DELIVER

Digital EducationaL programme involVing hEalth pRofessionals (DELIVER)

RESEARCH REPORT INTELLECTUAL OUTPUT 5: POLICY AND IMPLEMENTATION RECOMMENDATIONS

Progress 8 December 2023

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CONTENT

1. ABSTRACT

Background

The digital transformation is cultural in nature and affects the elements of society in all countries. It denotes a set of technological, cultural, organizational, social, creative and managerial changes associated with digital technologies in all aspects of human life. Healthcare has also been involved in the digitization process, from hospital care to community services. At national and international level, numerous actions have been proposed to investigate digital health and how to implement it for citizens (patients or caregivers) and workers (professionals, managers, politicians). Among these projects the DELIVER (Digital EducationaL programme InvolVing hEalth pRofessionals) was developed to enhance the digital skills of healthcare professionals (HCPs).

Aim

The aim of this document of the DELIVER project was to establish policy and implementation recommendations to provide valuable knowledge to multi-sectorial stakeholders within the fields of healthcare, education, technology and others interested in enhancing the digital health skills of HCPs.

Method

A set of recommendations was developed on the basis of the:
- analysis of the current scientific literature;
- analysis of the findings of the previous different DELIVER intellectual outputs;
- opinions of experts in digital health partners of the DELIVER project.

The recommendations were developed and finally approved (Consensus Development Method) during the Transnational Congress held at the end of DELIVER project.

Results

Twenty-one recommendations about education, implementation and technical features were developed. They include the empirical knowledge generated throughout DELIVER project combined with scientific literature that can be applicable also to the other European countries.

The recommendations describe:
- how to ensure that educational program and e-learning tools for health managers meet the current digital skills needs;
- how healthcare managers can endorse change management and provide a more enabling environmental for the anchorage, implementation and sustainability within the organizations involved in the project;

- how decision makers can speed up this process by initiating strategies that will motivate health organizations and educational institutes in establishing and applying the European digital skills program for undergraduate and post-graduate.

These recommendations are:
- Ensuring awareness by healthcare professionals (HCPs) of the benefits that digital health involves in order to motivate them to implement it in their work practice and develop a more positive attitude and mindset towards digitization. HCPs also need to be clear about the limits of digital health; therefore, when its use is not recommended and/or should be avoided, since one size doesn't fit all.
- Certifying the training attended by HCPs and the competencies achieved, using the same classification, to render transparent the level of competence achieved in a clear and unambiguous manner.
- Using validated instruments to assess HCP digital health competences in different healthcare settings, allowing periodic self-evaluation or hetero-evaluation to promote access to continuing education services aimed at increasing competences.
- Designing educational opportunities for HCPs and healthcare managers from the first level of studies (i.e., bachelor's degree or similar) and deepening them during advanced levels of education (i.e., master's degree or PhD), as well as through lifelong learning.
- The educational programs should be defined at the macro level, involving experts in the field of digitalization of healthcare, but the educational interventions must be customized according to the hardware and software used in specific realities. The programs should also consider the different skills that different profiles of HCPs need to perform their jobs (e.g., radiology technician compared to occupational therapist).
- Basic digital skills must be possessed by every HCP and healthcare manager. Examples of basic digital skills are word processing, database management, email, searching and browsing the internet, using spreadsheets, using presentation software, and using electronic medical records.
- Educational courses should be conducted according to the best educational standards available and following the principles of andragogy. Teaching and training in the use of digital tools should be integrated into everyday work life (pragmatic cases) and delivered only by qualified personnel (including local frontrunners or peers), providing materials for further study. New educational strategies may also be employed, such as massive open online courses, with a digital interface and gamification rules to be more impactful and intuitive.

- Considering different levels of digital transformation of society/HCPs and the digital divide existing in the general population as well as among HCPs, a modular approach (from the simplest to the most complicated competences) in the educational pathways is required. The digitization process must allow all HCPs to take advantage of its benefits.

- Recording the level of competences achieved by HCPs to map them at the local, regional, and national levels. This could be a strategic performance indicator, so decision-makers can establish a baseline and work toward improving digital competencies.

- As with the implementation of new digital technologies, new ethical issues may arise; therefore, ethics in digital health should be carefully considered and taught with practical cases, examples, and solution proposals. It is necessary to create conditions to enable HCPs to learn about new technologies and to reflect on the use they make of them in a meaningful manner.

- The time spent by HCPs attending digitization courses must be recognized as working time. The education activity should be accredited as continuing professional education. The development of digital competencies should be prioritized and acknowledged like healthcare specialization courses. It should also be a strategic priority. Learning and/or updating digital skills is a right and yet also a duty of HCPs, but they may not have the time for doing it.

- Promote national and international recommendations not only for the development of HCP digital skills but also for the digitization of healthcare environments(hospitals, outpatient clinics, healthcare facilities, home care services) and for patients who use digital health services.

- The provision of active support from healthcare direction positively influences HCPs' attitudes toward working with digital health. Healthcare managers should promote a culture to motivate staff toward positive acceptance of innovation. An effective collaboration between information technology staff and HCPs would enhance digital implementation.

- To avoid changes being perceived by HCPs as overwhelming and sudden, healthcare managers should break them down into smaller phases that address existing workflows and habits.

- Healthcare managers should reward the achievement of goals related to digital health implementation as with all types of programming.

