Report 2

Recommendations to ensure the introduction of mobile technology in practice placements settings

Digitalization in learning practice placement

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Report authored by: Beata Dobrowolska and Ariadna Huertas.

Co-authors: Agnieszka Chrzan-Rodak, Magdalena Dziurka, Patrycja Ozdoba, Marta Szara, Jadwiga Klukow, Justyna Krysa, Michał Machul, Monika Gesek, Cristina Casanovas, Daniel Moreno, and Esther Cabrera (coord.) Carlos Martínez-Gaitero (coord.) and the 4D Project Consortium.

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The 4D project (4D in the digitalization of learning in practice placement) is an EC-funded project aimed at introducing mobile technology in practice placements, creating a bridge between the different actors involved learning contexts to foster the best experience in practice-based learning in healthcare settings. Our multidisciplinary team uses qualitative, quantitative, and design methods to help European universities interested in introducing mobile applications in practice placements. We strive to design the best mobile app proposals based on input from various stakeholders, including students, clinical and academic tutors, managers, and others from different contexts such as universities and centers of practices.

Digitalization in learning practice placement

The 4D Project Consortium are: Esther Cabrera[1], Carlos Martínez-Gaitero[1], Carles Garcia[1], Beata Dobrowolska[2], Agnieszka Chrzan-Rodak[2] Ariadna Huertas[3], Cristina Casanovas[3], Daniel Moreno[3], Angela Fessl[4], [5]Sebastian Maximilian Dennerlein, Raymond Elferink[6], Stephanie Herbstreit[7], Cynthia Szalai[7] and Daniela Mäker[7].

[1]Tecnocampus, Pompeu Fabra University. Research group in Attention to Chronicity and Innovation in Health (Barcelona, Spain); [2]Faculty of Health Sciences, Medical University of Lublin (Lublin, Poland); [3]Germans Trias i Pujol Research Institute (Badalona, Spain); [4]Graz University of Technology. Institute of Interactive Systems and Data Science (Graz, Austria); [5]University of Twente (Enschede, the Netherlands); [6]Kubify BV - Learning Toolbox (Utrecht, The Netherlands); [7]Medical Faculty of the University of Duisburg-Essen (Essen, Germany).

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Content

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Executive Summary of the Report

Background

To address actual problems in teaching as well as learning, embed technologies in respective practices and increase acceptance, the Technology Enhanced Learning (TEL) solution(s) must be co-designed with affected researchers, teachers, students and administrative staff. Digitalising and transforming higher education requires a human-centered approach that promotes adoption and sustainable impact on practice. Leveraging this approach in digitalizing and transforming practice-based learning in healthcare also helps to understand determinants and factors of successful introduction of mobile learning in practice placements.

Aim

The aim of this report is to present evidence-based recommendations to ensure the introduction of mobile technology in practice placements settings.

Results and outcomes

The Recommendations to ensure the diffusion and introduction of mobile applications in practice placements in higher education are developed based on literature review and focus group study. As identified in our study, different strategies should be implemented to introduce mobile technology into practice placement, and they need to be considered at 3 different points of time:

(1) When designing the innovation/mobile technology (funding and economic issues, the technical features; deciding what kind of mobile device is more suitable; engaging learners, educators, patients and other stakeholders; setting clear guidelines and policies);

(2) During its implementation (providing training and guidance to educators, students, staff/clinical teachers and other stakeholders; counting on an implementation team; promoting a mobile technology “culture”; making the most of the limited time available for educational activities in practice placements); and

(3) Once introduced, to guarantee its sustainability (a technical and maintenance support; supplying access to devices and an insurance for lost, damaged or stolen devices; ensuring free Internet access and a good infrastructure; considering student's and stakeholder's feedback/Regular assessment and evaluation).

The process of introducing mobile technology into clinical education should involve all stakeholders engaged in clinical training and institutional support, including training coordinators, mentors, students and healthcare staff (with hospital ward managers). The support of students and stakeholders such as educators, and healthcare professionals is crucial for successful digitalization. In this sense, they should be involved in the process of selecting and implementing digital tools and should receive appropriate training to ensure their effective use. A collaborative approach involving healthcare providers, educators, and students can lead to the development of innovative and effective digital learning strategies.

Mobile learning is becoming increasingly popular in practice placements in healthcare higher education. Mobile devices facilitate access to information and allow students to combine theoretical training and clinical skills when they are used in clinical placements, among other benefits.

1. Introduction

Mobile learning is becoming increasingly popular in practice placements in healthcare higher education (Lee et al., 2021). Mobile devices facilitate access to information and allow students to combine theoretical training and clinical skills when they are used in clinical placements, among other benefits (Nikpeyma et al., 2021). However, many challenges regarding implementation of mLearning in clinical contexts have been reported (Lall et al., 2019). The successful adoption of mobile technology in clinical education requires careful consideration of the facilitators and barriers.

The 4D project (Determinants, Design, Digitalization, Dissemination) in the Digitalization of Learning in Practice Placement, funded by European Commission, aims to introduce mobile technology in practice placements, creating a bridge between the different actors involved in learning contexts to foster the best experience in practice-based learning in healthcare settings. One of the main objectives is to determine the key factors and the key elements to introduce mobile technology in practice placements. The 4D project has investigated the main benefits and challenges that mobile learning can entail by conducting a literature review and focus groups with students and stakeholders involved in practice placements. These methods helped us to identify the current state of the art and the best practices in mobile learning and technology use in clinical education and to provide valuable insights into the needs, values, and preferences of potential users of a mobile learning application. Focus groups, on the other hand, also provided us the opportunity to directly engage with potential users and gather their feedback and opinions on the App's design, features, and functionality.

