# M-Health: Development of a Mobile Application for Therapeutic Education of Patients in Clinical Hematology

Maha Elhabchi[1], Zineb Ouaissa[2] and Kamal Doghmi[3]

[1]*Research Laboratory of Psychiatry, Medical Psychology and History of Medicine, Faculty of Medicine and Pharmacy, Mohammed V University, 10100 Rabat, Morocco*
[2]*Cloud Systems Engineer, Founder and Main Engineer at Cloud Art, Engineering Degree in IT Networks and Systems from National Institute of Posts and Telecommunications, 10100 Rabat, Morocco*
[3]*Department of the Clinical Hematology Military Hospital Mohammed V 10045 Rabat, Mohammed V University, 10100 Rabat, Morocco*

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Abstract: Introduction: Clinical hematology is a discipline that requires comprehensive and multidisciplinary care. Patient therapeutic education is an essential element of this care. In order to follow global trends, this practice has integrated e-health. Methods and materials: Before creating the mobile application, a literature review on therapeutic education in clinical hematology was conducted. Additionally, a study is currently underway to identify specific patient needs. Its objective is to empower the patient. Results: Expected results include access to information, reduction of random searches, treatment monitoring, quality of life management, and data collection. Furthermore, it will enable interaction with the community. Discussion: In clinical hematology, patients require multidimensional and quality care. A mobile application for therapeutic education will meet an essential need. It will provide an interactive platform with refined information, allowing patients to better understand their disease, improve therapeutic adherence, and access community support. Conclusion: A mobile application for therapeutic education in clinical hematology is a valuable tool that can enhance patient understanding and help them better manage their health. This innovation demonstrates the importance of using technology for the well-being of patient.

## 1 INTRODUCTION

Clinical hematology (CH) is a specialized medical discipline that focuses on the study and treatment of blood disorders. It is characterized by direct, comprehensive, and multidisciplinary care. Given the magnitude of hematological pathologies, which are severe, chronic, and progress slowly, therapeutic education remains an essential element in patient care.

Patient therapeutic education (PTE) is a clinical approach aimed at helping patients better understand their illness and treatment, as well as developing a certain degree of autonomy to better manage their condition (Nadège Corradini, 2016). The integration of e-health in this practice could bring improvements to the information provided to the patient and their involvement in medical care.

E-health corresponds to the set of information and communication technologies (ICT) in the field of healthcare. It involves the application of all internet-connected technologies to make healthcare services more accessible, efficient, and affordable. It has a significant impact in the medical field, ranging from prevention to patient recovery. E-health is part of patient support to achieve several objectives, including improving monitoring, personalizing care, and innovating (Jagnoux, 2020).

Global e-health is currently undergoing significant development, and it is being used in various forms, including telemedicine or mobile health (E-santé & m-santé, 2016). It involves mobile information and communication technologies, such as smartphones and tablets, as well as all devices connected to mobile networks (Code de la santé publique, 2009). However, it is important to note that mobile applications have a strong presence in the global Smartphone market, with an estimated 3.6 billion users in 2020 (O'Dea, 2021), resulting in 218 billion downloads in 2020 (FMT, 2021). The

healthcare sector represents approximately 325,000 health and wellness-related applications, including over 10,000 specifically dedicated to mental health (Andrew D Carlo, 2019). All these data demonstrate that nowadays, the patient has become connected, having online access to health information and becoming increasingly informed. However, it is crucial to ensure the reliability of this information.

In recent decades, Morocco has undertaken several reforms aimed at improving the health of the population, within the framework of its aspirations for human development and social justice. Considering the number of 31.59 million internet users (Benmansour Saad, 2022) and the rapid expansion of new technologies, it is now imperative to adapt to this trend. In this regard, since over 47% of the global population is connected to the internet (Brahima Sanou, 2016), integrating into this market will bring numerous benefits to patients.

After conducting research on the App Store and the Play Store, to our knowledge, there is currently no application related to Patient Education in Clinical Hematology. In this article, our objective is to explain the design of a mobile application dedicated to Patient Education in Clinical Hematology.

## 2 METHOD AND MATERIALS

The development of a mobile application requires a thoughtful, data-driven approach (S. Nundy, 2014). A literature review on therapeutic education in CH was conducted to identify the educational needs of the patient. A study is currently underway to pinpoint the specific requirements of patients in clinical hematology at the Military Teaching Hospital Mohammed V in Rabat. This will help understand the needs, concerns, and challenges faced by patients with hematological diseases.

