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# Using digitalization for knowledge transfer in society is the future of transplantation: A pilot study

## ABSTRACT

**Introduction:** Recently, knowledge about transplantation among the general public has diminished. The COVID-19 pandemic has worsened this transplantation-related crisis, but has simultaneously contributed to the greater development of online education. The aim of the study was the assessment of the level of general public knowledge regarding transplantation and suggesting new possibilities of utilizing digital forms of information transfer in the process of societal transplant education (STE).

**Material and methods:** An online survey questionnaire, containing questions related to common transplantation knowledge, was conducted among students of faculties of medicine.

**Results:** Nearly the entire study group indicated that increasing knowledge as regards organ transplantation may prove to have a significant impact with respect to donating organs after death for transplantation. The study revealed that over 60% of respon-

dents held a false belief that a declaration of intent was a legally binding document rather than only a declaration of will. Over 20% of respondents erroneously believed that the donor's family had the right to object to organ procurement for transplantation. Facebook, websites for patients and applications were indicated as effective forms of STE. Having obtained the results, the first Polish prototype of an “e-transplant” application was designed for the purposes of STE.

**Conclusions:** The level of knowledge concerning organ donation for transplantation is insufficient among the general public and necessitates the development of modern STE methods. All forms of information transfer in the virtual media space become particularly useful for the purposes of STE, including the created application.

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**Key words:** societal transplant education; digitalization

## INTRODUCTION

Presently, the world offers a host of new information transfer technologies that enable building a modern knowledge society of the 21<sup>st</sup> century. The Internet, as the main repository of knowledge, facilitates decentralization of information sources as well as an individual approach and creativity in their use. Continuous learning, updating knowledge, and acquiring the skills to employ new technologies are therefore a necessity of modern times [1]. Currently the question is how to educate society,

especially regarding such a complex topic as health education (HE).

HE is defined as activities aimed at propagating information about health issues, nature and causes of diseases, and relationships between lifestyle and diseases. It is meant to increase people's motivation to change their conduct, particularly to modify health risk behaviors [2, 3]. Thus, HE constitutes a core example of societal education (SE), focused on improving the quality of life of individuals and the general public, with application of various media.

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Many HE programs target less educated and older people. Moreover, information provided by mainstream mass media may be insufficient and may reach a shrinking group of recipients, given that the media space is already dominated by online media that gain ever more popularity among information recipients, especially younger ones [4].

The importance of educating the public about transplantation has been discussed in medical communities for years. Based on the consensus following the conference “Live Donor Community of Practice” initiated by the American Society of Transplantation in 2014, Waterman et al. formulated appropriate recommendations, pointing out that living donor kidney transplant education of patients with kidney disease eligible for transplantation should occur repeatedly. The authors stress the importance of supporting those who are involved in transplantation and dialysis in this educational process, as well as the necessity for medical teams to constantly perfect their skills to educate patients. However, what is most relevant for this article is that it is indispensable to create appropriate tools for transferring information via new technologies and improving educational content [5].

As stipulated by the Polish law, cells, tissues, and organs may be procured for transplantation from a deceased person if the deceased did not object to organ donation during his/her life [6]. In 1972 in the UK, Elisabeth Ward initiated *donor cards* that have been successively adopted in many countries, including Poland, where implied consent exists [7]. Such a declaration of intent is of an informative nature, and there is no need to report or register it anywhere. Nevertheless, it is recommended that one informs about one’s intent one’s relatives since they are asked about the deceased family member’s decision expressed during his/her lifetime as part of the organ procurement authorization process.

Currently, there is no evident increase in social awareness about organ transplantation despite the activity of organ recipients and their families and the efforts of the transplantation-related community to disseminate relevant knowledge.

The present organ-transplantation crisis was significantly worsened by the COVID-19 pandemic. The understaffing of transplant teams owing to sick leave, creation of isolation wards and consequent delegation of traditional medical tasks to combat the pan-

demic, and relocation of medical personnel greatly affected educational initiatives on transplantation. Transplantation-related issues were almost completely erased from the media space as the media focused on the SARS-CoV-2 infection. Pandemic restrictions introduced limitations concerning mass gatherings, making it impossible to educate the public during meetings and cultural events.

However, the pandemic also contributed to the development of education in all areas of life occurring in the virtual space. Thus, the COVID-19 pandemic influenced HE processes in two stages — initially, it slowed them down, then it generated a new type of health-promoting impact on society via digital information transfer.

