the study's limitations. Although the sample size was adequate for an exploratory study, the recruitment did not consider potential variations in students' perceived competence as they progressed through the course. Therefore, future studies should stratify the sample according to degree background and course year to better explore the intervention's potential benefits based on the students' development phase. Such experimental studies must ensure true randomization and the existence of a passive control group. Another potential limitation is the heterogeneity of teaching and learning opportunities and environments across the six partner universities in Vietnam and Bangladesh. Although the medical and nursing curriculum in both countries follows national regulations in terms of structure and content, active learning environments transcend the curriculum, and other non-controlled variables may have influenced students' perceptions of their self-efficacy and performance in this field. Likewise, although the involved teaching staff had the opportunity to immerse themselves in the DigiCare educational intervention during a full year of piloting and iterations, potential variations in teaching style may have influenced study outcomes locally. Finally, although our findings showed positive results in terms of self-management support competence and course satisfaction, future studies should explore how the developed educational intervention can impact students' perceptions of their leadership skills, role independence, and career perspectives (Vijn, et al., 2017).

In conclusion, our findings suggest that a structured educational intervention can enhance the competence of nursing and medical students in clinical coaching. The post-intervention scores showed a significant increase across various domains of self-management support, as perceived by the students in terms of both self-efficacy and performance. However, future studies with control groups and longer follow-up periods are necessary to determine the effectiveness of this low-cost educational intervention.

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5.6 Reflections on the Concept of Coaching and the Roles of a Coach and Coachee

Annukka Huuskonen, Essi Ylistalo, Katariina Kunnas and Nina Smolander

The DigiCare project successfully developed and integrated the DigiCare Model and Learning Packages into the DigiCare Educational Program. These outputs underwent piloting in higher education institutions among our Asian project partners. Participant feedback played a crucial role in refining and improving the DigiCare Model and Learning Packages, with the aim of applying them in healthcare education settings wherever they are considered beneficial and relevant. This chapter focuses on the results collected from students' experiences of using coaching models, specifically the GROW model. The feedback form used in the DigiCare Project gathered demographic information, assessed the level of agreement with statements related to different phases of the GROW model, and included responses to open-ended questions.

The main goal of the DigiCare project was to enhance the digital and coaching skills of healthcare professionals, ultimately leading to the provision of high-quality care to patients in Asian partner countries. The project aimed to promote these competencies to ensure that future healthcare professionals possess the necessary skills to deliver patient-centered care that aligns with the evolving trends of digitalization in healthcare in Bangladesh (Ahmed et al., 2020) and Vietnam (Dang et al., 2021). By equipping healthcare professionals with responsive and up-to-date skills to effectively motivate (Rutten et al., 2014) and coach patients with chronic diseases such as diabetes (Komkova et al., 2019)., cardiovascular diseases (Yousuf et al., 2018) or hypertension (Nguyen-Huynh et al., 2022) and improve their lifestyle choices for healthier behavior (Lindberg et al., 2017; Rise et al., 2013), the DigiCare project aimed to address the increasing healthcare demands of patients in partner countries, both in the present and future (Albis et al., 2019; Tran et al., 2016).

This undertaking necessitated a collaborative effort to improve and update the educational program, incorporating a novel competency area of patient coaching into healthcare education programs (Charli-Joseph et al., 2016). Coaching was an unfamiliar concept within the healthcare context of the partner countries, and its integration into educational programs necessitated a broader conceptualization of the phenomenon, as well as the development of plans for implementation, evaluation, and feedback (Dolansky et al., 2017). To address this, the DigiCare project developed the DigiCare Model (Read more in Chapter 3) and its corresponding learning packages (Read more in Chapter 4.1), which were subsequently put to the test in practical settings at Asian partner universities. Through this collaborative piloting process (Read more in Chapter 4.1) and the collection of valuable feedback, we were able to refine and tailor the educational program to align with the Asian context (Sánchez-Franco et al., 2021).

The Feedback Analysis

The DigiCare feedback form (Read more in Chapter 5.1) was utilized to collect student feedback after pilot cycles 3, 4, and 6 (Read more in Chapter 4.1). The feedback results presented in this chapter were collected after the completion of the final pilot cycle, which encompassed the comprehensive piloting of the entire DigiCare Model (Read more in Chapter 3) and its Learning Packages. This pilot cycle involved theoretical lessons conducted using the flipped learning method, coaching training with peers, and coaching sessions with either a patient or a student's relative (Read more in Chapter 4).

The questions in the feedback form were designed to find out the students' experiences with practicing the use of the GROW model. The aim was to gather feedback on how students perceived and experienced each phase of the GROW model (Table 12 and Table 13). Students were encouraged to reflect further on their experiences as a coach (Figure 29) and a coachee, and to share their perspectives through open-ended questions. The feedback also included students' encounters with in-person and online coaching sessions, their experiences with the coach's interaction, focusing on professional communication, as suggested by local experts. Additionally, participants had the opportunity to provide feedback on their preparation for coaching training and their perceptions of the education provided.

As explained in more detail in chapter 5.1, the feedback form collected demographic information, information on the level of agreement with the statements and open-ended questions. The demographic information (Table 11) was analyzed using SPSS software.

Written feedback in the open-ended questions was collected in three languages: Vietnamese, Bangla, and English. Responses in Vietnamese and Bangla were translated into English and analyzed by grouping the content thematically. Four project members participated in the analysis of the feedback. The results of each analysis were compared with each other to ensure consistency.

Ethical Considerations

Each participating higher education institution applied for ethical approval individually if required by their university's statutes. Students who took part in providing feedback were provided with comprehensive information regarding the purpose of the feedback collection, the collection and processing procedures, as well as their rights as participants. Responding to the feedback form was voluntary, but students were informed that their response would be considered as informed consent to participate in the feedback collection process. Students were also informed of their right to withdraw from the study at any time without facing any consequences or being required to provide explanations.

All responses were collected digitally, and the raw data was accessible only to the Finnish project members who did not hold any teaching roles related to the respondents. This arrangement was implemented to safeguard participants and alleviate any concerns regarding potential repercussions for providing honest feedback.

Participants

In the final pilot cycle of the DigiCare project, a total of 344 healthcare students from partner universities in Bangladesh and Vietnam participated. All participants were provided with a link to the feedback form, which was sent to them via email or WhatsApp. During the pilot orientation, participants were informed about their involvement in the pilot and the accompanying feedback questionnaire.

The respondents (N=137) were healthcare students studying nursing (n=84), and medicine (n=28) in three Bangladeshi universities (Universal College and Hospital, Khulna City Medical College and Hospital, City Medical College and Hospital), and two Vietnamese universities (Hanoi Medical College and Nam Dinh University of Nursing) (Table 11). The response rate was 39.8%.

Table 11. Demographic characteristics of healthcare student responders

	Participants (N = 137)	
Variable	n	%
Gender		
Female	102	96.2
Male	4	3.8
Age		
20 years or less	32	23.4
21–23	88	64.2
Over 23 years	11	8.0
Curriculum		
Medicine	28	20.4
Nursing	84	61.3
Level of study		
Undergraduate	132	96.4
Postgraduate	4	2.9
Form of study		
Full-time	69	50.4
Part-time	55	40.1
Field of study		
Medicine	11	8.0
Medicine and surgery	20	14.6
Community medicine	3	0.7
Pathology, Pharmacology and Microbiology	1	0.7
Health education	1	0.7
Midwifery	4	2.9
Nursing and midwifery	7	5.1
Nursing	78	56.9
Higher Education Institution		
City Medical College and Hospital (1)	32	23.4
Hanoi Medical University and Hospital (2)	7	5.1
Khulna City Medical College and Hospital (1)	12	8.8
Nam Dinh University of Nursing (2)	46	33.6
Universal Medical College and Hospital (1)	40	29.2

1 = Bangladeshi higher education Institution,
2 = Vietnamese higher education Institution

The majority (n=102; 96%) of participants were female students. The median age of the participants was 21.0 years (range: 18-25) and most of them were undergraduate students (n=132; 96%). Half of the respondents (n=69; 50%) were full-time students and more than half (n=78; 57%) were studying nursing. The distribution of participants by university was uneven with over half of respondents being students at two universities (Nam Dinh University of Nursing, n=46; 34% and Universal Medical College and Hospital, n=40; 29%).

Results

The level of preparation for the coaching pilot varied significantly among participants. On average, participants reported spending 16 hours preparing for the pilots, (range 5 minutes to 96 hours). It was particularly noteworthy that some participants described preparing for the pilot for an extensive period, even weeks in advance. Approximately half of the participants felt that the duration of the pilot was sufficient (n=37; 27%) or very sufficient (n=34; 24.8%). Moreover, more than two-thirds of respondents believed that the amount of theory training and self-study provided for the pilot was good (n=52; 38%) or excellent (26.3%; n=36).

In terms of ethical considerations, around two-thirds of respondents considered ethical aspects often (n=43; 31.4%) or very often (n=44; 32.1%). Data security was a topic of consideration for nearly 70% of respondents, with 36.5% (n=50) discussing it often and 32.1% (n=44) discussing it very often.

Using the GROW Coaching Model

Healthcare students' experiences of using the different phases of the GROW model as coaches were positive. More than half of the responses to the items (Table 12) indicated that the steps were implemented mostly or many times, accounting for approximately 60% of the total responses for each item. However, it is important to note that some respondents did not ask any questions related to the coaching phases.

Table 12. The items on the feedback form that asked healthcare students about their experiences of being a coach (N=137) during coaching practice after the pilot cycle 6. Responses are in percentages.

Items	Not at all	Rarely	Few times	Often	Many times
Asked questions about your patient's health habits	2.9	13.1	18.2	32.8	32.8
Asked your patient to talk about any problems or their effects to patient's health	4.4	14.6	19.0	31.4	30.7
Asked your patient to talk about his/her goals in caring for health	2.9	8.8	20.4	35.0	32.8
Gave your patient choices about options to think about	2.2	10.2	29.2	29.2	29.2
Helped your patient to set specific goals to improve his/her health	3.6	9.5	26.3	29.9	30.7
Asked for patient's ideas when you made the health plan together	2.2	8.8	20.4	35.0	33.6
Helped your patient to make the health plan that patient could do in daily life	2.9	8.0	24.1	33.6	31.4
You were able to establish quality interaction with your patient during the coaching session	0.7	8.0	26.3	32.8	32.1
You received positive feedback of your coaching session	1.5	11.7	17.5	34.3	35.0

Similar to the feedback from students in the role of coach, students in the role of coachee also provided positive feedback regarding the effective use of the GROW model. For all but one item, more than half of the students indicated that they were mostly, or many times coached using a person-centered approach according to the phases of the GROW model (Table 13). However, there was a notable difference in responses regarding the item about the coach considering the coachee's own suggestions. Less than half of the students felt that the coach mostly (21.2%) or many times (22.6%) ignored coachee's own suggestions.

Table 13. The items on the feedback form that asked healthcare students about their experiences of being a coachee (N=137) during coaching practice after the pilot cycle 6. Responses are in percentages.

Items	Not at all	Rarely	Few times	Often	Many times
I was asked questions about my health habits	3.6	11.7	21.9	32.8	29.9
I felt accepted	3.6	7.3	18.2	36.5	34.3
I felt understood	4.4	10.2	20.4	30.7	34.3
I was told what to do regarding my health	2.2	5.8	21.9	35.8	34.3
I had an opportunity to share my thoughts about my health	2.9	13.1	21.9	27.0	35.0
I was encouraged to express my ideas related to my health	2.9	10.2	16.8	34.3	35.8
The coach ignored my suggestions	16.8	13.9	25.5	21.2	22.6
My ideas about my health were appreciated	1.5	6.6	24.8	35.0	32.1
I felt I was involved in my health plan	3.6	11.7	19.7	33.6	31.4

Students’ Experiences in the Role of a Coach

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In the final pilot cycle of the DigiCare project, healthcare students had the opportunity to practice the role of a coach through various activities. Initially, they engaged in coaching sessions with their peers and received feedback from their peers regarding their coaching skills. Subsequently, they participated in coaching sessions with patients or their relatives (Read more in Chapter 4.1), focusing on lifestyle change topics.