- The health digitization process does not end with providing digital technologies to be used by HCPs for working but includes the phases of choosing/purchasing new technology tools, training/implementation, maintenance, and updating of hardware and software.

- When a new technology is implemented in clinical practice, HCPs must be provided with complete training, a user-friendly manual, and the possibility of having technical support for any problem. Technical support could be provided both in-person and remotely.
- The technologies used in out-of-hospital settings should be capable of interoperating with those in in-hospital settings, allowing patients and HCPs to have all health information together, available, updated, and protected. Interoperability within the sectors of the local region but also between regions is important. The presence of a stable and fast internet connection is required to work.
- Ensure that digital health systems are designed with appropriate technological redundancy in case of service interruptions, ensuring an on-demand equivalent backup system. Instructions for potential information technology failures are mandatory. Paper documentation should be used as a temporary solution only when the technological backup is not available, to avoid data duplication and loss. Ensure the adequate availability of digital health systems both in the hospital and for homecare services.
- Teach HCPs how to have a secondary plan for managing their work if the technology fails. In fact, patient care should not be interrupted in the event of problems with the technological systems.
- Healthcare system software (e.g., electronic medical records), for hospitals or homecare, should be intuitive to use and enable the extraction of data on patients and the interventions performed, to quickly create clinical reports supporting the decision-making process, internal quality evaluations, or analysis of the quality of the service provided.

Conclusion

The expert panel of the DELIVER project developed 21 recommendations approved by consensus; these can help multi-sectoral stakeholders, particularly policy makers for an optimal implementation of digital health processes among HCPs.

Key words

Digital technology, digitalization of health care, e-health, digital solutions, digital support, recommendation, policies

2. BACKGROUND

2.1 THE DELIVER PROJECT

This report is part of the DELIVER project (Digital EducationaL programme InvolVing hEalth pRofessionals), which was a project under the Erasmus+ programme (*https://project-deliver.eu/*),including partners from Italy, Slovenia, Spain and Denmark, who was lead on the project.

The digital transformation of health in European health care systems is dramatically calling for an increased use of digital technology (Kraus et al., 2021). Healthcare professionals (HCPs) are the core in accelerating the digital transformation of health and digital skills now and in the future are essential for them.
Thus, the overall goal of DELIVER was to enhance the digital skills of HCPs. The target groups are multidisciplinary HCPs and healthcare managers working in the hospital and/or community care sectors.

DELIVER project achieved the goals through five intellectual outputs (IOs):
IO#1 – Need analysis
IO#2 – Organisational analysis
IO#3 – Curriculum and learning material
IO#4 – Healthcare professionals' e-learning platform for digital skills
IO#5 – Policy and implementation recommendations

This is the report for IO#5.

Given the pace of change in technology and digital work opportunities, an increased focus is on digital competencies both in the academic and professional sphere. Digital competencies, also closely related to skills or knowledge, has been used almost interchangeable, and denotes a broadening spectrum of both hard and soft technical skills, mindset and attitudes towards the use of digital solutions in a daily context. In this context, the aim of IO#5 was to produce policy and implementation recommendations. The recommendations provide valuable knowledge to multi-sectorial stakeholders within the fields of health, education, technology and others interested in enhancing the digital health competencies of HCPs.

2.2 PROJECT PARTNERS

There were four partner institutions involved in the DELIVER project:
- Syddansk Sundhedsinnovation (Health Innovation Centre of Southern Denmark), Denmark
- Università degli Studi di Udine (University of Udine), Italy
- Fakulteta za Zdravstvo Angele Boškin (Angela Boškin Faculty of Health Care), Slovenia
- Fundació TIC Salut (TIC Salut Foundation), Catalonia, Spain

Health Innovation Centre of Southern Denmark was lead on the needs analysis (IO#1), Angela Boškin Faculty of Health Care was lead on organizational analysis (IO#2), Health Innovation Centre of Southern Denmark was lead on developing the curriculum and learning material (IO#3), TIC Salut Foundation was lead on the healthcare professionals' e-learning platform for digital skills (IO#4) and University of Udine was lead on the policy and implementation recommendations (IO#5).

All four project partners were responsible for the revision of this document and the final approval; they also participated actively in the consensus process aimed at approving the recommendations included.

2.3 THE DIGITAL TRANSFORMATION AND DIGITAL HEALTH

We live in an ever-changing world characterized by the digitization of every area of our lives. It is an objective fact how technological solutions have impacted on daily life, revolutionizing communication, facilitating the acquisition of different information and significantly improving the quality of life, this is the digital transformation (Longhini et al. 2022).
The health care system is also involved in this process called digital health (World Health Organization, 2021). The definition of digital health proposed by the World Health Organization (WHO) is "the use of information and communications technology in support of health and health-related fields" (World Health Organization, 2019).

The digitization process of the society and of health care began over 50 years ago, but in the last decade and above all due to the COVID-19 pandemic, imposing social distancing norms and nationwide lockdowns, has developed even faster (De' et al. 2020).