The application will be designed for all patients suffering from hematological diseases. Its main objective is to optimize the follow-up of patients in CH by providing information about the disease, treatment, various assessments, lifestyle management, and a discussion space for questions and sharing experiences.

The application will be named "*HÉMAeduc*," referencing hematological pathologies ("HEMA") and therapeutic education ("educ"). It will allow the patient to:

- Inform themselves about the disease: definition, progression, symptoms, and diagnostic tests.

- Manage medications: track treatment (dose/timing).
- Manage appointments: send reminders for appointments.
- Lifestyle management or provide advice: exercise, pain, fatigue, dietary recommendations, and sexual aspects.
- Forum: a space for sharing (questions/answers, discussions).



Figure 1: The home screen of the application.

The application will first be made available on the Android platform for several reasons. Firstly, since Android is developed by Google, it gives us free access to all the necessary tools for application development. Additionally, it offers us a wide range of mobile devices. Then, it will be available on iOS, with free, simple, and easy accessibility, allowing all age groups/education levels to connect. It will be offered in two languages, Arabic and French. English will be added after evaluation in order to reach a wider audience of patients.

After the finalization of the mobile application, it will be tested and evaluated to ensure its ease of use and effectiveness.

Note that the advantages of a mobile application are as follows:

- Direct access to the application's content via an icon on the Smartphone.
- Functioning without the need for an internet connection.
- Ease of use.
- Traceability of all necessary data.

## 3 EXPECTED RESULTS

The development of a mobile application for therapeutic education in CH has many advantages and will have a positive impact on the quality of care and patient well-being.

The expected results of this mobile application include:

- Access to information: Providing patients with access to educational information about their disease and lifestyle at any time and place, promoting their autonomy and self-learning.
- Reducing random searches: Providing accurate and up-to-date information to better manage the disease.
- Treatment monitoring: Including features to track and remind medication intake, which can improve therapeutic compliance.
- Quality of life management: Contributing to a better understanding of the disease, treatment, and symptom management to improve the quality of life for patients.
- Data collection: Gathering data on patient use and engagement to evaluate the effectiveness of therapeutic education and enhance healthcare.
- Community interaction: Allowing patients to discuss and share experiences, ask questions, and receive mutual support.

## 4 DISCUSSION

The COVID-19 pandemic has highlighted the significance of digital platforms in healthcare delivery. The digital health market encompasses mobile health ("M-health"), which is a subset of e-health. It is utilized for managing chronic illnesses and promoting patient well-being through medical applications on mobile phones, sensors for monitoring vital signs (CareSimple, 2023), telemedicine, health information technologies (IT), and personalized medicine.

In 2020, more than 10 billion connected objects were recorded, of which 80% were in the healthcare field, with a total of 100,000 mobile applications (Stéphane Mouchabac, 2023). Mobile health applications remain an intelligent solution for obtaining health-related information, used by patients. They pursue various objectives, such as educating patients about their illness, treatment, medication management, as well as adopting a healthy lifestyle, while promoting a certain degree of monitoring and self-management (Najm, 2023).

Generally, information about patients' health and diseases comes from healthcare professionals, family members, media, magazines, and the internet (Rogers SN, 2012) Managing and controlling this information on the internet is complex, and patients may end up with inaccurate data, which can lead to serious consequences (Tabitha Tonsaker G. B., 2014). Connected patients, also known as E-patients, consult information on the internet and actively participate in their care in parallel with that offered by healthcare professionals. They use the internet to better prepare themselves for their condition (nikos-rose, 2012). Numerous studies have proven that online research (Sands, 2004) influences patients' choices and decisions. Therefore, social networks play a role in providing emotional support and give patients a voice to ask questions, share their experiences, and provide answers, which has led to the emergence of an expert patient model. Online communities have been created in the United States and France (Benoît Brouard, 2014) to allow patients to discuss and share their experiences.

