

# First Polish mobile application for patients undergoing total hip arthroplasty

Łukasz Pulik , Krzysztof Romaniuk, Nicola Dyrek, Nina Grabowska, Paweł Łęgosz 

Department of Orthopedics and Traumatology, Medical University of Warsaw, Poland

## Abstract

Total hip arthroplasty (THA) is one of the most frequent orthopedic procedures worldwide and its surgical volume is constantly growing. To address the patients' restricted access to healthcare resources and limited one-on-one contact with the surgeon during the COVID-19 pandemic, we created a reliable source of information for patients undergoing THA. The use of mHealth is increasing with access to modern technology in Poland. Information related to health issues is the second most common web search performed by older adults. Our project aimed to create the first Polish mobile application for THA patients: Endopedia.

Endopedia was developed for the Android platform based on a survey performed among patients and a collection of frequently asked questions on patients' internet forums. The content was adapted to the elderly and visually impaired requirements. mHealth solutions should not replace one-on-one conversation, but they can provide substantial support for patients in conditions of limited information.

**Key words:** public health, total hip arthroplasty, hip replacement, patient education, mobile application.

## Introduction

Total hip arthroplasty (THA) is one of the most frequent elective surgical procedures worldwide. The number of primary THAs in Poland in 2020 was 42,089, placing the procedure among the ten top inpatient operations. The capacity of THA is expected to increase significantly, despite a temporary decline due to the COVID-19 pandemic noted both in primary (30%) and revision procedures (40%). Restoring the former volume will burden the whole healthcare system and require extraordinary measures [1].

To address the problem of restricted access to healthcare resources, self-management strategies for patients could be implemented. Stress related to upcoming hip surgery is reduced by traditional one-on-one communication with the doctor.

The process can be supplemented by preoperative education plans such as dedicated classes, videos, booklets [2], or via Mobile Health (mHealth) solutions such as telemedicine [3] and mobile applications [4].

Nowadays, the use of mHealth is increasing with access to modern technology. The mobile applications can promote and help maintain a healthy lifestyle or be tailored to individual patient groups and interventions [5].

## Material and methods

Virtual communication, including websites, social networks, and mobile applications, is part of the everyday life of all ages and socioeconomic groups. Among older adults (< 60 years) in Poland, 77.7% use the internet, mainly for email communication or to find sources for health-related content [6]. Currently, at least 74.8% of the population use smartphones on a daily basis, mostly Android and iOS-based systems [7].

Smartphone applications for patients undergoing THA can encourage healthy behaviors, provide patients with information prior to surgery, and aid during recovery and rehabilitation [4].

They could also be used in fast-track or ERAS protocols (Enhanced Recovery After Surgery), increasing

---

### Address for correspondence:

Łukasz Pulik, Department of Orthopedics and Traumatology, Medical University of Warsaw, 61 Żwirki i Wigury St., 02-091 Warsaw, Poland, e-mail: [lukaszpulik@gmail.com](mailto:lukaszpulik@gmail.com)

Submitted: 14.03.2022; Accepted: 31.05.2022



**Fig. 1.** The logo project of Endopedia – first Polish mobile application for patients undergoing total hip replacement surgery. Written permission was obtained for publication purposes.

**Table I.** Sections of Endopedia – the first Polish mobile application for patients undergoing total hip replacement surgery

Main sections	Frequently asked questions
Before the surgery	<ol style="list-style-type: none"> <li>1. Get ready for the surgery</li> <li>2. Hospital bag checklist</li> <li>3. Prepare your home for your needs</li> <li>4. Should I bring past medical documentation?</li> <li>5. Pre-operation don't</li> <li>6. What is "pre-habilitation"?</li> <li>7. What to eat before surgery for better recovery?</li> <li>8. Hospital stay – what to expect and how long will it take?</li> </ol>
Hospital stay	<ol style="list-style-type: none"> <li>1. What is the hospital stay like?</li> <li>2. What does the implant look like?</li> <li>3. The day of admission</li> <li>4. The day of the surgery</li> <li>5. The first day after the surgery</li> <li>6. X-ray after the surgery</li> <li>7. Rehabilitation at the hospital?</li> <li>8. Do I need any assistance to get home?</li> </ol>
After the surgery	<ol style="list-style-type: none"> <li>1. When will I recover?</li> <li>2. When will I be discharged?</li> <li>3. The rehabilitation – what exercises will I be doing?</li> <li>4. How to walk with elbow crutches?</li> <li>5. When will I be able to walk independently?</li> <li>6. How do I get in and out of bed and climb the stairs?</li> <li>7. Sexual activity</li> <li>8. How to care for a scar? Do the swelling and pain go away?</li> </ol>

