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Digital Health in the Medical Curriculum: Addressing the Needs of the Future Health Workforce

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The European Medical Students´ Association (EMSA) represents medical students across Europe. We envision a healthy and solidary Europe in which medical students actively promote health. EMSA empowers medical students to advocate health in all policies, excellence in medical research, interprofessional healthcare education and the protection of human rights across Europe.

Executive Summary.

Digital health literacy and skills of health care professionals are prerequisite competencies for the successful digital transformation of healthcare. In contrast to this, the EMSA survey on eHealth reveals a significant gap between the overall willingness of students to become key players in a meaningful digitisation of healthcare and the competencies and skills they have acquired through their learning. Therefore, EMSA calls to support digital health literacy and health professionals in particular through (1) the implementation of digital health into medical education (2) strengthening interprofessional collaboration and (3) providing European platforms to exchange best practices.

Introduction.

"Digital health"[1] denotes the connection of health, health provision, life and society with digital technologies to improve the efficiency of health care and to apply health services more individually and effectively. Further, the term includes the use of both information and communication technologies (ICTs) to address the health problems of patients (Bhavnani, Narula, and Sengupta 2016). On that basis, *"eHealth literacy"* refers to the ability of individuals to seek, find, understand, and appraise health information from electronic resources and apply such knowledge to addressing or solving a health problem (Norman and Skinner 2006). *"Digital skills"* include awareness of genomics and artificial intelligence (AI), leadership skills and improved understanding of ethical considerations concerning the new technologies (Topol 2019).

High hopes are connected to the digitalisation of healthcare as digital solutions might increase the quality, accessibility, and affordability of health services (World Health Organization 2019). This includes advantages such as access to more accurate health data, better coordination of care-delivery, an expanded range and even a shift of tasks and responsibilities for the health workforce. For instance, within the next 20 years, it is expected that 90% of all jobs in the National Health Service (NHS) would require digital skills (Topol 2019). However, so far, an extensive and sustainable implementation of digital technologies has advanced slowly, both into clinical settings (Wachter, n.d.; Ross et al. 2016) as well as into national health systems (World Health Organization 2019; Hüsers et al. 2017). A recent study by the Bertelsmann Stiftung found that EU member states/countries digitise their healthcare systems at very different speeds with France, Germany and Poland trailing behind (Bertelsmann Stiftung 2019). In some countries healthcare was found to be the least digitised sector of the economy (Graumann et al. 2017). Among the various determinants contributing to the successful implementation of digital health are healthcare professionals' (HCPs) familiarity and ability with digital technologies, perceived usefulness and reluctance of changing clinical habits (Gagnon et al. 2016). Thus, it is

[1] Being aware of the ongoing discussions on the differences between "digital health" and "eHealth" definitions, in this paper we use both terms interchangeably.

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important to examine existing competencies and skills needed by the future health workforce. The European Medical Students' Association (EMSA) conducted a survey in 2018 to assess medical students' expectations towards eHealth and respective needs regarding its implementation in medical education (European Medical Students' Association 2019). Our observations and findings led to a critical discussion of the status quo and respective recommendations from the perspective of medical students in Europe which will be presented in this policy document.

Discussion.

Among the factors enabling the successful implementation of digital health are digital health literacy and digital skills of HCPs along with their trust in the potential of novel digital health solutions (Lennon et al. 2017; Ross et al. 2016). Ultimately, they are prerequisites for the successful digital transformation of healthcare. The promotion of digital health literacy and digital skills requires a multifaceted and diverse approach in order to engage the different stakeholders. Important aspects to be considered are the need for new, future-proof health curricula, integrating interprofessional collaboration and the importance of supranational coordination and monitoring.

Digital Health Literacy and Skills for the Future Health Workforce

Identifying HCPs and healthcare students as central connectors within a challenging digitalisation of the healthcare sector is paramount to its efficacy. Education and training of HCPs were identified as key facilitators of digital health implementation (Ross et al. 2016; World Health Organization 2019).
In accordance with previous research (Stellefson et al. 2011) the EMSA eHealth survey showed that the majority of medical students (53%) considered their eHealth skills as 'poor' or 'very poor.' However, the results also illustrated the wish and need of medical students for sufficient digital health literacy and skills. In summary, the results of the consultation clearly showed a gap between the overall willingness of students to become key players in a meaningful digitisation of healthcare and the competencies and skills they have acquired through their learning (European Medical Students' Association 2019). Thus, there is an urgent need to implement digital health literacy and digital skills in the education and training of health professionals.