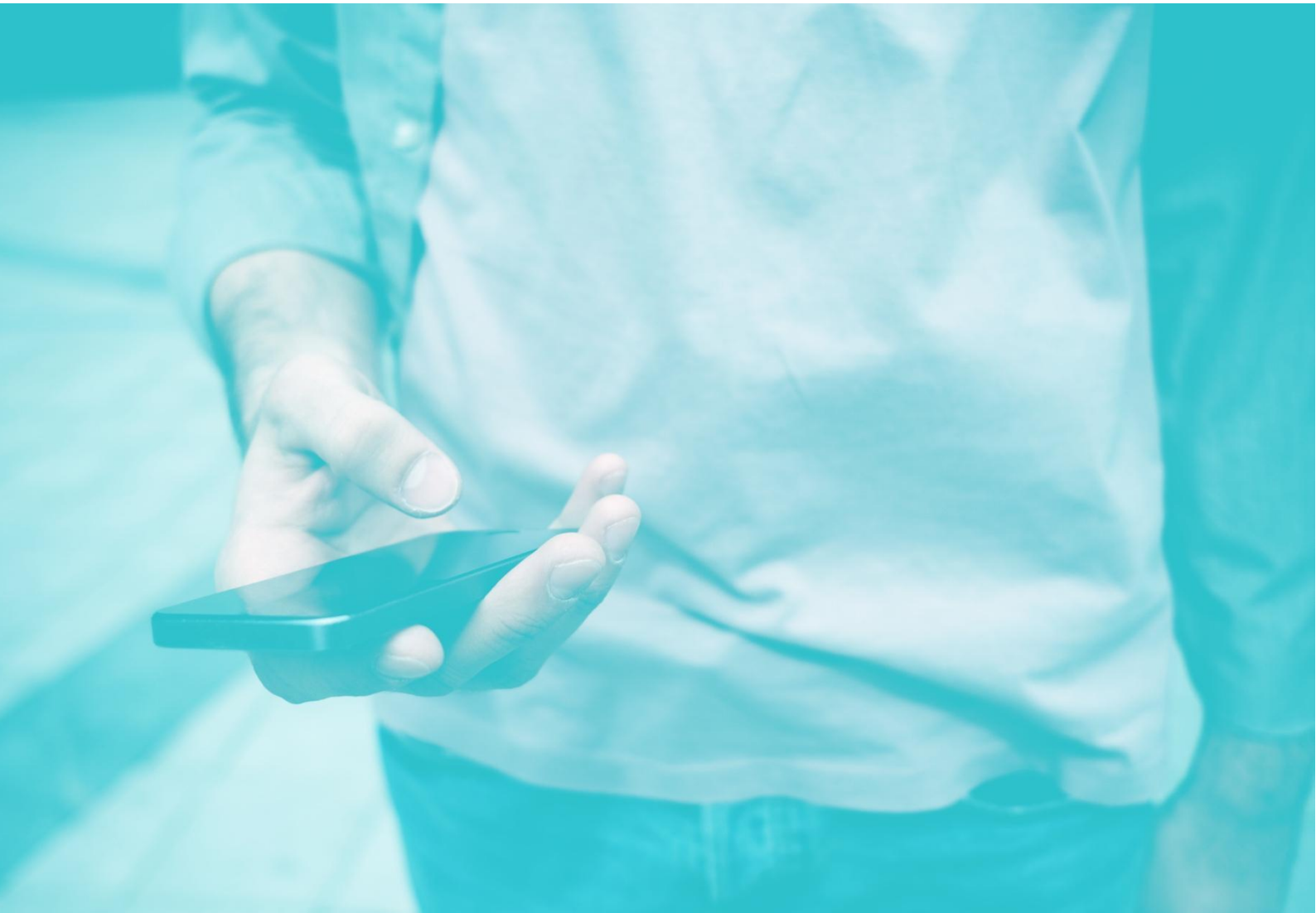
From this, we have distilled several key areas that have to be taken into consideration to co-Design a mobile learning application (App) for successful adoption of mobile technology in practice-based learning reflecting users' core values and needs and to ensure a successful digitalization of practice-based learning in healthcare higher education. By addressing the challenges and leveraging the facilitators, educators and other stakeholders can develop effective and innovative digital learning strategies that can enhance the quality of healthcare education.

In this report, we present an overview of each issue alongside recommendations to mitigate their effects. Before going into these recommendations, a summary of the results of the literature review and focus groups are presented below.

As stated in the previous section, mobile technology in clinical education and practice placements can have many benefits but also entails many challenges that need to be addressed. The results found in the literature and focus groups let us to distil several key areas that have to be taken into consideration to co-Design a mobile learning application (App) for successful adoption of mobile technology in practice-based learning reflecting users' core values and needs and to ensure a successful digitalization of practice-based learning in healthcare higher education. Therefore, the aim of this report is to present evidence-based recommendations to ensure the introduction of mobile technology in practice placements settings.