It is important to implement digital health considering several aspects that are (Lee, 2014):

- **Addressing the digital divide.** The digital divide is the gap between people who have access to digital technologies and those who do not. This gap can have a significant impact on health outcomes, as people who do not have access to digital technologies may be less likely to receive preventive care, manage chronic conditions, or access timely information about their health. There are several ways to address the digital divide, such as providing free or low-cost internet access, making digital health devices more affordable, and providing training on how to use digital health technologies. The inequality of the digital divide concerns developed countries compared to developing ones but also the young and the elderly of the same population.
- **Increasing digital health literacy.** Digital health literacy is the ability to understand and use digital health technologies to manage health and wellness. Globally, the digitization rates of the population are still low. There are a number of ways to increase digital health literacy, such as providing education and training, creating user-friendly interfaces, and using plain language.
- **Protecting patient privacy and security**. As more and more health data are being stored and transmitted electronically, it is important to take steps to protect patient privacy and security. This includes using strong encryption, implementing access controls, and educating patients about the risks of data breaches.
- **Fostering collaboration between stakeholders.** Digital health is a complex field that involves a variety of stakeholders, such as patients, providers, payers, and technology companies. To improve digital health, it is important to foster collaboration between all the stakeholders. This can be done by creating shared goals, developing common standards, and sharing data.
- **Investing in research and development.** To improve digital health, it is important to invest in research and development. This research should focus on topics such as the effectiveness of digital health technologies for different health conditions, the impact of digital health technologies on patient outcomes, and the ethical implications of digital health.
- **Developing user-friendly digital systems**. Users should be able to easily use your digital systems. If they find them difficult to use, they will not use them. Make sure that your systems are user-friendly and easy to navigate.

Furthermore, the digitalization of healthcare is fueled by the advances in technology (Kokol et al. 2022) and holds the potential to improve the healthcare sector, as well as the generation and dissemination of health information (Lupton 2017). Digital health technologies offer valuable ways for HCPs and users (citizens/patients) to create, manage and share health data. According to Perakslis & Ginsburg (2020), digital technology can improve the healthcare sector by three main modalities: improved data communication, miniaturization, and decentralization of

devices. Understanding the value of digital health is challenging (Perasklis & Ginsburg, 2020): some digital tools can bring convenience (e.g., optimizing tasks) while others bring novel capabilities (e.g., remote monitoring). In this scenario, the healthcare sector benefits of digital health at multiple levels:

(a) for the citizens (i.e., to access health services),

(b) for the clinicians (i.e., remote monitoring, clinical decision tools),

(c) for the healthcare sector managers (i.e., electronic shift rostering) and

(d) for the system, where technology becomes an innovative and efficient way to support, and also to deliver, the health services.

Innovations and technologies could also be accompanied by negative effects (e.g., inappropriate usage, malfunctioning, data breach, service disruptions, etc.) both in the long and short term, for this reason digital health policies should consider the implementation, evaluation, best use and financing of new health technologies (Ricciardi et al. 2019; Sheikh et al. 2021). A successful strategy of digital health implementation policies should integrate different aspects and consider education as a pillar (Odone, 2019). In fact, digitalisation is an integrated process where the implementation of new digital technologies is accompanied by appropriate training to ensure its feasibility and optimal implementation.

2.4 THE DIGITAL HEALTH POLICIES

Digital health policies are a set of laws, regulations, and guidelines to optimise the digitalisation processes in healthcare. Policies aim to ensure that digital health technologies are safe, effective, and accessible to all. These policies should be included in a global digital strategy, as suggested by WHO: "The global strategy aims to create a shared understanding among all Member States regarding the importance of digital health solutions, and an approach towards creating an interoperable digital health ecosystem which is to be understood as a digital interoperable information technology infrastructure that is primarily used by the health care community across all care settings, in particular by health care providers, health service providers and patients as well as by public health authorities, universities and research institutions. An interoperable digital health ecosystem should enable the seamless and secure exchange of health data by and between users, health care providers, health systems managers, and health data services. Health data are predominantly generated by and processed between health care providers and the health care community" (World Health Organization, 2021).

Digital health policies followed by recommendations addressing the different levels (individual, managerial and system) are needed to optimize the dissemination of health digitization across the different stakeholders (Tsang et al. 2022).

There are several different stakeholders that should be involved in digital health policies and recommendations, including citizens (patients), healthcare professionals, managers (at the workplace level), governments (locally, nationally or internationally) and technicians (software developers, hardware developers, entrepreneurs, information technology system managers) (World Health Organization, 2016).

Healthcare providers and patients are responsible for implementing and using digital health technologies in practice, while governments play a key role in setting the overall policy framework for digital health. Technology companies are responsible for developing and commercializing digital health technologies. It is important to recognize the point of view of all stakeholders to develop policies that are effective and applicable for the promotion and development of digital health.

Ultimately, the aim of digital health policies, including recommendations, is to maximize the benefits of digital health while minimizing the risks. The main benefits of digital health are:

- Increasing access to healthcare systems: Digital health technologies can help to improve access to healthcare systems by making it easier for patients to connect with providers and receive care.

- Improving the quality of care: Digital health technologies can help to improve the quality of care delivered by providing patients with access to more information and resources, and by helping providers to make better decisions.

- Reducing healthcare-related costs: Digital health technologies can help to reduce costs by simplifying administrative processes and improving efficiency.