cost-effectiveness and patient safety during the COVID-19 pandemic. Additional support is worth considering when outpatient appointments are limited, and patients should be discharged as early as possible [8].

There are at least seven free-of-charge applications for patients undergoing THA in English. However, direct translation into a foreign language and usage in different health systems or cultural settings raise concerns of whether patients will benefit.

The authors of the systematic review of applications dedicated to THA patients highlight the need for collaboration between patients and clinicians at all steps while creating the content. It should reflect real-life concerns and questions related to the procedure. Also, the usability should be adjusted for older patients to ensure that they can use the application effectively [4].

Most patients undergoing surgery are eager to use mHealth applications to promote independence, reach out for information, track the recovery process or interact with surgeons [9].

However, older adults can face technical problems or can have impaired vision. Consequently, the appropriate font size, good contrast, and large button sizes should be used in the entire application. The construct should be as simple as possible with easy navigation and short sentences [10].

### Endopedia – mobile application for patients

Our project aimed to create the first Polish mobile application for THA patients (Fig. 1). The application designed with patient engagement could reduce surgery-related anxiety and help the patient fully understand the process in a setting with potentially limited access to reliable information.

The application content was prepared based on an online survey of patients after THA and internet forums for patients. Two Internet forums for patients after joint replacement surgery (over 4,000 forum participants) were screened for the most frequently asked questions. Patients were asked what information would be most valuable to them before surgery, during their hospital stay, and after leaving the hospital.

The content was prepared according to patients' needs by orthopedic surgeons with experience in reconstructive joint surgery, physiotherapists, and medical students, then transferred to sections and subsections of Endopedia (Table I).

Another important element of the work on the application was the creation of instructional videos. The Endopedia application was created based on aspects



**Fig. 2.** Video content of Endopedia. Instructions on lying down on the bed (A) and getting up (B). When using orthopedic crutches, the patient should first adjust them to height. The technique of walking on crutches is explained in the video (C, D). Written consent to present the images was obtained.

included in the MARS tool (multidimensional measure for trialing, classifying, and rating the quality of mobile health apps) [11].

We used usability recommendations for the mHealth application by Ahmad et al. [12]. The application has been adapted to meet the requirements of elderly and visually impaired people – large letters, easy navigation, intuitive construct [12].

Considering the needs of patients, we have created an Endopedia mobile application that is the first Polish-language portable source of information for patients

undergoing THA. It introduces the preparation and the course of THA in an accessible way for every patient.

After the operation, it guides limitations and recommendations for further functioning and rehabilitation. It combines educational videos, information in text and simple diagrams or pictures (Fig. 2).

It can be addressed to every orthopedic patient, emphasizing seniors and people with disabilities. The application can be downloaded for free from the Android store. The content is also available in a smartphone-specific website version, recommended for phones with

other operating systems. Ward patients pre-tested the application. An advertising campaign on internet forums and hospitals in orthopedic wards is ongoing.

Today, mobile applications for patients undergoing orthopedic surgery are not only educational. They are used for post-operative pain control, leading to faster reduction of pain and decreased opiate consumption [13] or to support the rehabilitation process [14].

On the other hand, many mobile applications have been developed to support the work and education of orthopedic surgeons and trainees. Validated measurement tools or applications containing decision-making algorithms or guidelines simplify daily work and constitute a handy reference for physicians. Other applications allow for simulations of treatments in augmented or virtual reality [15].

## Conclusions

Mobile solutions should not replace one-on-one conversation. However, they can be very helpful in conditions of limited information.