## CLINICAL RATIONALE FOR THE STUDY

An objective assessment of knowledge in the general public, and particularly its lack, as regards basic legal regulations and transplantation-related notions is imperative in modern times. This is the only way to recognize how much transplantation communities need to do. In order to create information content of new quality, new tools must be designed to influence social awareness. These tools should be adapted to the environment in which the general public functions, and modern societies mostly reach for digital information.

## AIM

This study aimed to assess the level of knowledge in the general public about basic organ transplantation issues and to suggest new possibilities for utilizing digital forms of information transfer in the process of societal transplant education (STE).

## MATERIAL AND METHODS

In January 2022, an online survey questionnaire containing 15 questions related to common knowledge about organ procurement for transplantation was conducted among 63 students of *Collegium Medicum*, Nicolaus Copernicus University (Toruń), and *Collegium Medicum*, University of Warmia and Mazury (Olsztyn). Initially we intended to survey more students. The limited number of students (63) resulted from a very short deadline for completing the project whose results were to be presented at the transplantation conference held in the Senate of the Republic of Poland in January 2022. We had no influence on this deadline.

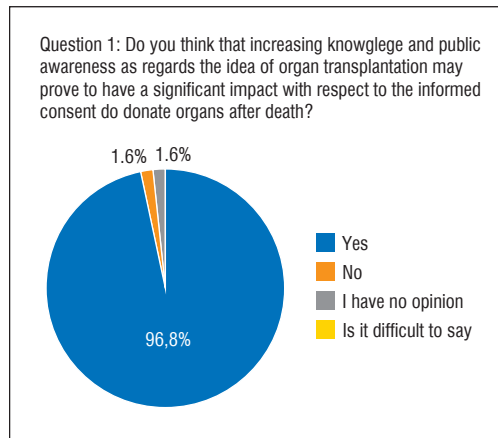


Figure 1. Answers to question 1

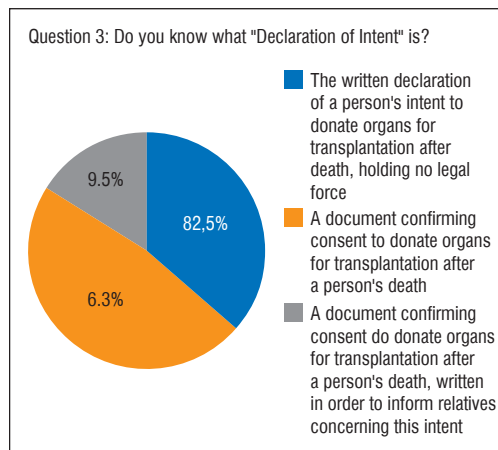


Figure 3. Answers to question 3

Statistical analyses were performed with Statistica 13.1 software, and the pie charts were created in Microsoft Excel.

A prototype of an educational application called “*e-transplant*” was designed (Age-mit Company). Adobe software was utilized to prepare its graphic design and Adobe Illustrator 2022 CC (26.0 version) to create vector graphics that were processed in Adobe XD (51.0.12 version) to design its interface.

## RESULTS

Almost all of the study group (99.8%) indicated that increasing knowledge and public awareness about organ transplantation may prove to have a significant impact on informed consent to donate organs after death (Fig. 1). Simultaneously, many respondents (82.5%) claimed that information about transplantation provided by various media was insufficient (Fig. 2).

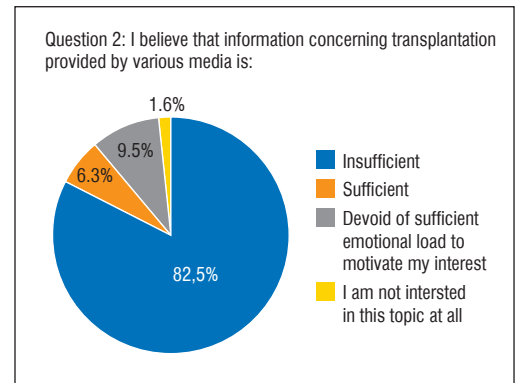


Figure 2. Answers to question 2

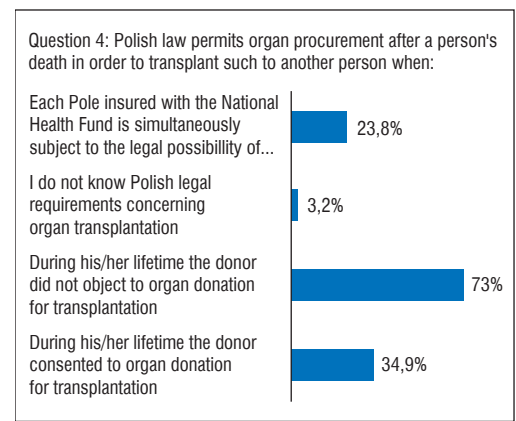


Figure 4. Answers to question 4

The study demonstrated that only 36% of respondents understood the notion of the declaration of intent correctly while over 60% held a false belief that the document revealing one's intent was a legally binding, rather than informative (Fig. 3). The survey confirmed a low level of knowledge about legislation regulating organ donation for transplantation (Fig. 4). An erroneous answer that in Poland organs can be procured for transplantation after death when “consent was given” was provided by 34.9% of respondents. Respondents (23.8%) also mistakenly equated consent for medical services, which they provide within the framework of primary healthcare, with consent for organ donation.