Results from evidence Report 1

Key factors, perspectives and needs of actors involved to digitalize successfully practice-based learning in healthcare higher education.



2. Results from evidence Report 1

Key factors, perspectives and needs of actors involved to digitalize successfully practice-based learning in healthcare higher education.

2.1. Benefits and facilitators of mobile learning in practice placements in healthcare higher education

Generally, there is a positive attitude of students, educators, staff and patients towards mobile learning in clinical education and find them useful. An enthusiastic attitude toward mobile technology in clinical education can help educators and students take advantage of the many benefits that mobile technology has to offer, ultimately leading to improved learning outcomes and better-prepared future healthcare professionals.

Mobile learning improves the quality of clinical education. It can make clinical education more engaging and interactive by incorporating multimedia elements, such as videos, images, and interactive simulations. This can help students better retain information and apply it to real-world scenarios. It can also enhance student engagement by providing personalized and customized learning experiences by recording and tracking clinical activities and progress, providing a more accurate and comprehensive record of student learning. Mobile learning can also provide a platform for students to receive feedback and evaluation on their performance. This can help them to identify their strengths and weaknesses and develop a plan for improvement, which can help to reduce their stress and anxiety. Overall, mobile technology can enable educators to tailor learning experiences to individual students' needs and learning styles, providing more personalized and effective instruction.

Portability, flexibility and accessibility are some others benefits of digital and mobile learning. Mobile technology enables students to access a wide range of educational resources, such as eBooks, journal articles, and interactive learning tools, from anywhere and at any time. This can help students learn more efficiently and effectively. Mobile technology can also provide access to virtual simulations, video demonstrations, and other educational resources, allowing students to practice and improve their clinical skills. In short, mobile technology allows students to access educational resources and complete learning activities at their own pace and in their own time.

Moreover, it is an effective tool to organize the clinical training. Mobile technology can facilitate communication between students and healthcare professionals and between stakeholders, allowing for better collaboration and the exchange of knowledge and ideas, and feedback in real-time. In addition, mobile technology can help educators and students communicate more efficiently and effectively, whether through messaging, discussion forums, or video conferencing. This can facilitate more frequent and meaningful interactions and enhance the overall learning experience.

On the other hand, mobile learning can facilitate the onboarding process and help to reduce the stress and anxiety of students when they start their practice placements in healthcare. It can provide a range of tools and resources that can help to support students during the onboarding process in practice placements. For example, orientation materials, such as handbooks, guides, and videos, which can help to familiarize them with the practice placement environment,

policies, and procedures. As it has been reported, mobile learning can provide interactive training and simulations, which can help students to practice and develop their clinical skills in a safe and controlled environment. This can help to build their confidence and reduce anxiety when they start working with patients. In addition, mobile learning can provide a platform for students to connect and communicate with their peers and faculty members. This can help to create a supportive learning environment, where students can ask questions, seek feedback, and share their experiences.

Finally, mobile learning can also play an important role in increasing patient safety and reducing variability during care. Mobile learning can be used to deliver standardized protocols and guidelines to students, ensuring that all patients receive consistent, high-quality care. In addition, it can enable students to access information on the go, such as medication dosages, drug interactions, and patient allergies. This can help prevent errors and improve patient safety. Moreover, mobile learning can provide students with access to training materials and educational resources on an ongoing basis. This can help ensure that students are up-to-date on the latest best practices and protocols, reducing the likelihood of errors and improving patient safety.

2.2. Challenges and barriers of mobile learning in practice placements in healthcare higher education

First of all, there is a lack of clear regulations and guidelines for using mobile technology in a clinical setting. This can create several challenges and risks for students, healthcare providers, patients, and their data. Additionally, the accuracy and reliability of mobile technology can vary greatly, and the lack of standardization and regulation can make it difficult to assess the quality of the technology being used.

Secondly, there is a lack of a culture of accepting the use of mobile devices for scientific and educational purposes, which can be a significant barrier to the effective use of these technologies in practice placements. Some stakeholders and patients perceive mobile devices as a source of distraction, particularly in educational and clinical settings. These disruptions in workflow distract students from their primary duties.

So, the use of personal mobile devices by students can blur the line between personal and professional use. Even if students are using technology for educational purposes, they may feel disrespectful when using mobile devices in front of patients.

This lack of a culture of accepting the use of mobile devices can make it difficult to convince individuals and institutions to use mobile devices for scientific and educational purposes. Moreover, some people may perceive mobile devices as less reliable than traditional scientific and educational tools, such as textbooks or laboratory equipment.

In this sense, educators, students, and healthcare professionals may be resistant to the adoption of new technologies due to factors such as lack of familiarity, fear of technology, or a preference for traditional methods. So, resistance to change has become a significant barrier to the successful digitalization of practice-based learning.

The lack of digital competencies, skills and proper training of students and stakeholders involved in practice placements can also be a significant barrier to the successful adoption of mobile learning. Students and stakeholders who lack digital competencies may be hesitant to use mobile

devices for learning purposes, which can limit the potential benefits of mobile learning. They may struggle to navigate mobile platforms and applications, which can lead to frustration and a lack of engagement with mobile learning.

In addition, the lack of time in practice placements can be a significant barrier to the effective use of mobile devices for educational purposes. Students and healthcare providers may have limited opportunities to use mobile devices due to time constraints. This can lead to a lack of engagement with mobile learning.