»

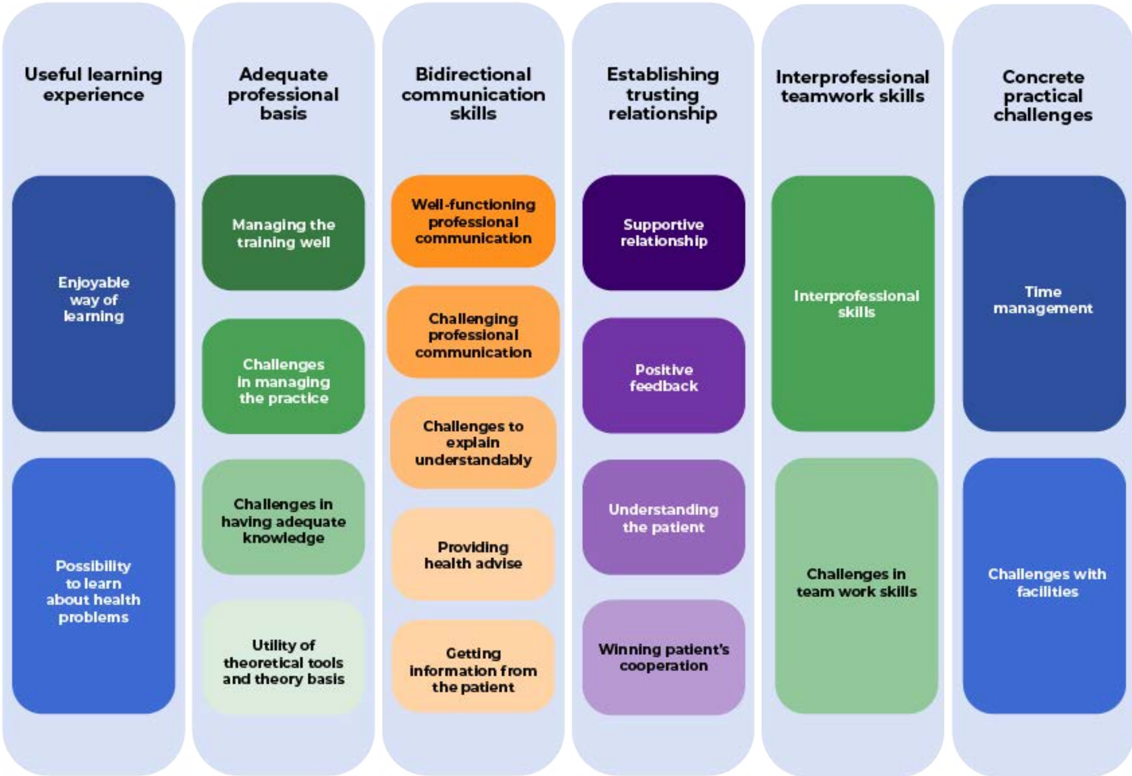

Figure 29. Students' experiences in the role of a coach

In the role of the coach, students described their learning experiences in terms of expressions that were categorized into two main categories: achievements and challenges. The figure 29 provides an overview of the sub-categories related to their experiences. Students reported the experience as useful for learning, but also identified practical challenges. The coaching exercise was perceived as a useful learning experience, an enjoyable way to learn and an opportunity to deepen their understanding of the management of chronic health problems.

Examples of phrases used by students to describe the coaching experience include:

> *"Enjoying every moment"*

> *"Almost everything went well"*

For the majority of students who participated in the pilot, coaching was a new concept. They reported significant learning and skill development for future use. However, students also expressed challenges related to their need for a strong professional knowledge base to effectively fulfill the role of a coach while also simultaneously applying professional communication skills. Based on the feedback received, students identified the importance of managing the coaching situation as a whole and guiding it in the desired direction in accordance with the coaching framework. This required a solid understanding of the GROW model and theoretical knowledge of the specific chronic disease to provide appropriate health advice. Despite these challenges associated with the role of the coach, students expressed confidence in their ability to counsel patients, provide information, and complete the coaching process successfully.

Students also emphasized the importance of establishing a trusting relationship with the coachee to perform effectively in the role of a coach. Building this trust was seen as crucial for obtaining relevant information from the coachee. It required the application of professional and interactive communication skills, including the ability to explain things clearly. However, students expressed challenges in managing the coaching situation. They mentioned the need for active listening, asking questions at the appropriate time, engaging in natural conversation with the patient, and overall, having a conversation with the patient in general as components of a well-managed scenario. Other challenging aspects included demonstrating understanding and empathy, being confident in the role of the coach, and providing positive feedback to the coachee. Furthermore, students recognized the importance of considering the patient's cultural background to establish a connection. However, they also acknowledged the difficulty of applying cultural knowledge within the coaching situation.

The practical challenges mentioned by students were related to time management and structural issues. The following terms were used to describe time management challenges:

> *"Not enough time"*

> *"Limited time to explain theories to people."*

> *"Challenging to arrange tasks to complete them together"*

The structural challenges identified by students encompassed various aspects such as infrastructure, organization, information technology and geographical distance. While students generally felt that inter-professional teamwork skills worked well, they did encounter some challenges. Interprofessional skills involved consultation, teamwork, and solidarity within the team. Challenges in teamwork skills were described in terms of task organization, collaborative completion, establishing connections, and mutual understanding.

« »

Students' Experiences in the Role of a Coachee

The answers related to the role of the coachee were interpreted in relation to how the coachee experienced the coaching situation. The interaction between the coach and coachee was described in a positive light, with terms such as good, friendly, interactive, and safe being used.

One respondent expressed this in the following words:

> *"Our relationship with sir was very good this is new idea for us it is very necessary for us it will help us a lot to have good relationship with patient."*

Based on the responses, it can be concluded that the students recognized the significance of the interaction between the coach and the coachee. Several respondents emphasized desirable qualities related to this interaction. They expressed that the relationship should be social, understanding, intimate, and open.

Respondents felt that the coach was able to help them with their health problem. They reported that the coach encouraged their learning about the chronic illness, empowered them to take ownership of their health problems, and provided them with options, solutions, and encouragement.

The original quotes below illustrate this well:

> *"Stay informed about health issues and make a better self-care plan."*

> *"Know how to take better care of yourself, what to do and what not to do."*

The student responses regarding challenges during the coaching session varied, but some common patterns were identified. One recurring and relevant theme was the importance of knowledge about chronic illness, and the lack of knowledge was perceived as a challenge in the coaching relationship.

One respondent expressed this challenge in the following words:

> *"We lacked a bit of Knowledge about the disease, so it was a little difficult to talk to the patient as we know little about the disease."*

Similarly, the coachees emphasized the importance of the coach's understanding of the coaching process, including its theoretical background, for the effective conduct of the coaching session. Furthermore, the coachees highlighted the significance of the coach's ability to identify and address the coachee's health issues, which was considered essential for the success of the coaching session. However, coachees noted that this task of identifying health issues was perceived as challenging. Effective communication skills were identified as a crucial competency in this context. Coachees observed that coaches sometimes struggled to ask relevant questions to extract the necessary information. Additionally, the ability to establish an appropriate relationship and motivate the coachee to take action was also identified as a challenge.

Other challenges that had an impact on the coaching session included difficulties in time management, network connectivity issues, and geographical distance. It is worth noting that the coaching sessions were conducted online, which added an additional layer of complexity to these challenges.

The Experiences of Online Coaching

The experience of online coaching was a novel concept for the participants. However, the majority of participants acknowledged the benefits of online coaching and provided positive feedback. On the other hand, there were also some respondents who expressed criticism regarding their experience with online coaching. Those respondents who had a positive experience with online coaching described it as an enjoyable and useful way of coaching.

It was also perceived as efficient and timesaving.

> *"Largely positive overall."*

> *"Will bring a lot of good for students/health care workers."*

Those who expressed a more critical perspective considered online activities to be secondary to face-to-face interactions. They perceived online coaching as less dynamic and more serious compared to in-person coaching.

More critical views included:

> *"Not appropriate as live coaching."*

> *"Not as... vivacious and fun as offline."*

Respondents highlighted various benefits of online coaching, including financial and time savings. Online coaching was perceived as convenient and flexible, as it eliminated the need for travel for both the healthcare professional and the patient. The online environment was also seen as a platform for healthcare professionals to develop new skills while maintaining a good relationship with their patients.

Respondents recognized both the advantages and disadvantages associated with digital tools and applications for self-management. The advantages included time and cost savings, as well as increased efficiency in service delivery since online coaching is not constrained by location. The use of digital tools was also seen as beneficial in reducing the workload of health professionals while enabling them to provide continuous support to patients.

The following quotes are examples of responses relating to the benefits of digital tools and applications in supporting self-care:

> *"It will deliver medical services to remote areas."*

> *"Help you work more efficiently."*

The disadvantages of using digital tools and applications to support self-management were identified as their limited applicability to all situations and the challenges associated with network problems and technology use in general. Some respondents expressed concerns about the efficiency of online communication.

Examples of responses related to these drawbacks include:

> *"Since our country is not yet a developed country, there is no network system in all parts of the country."*

> *"Difficult to use with elderly and poor people."*

Limitations of the Feedback Analysis

There are several limitations to consider in the process of collecting student feedback, which may have influenced the results. Firstly, despite discussing the content and language requirements of the feedback form with all partners, the initial response rate for the first round of feedback was low. This could be attributed to the fact that the original feedback form only included questions in English and Vietnamese. Recognizing the potential language barrier for Bangladeshi students, the questions were subsequently translated into Bangla. Following this change, the response rate improved. Furthermore, it was observed that the response rate was low when the feedback form link was sent via email. However, based on the advice from our partners, sending the link via WhatsApp resulted in an improved response rate.

Secondly, the feedback form consisted of many questions that were closely related, which made it difficult for some students to differentiate between them. This could have led to confusion and affected the accuracy of their responses. Thirdly, the inclusion of several open-ended questions posed challenges, particularly for students in Vietnam and Bangladesh who were not accustomed to providing individual feedback. As a result, many responses to the open questions were brief, which limited the depth of information obtained and made it challenging to draw meaningful conclusions.

Fourthly, we observed instances of identical responses in the same language, suggesting possible group responses or sharing of answers among students. This introduced bias into the results and compromised the individuality of the feedback. Finally, we were informed by our partners that students have a cultural tendency to please, which may have influenced their responses to provide positive feedback. This cultural practice may have influenced the authenticity and accuracy of their responses.

Conclusion

The DigiCare pilots proved to be instrumental in gathering valuable information and feedback regarding the quality of the project outputs. This feedback was crucial in refining and further developing the DigiCare Model, Learning Packages, and Educational Program to achieve the desired project outcomes.

> **Integrating a new competence into a curriculum requires support from the organization and decision-makers, sufficient time for change, and continuous program development and evaluation.**

When implementing a new educational program in healthcare education that introduces a new competency, it is important to consider the specific characteristics of the piloting process. Special attention should be given to the clarity and comprehensibility of the feedback collection questions, ensuring that the process facilitates individual, honest, and constructive feedback. Additionally, piloting helps to create an educational program that meets the needs of the educational institution and the demands of the workforce.

It is worth noting that integrating a new competence into a curriculum requires support from the organization and decision-makers, sufficient time for change, and continuous program development and evaluation. These elements are vital for the successful implementation and sustainability of the new educational program.

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6. Discussion

Nina Smolander, Katariina Kunnas, Essi Ylistalo
and Annukka Huuskonen

In this chapter, we reflect on the accomplishments of the DigiCare project, the success of its outputs, and the various stages of our project journey. The project involved a multicultural consortium connecting European and Asian higher education institutions from Finland, Portugal, Bangladesh, and Vietnam. Throughout the course of the DigiCare project, we encountered exceptional and challenging situations that impacted everyone involved. The pandemic notably slowed down our project work, and the reliance on online meetings over a period of two years had an impact on the intensity of our collaboration. Some Asian partner universities had to allocate their resources to clinical pandemic care, further affecting our progress. Nevertheless, the post-pandemic phase of the project provided a genuine sense of accomplishment for the entire team. It fostered innovative collaboration and facilitated the development of all project specialists involved.

Erasmus+ Capacity Building in Higher Education projects are collaborative initiatives involving higher education institutions from EU Member States and third countries outside the programme. These projects have various objectives, including the development and modernization of the quality and accessibility of higher education in partner countries, addressing challenges within their educational systems, and fostering people-to-people contacts, intercultural awareness, and understanding. The projects hold the potential to enhance the skills level of partner country higher education institutions through educational programs, curriculum development, strengthening innovation and internationalization capacity, and promoting cooperation at local, regional, and international levels. The DigiCare project specifically focused on curriculum development within the partner universities, which involved the creation of the DigiCare Model, development of teaching materials for healthcare education, and expertise in utilizing teaching and research methods (Read more in Chapter 2.1).

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The necessity for the DigiCare project in Bangladesh and Vietnam was evident, as these countries face similar global challenges related to chronic diseases, just like developed nations. Over the past few decades, Asia has witnessed a substantial rise in chronic diseases, including diabetes and cardiovascular diseases, placing immense pressure on the healthcare system. The existing healthcare capacity is strained to its limits, demanding a diverse range of solutions to alleviate this situation.

Moreover, societies worldwide have experienced significant advancements in digitalization, and Asian countries are no exception. This digital transformation opens up numerous opportunities for the advancement of healthcare education and service delivery. However, the widespread integration of digitalization in healthcare education and care provision necessitates the development of teaching content and methods, as well as a shift in mindset from traditional to modern teaching approaches.

The project's objectives and goals were achieved through various means, including the development of the DigiCare Model tailored to the Asian context (Read more in Chapter 2.2). Additionally, teaching materials for healthcare education were created (Read more in Chapter 4.2), and the competences of healthcare teachers were enhanced through the implementation of new teaching and research methods. The project also generated research articles based on the outcomes collected during the pilot phases and published e-book.

> **The competences of healthcare teachers were enhanced through the implementation of new teaching and research methods.**

An essential task of the project involved integrating curriculum development into existing curricula. Consequently, this e-book presents the project's outcomes, evaluates their success and effectiveness, and explores strategies for incorporating them into the curricula of higher education institutions in the partner countries.

The DigiCare Model

The main outcome of this project is the DigiCare Model, described in Chapter 3, which explains the content and connections of various concepts related to chronic disease self-management in the digital era. Enhancing competence in managing chronic diseases involves integrating different societal levels, from individuals to families, communities, and society as a whole. Coaching, both in-person and online, plays a crucial role in developing this competence. Person-centered care, professional relationships, and health technologies provide support for individuals to effectively manage their conditions.