The journey of care in clinical hematology is very long, it starts from the announcement of the disease until the recovery (including remission and sometimes relapse) (Nadège Corradini, 2016). The patient with a hematological disease undergoes a profound upheaval at different levels. From the announcement, their life undergoes significant changes. They embark on a reflection to understand their disease and search for information about it in order to cope with their fears and frustrations (Håkan Nunstedt, 2017). The information provided by the doctor at this stage must be clear, transparent, and formulated in a simple manner, avoiding the use of complex medical jargon (Caroline Besson, 2012), which is not always the case. Moreover, malignant hematological disorders are often unknown to patients and their loved ones, which raises numerous questions regarding the disease itself, the care journey, and the various changes that will impact their lives (RochePro, 2022). All of this drives the patient to search for information online to fill in the gaps or misunderstandings related to the provided information.

However, before the confirmation of the diagnosis, the patient goes through a path full of alerts and suspicions between the symptoms and additional tests (Martine Ruszniewski, 2012), which requires a degree of information to navigate. This information is generally obtained from the doctor, loved ones, and the internet (Martine Ruszniewski, 2012). Online

information can enhance the patient's knowledge and skills (Tabitha Tonsaker G. B., 2014), thereby developing a degree of empowerment to participate in their own care.

Therapeutic adherence is one of the pillars of care. The patient is frequently faced with managing their prescribed treatment, and it is their responsibility to handle it. According to the World Health Organization (WHO) (Patricia V. Burkhart, 2003) nearly half of the patients do not adhere to their treatment as agreed with their prescriber and this has repercussions on both the patient and the healthcare system. The stakes related to non-adherence are considerable (Nordt, 2019), as the WHO estimates that improving patient adherence would have a greater impact on human health than the development of new medical therapies. A mobile application for managing treatment and medication reminders is very useful for the patient; it offers very interesting features for better health management. Pilot studies have shown that mobile applications, especially those with medication reminder notifications, are a feasible and acceptable means to improve treatment adherence (Rachel M Morse, 2020).

Furthermore, adopting a healthy lifestyle remains the best preventive measure for hematology patients due to their fragility. It is crucial to give great importance to the quality of information provided in order to address complications related to treatments such as chemotherapy. The majority of patients receives their therapeutic treatment in the morning at the day hospital via intravenous route and finishes it by the end of the day, either orally at home. These treatments differ in terms of effectiveness and side effects, such as nausea, hair loss, vomiting, etc. (Tillier, 2021). A literature review conducted by Penedo and al (Frank J Penedo, 2020), demonstrated that telehealth plays an effective role in managing symptoms during treatment. Similarly, pain management is crucial, as shown by a meta-analysis indicating that more than half of the patients experience pain during treatment, and over 65% of patients with advanced stage of the disease suffer from it (Marieke H J van den Beuken-van Everdingen, 2016) ). E-health opens up new perspectives as it places the patient at the center of the system and allows them to participate in their own care. Nevertheless, there are an increasing number of applications dedicated to pain management (Pain Therapy, Pain Sense, My Pain Coach, CatchMyPain, etc…), but most of them are not adapted to the specific needs of patients in hematology. Furthermore, relevant advice on physical activity (Shiraz I Mishra, 2012) and sexuality (Lorène Seguin,

2020), have benefits for the quality of life of patients. Regarding nutrition, several mobile applications are already being successfully used in different specialties (Megan E Rollo, 2016).

Despite all the advantages offered by an application on ETP in clinical hematology, there are limitations such as:
• Sustainable hosting of the application requires finding long-term sponsors.
• Finding international partners in order to adapt the information according to geographical regions.
• Ensuring the update of the provided information requires a multidisciplinary team.
• Dealing with possible threats to the confidentiality and security of information transmitted through mobile applications.
• Lack of long-term commitment from the patient.

Regardless of these challenges, in clinical hematology, the patient requires comprehensive, multidisciplinary, and primarily quality care. This leads us to develop a mobile application for therapeutic education in clinical hematology to meet an essential need for patient therapeutic education. This application will offer an interactive platform with accurate and refined information, allowing patients to better understand their disease, improve their therapeutic compliance, and access community support. Additionally, this application can contribute to reducing healthcare costs in case of frequent medical visits. It will also promote the psychosocial aspect by enabling the sharing of experiences and lived experiences among patients, thus improving the quality of care.

## 5 CONCLUSION

A mobile application for therapeutic education in clinical hematology is a valuable tool for patients with hematological diseases. It promotes their autonomy, enhances their understanding of the disease, and contributes to improving their quality of life while strengthening their commitment to treatment. This innovation underscores the importance of using technology for the benefit of patient's well-being.

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