Digitalization can raise security and privacy concerns related to the storage and sharing of personal data and information. So, mobile technology needs to be integrated with existing clinical systems and workflows, which can be a complex and time-consuming process.

Inadequate infrastructure such as low-speed internet connectivity or outdated hardware can hinder the effective use of digital tools. Battery life, too small screen to read all learning materials, complicated scroll view, and non-transferability to different mobile devices are some other technical barriers that mobile devices may have.

Digital tools and infrastructure can be expensive, which may be a significant barrier for educational institutions, especially those with limited resources or located in remote areas. Mobile devices can be high-priced, particularly if they need to be purchased for students who do not have their own devices. Moreover, mobile devices require ongoing maintenance and support, which can be costly. This includes the cost of software updates, repairs, and technical support. In addition, mobile learning requires access to reliable data and connectivity, which can be big-budget for organizations, particularly if large amounts of data need to be transferred. Developing mobile learning materials and applications can also be expensive, particularly if they need to be customized to meet the specific needs of a particular organization or practice setting.

Finally, infection control is another important consideration when using mobile devices in practice placements, particularly in healthcare settings. Generally, there is a lack of clear policies and students show concerns regarding this issue, leading to a low commitment of the use of mobile technology in practice placements.

Recommendations to ensure the introduction of mobile technology in practice placements settings. When designing the innovation/mobile technology. During its implementation and once introduced, to guarantee its sustainability.

3. Recommendations to ensure the introduction of mobile technology in practice placements settings.

Presented below recommendations are based on literature review and focus groups study among health care and medical students, and also stakeholders – different actors involved in the process of clinical education.

As identified in our study, different strategies should be implemented to introduce mobile technology into practice placement, and they need to be considered at 3 different points of time:

1. When designing the innovation/mobile technology
2. During its implementation
3. And once introduced, to guarantee its sustainability

3.1. Designing the innovation/mobile technology for learning in practice placements

Designing mobile technology for learning in practice placements requires careful consideration of several factors. Some important factors to consider are the economic issues that are involved in digitalization in practice placements, technical features of the innovation/mobile technology and different methods to avoid security and confidentiality problems. It is also essential to decide what kind of mobile device is more suitable, develop several strategies to increase student and educator's engagement and clear guidelines and policies should be set. By considering these factors mobile technology can be designed that is effective, engaging, and sustainable for learning in practice placements. Specifically, the following aspects should be considered:

Funding and economic issues

The cost of developing and implementing the mobile technology should be considered. It should be cost-effective and provide value for money. To address these costs, it is important to carefully evaluate the potential benefits of mobile learning and to develop a realistic budget that takes into account the costs of devices, maintenance and support, data and connectivity, and development. Additionally, it may be helpful to explore cost-sharing arrangements with other organizations or to seek funding from external sources, such as grants or foundations. It is also important to ensure that any investments in mobile learning are cost-effective and provide value for money. This can be done by regularly evaluating the impact of mobile learning on student learning outcomes, healthcare outcomes, and cost savings. By demonstrating the value of mobile learning, it is possible to secure on-going funding and support for these initiatives. To overcome some economic barriers, several studies suggest considering the cost of application (Fournier, 2022; Mann et al., 2015; Maudsley et al., 2019), devices and Internet packages (Alegría et al., 2014; Nikpeyma et al., 2021). Other authors conclude that university investment in the innovation should be increased (Attenborough & Abbott, 2018).

It is also confirmed by students and stakeholders from focus group study. One stakeholder underlined "I think there should be a budget dedicated to this...(digitalization)" (Sth/Sp/7).

Considering the technical features

Considering the technical requirements and the technical features when designing the innovation/ mobile technology is crucial for its success. Some examples are allowing storage offline, with the option to upload documents when Internet access becomes available (Green et al., 2015). Content needs to be adjusted so that it can be easily viewed on a small screen, reducing the potential for the users to give up on accessing information. Also, transferability of information and resources among different platforms and devices should be ensured (Davies et al. 2012; Luanrattana et al., 2010; Luanrattana et al., 2012) and devices should allow data synchronisation (Lall et al., 2019; Luanrattana et al., 2010), have enough device memory (Fournier, 2022; Nikpeyma et al., 2021), good software speed (Lee et al., 2021; Mettiäinen, 2015; Snodgrass et al., 2016), and a printing option for the documents (Boruff & Storie, 2014; Strandell-Laine et al., 2019; Mann et al., 2015). This is also confirmed by results from focus groups: “This application should have to be an application that can be downloaded quickly at the mentor's phone or at the work computer...” (Nst/Sp/3).

Among technical features of mobile technology used in clinical environment, data protection is a crucial aspect that should be taken into consideration when developing and implementing mobile technology in clinical education. Both user and patient data must be protected and treated with the utmost confidentiality and privacy. This includes ensuring that data is stored and transmitted securely, and that only authorized personnel have access to it. Additionally, compliance with all relevant laws and regulations related to data protection, such as the General Data Protection Regulation (GDPR) in Europe and the Health Insurance Portability and Accountability Act (HIPAA) in the United States, should be upheld. It's important to have robust data protection policies and procedures in place and to provide training to students and staff on how to handle and protect sensitive patient information. Some strategies to avoid security and confidentiality problems are authentication methods like using username and password protection, data encryption methods when sending information over the network, digital signatures, security over a wireless network, etc. (Luanrattana et al., 2010; Luanrattana et al., 2012).