At the global level, the World Health Organization in 2021 published the "Global strategy on digital health 2020-2025", remarking that also the 2030 Agenda for Sustainable Development "*highlights that the spread of information and communications technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge Societies*" (WHO 2021; United Nations 2023). The document states that digital health should be a health priority and must benefit people in a way that is ethical, safe, secure, reliable, equitable and sustainable (WHO 2021). Eight design principles for digital solutions are declared: (1) transparency, (2) accessibility, (3) scalability, (4) replicability, (5) interoperability, (6) privacy, (7) security and (8) confidentiality (WHO 2021). For the policy implementation, four main guiding principles have been established aiming to orient the global strategy towards the appropriate and

sustainable adoption of digital health technologies within the context of national health sector and health strategies (WHO 2021):

1. Acknowledge that institutionalization of digital health in the national health system requires a decision and commitment by countries.
2. Recognize that successful digital health initiatives require an integrated strategy.
3. Promote the appropriate use of digital technologies for health.
4. Recognize the urgent need to address the major impediments faced by least-developed countries implementing digital health technologies.

Furthermore, from the perspective of the global policies, the role of local, context-aware policies is fundamental and of primary importance. As referred by the first WHO's guiding principle "*the global strategy acknowledges that each country owns its digital health action plan built on the strategy, within its own national context. Along their path towards the health-related Sustainable Development Goals, countries will adopt digital health in a way that is sustainable, respects their sovereignty, and best suits their culture and values, national health policy, vision, goals, health and well-being needs, and available resources*" (WHO 2021). The crucial role of local government and policies has also been emphasized for developing a vision and creating the foundation upon which innovation activities can be modelled (Desveaux et al. 2019).

3. AIM

The aim of this document, the IO#5 of the DELIVER project, was to develop and approve policy and implementation recommendations to provide valuable knowledge to multi-sectorial stakeholders within the fields of health, education, technology, and others interested in enhancing the digital competencies of HCPs.

4. METHODS

The policy recommendations were developed basing on the:

- analysis of the current scientific literature;
- analysis of the findings of the previous DELIVER IOs;
- opinions of experts in digital health partners of the DELIVER project.

4.1 ANALYSIS OF THE CURRENT SCIENTIFIC LITERATURE

A narrative review of the existing national and international literature was made, about strategies, guidelines and best practices relating to training or education initiatives of HCPs in preparation and implementation of the digital health transformation. The key words used were: "digital health", "digitalization", "healthcare professionals", "policies".

A multiple policy case study design was adopted, and its results were summarized in a specific paper sent to a scientific Journal (currently under review). This study showed that the European Countries included in the case study have national or local policy documents for the development of digital health and specific government bodies for the implementation of the digital transformation which requires monitoring of outcomes over time. European states have developed their own digital health policies at different times and in different modalities, which reflect the state of digitization of the singular Country, but all of them have the aim of promoting it.
It is interesting to note that in the European Countries involved in DELIVER (Denmark, Italy, Slovenia and Catalonia - Spain) there were from 19 to 31 Healthcare Professions defined by their law, with different bodies in charge of professional organization and competencies development. The digital health policies should consider the common and the different skills that the various categories of HCPs need to perform their working activities.

A similar study (Wei et al. 2023) was developed to analyse the policy characteristics, the distribution of policy instruments, and the evaluation outcomes related to digital healthcare in China. The contents of digital health policies involved the aspects of user interaction, service quality, technological innovation, and regulatory standards. The policy instruments regarded the overall development trajectory of digital health but also exhibits an imbalanced pattern and lacks complementarity.

A recent scoping review (Conte et al. 2023) mapped the literature on embracing digital and technological solutions for the nurses but which can also be useful to other HCPs.

Specifically, the summarized literature emphasized that cultivating positive attitudes, possessing sufficient digital knowledge, competencies, self-efficacy, and displaying appropriate behaviors toward such technologies are vital in ensuring their effective incorporation into working practice. As mentioned, these characteristics may also be common to the other HCPs in the perspective of developing their own skills. These findings of this scoping review aligns with the findings of IO1 and IO2 of the DELIVER project.

An important aspect for the development of digital healthcare is that of the attitude towards digitalisation. In fact, it emerged that those who had positive attitudes towards technology tended to have lower levels of anxiety when using computers for work. The aptitude for the use of technology in private life activities is associated with a better use in the workplace. Attitudes towards digitalization vary according to characteristics such as young age, female gender and high level of education but the most important is their perception of the benefits and barriers associated with digital health.

Digital aptitude is not only innate, it must also be implemented among HCPs. Hospital directions have an important role in stimulating the development of digital skills among their HCPs and fostering collaboration between the information technology office and the clinical units.

The development of digital skills is essential because it allows HCPs to effectively use technology to improve their work activities, implementing patient outcomes and the safety of the medical treatments.

To assess and monitor the level of digital competence of the HCPs and associating educational and organisational factors in different healthcare settings over time, it is recommended to use validated tools such as: DigiHealthCom and DigiComInf (Jarva et al. 2023), the e-HEALS tool, the Gassert/McDowell Computer Literacy Survey, the Awareness, Knowledge, Attitude, Skills tool, the Multicomponent Assessment of Computer Literacy, and the Pre-test for Attitudes Towards Computers in Healthcare Assessment tools (Longhini et al. 2022). The evaluation of the HCP competence is also useful to plan appropriate educational initiatives to improve the digital health at different stages of their careers. Currently these tools have only been validated in a few languages. It would be necessary to validate these scales in the other European languages in order to have valid instruments to generate comparable results in the different countries. In the literature there are validated scales for assessing the digital skills of specific categories of HCPs, in particular for nurses, but the objective of this document is to suggest solutions that are applicable to all HCPs.