The Future-proof Health Curriculum

The Topol review *"Preparing the healthcare workforce to deliver the digital future"* identifies the top digital technologies affecting the health workforce. According to the review, digital medicine (i.a. telemedicine and mHealth), AI and robotics, as well as genomics would affect 80% of the health workforce in 2040 (Topol 2019). Furthermore, future HCPs would have to become aware of the ethical and patient safety considerations posed by the digital transformation of healthcare (European Commission 2019). Additionally, the shift away from technical tasks towards a more patient-centered

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medicine accompanied by the change of the traditional doctor-patient relationship requires different communication skills (Masters 2017). In line with these considerations and recent scientific works [1,2](Fridsma 2018; Topol 2019), the EMSA survey on eHealth found that medical students wish to receive education on telemedicine and mHealth as well as on artificial intelligence in healthcare, genomics and data analytics. Practical training with digital health technologies in order to acquire the necessary digital skills was also strongly demanded (European Medical Students' Association 2019).
Including the various dimensions of digital health is a challenging task for curriculum developers, yet it is urgently needed. If they accept this challenge, education providers can build upon preliminary work: priorities and action plans for the improvement of IT skills in the EU healthcare workforce have recently been set out (Li et al. 2019). In 2018, Brunner et al. published an eHealth capabilities framework aiming to support education providers in developing health curricula that meet the increasing need for digital health education. The framework requires graduates to acquire competencies in four domains: (1) digital health technologies, systems, and policies; (2) clinical practice; (3) data analysis and knowledge creation; and (4) technology implementation and codesign (Brunner et al. 2018). It is crucial to take into account the existing approaches for designing a health curriculum that meets the urgent need of future HCPs for digital health literacy and skills.

Ensuring the Competence of Educators

Continuous education and training of HCPs regarding digital health literacy and skills exceed ensuring the most effective application of digital health in clinical workflows (Torous et al. 2018). Physicians are educators whose proficiency in digital health has a direct impact on learning outcomes of undergraduates. For instance, Li et al. found that *"ensuring the competence for educators could impact on the IT skill improvement most"* (Li et al. 2019). Ultimately, teaching of digital health literacy and skills must follow a holistic approach and be integrated equally into undergraduate and continuing medical education.

Interprofessional Collaboration

Healthcare, evolving through the disruptive changes brought about by digitalisation, nowadays more than ever engages numerous different professions. Thus, interprofessional collaboration is a substantial part of a future-proof health curriculum. Areas such as engineering, computer science and entrepreneurship have become increasingly important for medical graduates and therefore should be part of undergraduate medical education (Nelson and Staggers 2018; Salminen et al. 2014).

European Best Practice Exchange

On the European level, several networks were established to support the digitalisation of healthcare. These approaches take into account the heterogeneity of European healthcare systems and the different speeds of digitisation in the EU member states (eHAction, n.d.; European Commission

2016)(eHAction, Multi Annual Work Program). The European networks coordinated by the European Commission or respectively the EU member states address the digitisation of health care at many different levels and from various perspectives. However, the implementation of digital health literacy and skills into healthcare students' education so far has played a subordinate role or has been missing in the strategies. Although equipping HCPs with e-competencies is an objective of the eHAction Working Package 6 "Overcoming Implementation Challenges", the target group are graduated HCPs (eHAction, n.d.). We call to put the integration of digital health into undergraduate healthcare education high on the European policy agenda.

The Deans' Meeting "Training Future-proof Doctors for the Digital Society" on April 12th, 2019, in Rotterdam was an important step in the right direction. Representatives of students, junior doctors and deans from 25 different European countries developed together with educators, policy makers and digital health innovators a set of recommendations for action to adapt medical doctors' training to the challenges posed by the digital transformation of health. Participants committed themselves to take them forward in their own national context to raise policymakers' awareness (European Commission 2019). Such platforms for interprofessional collaboration, cross-disciplinary training and structured approaches to obtain findings of best practices are essential to ensure continuous improvements in a rapidly changing field.