At the family level, family-centered care involves involving and supporting family members in decision-making processes and creating an environment of understanding. The community level offers essential support systems, reduces stigma, and promotes awareness through education. Broader societal factors, such as policies and technological infrastructure, have an impact on chronic disease management.

The spinning wheel illustration of the DigiCare Model demonstrates the interdependence and interconnectedness of these levels. While the individual level is vital, a holistic approach that considers all levels is necessary to empower individuals with chronic diseases effectively. Regular updates to the model should incorporate new technologies and understand their implications. Recognizing the multidimensional nature of chronic disease management is crucial when designing educational programs and interventions.

In conclusion, the interaction between individuals, their families, communities, and broader societal structures creates an environment conducive to effective self-management of chronic diseases. Adapting the model to advancements in digital health is important, and a multidimensional approach should be adopted when designing interventions.

The Learning Packages

In addition to the DigiCare Model, this project developed relevant learning packages (Read more in Chapter 4.1) to facilitate the teaching of the model concepts and their interconnectivity. These packages also integrate easily adaptable active learning methods into healthcare education.

The themes of the learning packages were derived from the concepts of the DigiCare Model, expert opinions, needs analysis provided by the partners, and feedback from the pilots. The inclusion of professional communication in the learning packages is noteworthy, as its need was specifically identified by the Bangladeshi project experts. The development of professional communication skills emphasizes the central role of the patient encounter in the care relationship (Read more in Chapter 5.4). The learning package presentations are designed to provide an overview of the themes covered in all packages. Each user of the learning packages will acquire a foundational understanding of the various themes and can adapt the content to meet the specific needs of their institution or teaching group. Additionally, the notes accompanying the learning packages offer suggestions for active teaching methods and provide ideas for further reading material. Each learning package also includes a reference list.

Pilots and Evaluation

In the DigiCare project, six pilots were conducted at partner universities, with the first two pilots involving healthcare teachers and the remaining pilots including nursing and medical students. One of the pilots also had participants from European universities.

The content and structure of the pilots (Read more in Chapter 4.1) challenged the teachers and students in our partner countries, as we introduced new educational content and methods to them. Integrating digital coaching competence into education and healthcare evoked conflicting feelings. Some of the participants believed that digitalization could solve several healthcare challenges, while others felt that integrating it into healthcare was not yet achievable. Students also had similar conflicting experiences (Read more in Chapter 5.6). On one hand, fostering students' self-directed learning and emphasizing ownership of their learning posed challenges for them. Additionally, students were not accustomed to providing feedback on their education, which made it difficult to critically refine the project outcomes based on feedback. However, we received new themes for the content of the learning packages from student and teacher feedback. According to our project experts in Bangladesh and Vietnam, their students had a strong desire to please the teachers, respond to questions in a way they assumed was expected, and provide desired feedback. This raises critical reflection on our evaluation data.

The Project Consortium Achievements

The achievements of the DigiCare project are remarkable considering the structure of the project consortium and the global circumstances during the project period. Our consortium comprised members from Europe and Asia, representing four different countries with diverse teaching and working cultures. These cultural differences influenced aspects such as power dynamics (deriving from low and high-power cultures), hierarchies in project work activities, levels of initiative, and approaches to common project work. Additionally, the teaching paradigms varied significantly among the participating higher education institutions, necessitating an understanding of different teaching methods and facilities.

One area of project work that we continuously developed throughout the project period was communication and task allocation among the project team members. To ensure that partners responded and acted in a manner conducive to the project, it was necessary to delegate communication effectively. This involved determining what information needed to be communicated directly by the project manager and what could be delegated to other team members. By delegating communication and tasks, partners were empowered to take ownership of their respective tasks and contribute to the project's progress. Delegation allowed for timely responses, coordinated actions, and a collaborative approach among the consortium members, ultimately supporting the success of the project. However, in this area, we can always strive to improve our skills and knowledge even further.

Furthermore, the pandemic significantly disrupted our project's transnational meetings, hindering team building and the opportunity to fully understand each other's working styles. On-site and in-person meetings play a crucial role in project planning, innovation, lively debates, and justifying viewpoints. However, online activities, while present throughout the project, cannot fully replace in-person interactions. In-person meetings are pivotal for building trust among consortium members, fostering transparency, enabling direct communication, and facilitating bold innovative work. Despite the challenges, consortium members have reached a high level of expertise. They have improved their digital skills, teaching methodologies, and experienced active working styles in transnational meetings. The incorporation of active methods like world cafe and small group workshops in transnational meetings has introduced consortium members to active teaching methods. These methods have allowed members to personally experience and experiment with active teaching approaches, leading to further enhancement of their skills and knowledge.

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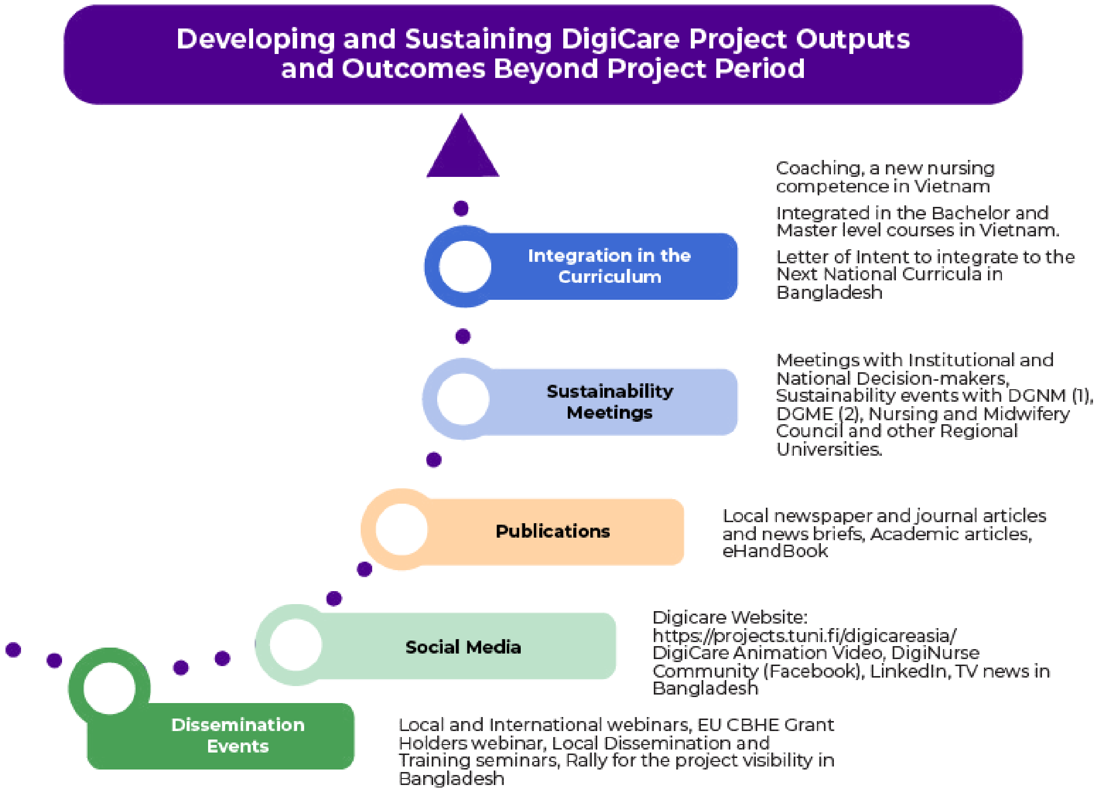
The project work skills of the consortium members developed throughout the project period, particularly for higher education institutions with no prior experience in international project work. Project management intricacies were unfamiliar, requiring guidance from the coordinator. As the project progressed, bilateral meetings and discussions on challenging matters played a crucial role in resolving issues or, at the very least, contributed to helping the partners cope with the challenges they faced. These challenges encompassed various aspects, including reporting, resource allocation, and transnational meetings. The result was the development of more streamlined working methods, enhancing the overall efficiency and effectiveness of the project.

The use of a common online working platform proved to be a successful solution, albeit with substantial technical support from the coordinator. The platform increased everyone's capacity, facilitating collaboration, communication, file sharing, and authentication of meeting activities through written notes and video files. This ensured that everyone had an opportunity to stay updated with project work, even when unable to attend online meetings. Networking with consortium members and regular online and in-person meetings were essential for maintaining flexibility and efficiency in project work. Building trust within the consortium involved having the courage to ask questions, seek clarification, and foster open communication.

> **Networking with consortium members and regular online and in-person meetings were essential for maintaining flexibility and efficiency in project work.**

Disseminating activities and events as well as sustaining project results have required significant effort from the consortium (Figure 30). Experts from partner countries have organized various events to present the project and its outcomes. Additionally, substantial work has been done in terms of disseminating results through various media channels. Several journal articles have been published in Bangladesh and Vietnam, and efforts have been made to publish scientific publications in relevant journals. We have even participated in a rally in Bangladesh to increase the project's visibility. The project is also showcased on a Facebook group and the LinkedIn profiles of project members. In addition, the coordinator has had several meetings with decision-makers, with the representatives from partner countries. These meetings have provided an exceptional opportunity to enhance the integration of project outputs into curricula and ensure the long-term sustainability of project outcomes beyond the project's duration.



1 = Directorate General of Nursing and Midwifery
2 = Directorate General of Medical Education

Figure 30. Dissemination and Sustainability Activities

Afterword

The DigiCare project has accomplished significant achievements, including the development of the DigiCare Model as a key outcome. Additionally, a video highlighting the main aspects of the DigiCare Model has been created to introduce it to the public (https://youtu.be/vQ_jhavzd48). Healthcare teachers and students have utilized the model and learning packages to gain practical experience in coaching both in-person and digitally. They have enhanced their skills in promoting self-management and utilizing digital technologies, preparing them for the challenges of healthcare digitalization.

The DigiNurse community has grown throughout the project, and project results and knowledge have been effectively disseminated through articles and events. The publication of this work aims to foster success in applying the DigiCare model, methods, and materials, particularly in Asian healthcare contexts. Our collaborative efforts aspire to contribute to healthcare education and its ongoing advancement.

The DigiCare project has provided consortium members with valuable expertise in healthcare education, research, and project work. These competencies will undoubtedly be valuable in facing future challenges and engaging in collaborative projects.

Most importantly, the project has fostered a diverse network, friendships, meaningful encounters, fresh perspectives, and the opportunity to glimpse into each other's worlds. The project has created the DigiCare family, and just as in every family, we have lived a colourful project life together, engaged in discussions, agreed, and disagreed, defended, and argued for our own positions, and challenged each other. From this tapestry of life emerges the innovative and fresh perspectives that nursing education and the renewal of nursing practice require. And just like in families, we have achieved something unique: a sense of community and acceptance of individuality.

The TAMK team would like to express our heartfelt gratitude to all the members of our project teams in Bangladesh, Portugal, and Vietnam. Your contributions have been invaluable in the advancement of education and healthcare development. The dedication, expertise, and collaborative efforts of each team member have played a significant role in the success of the project.

Together, we have achieved remarkable milestones and made a positive impact on healthcare education. As we move forward, let us continue our collaboration, sharing knowledge and experiences, and working towards further advancements in the field.

Thank you for your commitment and hard work. Our continued partnership holds great potential for creating lasting positive change in healthcare.

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Appendices

Appendix 1. Barriers of Self-Management of Chronic Diseases Digitally. Summary of the Literature Review

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Abstract

Background: Self-management of Chronic diseases using digital health technologies have tremendous potential via education, monitoring and support, timely feedback, and remote access to health professionals. The use of digital tools has been surprisingly low in clinical practice, even though the shift to a value-based care system has encouraged the adoption and use of it to manage chronic conditions. Moreover, to our knowledge, there is limited information on the factors that hinder the adoption of digital technologies. **Objective:** This review provides a comprehensive summary of the barriers to adopt digital health technologies for self-management of chronic diseases which can lead us to develop a model for developing self-management interventions (SMIs) particularly for the developing countries like Vietnam and Bangladesh. **Methods:** Structured literature searches were conducted using 3 databases to identify relevant studies from 2014 to 2020: PubMed or Medical Literature Analysis and Retrieval System Online, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Excerpta Medica database (EMBASE). We found 89 literatures according to our inclusion and exclusion criteria. The total of 14 articles were included and analyzed using qualitative content analysis. **Results:** Through the analysis, four main types of barriers for self-management of chronic diseases digitally were found, such as limitations due to personal conditions, inadequate technological competence, poor usability of technology, and hindered motivation to use technology. **Conclusions:** We can overcome the barriers by real-world testing and incorporating feedback which will help in designing technologies and it will improve their overall usability. Finally, to fully realize the potential of digitally enabled self-management of chronic conditions, there is a greater need to validate these technologies by overcoming these barriers with reliable and accurate information which will improve the cost effectiveness and competency of these digital health technologies. **Keywords:** Barriers, Self-management, Digital health technologies.