Several technical issues were also indicated by students and stakeholders being involved in focus group study. One focus group participant underlined: "...what I would like is to have an app that I could use on my mobile if I need it, but also that I could use on my computer. That is, if I need it on a different screen or a tablet...For me it is something important" (Sth/Sp/ 9).

Deciding what kind of mobile device is more suitable

It is important to consider the type of mobile device that will be used for learning. Some authors have stated that tablets and other mobile devices seem more legitimate than the smartphone among staff and patients (Alegría et al., 2014; Harrison et al., 2019). One Polish student stated: “To ensure the patient, (…) this is not my tablet, this is the medical device” (St/Pl/8).

Contrary, other studies suggest that smartphones enable students to carry less and may reduce costs of using different mobile devices (Davies et al. 2012, O'connor & Andrews 2015). So, it is essential to decide what kind of mobile device is more suitable according to the context where it is implemented. One Spanish student highlighted: “It also depends on the person, as well as on the unit and the level of work they have. In primary care there is a work rhythm and in the emergency unit there is another” (Nst/Sp/4). And also, Polish stakeholders underlined that all students have smartphones and like to use smartphones: “I've never seen a student without a phone” (Sth/Pl/4)

Engaging learners, educators, patients and other stakeholders

Mobile technology should be designed to increase student and educator engagement. This can include innovative and attractive activities to increase users' engagement and motivation should be also considered (Willemse 2018). Students may be more accustomed to using mobile devices for leisure and entertainment, rather than for learning purposes. This could lead to a lack of motivation and engagement when using mobile technology in clinical education. To overcome this, it is important to design and implement mobile technology in a way that is engaging and interactive, and that aligns with the students' learning needs and preferences. Additionally, providing students with the necessary training and support to effectively use mobile technology for learning can help to overcome this challenge. As reported in the literature, to ensure student's and educator's engagement curricula and learning objectives should be considered when designing the innovation as well as adapting contents according to the students' grade (Green et al., 2015; Luanrattana et al., 2010; Luanrattana et al., 2012; Maudsley et al., 2019). Therefore, educators should be involved when designing the innovation (O'Connor & Andrews 2018). This was also reported in the results from focus groups: "I also think that if you take into account all the opinions of people who have done internships and who are doing different courses in different fields.... What you can take into account is the things that would be useful, those that would not, and also for the clinical mentors'' (Pst/Sp/2) On the other hand, there should be a common strategy while developing the mobile technology: "A central system from which everything runs in some way and with standardised apps that are autodidactic and compulsory for everyone to use" (Sth/Ge/3).

The innovation should also integrate other aspects of medical's school e-learning facilities, like an e-portfolio (Davies et al. 2012). One German student stated: "We have our digital sources, but if the University could offer verified content, we could rely on it" (MSt/Ge/3).

Setting clear guidelines and policies

It is important to establish clear regulations and guidelines for the use of mobile technology in clinical settings. These regulations should address security and privacy, quality of care, liability, and other issues to ensure that the use of mobile technology enhances, rather than detracts from, the quality of education and patient care. This recommendation is supported by the evidence and results from our qualitative study, so providing institutional governance about using mobile devices in the workplace is a key point (Maudsley et al., 2019). Also, explicit and clear policy should be set, as well as behaviour codes (Lall et al., 2019; Lamarche et al., 2016; Luanrattana, et al., 2012; Mather & Cummings, 2016; Maudsley et al., 2019; Payne et al., 2012; Willemse, 2018). One medical student indicated: "The Dean's office has to provide the rules on how to use the App" (MedSt/Ge/5). Other students underlined: "... there are institutions that impose that you cannot use the mobile phone" (Nst/Sp/6), highlighting the problem of lack or clear guidance in this matter.

Such a policy should be set also to avoid distraction issues. If students get distracted while using mobile technology in a clinical setting, it can pose a risk to patient safety. In healthcare, attention to detail and focus on the task at hand is crucial to prevent errors and ensure that patients receive the best possible care. Therefore, it's important to ensure that the implementation of mobile technology in clinical education does not compromise patient safety and that students are fully focused on the task at hand. This can be achieved by setting clear guidelines and expectations for the use of mobile technology in clinical settings, providing training and support for students, and monitoring the use of mobile technology to identify and address any potential risks.

Another potential risk with the use of mobile technology in clinical education is the potential for abusive use of the app. This could include using the app for non-educational purposes, sharing sensitive patient information, or using it in a way that is not in compliance with healthcare regulations and policies. To prevent such abuses, it's important to have clear guidelines, policies and rules in place for the use of mobile technology in clinical education, and to provide training and education on responsible use and data privacy. Additionally, it's important to have monitoring and oversight in place to detect and address any potential abuses of the app, and to have appropriate measures in place to address such abuses.

Moreover, policies and guidelines should also address infection control issues and provide guidance on the appropriate use, cleaning, and handling of mobile devices. Some recommendations are:

- Regular cleaning, to prevent the spread of infection.
- Dedicated mobile devices that are only used for healthcare purposes. These devices should not be used for personal purposes and should be kept separate from personal devices.
- Hand Hygiene: Healthcare providers and students should practice good hand hygiene before and after using mobile devices. This can help to prevent the spread of infection from the device to patients or from patients to the device.
- Protective Covers. These covers should be made of a material that is easy to clean and disinfect.