Over 20% of respondents were mistaken in thinking that the donor's family has the right to object to organ donation. The results concerning the role of the donor's family in the process of organ donation are presented in Fig. 5.

As forms of SE that effectively shape public awareness (Fig. 6), respondents primarily indicated meetings with organ recipi-

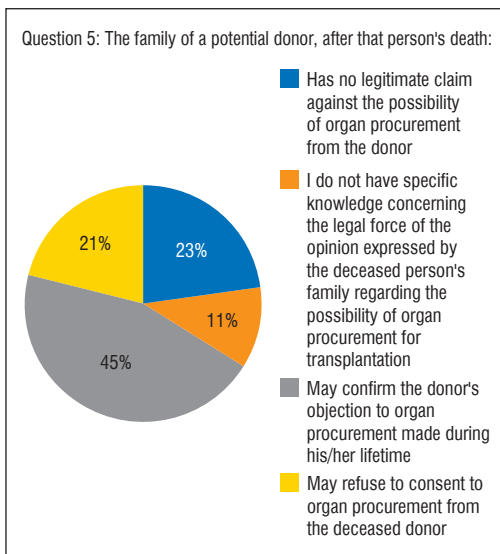


Figure 5. Answers to question 5

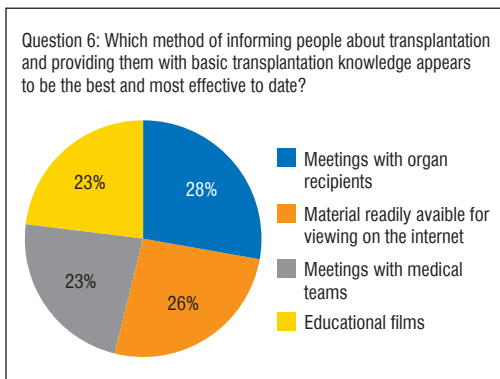


Figure 6. Answers to question 6

ents (28%), followed by information obtained on the Internet (25.7%), educational films (23.4%), and meetings with medical teams (22.7%).

As efficient and attractive digital forms of providing information, serving as a potential source of knowledge on transplantation, respondents indicated: applications (73%), Facebook (58.7%), and websites for transplant patients (30.2%). Fig. 7 illustrates the responses given to this question.

A powerful and unambiguous message was obtained when respondents were asked to complete the sentence: "If I were to help with raising awareness about transplantation and increase the number of organs donated for transplantation, I would...". One of the most interesting answers was as follows: "I would educate the largest number of people in order to encourage them to confirm their declaration of intent, (...) so that each person was prop-

erly educated and left the declaration of intent (positive would be the best), for instance, with the General Practitioner to eliminate the problem (...) whether the family consents or not".

Many respondents suggested that "the number of events that promote transplantation be increased", whereas all of them confirmed the necessity to organize media campaigns and invite transplant recipients to both traditional and social media. The boldest ones recommended "expressing the intent (to donate organs) in social media". The target group of STE was identified: "children should be educated and familiarized with the topic of transplantation so that donation is something natural, and the next generation would not need to deal with the family's 'refusal' because of prejudice or other beliefs".

A few respondents proposed introduction of a compulsory course in schools and universities aimed at implementing elements of general knowledge about organ donation into everyday social life.

## DISCUSSION

As the survey results demonstrate, STE constitutes the basis of disseminating knowledge in the society, hence influencing the subsequent process of organ donation (Fig. 1). The majority of respondents (Fig. 2) felt that information concerning transplantation provided by the media was insufficient. Given their relatively young age and fields of study, the study group should be considered as having a high level of medical knowledge. Consequently, the results in other social and age groups should be expected to be much worse.

The results revealed that over 60% of future medical doctors did not know basic precepts of the Polish transplant law and its social implications (Fig. 3).

The most striking result concerned the lack of knowledge about the role of the donor's family in the organ donation process (Fig. 5). This issue, combined with the wrong interpretation of the legislation, is a common source of misunderstandings and fake news during transplantation-related events organized in Poland. The survey results perfectly illustrate this problem. The necessity of actively conducted STE was also confirmed by surveys performed by the Public Opinion Research Center, which revealed that 75% of Poles have never talked about organ donation with their relatives [8].