Introduction

Elderly people are growing at a rapid pace as well as the chronic diseases, methods and technologies must be found to help them to take care of their illness by themselves. Self-management of Chronic diseases digitally have tremendous potential via education, monitoring, support, timely feedback, and remote access to health professionals [10]. When designed and implemented successfully digital technology has offered an opportunity to support the quadruple aim of health care by improving health outcomes, increasing patient experience, reducing health care costs, and improving clinician satisfaction. [11]. The American Medical Association defined digital health technologies are as those systems and solutions that engage patients for clinical purposes, collect, organize, interpret, use clinical data, and manage outcomes and other measures of care quality including telemedicine and telehealth, mobile health, wearables, remote monitoring, and apps [12].The use of digital tools has been surprisingly low in clinical practice, even though the shift to a value-based care system has encouraged the adoption and use of it to manage chronic conditions [13]. Moreover, to our knowledge, there is limited information on the factors that hinder the adoption of digital technologies. Previously published literature includes surveys that cite factors influencing Digitalization adoption such as organizational and financial barriers [14]. This review provides a comprehensive summary of the barriers to adopt digital health technologies for self-management of chronic diseases which can lead us to develop a model for developing self-management tools particularly for the developing countries like Vietnam and Bangladesh.

Methods

Structured literature searches were conducted using 3 databases to identify relevant studies from 2014 to 2020: PubMed or Medical Literature Analysis and Retrieval System Online, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Excerpta Medica database (EMBASE). The detailed search strategies for PubMed have been provided as an example (Figure 1). We found 89 literatures according to our inclusion and exclusion criteria. At first, two reviewers, with subject matter and methodological expertise, independently reviewed all abstracts identified by the searches and conflicts were resolved by a third reviewer. Then, two reviewers screened the full texts to select the final studies to be included in the review. The authors also conducted a gray literature search (including conference proceedings) through a Web search engine. In addition, one articles were handpicked based on the same inclusion criteria used for articles analyzed using qualitative content analysis. The total of 14 articles were included and analyzed using qualitative content analysis.

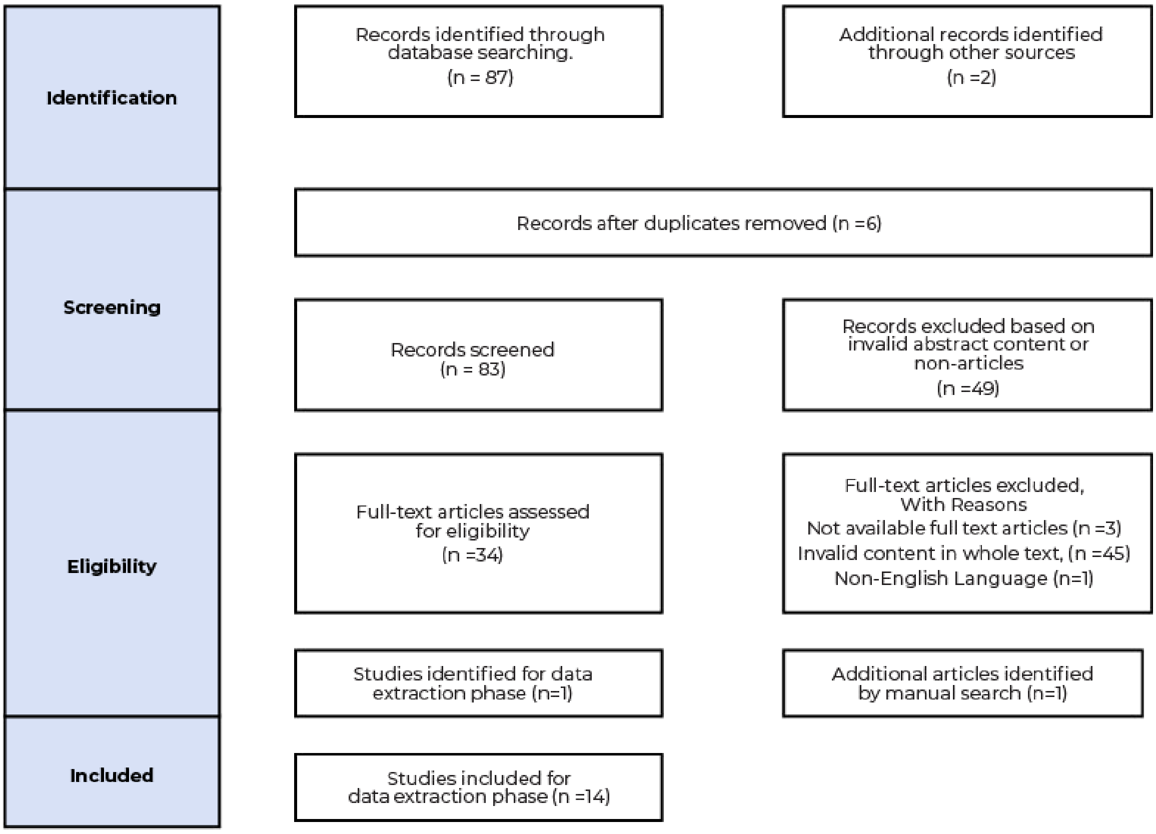

Figure 1: Prisma diagram for barriers of self-management of chronic diseases digitally.

Results and Discussion

Through the analysis, four main types of barriers for self-management of chronic diseases digitally were found, such as limitations due to personal conditions, inadequate technological competence, poor usability of technology, and hindered motivation to use technology.

Table 1: Key findings of barriers of self-management of chronic diseases digitally.

Limitations due to personal conditions

- Health impairments
- Financial concerns to use digital technology.

Inadequate technological competence

- Lack of awareness about digital tools in self-management
- Inadequate support to use digital tools.
- Insufficient technological skills

Poor usability of technology

- Difficult to use apps.
- Continuous up-dating of the apps needed.
- Concerns about online confidentiality
- Malfunctioning technology
- Health threat due to unsuitability of the app
- Insufficient access to internet and devices

Hindered motivation to use technology

- Considering apps not adding value
- Feeling digital tools more troublesome than beneficial
- Time consuming to use.
- Difficulty in persistent using

First, **Limitations due to personal conditions** included health impairments and financial concerns to use digital technology which describes below.

Health impairments contained cognitive and psychological barriers that hinder the use of digital technology in self-management such as creating password, remembering it as well as difficulty to access to the web, which felt like a burden rather help them to manage the diseases (1,3,4). Moreover, physical and sensomotor disabilities impair ability to access to the web and the effort required to use the apps for self-monitor formed a barrier (1, 4).

Financial concerns to use digital technology meant concern about affordability of mobile data (3), affordability of the apps to all (5), concerns about the costs of use of internet (3) and smartphone data plans (9).

Secondly, **Inadequate technological competence** included lack of awareness about digital tools in self-management, inadequate support to use digital tools, and insufficient technological skills are described in detail below.

Lack of awareness about digital tools in self-management was about limited health literacy (3), information gap about availability of digital tools (2), nor getting recommendation (2) or GP's advice to use an app (3). Moreover, patients were not being aware of tools available and it was not recommended by their GP or someone else (2, 3).

Inadequate support to use digital tools was about lack of patient education to support self-management as well as they need help to operate the computer (7). In addition, individual needs for additional and expanded training to use smart device system and follow up assistance (6). A study mentioned about the limitations in duration of support (1).

Finally, **Insufficient technological skills** include Limited skill to use the internet (3), Lack of basic computer skills (3), Difficulty in using apps (5), Inexperience with computer (7), Difficulty in using the net initially as well as later (7) and poor technological literacy (5).

Next barrier for digital self-management is **Poor usability of technology** which is the most frequently mentioned barrier which includes difficult to use apps, continuous up-dating of the apps is needed, concern about online confidentiality, malfunctioning technology, health threat due to unsuitability of apps and insufficient access to device and internet are described below.

Difficult to use apps includes apps are not user friendly, had complicated layout, and was difficult to use and navigate (5). It also pointed out that different units of measurements in different countries. (5)

Continuous up-dating of the apps needed comprises app content needs continuous re-evaluation for sustainable engagement (8), as well as teaching approach needs reevaluated regularly for sustainable engagement (8).

Concerns about online confidentiality encompasses smart phone base mHealth could pose a threat to unstable patients (6) and Diabetes app doesn't suit the patients with multiple chronic illness (6). It also mentioned that longitudinal progress on the graph are less useful for patients with stable condition (6) and lack of knowledge to interpret questions of app led to inaccurate report (6). Another study reported that difficult to develop an appropriate PROM [patient reported outcome measures - questionnaire for self-assessment of self- management] (7),

Malfunctioning technology involves technical issues such as connectivity, technology failing, app crash and slow internet connection prevented patients from using DHTs (5). Additionally, some feels that high speed internet is a must (8) for digital health care.

Health threat due to unsuitability of the app covers patients were comfortable with access to health data being limited to only themselves and their providers. However, patients were concerned about personal information is in the web (3, 9), confidentiality of diagnoses (3), and their medication in the web (3). They are also concern about risks of accessing information online (3), vulnerability of online systems to hackers (3), computer viruses (3), and online security (3).

Insufficient access to internet and devices consists of patients have limited access of computers (3), the internet (3,9), and a computer or smartphone (9). It also mentioned that the net and format of the PROM must be easily accessible. (7).

Final barrier is **hindered motivation to use technology** which includes considering apps not adding value, feeling digital tools more troublesome that beneficial, time consuming and difficult in persisting using described below.

Considering apps not adding value contains patients pointed out current self-care methods were considered sufficient without apps (5), and there is a disbelief that app would improve self-management (5), who feel apps are not superior than writing down physically (5). On top of that, the health condition was not considered to need app for self-care support (5), which makes it less valuable intervention added to the management. Moreover, they assume that their GP is GP is unfamiliar with the technology and not interested about app use (5).

Feeling digital tools more troublesome than beneficial incorporates another barrier frequently highlighted in the literature was the complexity of technologies (n=5). Usability and technical issues led to frustration and discouragement (6) as well as patients have disbelief on help of technology applications in improving quality of life (4). Moreover, they assume that inadequate technical training of health worker may lead to longer consultation (6). In addition, they did not have the desire to learn newer technologies (5). However, patient did not like loss of face-to-face communication (8) because they would not be accountable for their behaviors (2).

Time consuming to use introduces time required to use the apps for self-monitoring formed a barrier (2), as well as intensive assessment, self-survey length and complexity could be burden for patients (7).

Lastly, Difficulty in persistent using have barriers in adapting, persistently using of technology in self- management use (4), as well as sustaining engagement is difficult (8).

Conclusion

Our findings suggest that several important barriers of self-management of chronic conditions digitally such as limitations due to personal conditions, inadequate technological competence, poor usability of technology, and hindered motivation to use technology. Developing countries such as Vietnam and Bangladesh where digitalization is rap idly growing, it will tremendously shape up the health care for the growing elderly population.5(5)

We can overcome the barriers by real-world testing and incorporating feedback which will help in designing technologies and it will improve their overall usability.

Finally, to fully realize the potential of digitally enabled self-management of chronic conditions, there is a greater need to validate these technologies by overcoming these barriers with reliable and accurate information which will improve the cost effectiveness and competency of these digital health technologies.

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Appendix 2. The Ethical Issues in Digital Healthcare That Healthcare Professionals Should Consider. Summary of Literature Review

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Introduction

Digital technology is already a part of our daily lives. We use smartphones to navigate our routes and order our purchases [6]. Also, in the field of health, the digital dimension is ever increasing, and in the last few years, digital health initiatives received much interest and increasing investments from public and private sources [6]. Digital technologies are getting priorities in all areas of the patient dealings, both within research area and the clinical sectors, throughout healthcare systems across the world [5].

With this understanding of a public health justice approach, we discuss the ethical chances and challenges unfolding in digital health. The research question of the literature review was, What are the ethical issues in digital health care that health care professionals should consider? We base our analytic overview of these issues on a narrative review in order to obtain a broad perspective on recent and relevant literature on digital (public) health. We point out what ethical guidance is needed for health care Professionals.

Result

We searched two Databases that are PubMed Advanced and Google Scholar for studies on ethics on digital health care that health care professionals should consider published between 2014 to 2020. Through database searching we found 339 relevant articles. After removal of duplicates, the remaining records were assessed for relevance based on abstracts. References of included studies were checked for other relevant studies. Total 114 records were identified, out of which 109 articles were excluded for main reasons and finally 7 articles matched the inclusion criteria and were included for this review. The process used to reduce and evaluate the records is illustrated in Prisma diagram (2009) (Figure 1).

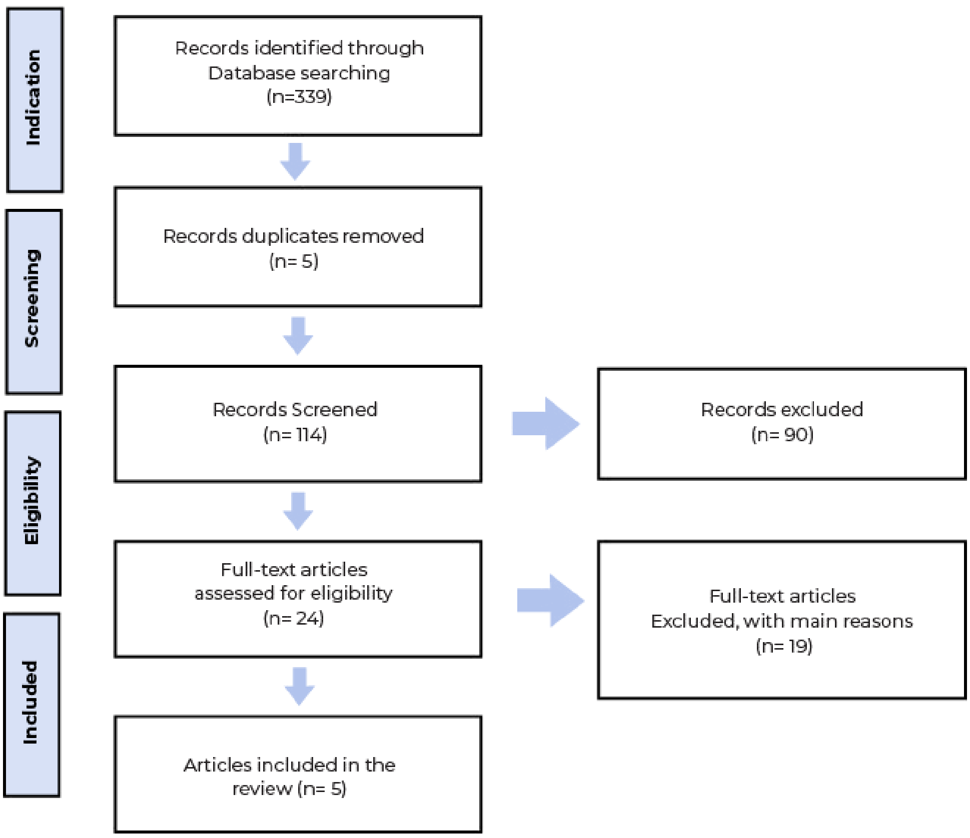

Figure 1. Prisma diagram of the process used to reduce and evaluate the records.