Another systematic literature review (Kraus et al. 2021) showed how multiple stakeholders implement digital technologies for management and business purposes.

The findings underlined five clusters: emphasis on an approach patient-centered, operational efficiencies of healthcare organizations, the organizational factors and

managerial implications, impact on workforce practices, and socio-economic aspects. These clusters were linked together into a model showing how these various forms of technology implementation led to operational efficiencies for services providers. HCPs should remember that patients' insight into their illnesses and treatment options has improved with the rise of digitalisation, and they have grater decision-making power in their care process. In various contexts the efficiency of digital systems has been demonstrated but in order to work the systems had to be suitable for the realities where they were implemented. The effectiveness of digital health implementation is feasible if clinical staff are involved and managers adopt a bottom-up approach, characterized by a participatory process. It is demonstrated for the implementation of electronic medical records. Conversely, if healthcare managers enforce implementation and HCPs are not sufficiently involved in co-development, this has a negative impact on the process of digitalisation.

There are few studies on the digital transformation of employees within healthcare organizations. To relate digital health and work transformation, hospitals must first "engage in inflection, deepening and revitalization." Flexing refers to how employees and hospitals respond to external stimuli and leverage technology to achieve greater work flexibility; the insight refers to professionals' behavior and the reconsideration of their role as HCPs in a digital age; the constant changes to workers' tasks and skills is described as "revitalizing". These three characteristics are interdependent and influence the strategy orientation of a company. With respect to the bottom-up approach, skills development around managing tensions between revitalization efforts at all levels of the hierarchy is required. Managers should strive for results while keeping staff motivated.

Concerning socio-economic aspects of the development of the European digital health market, in the past 15 years investments have been highly linked to socio-economic and technological promises, as well as policy initiatives. The health financialization in the European Union has been widely regulated by law and the demand for financial measurement is rising amongst political leaders. However, the shares of money invested are different between the various European Countries.

Not only the different amount the money invested by European countries for digital health must be considered, but it is also necessary to evaluate how these investments are distributed within the Regions/Provinces that constitute a State. We must not create disparities in the digital health proposal of the HCPs which means different treatment opportunities for citizens/patients. For this reason, a scoping review (Farre et al. 2023) was conducted, to map and explore existing evidence on the use of digital technology to deliver healthcare services with explicit consideration of health inequalities in UK (England, Scotland, Wales, Northern Ireland). The scoping review found that only two studies addressed digital health inequalities, and only one of them proposed an intervention. Based on the paucity of studies on this phenomenon, it was unclear whether digital health interventions in

the UK worked for citizens/patients most at risk of health inequalities. It is necessary to map the situation of the development of digital health among HCPs also in other European Countries.

A systematic review (Longhini 2022) about digital health competencies among HCPs showed that HCP competences were mostly (35% of the studies) assessed with non-validated tools. The investigated areas of HCP digital competences were: the self-rated competencies, including the digital or eHealth literacy, and the patient-oriented or the process of care-oriented competencies; the psychological and emotional aspects toward digital technologies, including the attitudes, believes, confidence and awareness; the use of digital technologies, including the general and the specific use of technology; the knowledge about digital technologies. The review highlighted that only half of the studies analyzed reported definitions of the competencies assessed, suggesting that future studies should be strengthened in their conceptualization and grounded in their development on clear conceptual frameworks and definitions. It concluded that there was the need for HCPs to expand research on psychological and emotional elements and the ability to use digital technology to self-learn and teach others.

4.2 ANALYSIS OF THE FINDINGS OF PREVIOUS DELIVER IOs

In particular the findings of previous DELIVER IOs were: the IO#1 – Need analysis, the IO#2 – Organizational analysis, and the IO#4 – Healthcare professionals' e-learning platform for digital skills were used to find insights. The professionals involved were: nurses, midwifes, physiotherapists, occupational therapists, physicians, psychologists, healthcare managers of HCP and health care managers of human resource, general service and responsible for education/training of HCP´s, secretary and administrative role, social and healthcare assistant.

The DELIVER IO#1 was aimed at:
a) establishing the level and type of digital competencies HCPs need to provide high quality care and
b) identifying the current digital competency gap among HCPs, including the biggest needs for improvement of digital competencies of HCPs and healthcare managers.
The IO#1 was developed with a mixed-method approach, including both quantitative survey and qualitative individual and focus group interviews.
The quantitative analysis which involved 395 HCPs, collected HCP self-reported digital competencies and showed that the strength and weaknesses are quite and surprisingly similar across the Countries (the differences are minor, especially considering the general differences in their healthcare systems). The respondents had

the high scores in the areas of: User skills, Data – information and security, Communication and Dissemination. These areas were related to a traditional understanding of patient care and safety, i.e. being competent in the use of a device, communicating with patients and safe patient data practice. They scored lower competencies in the areas of: Awareness, Implementation and Development. These areas are related to a mindset aimed at keeping up to date with emerging digital technologies, implementing them and awareness of one's shortcomings.