By implementing these strategies, it is possible to control infection problems when using mobile devices in practice placements. It is important to ensure that all healthcare providers and students are trained on infection control procedures and the appropriate use of mobile devices. Additionally, it is important to regularly review and update policies and guidelines to ensure that they reflect current best practices and recommendations.

3.2. Implementing mobile technology for learning in practice placements

The implementation process of mobile technology in practice placements requires careful planning and consideration of several factors. Some strategies to ensure its success are providing training and guidance, counting on an implementation team or promoting an innovation culture. By considering these factors, educators and stakeholders can successfully implement mobile technology for learning in practice placements. This can help to improve the quality of learning experiences, increase engagement, and support the achievement of learning outcomes. Here are some important factors to consider when implementing mobile technology:

Providing training and guidance to educators, students, staff/clinical teachers and other stakeholders

To address the lack of digital literacy and competencies among students and stakeholders, it is important to provide training and support for them to develop their digital competencies. This can be done by offering workshops and training sessions on how to use mobile devices and platforms for learning purposes, as it has been reported in focus groups: “Perhaps a previous course should be given to all the clinical mentors to say look, we have made this App, it works this way and that they are already situated in the use of this App” (Nst/Sp/9). It may also be helpful to provide resources and guides on how to navigate mobile platforms and applications. In addition, it is important to address security and privacy concerns by providing guidance on how to protect personal information and data when using mobile devices for learning purposes. It is also important to involve stakeholders, including students, educators, and practitioners, in

the development and implementation of mobile learning policies and guidelines. By involving stakeholders in the process, it is possible to identify and address any concerns or challenges related to the adoption of mobile learning. This can help to ensure that the use of mobile devices in practice placements is seen as a valuable and effective tool for learning and professional development. This recommendation is supported by our findings from the literature review and focus groups, as shown below. As reported in the literature, sufficient training and guidance is essential for successful implementation of any innovation. This training should be provided to educators (Attenborough & Abbott, 2018; Luanrattana et al., 2010; Luanrattana et al., 2012), staff and clinical teachers (Luanrattana et al., 2010; Luanrattana et al., 2012), and especially to students (Beauregard et al., 2017; Dearnley et al. 2008; Fadi et al., 2015; Green et al., 2015; Luanrattana et al., 2010; Luanrattana et al., 2012; Mann et al., 2015; Masters & Al-Rawahi, 2012; Strandell-Laine et al. 2015), including clear guidance about how to use the content in a clinical setting and privacy and confidentiality issues (Lai & Wu, 2016; O'connor & Andrews, 2015; Scott & Curtis, 2013; Willemse 2018). Some authors have stated that educator's trainning could foster nursing students' information literacy and evidence-based practice when using mobile devices (Doyle et al., 2016). So, digital professionalism in student orientation and better staff role-modelling about using mobile devices in the workplace, including the law and maintaining doctor patient relationships while using the device, should be considered (Maudsley et al., 2019). It is also essential teaching students to think critically about the information accessed through mobile technologies when making decisions about patient care (Sedgwick et al., 2016). Some authors have suggested to provide this training in small groups, informing on features such as synchronizing, and allowing sufficient time to become familiar with the device (Farrel et al., 2008). The aspect of training was also very often highlighted by students and stakeholders taking part in focus group study. One Polish clinical mentor underlined: "Because if we were trained, it seems to me that there would be no resistance from mentors here. You have to keep up with the times and it is known that everything is moving forward, so we have to adapt to it, to certain changes that are coming" (Sth/Pl/6). In this sense, a Spanish student also highlighted: "Perhaps a previous course should be given to all the tutors to say look, we have made this app, it works this way and that they are already situated in the use of this App'' (Nst/Sp/9)

Counting on an implementation team

Counting on an implementation team (including clerkship directors) and a prominent leader for students and staff to approach with ideas, will contribute to successful implementation (Maudsley et al., 2019). Having an implementation team can be essential to the success of mobile learning in practice placements. An implementation team can help to ensure that the mobile learning program is effectively planned, designed, and executed, and that any issues or challenges are addressed in a timely manner. An implementation team can provide a range of valuable contributions to mobile learning, including:

- Technical expertise: An implementation team can provide technical expertise in areas such as app development, device management, and data security, ensuring that the mobile learning program is well-designed and reliable.
- Project management: An implementation team can help to manage the mobile learning project, ensuring that it is delivered on time and within budget. This includes overseeing the development and deployment of the mobile learning program, monitoring progress, and managing any issues or risks that may arise.
- User support: An implementation team can provide user support for learners, ensuring that they are able to use the mobile learning program effectively and efficiently. This includes providing training and guidance on how to use the technology, troubleshooting any issues that arise, and addressing any concerns or feedback from learners.

- Stakeholder engagement: An implementation team can engage with stakeholders, including practice placement supervisors, clinical educators, and other professionals involved in the placement, to ensure that the mobile learning program is meeting their needs and addressing any concerns or challenges that may arise.