The results of the included articles answering the research question were extracted and analyzed using qualitative content analysis.

In this literature review we revealed four categories of ethical issues that should be considered by health care professionals. These were Patients' rights in digital health care, Responsible behavior of health care professionals in digital health care, Governance of health care data and Equity in digital heath care.

Patients' rights in digital health care included patient security in digital health care and freedom of informed choice in digital health care.

Patient security in digital health care was described as patients being concerned about their confidentiality in digital communication and their privacy being a key element of trustworthy artificial intelligence [1,6,7]. Health care professionals should consider about patient safety and should prevent any kind of unintentional harm to them [3,7].

Freedom of informed choice in digital health care meant preservation of dignity and support of human autonomy in digital health care services [6,7]. In case of video visit clinician need to trust on patient's judgement to avoid negative disturbances [2]. Valid informed consent, an important value and part of ethics (1), should be taken from the patient considering long time data use and storing as well as technological and language difficulties, because it plays an important role to find out truthful information [4,6].

Responsible behavior of health care professionals in digital health care included Accountability in digital health care, Transparency in digital health care, Relation of trust in digital health care.

Accountability is important in procedural value for digital health which maintain trustworthiness of artificial intelligence [6,7]. In case of video visit sensibility of clinician is required to avoid negative disturbances [2]. Human agency and oversight also have importance for trustworthiness of artificial intelligence [6].

Transparency in digital health care is another key element of trustworthy artificial intelligence which has important procedural value for digital health [6,7].

Relation of trust in digital health care is important in between service receiver and service provider to mitigate ethical risk [3,6,7]. By working together in relationships of trust patient safety can be maintain also [3].

Governance of health care data includes Safe accessibility of Digital health care data and Responsible Management of health care data. Most of the patients want to keep their data private and confidential [5]. Important value in digital health is safety of information [6]. So, data should be stored in a safe way to protect from unauthorized access [6,7]. Exploitation of data should be prevented carefully [6].

Responsible Management of health care data implies that trustworthy artificial intelligence should be robust, lawful, and ethical [7], so governance to be considered in rollout of digital access between patient and clinicians [3]. Data should not be used without any purpose [6]. Awareness of data use and data ownership has important value in digital health care [6, 7].

Equity in digital heath care includes Individual equity in digital health care and Societal equity in digital health care. Individual Equity in digital health care means equity in empowerment, access, exclusion, inclusion and getting equal treatment in health care access [6, 7]. All kind of fairness and ethical issues to be considered in rollout of digital access between patient and clinicians [3, 7]. Societal equity in digital health care Non-discrimination, non-stigmatization, environmental and societal well-being are also the key element of digital health care [6, 7].

Figure (2) showing the ethical issues in digital health care that health care professionals should consider.

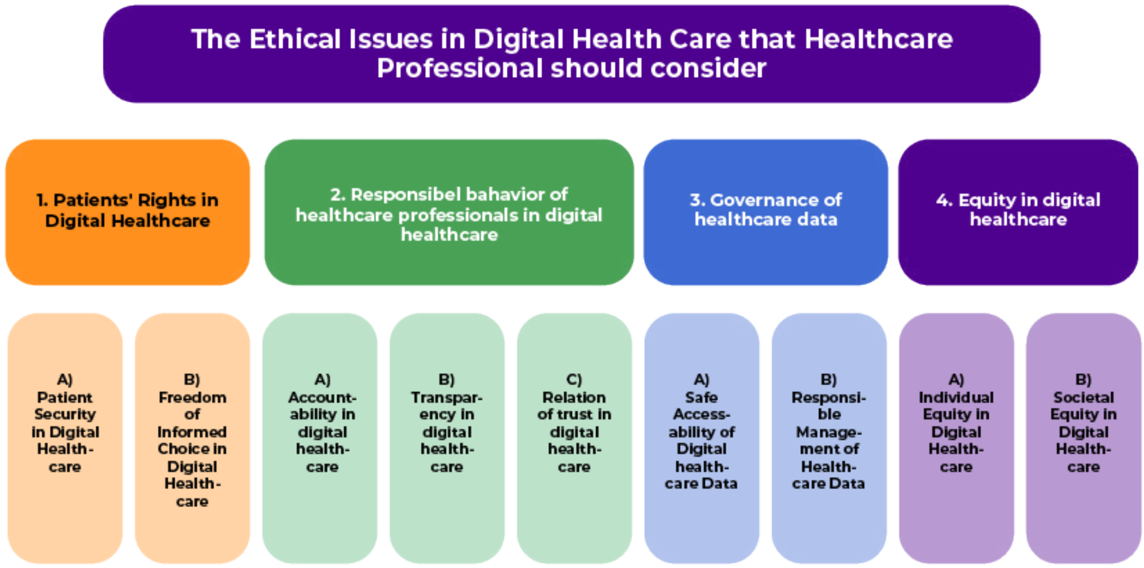

Figure 2. Categories of the Literature Review.

Conclusion

Ethics is the most important issue which to be considered in digital health care system like all other types of services. Health care provider should be ethical in providing digital health care services. The ethical issues are to be considered under the four-broad heading - Patients' rights, Responsible behavior of health care professionals, Governance of health care data and equity in health care. Trustworthy and equitable access to digital health care and interventions offers chances to healthcare coverage, spread of health information and literacy, and potentially efficiency of care. Overall Regulations and policies focusing on ethical guidance are needed for fair, equitable and trustworthy digital health aiming to empower service receiver.

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Appendix 3. Digital Competencies of Nursing Students. Summary of Literature Review

Authors: Le Thanh Tung, Ngo Huy Hoang, Truong Tuan Anh, Nguyen Thi Minh Chinh, Nguyen Thi Thanh Huong, Mai Thi Thanh Thu, Hoang Thi Minh Thai, Hoang Thi Van Lan, Pham Thi Thuy Chinh

Introduction

Over the last few decades, digital competence is a concept that is increasingly used in public discourse. However, the definition and meaning of this concept are unclear. In policy documents and policy-related discussions digital competence related to "what kinds of skills and knowing people should have in a knowledge society, what to teach young people and how to do so" (Ilomäki, Paavola and Lakkala, 2016, p. 655). Therefore, the scope of this paper investigated existing literature in the field of digital competence of healthcare students in Asia to identify the lack of clear definitions and theory in the current body of evidence; and clearly understand on this concept in different times and countries.

Aims

This literature review aims to explore the knowledge on the digital competency in healthcare students in Asia.

Review method

A searching was conducted on Academic Search Complete, Cumulative Index of Nursing and Allied Health Literature (CINAHL), Medline with Full Text, and Medline Journals. Two hundred and eighty-nine journal articles meeting the high-level search criteria were found. Key search phrases and database results are cited in Table 1. Key terms included "nurses," "nursing students," "personal digital assistants," "mobile technology," and "handheld devices." After eliminating studies more than five years old, duplicates, articles related to non-nursing health care professionals, opinion pieces, published studies involving only practicing nurses and not students, dissertations, and articles on social media, seventeen published studies involving the use of mobile devices in nursing educational settings met the criteria for inclusion.

Research Question: What are the digital competencies of nursing students/health care students in Asia?

1. **Population:** nursing students/health care students
2. **Concept:** digital competencies
3. **Context:** Asia
4. **Key words:** digital competencies, nursing students, health care students
5. **Scope of review**
   - Studies need to look at: 289
   - Studies need to use: 5
   - The data collection was conducted in 5 years, from 2014 to 2019, and inclusion and exclusion criteria were defined (Table 1.)

Table 1. The Inclusion and Exclusion Criteria

Inclusion criteria	Exclusion criteria
Articles published from 2014 to 2019	Non-research article
English language	Government policy
Answers the research question	
Full-text available	

6. Search Strategy

Data sources: A comprehensive electronic database search was conducted in PubMed, Web of Science, CINAHL, Embase, PsycINFO, ISI, SCOPUS, to retrieve relevant articles published in English between January 2014 and November 2019

Search Strategy: ("digital competenc*" OR "digital skills" OR "ICT competenc*" OR "ICT skills" OR "digital abilit*" OR "ICT abilit*" OR "digital capabilit*" OR "ICT capabilit*" OR "informatics competenc*" OR "informatics abilit*" OR "informatics capabilit*") AND ("nursing students" OR "health care students")

7. Search outcomes

After the removal of duplicates, the remaining records were assessed for relevance by the searcher based on abstracts. Subsequently we identified 5 records that met the criteria of this systematic review. The process used to reduce and evaluate the records is illustrated in Fig 1 Prisma diagram (2009)

8. Data extraction and synthesis

All 5 articles included were quantitative studies. Table 1 summarizes studies included in this review and we may later report detailed findings in terms of these subsequent themes to identify models that we could investigate as a part of the DigiCare project.

Summary

The purpose of this paper searched the articles that related to digital competences of Asia health care students. After searching, five articles which are quantitative studies were found. The contents of those articles illustrated the digital competences of Asia health care students.

As a result of the analysis, three main digital competences of Asia students were knowledge, skill and attitude about digital were found (Table 2.). Firstly, **knowledge about digital** which consists of perceive smartphone useful for internet, perceive internet useful for health, perceive internet useful for leaning activities, knowledge about using software, knowledge about evaluating and using health resources located on the Internet. Secondly, **skills about digital** include skills to search, use and evaluate health information on the Internet; skills to learn through internet; and skills to find and use websites. Finally, attitude about digital includes attitude to use the internet and attitude to use the computer.

For knowledge about digital, nurse students perceived smartphone useful for internet as most of them (78.3%) reported smartphones as their initial vehicle for using the internet (1). The second point, nurse student perceived internet useful for health because the internet helps them to make decision, to find helpful health resources, to access health-related resources, and to find the knowledge related to e-health. The evidence showed that there were 65.1% of students who reported internet was useful for making health decisions (1) and 16, 9% of students responded that internet was very useful tool in helping them make decisions about their health (4). Furthermore, only 25.6% (n = 45) of students felt confident using the information from the Internet to make health decisions (4). There were 40% of students either agreed or strongly agreed with where to find helpful health resources on the Internet (4). In Sharma et al (2019) showed that 61.8% of participants felt that it was important to be able to access health-related resources (1). In Park at el (2015) illustrated that participants with a high level of e-health understanding found that the Internet was more useful and important than participants with a low medical level (4). The third point, nurse student perceived internet useful for learning activities. In the study of Yan Li et al (2015) showed that the Internet DLOs (Digital Learning Objects) was accuracy, usefulness, and importance was rated as 6.85 (SD 1.48), 7.27 (SD 1.53), and 7.13 (SD 1.72), respectively, out of a high score of 10 (3). The next point, for knowledge about using software, the evidence showed that less than 25% of the students reported having little or no knowledge in Excel and other software (5). Lastly, for knowledge about evaluating and using health resources located on the Internet, Park and Lee (2015) indicated that in terms of perceived ability to differentiate between a high quality and a low quality of a health-related web site, only 27.8% (n= 49) agreed or strongly agreed (4).

Skills about digital consists of nurse students' skills to search, use and evaluate health information on the Internet. Sharma et al (2019) showed that 44.7% of the sample perceived that they had an average level of Internet skills (1). Dashti et al (2016) study on E-Health literacy of medical and health sciences university students in Mashhad, Iran showed that almost half of the students had moderate level of internet skill based on eHealth literacy questionnaire (2). Moreover, another study showed that 50% of the participants either agreed or strongly agreed that they felt comfortable using the Internet to find information (4). Nurse students had skills to learn through internet. The evidence showed that 97.5% (428/439) learned a variety of clinical procedures through Internet DLOs (3). Nurse students also had skills to find and use websites which were skills to using YouTube, websites, and blogs (3). Three-quarters (341/439, 77.7%) of students used public search engines, 93.2% (409/439) of them used YouTube, almost half of them used universities' websites, 12.5% of them used blogs, 29.8% of them used manufacturers' guidelines, and 26.9% of them used other websites to be accessed DLOs (3).

For attitude about digital, nurse students had attitude to use the internet and attitude to use computer. Nurse students frequently used the internet but not for health purposes (1). One study showed that only 19.7% reported that they used the internet for health purposes (1). However, the internet using time was reported as 120.00, IQR=180.0 minutes (minimum was 10.0 minutes and maximum were 900.0 minutes) (2). Besides that, rarely student used internet for study on health subject (3) and attitudes towards internet depends on students' perception of their skills, usefulness of and frequency of using internet (1). Moreover, nurse students' attitude to computer use depends on students' perception of their competence (5).