Analyzing the digital skills for individual health professions, the scoring of HCPs followed a similar pattern. However, physicians scored lower on average on all items, particularly in problem solving and implementation/development. Healthcare managers scored the highest on all parameters and there are high gaps compared to HCPs in the items: development, data usage, and implementation. This was a positive consideration because managers often oversee digital technologies implementation.

The qualitative analysis which involved 74 HCPs, showed that HCP digital competencies were not among their priorities. HPCs primarily associate digital skills with knowing how to use digital tools, i.e. to have procedural skills and not the other skills (e.g., communicating through technology). The problems related to digital health, experienced by all the Countries were: a) more administration and registration, that means time away from the patients; b) the changes are seen as a burden; c) fear and reluctance to replace contact with patient with digital technologies. The common positive effects of digital technologies experienced by HCPs were: a) faster and easier access to updated information by uniform and centralized digital documentation; b) share information across providers by shared systems; c) create optimization of time for HCPs and faster patient care, improving the quality and the data security. In particular, the interviews highlighted that the most important factors for developing digital health among HCPs were the attitude and the mind-set. Open-mindedness, interest, curiosity, patience and courage are considered very important attitudes and qualities for digital health transformation. These factors were both appreciated by HCPs and healthcare managers, who considered them the potentials for improvement of digital competencies.

About the barriers related to the HCP and healthcare education on digital heath, all countries experienced inadequate training due to lack of time and scarcity of resources. Both the survey and the interviews emphasized a lack of a structured educational approach to compliment the implementation of new technologies. Self-training/learning by doing or peer support were the most common and training is generally designed locally by more expert colleagues or information and technology staff. The healthcare organizations' structures didn't facilitate the implementation of digital solutions proponing digital competencies and in many cases there was a lack of adequate technological equipment or insufficient technology support.

The role of managers should be to make sense of digital technologies in an every-day context and create better conditions for knowing how to use new technologies. Training is essential to realize and recognize the opportunities of digital health.

The DELIVER IO#2 was aimed at:
a) establishing the level of digitization in all partner countries and the type of digital solutions used to provide health care delivery in the hospital and community settings; and
b) exploring the organizational factors: general attitudes of institutions towards digitization; their strategy of digitalisation, organisational structure, leadership, and workplace culture; barriers inside of the organisation to the digitalisation processes and facilitators of digital transformation.

The IO#2 was developed with interviews (individual and focus group) and a digital survey among information technology experts.
About the organisational readiness for digitalization, including strategies and structures: digital strategy was in place but not every HCP and healthcare manager was familiar with it, since it was not in their scope of responsibilities. There were not unified strategies to digitalisation due to the a) different scope of obligatory digital tools in different countries and in different levels of health care (primary, secondary, tertiary); b) all digital solutions were not developed at the national level.
The organisational readiness for digitalisation depended on the country, the sector, the department, the mindset and the implementation strategy.
In some countries health care institutions were better equipped with digital technology than in others; there were also differences in both access to and the quality of the digital technologies in private health compared to public health.

About organisational attitude towards digitization and management support in using digital technologies: a) the overall attitude of the healthcare directions towards digitalisation in health care institution was positive; b) some organisations had difficulties due to budgets (e.g., for replacing old hardware or for providing software updates); c) Many HCPs, especially the older, often found difficult to use the computers or the programmes; d) HCPs may have not received adequate support by expert; e) The confidentiality and privacy of the data was a big concern of HPCs; f) COVID-19 pandemic brought different work dynamic and speed up the digitalisation processes in health care institutions that would otherwise take more time; g) the HCP problems to implement digital transformation.
About the description of organizational factors to the digitization and implementation of educational programme, the identified barriers were: a) the resistance to change; b) the lack of digital skills (often by senior HCPs, sometimes by healthcare managers); c) the lack of training; d) the lack of equipment and human resources; e) the patient inability to use digital technology (older patients); f) the lack of unified digital solutions at the national level; g) the different digital supports for the different categories of HCPs; h) the lack of systematic planning and organisation of the digital transformation; i) the presence of inflexible structures and rules in healthcare

settings. While the key facilitators were: the usefulness and the easiness to use; the direction digital culture; the sufficient time for training and to become confident with new technologies.

The DELIVER IO#4 was aimed at developing an HCPs' eLearning platform for digital skills. The specific aims were: a) developing an online digital competencies eLearning platform to enable continuous professional development; b) designing a common transnational educational program with an accredited curriculum that focus on digital competencies for healthcare professionals; and c) establishing eLearning tools that support health care managers in the digital transformation of health. In the pilot phase, comments from involved HCPs and healthcare managers were collected during the content evaluation of the DELIVER online educational course. There were involved HCPs and healthcare managers from the partner Countries of the DELIVER project was representative of all the professionals to whom the digital platform is aimed.
At the overall level, they suggested to:
a) use concrete examples about digital health situation in daily practice, including ethical problems, and addressing possible resolutions;
b) offer a translated contents into the local language 'in order to facilitate the understanding given that English language may be a barrier;
c) use the principles of gamification to make the interface appealing, with intuitive online navigation;
d) provide the contents with links for having additional materials to deepen the self-directed learning and study.

4.3 OPINIONS OF EXPERTS IN DIGITAL HEALTH PARTENRS OF THE DELIVER PROJECT

All the objectives of IO#5, the goals of the policies and recommendations were shared among all the DELIVER project partners. The points to be dealt with in the various recommendations, the structure that this document should have and the methods for reaching consensus were shared and agreed. This process began with the start of the DELIVER project and ended with the presentation of the draft of IO#5 document with the related recommendations.