Promoting a mobile technology "culture"

It is important to create a culture that values and embraces the use of mobile devices for scientific and educational purposes. This can be done by promoting the benefits of mobile devices, such as their portability, flexibility, and accessibility, and by providing training and support for their use. It is also important to demonstrate the reliability and effectiveness of mobile devices through research studies and case examples. If the practice placement has a digitalization culture, students and stakeholders would be more motivated to use technologies. One stakeholder interviewed stated: "The culture of the institution. This hospital, for example, is an institution that... You just enter the hall and look next door, there is one QR and it invites you to download an application to find out what the process is and where your family member is. Then all this, whether you like it or not, also promotes the rest of the professionals to get on the bandwagon" (Sth/Sp/7). Promoting an innovative "culture" (Maudsley et al., 2019) will increase staff and patients' engagement, empowering them. To engage and empower supervisors and clinical staff some strategies are reported in the literature. For example, assuring them that mobile technology is used for pedagogical purposes (Gray & Gillgrass, 2020; Luanrattana et al., 2010; Luanrattana et al., 2012). Also, initiatives to improve staff awareness about the value of portable devices could be developed (Lall et al., 2019; O'Connor & Andrews 2018). And promoting a better coordination between university and practice placements to promote an understanding of what constitutes appropriate use of mobile devices by students for learning (Harrison et al., 2019). The results from our literature review and focus groups show how students feel disrespectful when using their mobile devices in front of patients: "...not having to take out the mobile because it is something that you want or not, it is frowned upon by both the patient, the patient's relatives, even their own tutors, nurses ..." (Nst/Sp/7). To overcome this challenge and to engage patients and their families, students and healthcare staff should explain them why they were using a mobile devices to avoid misinterpretation and ask for their consent and/or jointly using devices with them (Gray & Gillgrass, 2020; Lall et al., 2019; O'Connor & Andrews, 2016; Harrison et al., 2019). Explaining the benefits of mobile devices to improve the quality of care and safety and as educational tools is also essential (O'Connor & Andrews 2018). This is also reported in the results from focus groups: "…and as a teacher I have to be able to explain it to the patients, if the patient wants to know how it works"(Sth/Ge/10). One Spanish student also stated: "Communicate it, explain it. Exactly. That is, tell the patient: Look, I'm going to have the mobile phone to do this...and tell them to avoid misunderstandings..." (Nst/Sp/4). Additionally, it may be helpful to involve key stakeholders, such as students, educators, and patients, in the development and implementation of mobile device policies and guidelines to ensure buy-in and acceptance of these technologies.

Making the most of the limited time available for educational activities in practice placements

Clinical placements often are very busy and students and clinical mentors do not have time to use mobile devices for learning purposes. To overcome the lack of time in practice placements, targeted and focused learning opportunities that are designed to be completed quickly and efficiently using mobile devices should be provided. Additionally, it may be helpful to integrate the use of mobile devices into existing workflows and activities to minimize disruption and maximize efficiency. It is also important to provide adequate training and support for students

and healthcare providers to use mobile devices for educational purposes. This can be done by offering short training sessions or tutorials that are designed to be completed quickly and efficiently. Additionally, it may be helpful to provide access to resources and guides that can be accessed quickly and easily on mobile devices. By addressing these issues and making the most of the limited time available for educational activities, it is possible to effectively use mobile devices for educational purposes in practice placements.

3.3. Sustainability of mobile technology for learning in practice placements

Mobile technology can be a powerful tool for enhancing learning outcomes in practice placements, but its success over time requires careful consideration of several factors. Once mobile technology has been implemented in practice placements, there are several important steps that educators can take to ensure that the technology continues to be effective and useful for learners. Here are some key things to consider for long-term success of mobile technology in practice placements:

Providing a technical and maintenance support

The issue of technical support for users of mobile technology during practical education has been underlined in the literature very often (Davies et al., 2012; George et al., 2010; Green et al., 2015; Luanrattana et al., 2010; Luanrattana et al., 2012; O'Connor & Andrews 2018). It is important to provide learners with adequate support throughout their mLearning journey, including technical support. This should include hardware, software, network connectivity (helpdesk, e-mail support, live chat with technical staff, web-information, FAQ, user tips, peers, troubleshooting page, etc) (Luanrattana et al., 2010; Luanrattana et al., 2012), in order to rectify software or other issues (Snodgrass et al., 2016). One study suggests to have an interdisciplinary team that includes technology experts and library scientists to provide support students may need, inclusion of mobile discussions on infection control and confidentiality (Mann et al., 2015). This is also reported in focus groups: "...it is very difficult to talk and deal with IT departments from the health field, in this case because you want things that can obviously be done or not. Therefore, to understand the other person, you have to let him know how he needs it..."(Sth/Sp/7). On-going training and support should be also provided to learners and educators to ensure that they continue to effectively use the mobile technology. This can include providing updates on new features and functionality, troubleshooting technical issues, and providing guidance on effective use.

Supplying access to devices and an insurance for lost, damaged or stolen devices

Learners and educators must have access to mobile devices that are compatible with the technology being implemented. This may involve providing devices or allowing learners to use their own devices. This is also stated in focus groups: "Well, if you had a device that the company provides, that you could use to solve doubts or whatever...available for everyone" (Nst/Sp/3). If learners and stakeholders use their own devices, providing insurance for lost, damaged or stolen devices in practice placements can be a useful way to ensure that users are protected and supported in the event of an unexpected incident (Green et al., 2015).