For the relationship among knowledge, skill and attitude about digital was found in the literature, the information technology knowledge and experience can contribute to students' positive attitudes toward working with computers, expose them to the world of technology and improve their computer competencies (5).

Conclusion

Our findings suggest that important digital competences of health-care student consisted of knowledge about digital, skill about digital and attitude about digital. The health care

students' ability to use internet vary depending on in what purpose internet is needed. The results can be used to develop the digital competences of nursing or health care students. The curriculum or course syllabus related to digital will be based on the current digital competences. Besides that, these results could be benefited in DigiCare Asia-project and development of our health care education.

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Appendix 4. Pedagogical Methods to Teach the Students to Coach Patients. Summary of Literature review

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Introduction

Pedagogy refers to an art and science of teaching where different methods used in different combination to enhance the learning outcomes. It supports intellectual engagement, connectedness to the wider world, supportive classroom environments and recognition of differences (9). Health coaching refers to providing patients with appropriate knowledge, skills, tools and confidence so that they can actively participate in their own care to achieve certain health goal (10). According to different studies, quality care and education can be ensured if students are involved in patient education (8). This literature review will discuss about the pedagogical method to teach students in order to coach patients. The research question for this literature review was, “What pedagogical methods are used to teach health care students to coach the patient?”.

Result

We searched two Databases (PubMed Advanced and Google Scholar) for studies on pedagogical methods that are used to teach healthcare students to coach the patients published between 2015 to 2020. After removal of duplicates, the remaining records were assessed for relevance based on abstracts. References of included studies were checked for other relevant studies. Total 120 records were identified, out of which 8 articles matched the inclusion criteria and were included for this review. The process used to reduce and evaluate the records is illustrated in Prisma diagram (Figure 1.).

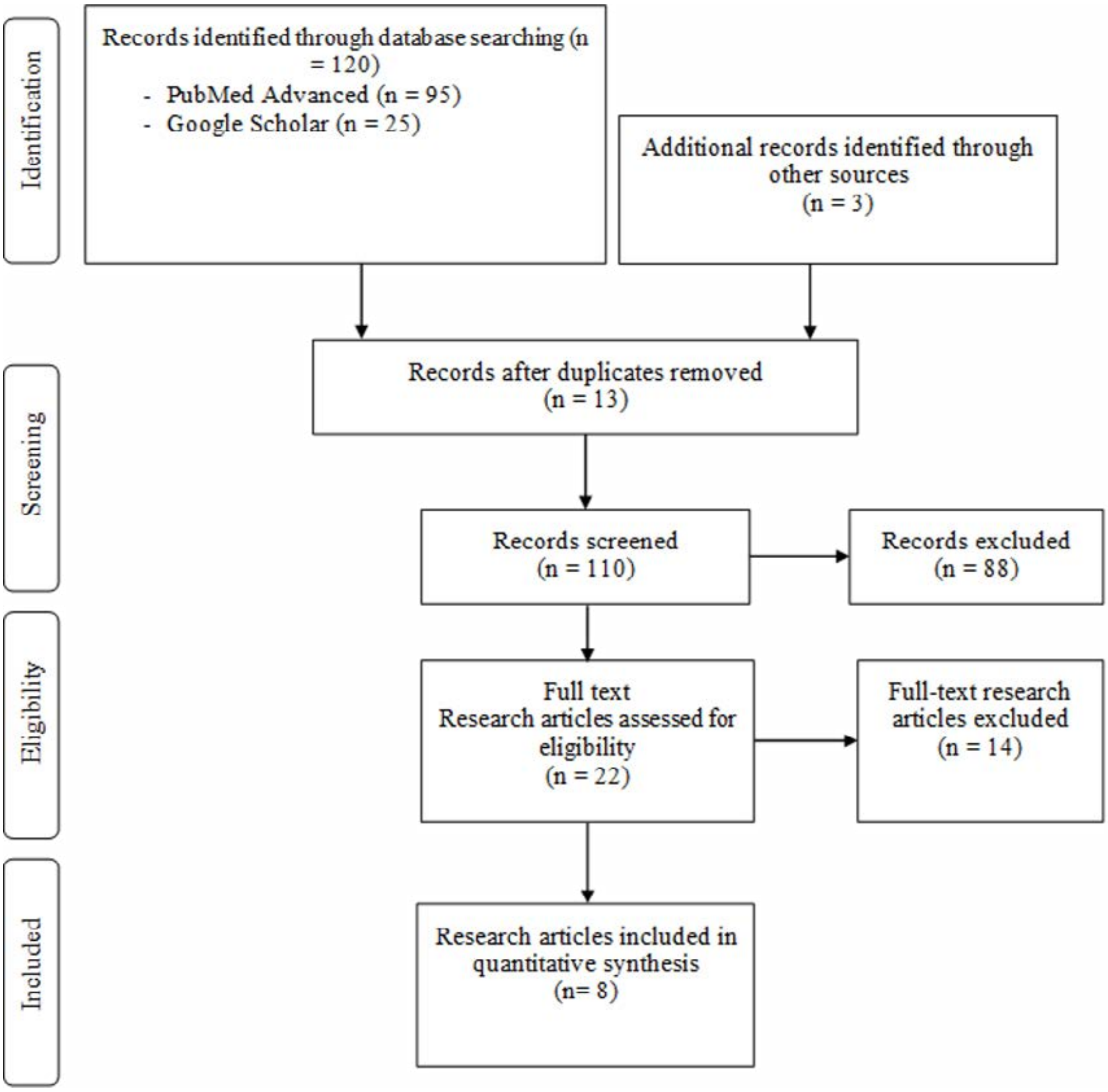

Figure 1. Prisma Flow Chart of the process used to reduce and evaluate the records.

The results of the included articles answering the research question were extracted and analyzed using qualitative content analysis.

The literature review revealed three sets of pedagogical methods to teach healthcare students to coach patients, namely, theory based active learning sessions, hands-on training of mixed approaches and teacher's support throughout the learning process.

Theory based active learning sessions included set of learning sessions about counseling skills (3), use of photos of selected topic to enable learning patient counseling (4), observations of multiform demonstrations of patient support activities (1,7) and discussions of assigned topics about patient counseling (4).

The **set of learning sessions about counseling skills** contained three hour long weekly sessions involving taught components and description of the skills to train the students about counseling skills (3). **The photos of selected topic** were used to represent assigned topic to make short presentation by the instructor to use it in a lecture and viewing them to the students in the class (4). In addition, **observations of multiform demonstrations of patient support activities** were done by viewing video of role-play demonstration, real clinical demonstration (1, 7), real life scenarios through one-way screen and videos by the trainees (7) while methods of **discussions of assigned topics about patient counseling** included discussion of the photos representing the assigned topic by the students during demonstration of the photos by the instructor in the class as long as needed to demonstrate to learn about of the component, discussion of the assigned topic in class meetings by the students, using presentation by the instructor in class meetings to guide the discussion by the students about the assigned topic and keeping focus of the discussion on the assigned topic by the instructor during class (4).

Teachers provided **hands-on training of mixed approaches** through student-provided patient education (8), school-based simulation trainings (5,7), role play of patient coaching sessions (2,3,7) and practical sessions in real clinical settings (1,7,8).

Students were involved in patient education with various forms through providing courses to the patients and their family members, arranging programs for various patient groups, providing a patient education health fair and providing a summer clerkship for patient education (8). **School based simulation** was done by using high fidelity manikins and adult patient simulators as real patients to practice and improve non-technical performances (5,7) along with formation of team to work in the same simulation which helped learning from each other (6). In addition, role play of **patient coaching sessions** involved actors to role play to create a simulation in a real-life setting (2,7). Students role played as both counselor and observer during training of counseling skills (3) as well. **Real clinical scenarios were used to provide health education** (1), to develop and improve non-technical skills (7) along with providing orientation and training sessions to the students with real patients before any practical experience (8) as **practical sessions in real clinical settings.**

Teachers supported the students through orientation to study coaching of the patients (4, 5, 7) and learning-promotive feedback (7,8) throughout the learning process. **Students were oriented with the course or topic through introduction and description of the goal** of the course using presentation (7) and provision of clear instruction regarding simulation to know what steps to follow in real situation. (5). However, assigning of a topic to the students relating to counseling for students to take photos (4) also helped in learning process. **Teachers provided feedback** by videotaping the trainees during showing the videos (7) along with oral and written feedback to help learning achievement (8).

Conclusion

The pedagogical methods used to teach health care students to coach their patient were reviewed where we found different methods used in different combination to enhance the learning outcomes of the students. We propose combination of these three sets of pedagogical methods to teach healthcare students to coach patients, for better learning outcome. However, while the mentioned approaches might be easy to apply, some of them, for example, simulation through high fidelity manikins, might still be challenging to implement considering the technological development of our country.

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Appendix 5. Exploratory Screening of the Health Literature

Authors: Truong Quang Trung (Hanoi Medical University),
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Nina Smolander (Tampere University of Applied Sciences)

This exploratory screening was conducted to form an overview of concept of health literacy in self-management of non-communicable diseases.

Describing concept of health literacy

Health literacy is defined as 'achievement of a level of knowledge, personal skills, and confidence to take action to improve personal and community health by changing personal lifestyles and living conditions' (WHO, n.d.). The other definition is the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decision (Ratzan & Parker, 2006). It is considered that from patient perspective, it is the **ability** to obtain, understand and act on health information. Meanwhile, for healthcare facilities, it is **capacity** to communicate clearly, educate about health, and empower their patients.

The Paache-Orlow & Wolf's theory indicates that a person's medical knowledge is distributed by individual (age, education, sight, hearing, speech, memory, and analytic factors) and sociocultural factors (occupation, income, social support, culture, language). Medical knowledge is the personal property of the patient, the knowledge that the patient acquires over time, and through which the patient also reflects the policies and practices of the health operating system. Medical literacy influences patient health outcomes through access to and use of services, provider-patient interaction, and self-care. (Paasche-Orlow & Wolf, 2007.)

Current evidence indicates that although they are correlated, **health literacy (HL) and patient activation (PA) are distinct.** HL, PA, and their determinants intersect and diverge and how these concepts might inform the development of self-management interventions were investigated based on reviewing relevant literature (Yadav et al., 2019). Previous researchers have identified determinants of low HL including age, educational attainment and socioeconomic status, culture beliefs and practices, and communication skills (including language barriers) between professionals and patients. This directly affects individual decisions, actions and their lifestyle behaviours and plays a key role in the prevention and management of chronic illness. PA refers to the knowledge, skills, and confidence a person has in managing their own health and care. Activation involves four stages (1) believing in the patient role, (2) building patient confidence and knowledge for self-care, (3) taking action to maintain and improve one's health and (4) staying the course even under stress. Measurement of PA informs how tailoring confidence building strategies have succeeded. Previous research has reported that symptom burden, illness perception, presence of comorbidities, age, body mass index, physical health status, depression, social support, financial distress, and lack of understanding their role in care process were independently associated with lower PA in e.g., COPD patients. (Yadav et al., 2019.)

The concepts of HL and PA contribute to self-management interventions in different ways. HL includes the skills and confidence required for self-management while PA focuses more on motivation and ability to act. In this light, communication of concepts on HL and PA needs to be more widely understood by academics, researchers, and policy experts as each of them plays a unique role in promoting self-management for chronic conditions. Both PA and HL are necessary in self-management intervention as each of them has unique roles in improving the patients' behaviour for management of their chronic conditions. (Yadav et al., 2019.)

Influence of health literacy on self-management of non-communicable diseases

Conceptual framework on HL of diabetes self-management describes HL affecting sociocognitive determinants: knowledge, understanding, beliefs and attitude within motivational phase and self-efficacy as well as social support within action control. System factors, such as health-care costs and accessibility to information affect other sociocognitive determinants together with the HL. The sociocognitive determinants in turn affect the diabetes self-management and further the glycaemic control (von Wagner et al., 2009.) Yadav et al. (2019) have distinct perception, seeing the sociodemographic variables, including skills, culture, belief, and practices as factors affecting person's HL. They also separated skills construction under domain of HL, and mindset of construction with motivation and care-confidence under influence of PA rather than HL. Both aspects affect the self-management of COPD. (Yadav et al., 2019.)

Koh, Brach, Harris and Parchman (2013) proposed a HL care model that would constitute a systems approach to improve patients' engagement in their care. This 20-item Health Literate Care Model (HLCM) begins with team formation, practice assessment and awareness raising. It contains interaction methods such as communicating clearly, the teach-back method, encouragement for questions, follow-up with patients and culture as well as language difference considerations. Also, it includes easy-to-read material design, effective use of health education materials and materials on how to improve medication adherence and review of brown bag medication (reviewing patients' use of medication and identifying medicine errors and misunderstandings). In addition, model ensures making of action plans, using health and literacy resources in the community, linking patients to nonmedical support, and getting patients' feedback. (Koh et al., 2013.)

Studies on how HL affects to self-management among NCD patients reveal **association between HL level and level of self-management, health, and wellbeing**. The results with diabetic patients suggest that HL may be indirectly related to patient health and well-being outcomes through psychosocial factors, communication with doctors, and self-management behaviour. Higher HL had significant positive effects on understanding of diabetes care, self-efficacy, communication with doctors, and medication adherence. In addition, HL might have a positive influence on exercise and diet through self-efficacy. Improving HL may lead to better self-management and improved health and well-being outcomes, although the impact of improvements in HL may be determined by the relationship between a patient's HL level and the understandability of the information provided. (Ueno et al., 2019.)