4.4 DEVELOPMENT AND CONSENSUS OF POLICY AND IMPLEMENTATION RECOMMENDATIONS

A formal method was followed for the development of the recommendations in order to comply with:

- the number, i.e. it is easier to arrive at the best solution with a group of experts than with a single individual;
- authority, i.e. the decision made by the group of experts has greater importance than that of an individual expert;
- rationality, i.e. statements can be improved when they are carefully discussed in groups, where each participant motivates their ideas;
- control of the procedure, i.e. using a structured method the subjective aspects of the decision-making process can be eliminated;
- scientific credibility, i.e. a formal method respects the requirements of a scientific method and therefore the validity of its results.

A Consensus Development Method (Palese et al., 2019) was employed involving (a) a group of experts in the field of digital health, composed of the members of the DELIVER Project, HCPs and healthcare managers; (b) the participants to the Transnational Congress (*www.fzab.si/index.php?mact=News,cntnt01,detail,0&cntnt01articleid=7130&cntnt01origid=15&cntnt01pagelimit=10&cntnt01returnid=469*).

The phases of the process were:
1. Summarising the knowledge available. A narrative literature review was conducted, on the policy and implementation recommendations for the implementation of digital health among HCPs, in May and June 2023, without imposing any limitations on language and time. Studies that were deemed relevant by the research partners were considered and summarised.
2. Writing the first draft of the policy and implementation recommendations. In July 2023, twelve recommendations were developed based on the best evidence emerged by the literature and sent to all the members of DELIVER Project.
3. Discussing the first proposal of the policy and implementation recommendations. The first proposal of statements was discussed among the members of DELIVER Project during the online meeting of the 1st of September 2023. Changes were made to better specify the recommendations, some sentences were divided into several different statements. Twenty-one statements were developed.
4. Sharing the second proposal of the policy and implementation recommendations. The second proposal of statements was shared to 10 HCPs and 10 healthcare managers, from the all Countries involved in the Project, to evaluate their comprehensibility and exhaustiveness. Few changes were required.

5. Discussing the third proposal of the policy and implementation recommendations. The third proposal of statements was discussed among the members of DELIVER Project during the online meeting of the 6th of October 2023. Only linguistic changes were made to English.

6. Discussing the third proposal of the policy and implementation recommendations. The last proposal of statements was discussed among the members of DELIVER Project during the face-to-face meeting in Udine (Italy) on the 23rd of November 2023. No further changes were required.

7. Voting the policy and implementation recommendations. The last proposal of the statements was definitively approved by vote during the annual conference took place in Lubiana (Slovenia) on the 24th of November 2023. The vote took place during a dedicated congressional session called "Promoting the digital transformation among healthcare professionals: policy-recommendations from the DELIVER project". Participation in this conference was free and possible both in person and remotely. Before voting, the process of developing recommendations and how to vote was explained to the participants. Each statement was rated on a 5-point Likert scale (strongly disagree, disagree, neither agree nor disagree, agree, strongly agree), registering any comments. Voting was done digitally, showing a QR code linked to Microsoft Forms. Participants used their smartphone or laptop computer as the connection device. The level of accordance reported was the sum of strongly agree and agree. At the Final Conference 98 people participated (55 on site and 43 remotely), the were HCPs, healthcare managers, educators, researchers and also students. None of them voted strongly disagree or disagree with the statements.

5. RESULTS

The statements developed and finally approved for enhancing the digital health skills of HCPs consider a) design systems capable of welcoming digital health; b) develop effective basic/advanced and general/specific training systems; c) create supports and incentives. They are represented by the following 21 recommendations, classified in education, implementation and technical features:

Education

- Ensuring awareness by healthcare professionals (HCPs) of the benefits that digital health involves in order to motivate them to implement it in their work practice and develop a more positive attitude and mindset towards digitization. HCPs also need to be clear about the limits of digital health; therefore, when its use is not recommended and/or should be avoided, since one size doesn't fit all. [approved with 100% of accordance]

- Certifying the training attended by HCPs and the competencies achieved, using the same classification, to render transparent the level of competence achieved in a clear and unambiguous manner. [approved with 94.4% of accordance]

- Using validated instruments to assess HCP digital health competences in different healthcare settings, allowing periodic self-evaluation or hetero-evaluation to promote access to continuing education services aimed at increasing competences. [approved with 88.9% of accordance]

- Designing educational opportunities for HCPs and healthcare managers from the first level of studies (i.e., bachelor's degree or similar) and deepening them during advanced levels of education (i.e., master's degree or PhD), as well as through lifelong learning. [approved with 100% of accordance]

- The educational programs should be defined at the macro level, involving experts in the field of digitalization of healthcare, but the educational interventions must be customized according to the hardware and software used in specific realities. The programs should also consider the different skills that different profiles of HCPs need to perform their jobs (e.g., radiology technician compared to occupational therapist). [approved with 88.9% of accordance]

- Basic digital skills must be possessed by every HCP and healthcare manager. Examples of basic digital skills are word processing, database management, email, searching and browsing the internet, using spreadsheets, using presentation software, and using electronic medical records. [approved with 94.4% of accordance]