The Responsibility of Professional Organisations

Most organisations representing healthcare professionals have identified the disruptive potential the digitalisation of healthcare, especially with regard to the job profile and work environment of health professionals. However, only three out of the nine European Medical Organisations (EMOs), namely EMSA, the Standing Committee of European Doctors (CPME) and the European Working Group of Practitioners and Specialists in Free Practice (EANA) published opinion papers or policies mentioning the importance of training of health professionals in digital tools (European Medical Students' Association 2016; Standing Committee of European Doctors 2017; Bolliger 2019). This lack of consideration by health professionals' organisations may contribute to the lagging progress in implementing digital health literacy and skills into medical education programs. The European Medical Organisations have to join forces advocating for the integration of digital health literacy and e-skills into healthcare education and Continuing Professional Development (CPD) programs in order to close the gaps and increase better healthcare outcomes.

Recommendations.

EMSA calls upon European medical faculties to:

- Raise awareness for and trust in the importance and the multiple dimensions of digital health

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among both educators and students.

- Encourage the dialogue between teachers and students to assess the necessities of improvement regarding the implementation of digital health into the curriculum.
- Meet the needs of medical students as future key players in a digitised healthcare system:
    - Implement educational formats on eHealth literacy and skills into the medical curriculum, including:
        - Data analytics, genomics and AI in health
        - Telemedicine and mHealth
        - Training with digital health technologies
        - Ethical considerations
        - Communication skills
    - ensure free access to according programmes (such as Matlab, R, SPSS and suchlike) to medical students
- Ensure competence of trainers and educators through implementing digital health literacy and skills in continuing education and training for HCPs
- Promote interprofessional collaboration in digital health education through including interprofessional formats in the medical curriculum, especially focussing on engineering, informatics, data science and entrepreneurship.
- Establish a monitoring system to evaluate and refine the implementation of digital health into the medical curriculum, taking into consideration the current research and developments in digital health.

EMSA calls upon all European Member States to:

- Put digital health literacy and skills of the health workforce on the policy agenda:
    - Allocate resources to support research on digital health literacy and skills and its implementation into HCPs education.
    - Support national initiatives and enhance the exchange of best practices for the implementation of digital health literacy and skills into medical education.

EMSA calls upon the European Institutions to:

- Put digital health literacy and skills of the health workforce high on the policy agenda
- Support interprofessional initiatives through platforms (meetings, conferences, online platforms), bringing together all professions and stakeholders from different sectors involved in the digital transformation of healthcare.
- Continue the establishment and support of European platforms to exchange best practices of digital health in medical education.
- Establish the “Deans Meeting: Training Future Proof Doctors for the Digital Society” as a

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continuing meeting and create formats pursuing similar goals.

EMSA calls upon the Eruopean Medical Organisations including EMSA itself to:

- Recognise the importance of digital health literacy and skills for the future health workforce.
    - Publish a joint political statement calling for the implementation of digital health into medical education and training.
- Raise awareness among their members of the importance of digital health literacy and skills.

Conclusion.

EMSA calls all stakeholders to recognise the importance of digital health literacy and skills for the future health workforce. To meet the needs of healthcare students, respective competencies must be implemented into medical education. EMSA calls the European institutions to support platforms to exchange best practices and advancements in digital health education, involving education providers, academia, policy makers, healthcare professionals and healthcare students.

Definitions.

AI	Artificial Intelligence
CPD	Continuing Professional Development
CMPE	Standing Committee of European Doctors
EANA	European Working Group of Practitioners and Specialists in Free Practice
eHealth	Electronic Health
EHR	Electronic Health Record
EMSA	European Medical Students' Association
EMOs	European Medical Organisations
EU	The European Union
HCP	Healthcare Professional
ICT	Information and Communication Technology
IT	Information Technology
mHealth	Mobile Health
NHS	National Health Service
WHO	The World Health Organization

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