African American asthma patients with poor HL had also poor medication recall and knowledge of co-pay requirements. They had less ability to provide information needed for a medical visit about a persistent cough unresponsive to medication. Patients with poor HL had a poor inhaler technique and limited understanding of inhaled corticosteroid function, as well as limited numeracy and print literacy. (Perez et al., 2016.) However, association of HL level and health behavior is not straight forward. In a cross-sectional study in an urban community in Thailand, one-quarter of the patients with poorly controlled blood pressure had good levels of health knowledge and HL and nearly half had good health self-care literacy but only 13% exhibited adequate self-management behaviors (Visanuyothin et al., 2019a).

HL affects in individual, family, and community level and therefore, it is essential to provide multi-dimension and multidisciplinary interventions to improve HL. Facilitators and barriers affecting COPD self-management in Nepal existed at the patient-family, community, and service provider levels. At the community level, widespread use of complementary and alternative treatment was found to be driven by social networks and was used instead of western medicine. Also, limited primary level healthcare providers' skills and lack of educational materials for COPD to promote HL and self-management affected at the community levels. (Uday Narayan et al., 2020).

Self-management interventions in low income or low HL populations with chronic illness were found to be most effective when three to four self-management skills are utilized, particularly when problem-solving is targeted (Schaffler et al., 2018). Similarly, an integrated intervention program for primary care patients with e.g., poorly controlled hyper-tension residing in an urban community of Thailand, resulted to be significantly effective in increasing knowledge and self-management behaviours (Visanuyothin et al., 2019b). Also, the results in the study on barriers of diabetes self-management support health education on lifestyle modifications to be tailor made taking into consideration family and social background and self-management among people with NCD (Anitha & Vanishree, 2019.)

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Appendix 6. Benefits of the Self-Management Support. Summary of Literature Review.

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Introduction

Self-management is in the crucial role in controlling chronic illnesses and maintaining quality of life for patients living with chronic conditions (Eller et al., 2018; Jaarsma et al., 2017). Care of these conditions mainly happens, not in hospitals nor by professionals, but at home by patients and their significant others during every-day living (Campbell et al., 2018). Self-management can be demanding for patient and their close ones in different ways. It needs sufficient skills and knowledge, but also motivation and emotional endurance. (Cramm & Nieboer, 2013.) More and more attention is paid in healthcare on enabling and supporting the self-management skills of patients with chronic illnesses and how the self-management education can be delivered (Heggdal et al., 2021). In addition to hospital-based programs, it can be organized utilizing different approached such as community programs (Mulligan et al., 2019). It is noteworthy to recognize the role of the digital self-management support through online interventions (Vassilev et al., 2015). Furthermore, patients with chronic conditions should also be involved in the developing process of the self-management interventions which are aiming to enhance self-management abilities (Donald et al., 2018).

This literature review provides information on the various benefits patients and their family received from different self-management support services and interventions by health care professionals. The research question was: How self-management support organized by health care has benefited patients with chronic diseases and their family members?

Methodology

This literature review by Tampere University of Applied Sciences (TAMK) was a continuation of the work started by the Hanoi Medical College (HMC) on the same topic. The complementary data search was conducted using the CINAHL database limiting to peer reviewed articles published within 2020-21. The articles found by the HMC were reviewed by TAMK and the results answering the research question were added as manual search results to the data. In conclusion of the searches, 16 articles, from Canada, Australia, Germany, Bangladesh, Nigeria, UK, USA, Switzerland, Norway, and China were included in the analysis (Figure 1). Eight of the research were quantitative, four qualitative and four conducted using mixed method. The data was analyzed using inductive qualitative content analysis.

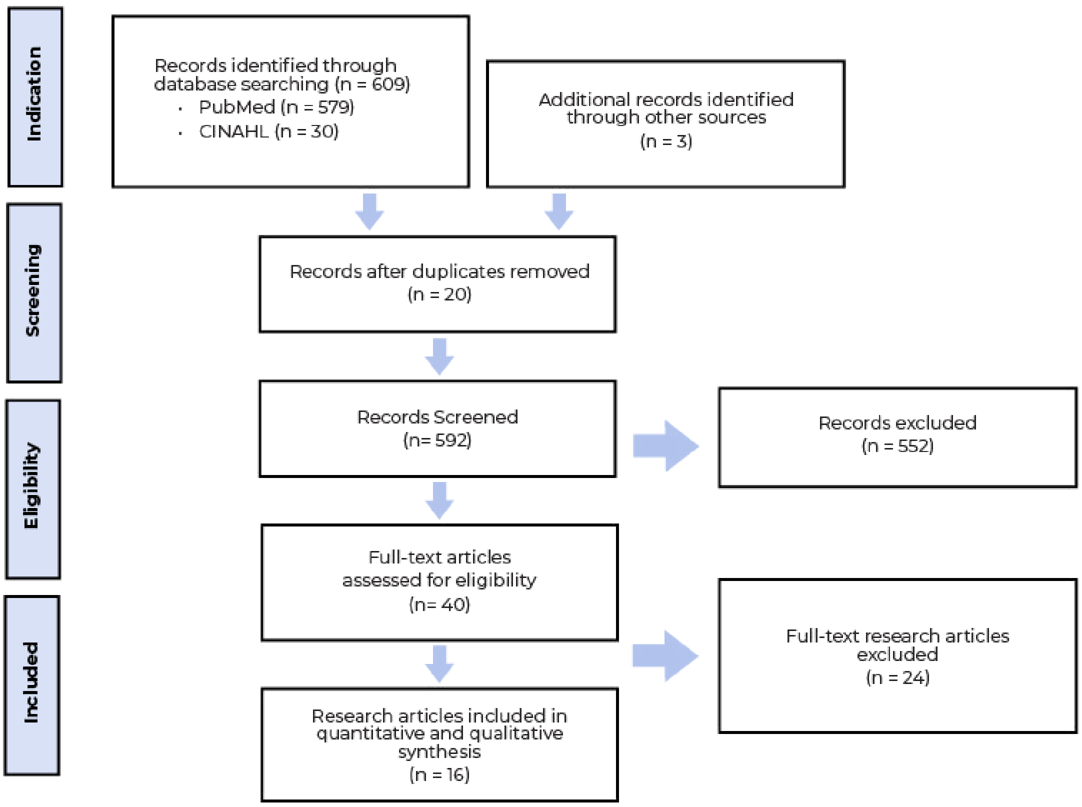

Figure 1. A Prisma Flow Chart

Results

Patients with chronic diseases and their family members benefited from self-management support organised by health care in physical, emotional, cognitive, and social levels resulting to comprehensive self-management governance. They gained strengthened ownership of self-management, more advanced health literacy competencies and started implementing healthier lifestyle which improved state of wellbeing and, also, resulted active reciprocal interactions in their relationships (Figure 2).

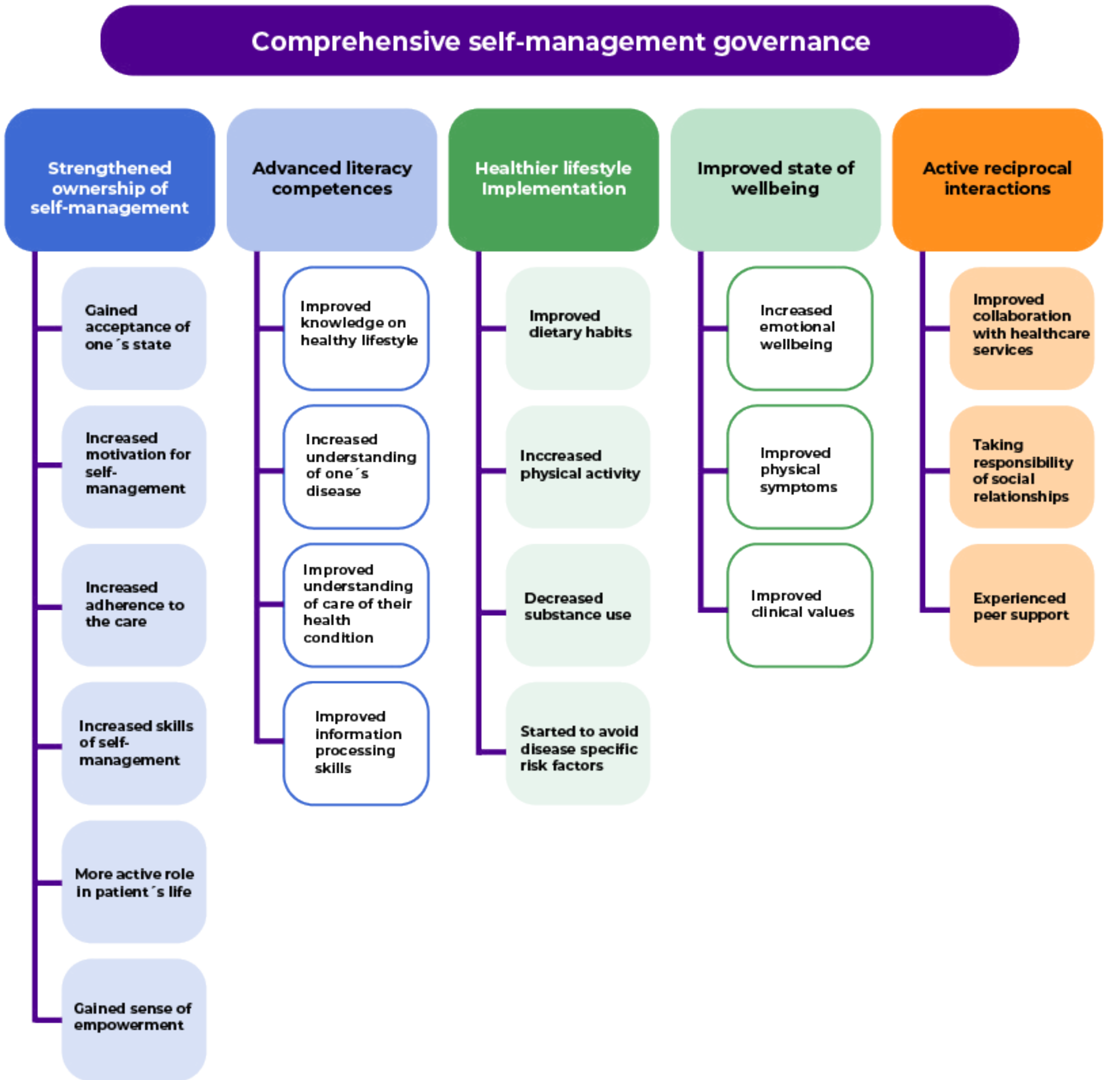

Figure 2. Main and sub-categories

Strengthened ownership of self-management

Self-management support organized by health care benefited patients with chronic diseases and their family members by **strengthening ownership of self-management.** This includes **gained acceptance of one's state (7, 13), increased motivation for self-management (1, 7, 11, 13), increased adherence to the care (2, 5, 10, 11, 12, 13, 15, 16), increased skills of self-management (2, 5, 6, 7, 9, 13, 14, 16), more active role in patient's life (7, 11, 12, 13, 16) and gained sense of empowerment (2, 5, 6, 7, 11, 13, 16).**

Through interventions and programs provided by health care, patients **gained acceptance of one's state.** They had more positive attitude towards their disease (13) and by the end of the programs they could live with their state (7, 13). The acceptance of the disease facilitated the experience of returning to normal life (7), determination for an active life increased initially and patients participated in daily life more than before despite illness-related challenges (13). They learned the feelings of being angry is part of the approval process (13).

Self-management support organized by health care **increased** patients' **motivation for self-management** which was reflected in their increased motivation to set goals (13). Patients also became motivated to possess their health (11), started to do things they used to be unwilling to do (7), and their motivation to engage to physical activities increased (11). Moreover, one intervention helped patients to start correcting their life situation from the onset and progression of the disease (7). Other interventions increased patients' willingness to dedicate time for their plan to achieve stability and maintenance of the long-term management of chronic illness (16) and patients' intent to self-manage his/her follow-up care (1).

Increased adherence to the care appeared in patients' accountability (16) and commitment to their treatment (2, 5, 10). It was made possible e.g., by information of how to engage in their care (12). Patients also engaged in learning the techniques to manage their disease (16). Through interventions and other support organized by health care patients' adherence in taking their medicines strengthened (5, 11), they used their medications more effectively (5) and followed their medication administration schedule (13). Patients also engaged in the exercises (16) and were more likely to walk at least five times a week (15).

Patients' **increased skills of self-management** were evident after interventions implemented by health care (2, 5, 6, 7, 9, 13, 14, 16). Patients were able to assess their skills in self-management activities (13), assess and identify their needs for follow-up (7) and health (7) and manage their disease (8, 13, 14). Developing own self-management strategies was also easier for them (13). Moreover, informative support helped patients to be more effective in their technology use (16).

Patients and their family members took more active role in patient's life. After getting self-care support from health care, patients realized that they should be actively involved in managing and improving their own health (11) and they became more active in their lives (7). Participants took more initiative (16), started to prepare for their visits with healthcare providers (13), and they began to seek more information about the disease and search information from several sources (11). They also realized that they needed to be more assertive to get understandable information (12). After getting health care provided self-care support patients started to prioritize things and goal setting was easier for them (13). They also learned how to engage in health-related activities, and they were able to perform free time activities (11). Moreover, family members supervised training of their next of kin (11). The informative support from health care worker helped even in trouble-shooting technology issues (16).