- Educational courses should be conducted according to the best educational standards available and following the principles of andragogy. Teaching and training in the use of digital tools should be integrated into everyday work life (pragmatic cases) and delivered only by qualified personnel (including local frontrunners or peers), providing materials for further study. New educational strategies may also be employed, such as massive open online courses, with a digital interface and gamification rules to be more impactful and intuitive. [approved with 100% of accordance]

Implementation

- Considering different levels of digital transformation of society/HCPs and the digital divide existing in the general population as well as among HCPs, a modular approach (from the simplest to the most complicated competences) in the educational pathways is required. The digitization process must allow all HCPs to take advantage of its benefits. [approved with 88.9% of accordance]
- Recording the level of competences achieved by HCPs to map them at the local, regional, and national levels. This could be a strategic performance indicator, so decision-makers can establish a baseline and work toward improving digital competencies. [approved with 88.9% of accordance]
- As with the implementation of new digital technologies, new ethical issues may arise; therefore, ethics in digital health should be carefully considered and taught with practical cases, examples, and solution proposals. It is necessary to create conditions to enable HCPs to learn about new technologies and to reflect on the use they make of them in a meaningful manner. [approved with 100% of accordance]
- The time spent by HCPs attending digitization courses must be recognized as working time. The education activity should be accredited as continuing professional education. The development of digital competencies should be prioritized and acknowledged like healthcare specialization courses. It should also be a strategic priority. Learning and/or updating digital skills is a right and yet also a duty of HCPs, but they may not have the time for doing it. [approved with 88.9% of accordance]
- Promote national and international recommendations not only for the development of HCP digital skills but also for the digitization of healthcare environments(hospitals, outpatient clinics, healthcare facilities, home care services) and for patients who use digital health services. [approved with 88.9% of accordance]

- The provision of active support from healthcare direction positively influences HCPs' attitudes toward working with digital health. Healthcare managers should promote a culture to motivate staff toward positive acceptance of innovation. An effective collaboration between information technology staff and HCPs would enhance digital implementation. [approved with 100% of accordance]
- To avoid changes being perceived by HCPs as overwhelming and sudden, healthcare managers should break them down into smaller phases that address existing workflows and habits. [approved with 77.8% of accordance]
- Healthcare managers should reward the achievement of goals related to digital health implementation as with all types of programming. [approved with 88.9% of accordance]
- The health digitization process does not end with providing digital technologies to be used by HCPs for working but includes the phases of choosing/purchasing new technology tools, training/implementation, maintenance, and updating of hardware and software. [approved with 94.4% of accordance]

Technical features
- When a new technology is implemented in clinical practice, HCPs must be provided with complete training, a user-friendly manual, and the possibility of having technical support for any problem. Technical support could be provided both in-person and remotely. [approved with 100% of accordance]
- The technologies used in out-of-hospital settings should be capable of interoperating with those in in-hospital settings, allowing patients and HCPs to have all health information together, available, updated, and protected. Interoperability within the sectors of the local region but also between regions is important. The presence of a stable and fast internet connection is required to work. [approved with 94.4% of accordance]
- Ensure that digital health systems are designed with appropriate technological redundancy in case of service interruptions, ensuring an on-demand equivalent backup system. Instructions for potential information technology failures are mandatory. Paper documentation should be used as a temporary solution only when the technological backup is not available, to avoid data duplication and loss. Ensure the adequate availability of digital health systems both in the hospital and for homecare services. [approved with 100% of accordance]
- Teach HCPs how to have a secondary plan for managing their work if the technology fails. In fact, patient care should not be interrupted in the event of problems with the technological systems. [approved with 100% of accordance]

- Healthcare system software (e.g., electronic medical records), for hospitals or homecare, should be intuitive to use and enable the extraction of data on patients and the interventions performed, to quickly create clinical reports supporting the decision-making process, internal quality evaluations, or analysis of the quality of the service provided. [approved with 100% of accordance]

6. CONCLUSION

6.1 LIMITATIONS

Most of the studies considered refer to the DELIVER project, i.e. to the four partner countries. These three countries and one autonomous region may not fully represent the European situation. However, there are no European or international surveys in the current scientific literature for a better view of the phenomenon.
The focus of this document is therefore predominantly European, the realities of other continents are little considered. Furthermore, the synthesis of the current literature is qualitative in nature, having carried out a narrative and non-systematic review.

6.2 CONCLUSIONS

The expert panel of the DELIVER project developed 21 policy and implementation recommendations that should be considered by multi-sectoral stakeholders, particularly by healthcare managers and policy makers for an optimal implementation of digital health among HCPs.
A fundamental aspect for the digital health implementation process is to create motivation for digital change among the various HCPs and involve them in the different development phases.

6.3 FURTHER IMPLICATIONS

The DELIVER project has allowed the collaboration of three countries and one autonomous region for the promotion of digital health among HCPs and health managers. This experience could be an example for future meaningful collaborations with a greater number of countries involved.
The efficacy of the recommendations developed should be evaluated in future studies, ensuring greater strength of the recommendations.

6.4 PROJECT SUSTAINABILITY

The findings of DELIVER project, this document and the reports of the other IOs, will remain available and downloadable for free on the DELIVER website (deliverable section). The DELIVER scientific publications are and will remain available on scientific databases (e.g., PubMed).

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