Ensuring free Internet access and a good infrastructure

Adequate infrastructure, such as a reliable network and sufficient bandwidth, is essential to support the use of mobile technology in practice placements (Gray & Gillgrass, 2020; Lamarche et al., 2016; O'Connor & Andrews 2018; Scott & Curtis 2013; Willemse et al., 2019). Ensuring free Internet access in practice placements can provide learners with the necessary tools to support their learning and improve their ability to carry out their duties. With free Internet access, learners can access a wide range of online resources, including educational materials, research articles, and professional development opportunities. Providing free internet access can also help to reduce barriers to learning, particularly for learners who may not have reliable access to the internet at home or who may not be able to afford the cost of internet access. There should be enough structures to guarantee a proper digitalization in wards, such as Wi-Fi coverage and access: "the organization (hospital) is not even ready to provide Wi-Fi for all users, we are digitalizing the entire patient process, and the patient is beginning to participate digitally in their process…"(Sth/Sp/6).

Considering student's and stakeholder's feedback/Regular assessment and evaluation

Regular assessment and evaluation should be conducted to measure the effectiveness of the mobile technology and identify areas for improvement. This can involve collecting feedback from learners and educators, analyzing usage data, and evaluating the impact on learning outcomes. When introducing mobile technology in practice placements, it is important to consider the feedback of both students and stakeholders to ensure that the technology is appropriate, effective, and well-received. Students are the primary users of the mobile technology, and their feedback is essential in understanding how the technology is being used and whether it is meeting their needs. Gathering feedback from students can help to identify any issues or challenges with the technology, as well as areas where it is working well. This feedback can be collected through surveys, focus groups, or individual interviews. Stakeholders, such as practice placement supervisors, clinical educators, and other professionals involved in the placement, can also provide valuable feedback on the use of mobile technology. They may have insights into how the technology is impacting the learning experience and the delivery of care, as well as any concerns or challenges that may arise. To effectively gather feedback from both students and stakeholders, it is important to create a structured and transparent feedback process. This could involve regular check-ins, surveys, or other feedback mechanisms that encourage open and honest communication. Once feedback has been collected, it is important to analyze and act on it. This may involve making changes to the mobile technology or how it is being used, or providing additional training or support to students and stakeholders. By taking the feedback into account, the practice placement can ensure that the mobile technology is meeting the needs of all stakeholders and supporting positive learning outcomes. To do that, healthcare leaders and students should be part of the conversation to mitigate the barriers of introducing mobile devices in clinical placements and it is essential to keep asking students what is needed from the device on clinical placement once introduced (Lee et al., 2021; Maudsley et al., 2019). This is also highlighted in focus groups: "... it is very important that these people (stakeholders and users) are also aware of the importance that as actors and participants in the use of these applications, they must act in the process of change and improvement.... (Sth/Sp/7).

Conclusions and recommendations

4. Conclusions

Introducing mobile technology in practice placements and clinical education can be a valuable tool for supporting learning and professional development of healthcare students, but some key factors should be considered to ensure that the technology is effective, sustainable, and contributes to the achievement of learning outcomes.

Students and stakeholders involved in the clinical education process present specific expectations regarding the introduction and use of mobile technology in their practical education. They shared their perspective and wishes regarding content of mobile application and needs concerning the organization of practical training in health care institutions. Some of the factors mentioned in focus groups and reported in the literature to guarantee a successful introduction of mLearning are the availability of technical support, the ease of use and accessibility of the App, the alignment with educational objectives, and the level of engagement and interactivity provided by the App.

The process of introducing mobile technology into clinical education should involve all stakeholders engaged in clinical training and institutional support, including training coordinators, mentors, students and healthcare staff (with hospital ward managers). The support of students and stakeholders such as educators, and healthcare professionals is crucial for successful digitalization. In this sense, they should be involved in the process of selecting and implementing digital tools and should receive appropriate training to ensure their effective use. A collaborative approach involving healthcare providers, educators, and students can lead to the development of innovative and effective digital learning strategies.

The effective use of mobile technology in clinical education requires the development of appropriate pedagogical strategies that support student learning. By taking into account the insights gathered from these sources, developers and educators can create a mobile learning application that is user-centered and meets the needs and preferences of its target users. This can improve the adoption and usage of the App, which is crucial for its success in practice-based learning environments. It is important to note that the design of the app should not only be informed by the users' needs and preferences but also be aligned with the learning objectives and the pedagogical approach of the educational program.

At the stage of implementing mobile technology in practical education, extensive promotional and training activities for students and all stakeholders should be undertaken. In addition, it is necessary to ensure that all parties involved in clinical education speak with one voice on the use of mobile technology, because only then can this technology be used in practice.

Sustainability of implemented mobile technology into clinical education requiring evaluation of students and stakeholders' opinion and needs. Regular evaluation and assessment should be conducted to measure the effectiveness of the mobile technology and identify areas for improvement.

Considering cultural acceptance of usage of mobile technology in clinical settings, and issues of professional image of medical personnel/students using mobile technology, patients should be involved in discussion and strategy development. Additionally, the use of mobile technologies in clinical education should result in reducing the burden of paperwork for students and stakeholders involved in education, so as to motivate all parties involved in clinical education to use mobile technology more.

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