When participating in self-care support activities patients **gained sense of empowerment.** Patients' confidence of self-care increased (2, 5, 6, 13, 16). Support provided subjects reassurance (16) and their confidence in coping with their symptoms and self-management skills strengthened (11). They felt more powerful (11), their self-efficacy improved (13) and they were able to discover something new about themselves (7). For some patients, knowledge of their own abilities and what they want became clearer (7). They wanted to advocate for themselves (13) and the received support enabled patients to be taken as experts in their own medical experiences (7). They were more aware of their self-care behavior (2) and their own responsibility in the management of their disease (11). The patients were able to plan their health promotion processes (7), they were empowered in decision making in their health issues (6) and they started to develop new self-management strategies (13). Some patients resumed self-care (13).

Advanced health literacy competences

Advanced health literacy competences included improved knowledge on healthy lifestyle (4, 6, 11, 13), increased understanding of one's disease improved (1, 5, 7, 9, 10, 11, 12, 13), understanding of care of their health condition (5, 7, 11, 16) and improved information processing skills (11, 13).

Improved knowledge on healthy lifestyle in research papers showed in patients getting useful information for everyday life (13) and becoming aware of physical activity, unhealthy drinking, and unhealthy eating habits. (11); e.g., the level of knowledge of salt and diet modification increased (4). The programs helped the patients to learn knowledge of prevention (11) and the knowledge a person has in managing their own health and care improved significantly (6).

By help of health care, **increased understanding of one's disease** overall was reached by patients (1, 5, 7, 9, 10, 11) and family members (11). They became aware of the severity (11) and the prognosis of the disease (11) as well as about how the disease progresses (11). They learned what contributes the development of the disease (11) and the uncertainties of the disease for patients (12). Patients' knowledge of their condition increased (5, 12, 13) and some patients were able to identify their exceeded comfort zones within their own physical limits (7).

Interventions **improved** patients' and their family members' **understanding of care of their health condition.** Their understanding what is smart for oneself increased (7) and the patients became aware of the importance of avoiding risk factors for their disease (11). Patients increased their knowledge in managing their own health and care (5, 11) and the same was reached also by their family members (11). Through the support provided by health care understanding of rehabilitation increased (11) and the reasons for daily tasks to control the disease became clearer (11, 16); e.g., understanding of respiratory training and respiratory training techniques (11). Knowledge of patient's medication increased (5, 11) as well as management of their medication (11). Patients' knowledge of services that can help managing self-care increased as well (5).

Improved information processing skills were evident within patients when they became more aware of the importance of knowledge of the disease (11). They also got trustworthy information (13). The interventions taught them to search for information to understand their illness (11) and based on information they didn't fear for the drug dependence anymore (11).

Implementing healthier lifestyle

During and after various interventions, patients started **implementing healthier lifestyle**. They **improved dietary habits (4,11,13,15), increased physical activity (3,7,11,15), decreased substance use (11,15) and started to avoid disease specific risk factors (11).**

Improved dietary habits meant that the patients ate healthier food (13) and avoided unhealthy food (11). Also, the practice of diet and salt restriction improved after intervention (4) and patients' fruit intake practice increased significantly (15).

Increased physical activity showed in significant increase of participants' mean number of days of exercise per week and mean hours of exercise per day increased a little (15). Supported by health care, the patients began to participate in more activities to control their symptoms (11) for example starting a swimming course (7). In one intervention, participants improved physical activity with help of app reminder function (3).

Health care interventions for self-management support **decreased substance use,** including participants being more likely to quit using smokeless tobacco and betel nut (15) and avoiding passive and active smoking (11). Participants' use of smokeless tobacco, chewing tobacco (e.g., Jorda, Gul), and betel nut decreased three times during intervention (15) and use of smoke tobacco or cigarettes decreased a bit during intervention (15).

With self-management support by health care, the patients **started to avoid disease specific risk factors.** The participants began to avoid risk factors (11), like high cooking fumes (11) and unhealthy behaviors (11). The participants also began to wear a mask (11) and to keep themselves warm outside. (11)

Improved state of wellbeing

Self-management support benefited patients with **improved state of wellbeing**, which included **Improved physical symptoms, Improved clinical values and Increased emotional wellbeing.**

Improved physical symptoms showed in reported improved physical health component HRQoL (Health Related Quality of Life) (9). The participants stayed healthy (11) and had fewer health complaints. (13) Self-management support led to improvements in breathing (16), also from perception of the participants (16). Patients learned how to breath comfortably (11) and their breathing performance improved (11).

Improved clinical values included patients' decreased systolic blood pressure, weight, BMI and HDL cholesterol level, (5) improvement of more than half of the measured scores after intervention (5) and improvement of participants' blood glucose levels significantly (15), including significantly lower mean HbA1c level (8). In one intervention, glycemic control improved (14), for example each blood glucose value sent via SMS reduced HbA1c levels in long run (14).

Increased emotional wellbeing meant that patients got a range of emotional and psychological benefits (16), reported improved mental health component in Health Related Quality of Life (9), became more hopeful (7) (13), felt accepted (13), encouraged (16), better emotionally (11), and more optimistic (11).

Trough the self-management support by the health care, the patients were more capable to handle their depressed feeling (13) and were not overwhelmed by difficult emotions anymore (13). The patient received confirmation that his/her thoughts and feelings were valued inputs to her/his own recovery (7) and patients who have had the disease for a long time realized that they had an on-going grieving process (7) and were allowed to be sad (7) and so achieved some empathy for themselves (7). Patients felt that they were understood by the health care providers (16).

Active reciprocal interactions

Through self-management support by the health care, patients were able to achieve **active reciprocal interactions** in forms of **improved collaboration with healthcare services, taking responsibility of social relationships and experienced peer support**

Improved collaboration with healthcare services meant that access to health care professionals became easier (11) and the participants had more opportunities to get help from health care professionals (11). The participants became aware of the mutual responsibility of health care worker and themselves (11) and established a more confidential relationship with health care providers. (13) Also, participants' usage of National Health Service's cost significantly less after one intervention (5).

Grown responsibility of social relationships got established by understanding the meaning of patient's own input, which made patients less angry and more co-operative with their family (7). Also, Family members learned how to support the patient (11). Self-management support helped to strengthen the social support network by developing new effectively communicated views (7). Grown responsibility in social relationships was also manifested by participants coaching other patients (11) and sharing their knowledge (11).

Experienced peer support provided an opportunity to compare their own experiences (7), receiving compassion from peers (7) and feeling of not being isolated in the peer group (13). Peer leaders unified participants (13) and the group process facilitated recovery (7).

Conclusions

The results show how health care has essential role in self-management support, and how it is effective and necessary for successful self-management of chronic diseases.

Patients and their families had wide range of benefits, which underlines how the self-management support should be extensive. Patients and family members strengthened their ownership of self-management and advanced their health literacy competencies. Through self-management support, patients and family members implemented the gained competences of healthier lifestyle, improving their wellbeing and active reciprocal interactions in their relationships.

Family members' perspective was hardly represented in the data, as their perspective was very little researched. However, when included in the research, family members participation in self-management was important.

Educating health care students to offer extensive self-management support, including family members, is essential to gain competences to offer this support. Variety of self-management support skills are needed, and this variety should be reflected in the educational Digi-Care model.

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Appendix 7. Example of the Learning Package:

1. Introduction to DigiCare Learning Packages.
https://www.slideshare.net/NinaSmolander/introduction-to-digi-care-learning-packages-digicare-learning-package-1pptx

2. DigiCare Model.
https://www.slideshare.net/NinaSmolander/digicare-model-digi-care-learning-packge-2pptx

3. Professional Communication.
https://www.slideshare.net/NinaSmolander/professional-communica-tion-digicare-learning-packge-3pptx

4. Motivating to Life-style Changes.
https://www.slideshare.net/NinaSmolander/motivating-to-life-style-changes-digicare-learning-package-4pptx

5. Positive Health.
https://www.slideshare.net/NinaSmolander/positive-health-digi-care-learning-package-5pptx

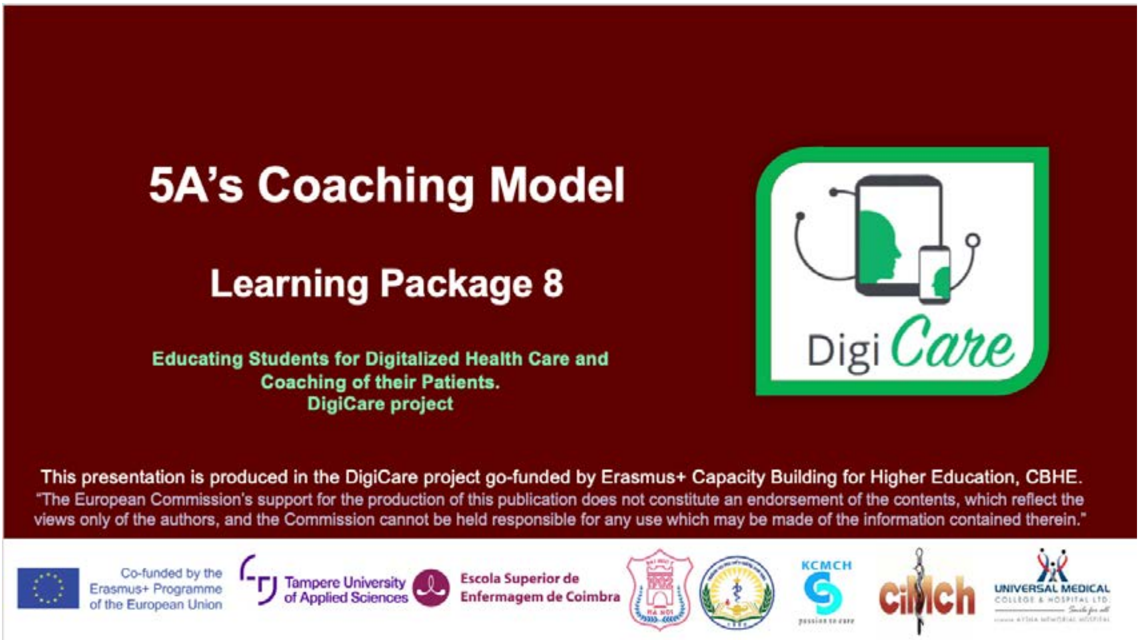
6. Self-management.
https://www.slideshare.net/NinaSmolander/selfmanagement-digi-care-laerning-package-6pptx

7. Coaching.
https://www.slideshare.net/NinaSmolander/coaching-digicare-learn-ing-package-7-pptx

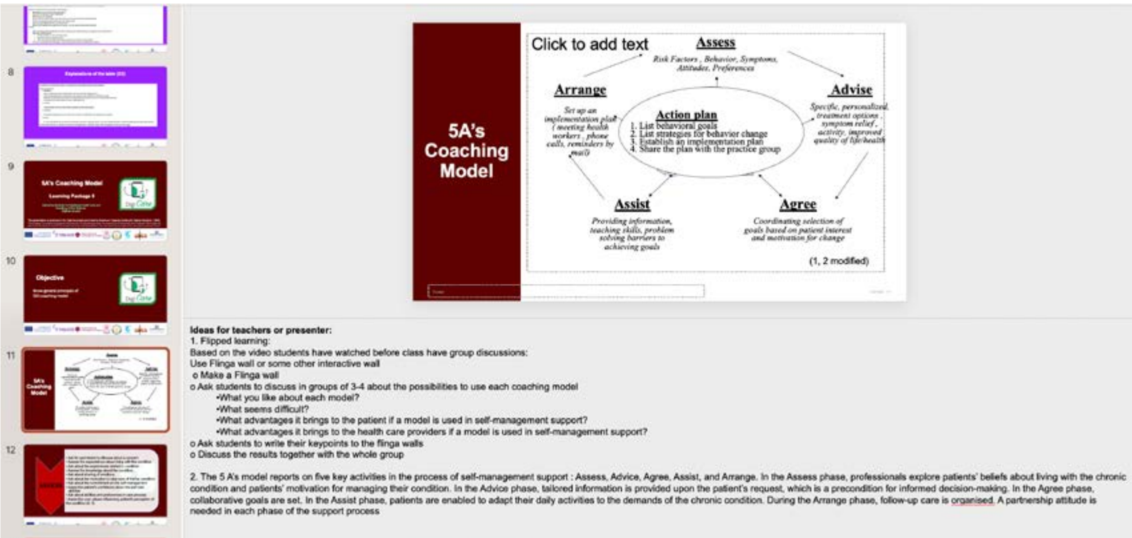
8. 5A's Coaching Model.
https://www.slideshare.net/NinaSmolander/8-5as-coaching-modelpptx

9. GROW Coaching Model.
https://www.slideshare.net/NinaSmolander/grow-coachin-model-digi-care-learning-package-9pptx

10. Integrating Digital Tools into Coaching. https://www.slideshare.net/NinaSmolander/integrating-digital-tools-in-to-coaching-digicare-learning-package-10pptx



Picture 1. An example of a learning package in the DigiCare project. Title slide for the 5A's coaching model.



Picture 2. An example of a slide with notes in the 5A's Coaching model learning package.

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Co-funded by the Erasmus+ Programme of the European Union

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