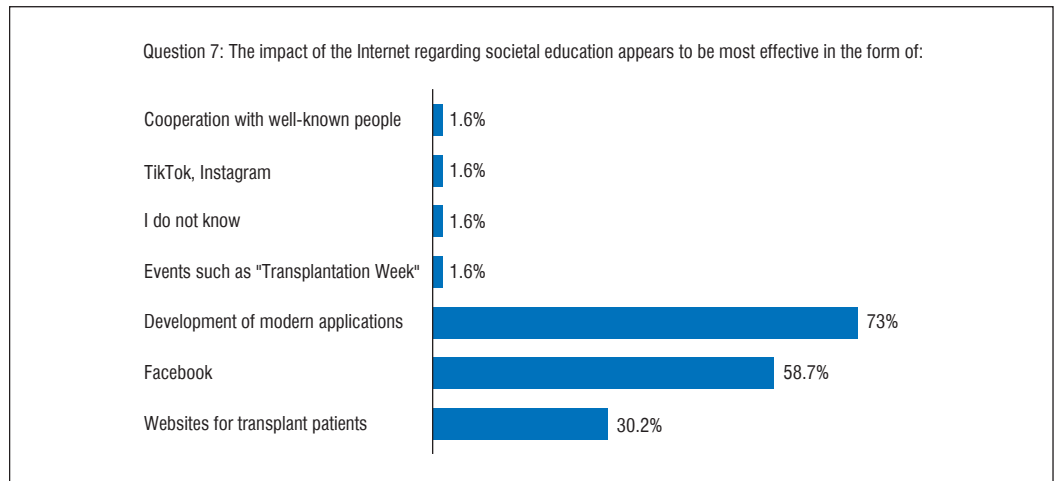


Figure 7. Answers to question 7

### INEQUALITIES IN EDUCATIONAL PROCESSES

Currently, the elderly, who are less able to cope with learning and operating new technical devices, are most vulnerable to exclusion due to their insufficient adjustment to modern information transfer [9, 10].

Although part of the society apparently has not adapted to rapidly changing educational modalities, including online ones, the COVID-19 pandemic and the resulting self-isolation blatantly revealed that modern technologies have not been sufficiently utilized in SE.

Yet, various means of electronic communication offered increased opportunities for acquiring knowledge [11, 12]. Thus, although the COVID-19 pandemic affected formal education negatively, it brought the society significantly closer to non-formal education and self-learning in the virtual space.

As reported by Zimmerman et al., inequalities in access to information are a serious problem of SE worldwide, leading to inequalities in HE, and consequently to inequalities in mastering proper health-promoting behavior [13]. As regards STE, currently it appears indispensable to search for means to offer broad and as equitable as possible access to information among various social groups. However, owing to the fast pace of changes involving thinking habits as observed in the younger generation, this age group seems the most valuable target group for STE.

### SCHOOL-BASED HE

Birch et al. emphasize in their study that high-quality school-based HE conditions health, which is indispensable in achieving learning success. Thus, improvement in both

formal and non-formal HE among students should be strived for [14, 15]. The significance of school-based HE is also indicated by Charzyńska-Gula et al. who stress that comprehensiveness and universality of school education enable systematic HE from the earliest age of pupils, hence indirectly influencing parents and guardians. Quality HE in schools is the most cost-effective and long-term investment in society's health. This is confirmed by the survey results since the majority of respondents indicated school age as optimal for acquiring knowledge about organ transplantation. They stressed the potential impact of well-educated pupils and/or students on their relatives' beliefs and thus on the way of thinking of another generation. This was also evidenced in the suggestion to include the basics of STE in the curricula of schools and universities, especially medical ones.

### PATIENT EDUCATION BY A MEDICAL TEAM

It is stressed in the relevant literature that each contact of medical staff (physician, nurse, physiotherapist) with a patient should include educational elements as the best possible means for providing reliable health information [3]. As regards transplantation, this role is often assumed by transplantation teams and transplant coordinators.

However, according to the study results, only 22.7% of respondents indicated medical staff as an effective source of information, placing this group in the final position, and Internet sources and meetings with patients as more effective educational methods. This is consistent with most literature data and may result from the lack of preparation of medical staff in

propagating transplantation knowledge (apart from a group of specialists). The group providing education should be definitely extended to include General Practitioners who have the first medical contact with patients. Respondents selected this group of physicians as potentially useful to disseminate transplantation knowledge among the general public.