In the future, we plan to build an iOS-compatible version and expand the application with a module on total knee replacement. This is a unique project developed largely by the Student Scientific Association of Reconstructive and Oncology Orthopedics, Medical University of Warsaw, Poland, to meet the needs of patients with reduced access to medical care during the COVID-19 pandemic.

The application website is available at:  
[www.endopedia.pl](http://www.endopedia.pl).

*The authors declare no conflict of interest.*

*This research was funded by the Medical University of Warsaw; the Medical University of Warsaw funded the microgrant program for medical students, with Krzysztof Romaniuk participating in the team.*

## References

- Czubak-Wrzosek M, Czubak J, Grzelecki D, Tyrakowski M. The effect of the COVID-19 pandemic on total hip and knee arthroplasty surgical volume in 2020 in Poland. *Int J Environ Res Public Health* 2021; 18: 8830, DOI: 10.3390/ijerph18168830.
- McDonald S, Page MJ, Beringer K, et al. Preoperative education for hip or knee replacement. *Cochrane Database of Syst Rev* 2014; 5: CD003526, DOI: 10.1002/14651858.CD003526.pub3.
- Mohammadi S, Miller WC, Wu J, et al. Effectiveness of eHealth tools for hip and knee arthroplasty: a systematic review. *Front Rehabil Sci* 2021; 2021, DOI: 10.3389/fresc.2021.696019.
- Bahadori S, Wainwright TW, Ahmed OH. Smartphone apps for total hip replacement and total knee replacement surgery patients: a systematic review. *Disabil Rehabil* 2020; 42: 983–988, DOI: 10.1080/09638288.2018.1514661.
- Helbostad JL, Vereijken B, Becker C, et al. Mobile health applications to promote active and healthy ageing. *Sensors (Basel)* 2017; 17: 622, DOI: 10.3390/s17030622.
- Dziuba S, Cierniak-Emerych A, Michalski G, et al. The use of the internet by older adults in Poland. *Universal Access Inform Soc* 2021; 20: 171–178, DOI: 10.1007/s10209-019-00700-y.
- Chmielarz W. The usage of smartphone and mobile applications from the point of view of customers in Poland. *Information* 2020; 11: 220, DOI: 10.3390/info11040220.
- Wainwright TW. Enhanced recovery after surgery (ERAS) for hip and knee replacement – why and how it should be implemented following the COVID-19 pandemic. *Medicina (Kaunas)* 2021; 57: 81, DOI: 10.3390/medicina57010081.
- Abelson JS, Symer M, Peters A, et al. Mobile health apps and recovery after surgery: what are patients willing to do? *Am J Surg* 2017; 214: 616–622, DOI: 10.1016/j.amjsurg.2017.06.009.
- Morey SA, Stuck RE, Chong AW, et al. Mobile health apps: improving usability for older adult users. *Ergonomics in Design* 2019; 27: 4–13, DOI: 10.1177/1064804619840731.
- Stoyanov SR, Hides L, Kavanagh DJ, et al. Mobile app rating scale: a new tool for assessing the quality of health mobile apps. *JMIR Mhealth Uhealth* 2015; 3: e27, DOI: 10.2196/mhealth.3422.
- Ahmad B, Richardson I, Beecham S. Usability recommendations for designers of smartphone applications for older adults: an empirical study, in software usability. In: *Software Usability*. IntechOpen 2021; 1–21, DOI: 10.5772/intechopen.96775.
- Pronk Y, Peters MCWM, Sheombar A, Brinkman JM. Effectiveness of a mobile eHealth app in guiding patients in pain control and opiate use after total knee replacement: randomized controlled trial. *JMIR Mhealth Uhealth* 2020; 8: e16415, DOI: 10.2196/16415.
- Milani P, Coccetta CA, Rabini A, et al. Mobile smartphone applications for body position measurement in rehabilitation: a review of goniometric tools. *PM R* 2014; 6: 1038–1043, DOI: 10.1016/j.pmrj.2014.05.003.
- Popat R, Mohan AT, Branford OA. Current uses of smartphones and apps in orthopaedic surgery. *Br J Hosp Med (Lond)* 2013; 74: 672–676, DOI: 10.12968/hmed.2013.74.12.672.