### TECHNIQUES EMPLOYED IN STE

The forms of educational and informative activities concerning organ donation and transplantation are varied and utilize multifaceted methods of knowledge propagation, e.g., expository methods (providing information during talks and lectures), programmed instruction (currently with the use of modern technologies, including applications), and exposure methods (when given issues appear in films and TV series). In 2020, a positive impact of a satirical show on the willingness to donate organs was reported [16] as well as the application of social marketing methods [17, 18].

In March 2022, the Kidney Transplant Center in Bydgoszcz, using effective marketing methods and distribution channels developed by an advertising agency, provided declarations of intent directly to 30 thousand university students in Bydgoszcz and Toruń. For the first time, advertising booklets, available on the market since 2007, contained declarations of intent [19].

### DIGITALIZATION OF INFORMATION IN STE

Thus far, a narrative approach to SE, and particularly to HE, has been one of the most effective means of communication. Currently emerging new technologies, such as online education platforms and applications for mobile devices, offer new opportunities. These tools for transferring digital information were also indicated by the survey respondents who perceived them as effective in accessing information quickly (Fig. 6, 7). As an innovative approach to HE, Adam et al. suggested the combination of local experiences in the narrative approach and digitalization of knowledge [20]. This approach based on merging of traditional and digital methods in STE, with educators' personal experiences, seems to us to be most optimal and promising. This is the path followed by the originators of the educational application in creating its prototype described below.

Considering new approaches, the project described by Waterman et al. was especially

interesting. The authors created a web-based digital library including narratives of living donor kidney recipients, donors, families, and patients waiting for transplants [21].

As this analysis implies, modern digital tools will become even more popular. Such tools are particularly useful for STE targeted at adolescents and young adults and are well suited to the demands of modern times.

### "E-TRANSPLANT" APPLICATION

The modern world is changing rapidly. Hence, the transplantation community must adapt its forms and methods of education and interaction with society to achieve its goals in these new conditions. The main aim is to increase the level of knowledge among the general public about basic issues related to donation, which may increase the number of transplants in the future.

For these reasons, for the first time in Poland, we developed a prototype of a STE application. It was designed by the Liver Transplant Center in Bydgoszcz in cooperation with the *Agemit* Company and is meant to be used in schools, dormitories, offices, universities, and homes of Poles as a convenient, attractive, and modern tool for disseminating transplantation knowledge. We called it "*e-transplant*" to signal our approach: shifting the focus from traditional to digital methods in STE. We believe that digitalization of education is the future of transplantation. Having reviewed relevant literature available worldwide, we had not found reports on a similar application, which was a further motivation to continue this project.

The application used in STE meets the expectations of school and university students, as confirmed by the study results. These age groups use applications dedicated to various areas of life daily and are familiar the virtual space. The created application is perceived as modern and effective, and thus an attractive form of social interaction.

The idea of employing the application in STE perfectly combines the traditional methods of SE (lectures, meetings, brochures, and books) with the modern way of transferring knowledge. It accommodates educators' experiences and trainees' expectations and meets formal and legal requirements. The information offered digitally is systematized (tabs for particular transplant organs) and authorized (cooperation with institutions and scientific associations), and each problem is covered

by standards and legal provisions. What is truly innovative about it, is the possibility of locating the nearest transplant center and establishing direct contact with the transplant coordinator to obtain information. It is also possible to click “Yes” in the application system as a conscious and symbolic act of accepting organ donation, which is visible for family, friends, and acquaintances who use smartphones daily.

The prototype is ready for development and will be further improved during the project implementation. Great interest in the “*e-transplant*” application expressed by various communities involved in the promotion of STE in Poland makes it, in a way, a moral obligation for the originators to continue working on the final product.

## CONCLUSIONS

The level of knowledge on the issues related to organ donation is insufficient among the general public and necessitates the development of modern STE methods, especially effective in young age groups.

In the era of digital information, all forms of information transfer in the virtual media

space become particularly useful for STE. The educational application described in this article can be a valuable and modern tool for promoting STE.

## CLINICAL IMPLICATION

The results indicate the necessity to continuously increase the level of knowledge about transplantation with various STE methods.

Young people, who shape the manner of thinking of new generations, constitute a particularly valuable target group for STE. The survey results reveal that digital forms of modifying social awareness are user-friendly and acceptable for young people, and consequently worth introducing into STE. Considering the results, the development of modern applications, similar to the one we have presented, may prove to be the future of transplantation.

It needs to be stressed that the results presented in this work are only part of a pilot study conducted with 63 students. Research should continue and be conducted on larger groups of respondents.

## CONFLICT OF INTEREST

None to declared.

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