



Application of Game-like Simulations in the Spanish Transplant National Organization

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ABSTRACT

Twenty years ago, the Spanish National Transplant Organization (NTO) started a management and organizational system, known as the Spanish Model, that has allowed the NTO to occupy a privileged world position regarding deceased donation rates, which have been 33–35 donors per million population in recent years. One of the key elements of this model is its instructional approach. Two years ago, the NTO started the project “educ@nt” in close collaboration with the e-UCM research group of the University Complutense of Madrid to support and maximize its successful professional training system. As a result, 3 game-like simulations have been developed representing the different procedural steps of the suprahospital level of the transplantation process. These simulations represent the donor and organ evaluation, the allocation of organs applying the corresponding geographic and clinical criteria, and the logistics of transportation. Simulations are based on 10 representative teaching cases that help students become familiar with the most common cases arriving in the NTO. For the 2nd consecutive year, these simulations have been used in different courses around Spain.

THE EXCELLENT deceased donation rates achieved by the Spanish National Transplant Organization (NTO) during recent years are the result of the so-called Spanish Model of Organ Donation and Transplantation.^{1,2} One of the key elements of that model is the continuous professional training targeted to all professionals directly or indirectly involved in the process of deceased donation through dedicated courses focused on the procedural steps of the aforementioned process. These necessarily include those steps mainly dependent on the NTO as the suprahospital agency in Spain.

The NTO, in close collaboration with the Complutense University of Madrid, has been working for 2 years on the “educ@nt” project. The results of this project are 3 low-cost educational game-like software simulations representing these suprahospital processes, to give support to and maximize the NTO instructional approach.

MATERIALS AND METHODS

These game-like simulations were developed with the use of the e-Adventure game platform that facilitates game development and integration of the games produced into the learning processes while at the same time reducing technical and cost constraints.^{3,4} The methodology to develop these simulations followed the idea of

achieving a more detailed and fine-grained formalization of the NTO processes. First, we investigated and acquired as much knowledge as possible about the NTO procedures to be simulated. Because common errors and other tacit knowledge⁵ are not usually formalized in the procedures documentation, we obtained this information by interviewing NTO experts. This kind of information was then represented by using, among others, game elements. Also, with NTO expert help, we selected a set of 10 actual donors as representative teaching cases to use. Game mock-ups were then developed and formatively evaluated by NTO experts to ensure that the information had been properly acquired and that the procedures were being represented as expected. If any mistakes were detected in the representation, the specification of the procedure as well as the simulations were modified and validated again. This phase tried to avoid what can be referred to as software failure, where a software developer does not grasp the domain and its

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intricacies correctly and thus develops software that is not useful for the medical user. This methodology continued following a cyclical process where each loop included a new version, which was finished, evaluated, and improved by fixing the mistakes found. These simulations are aimed at any health staff who want to practice and improve their knowledge of the suprahospital transplantation process.

RESULTS

Three simulations were developed as a result of this project. The first simulation represents the process of organ and donor evaluation. The student is asked to analyze an incoming donor case and determine whether or not each organ is suitable for transplantation. To do so, the student has to identify which information is relevant for the evaluation of donor and organ suitability. During the simulation, any missing data can block the evaluation of one or more organs. The second simulation represents the phase of organ allocation. The student is asked to allocate the liver, heart, and lungs to the corresponding hospital, taking into account the national allocation criteria. The student must demonstrate that he/she can oversee this allocation process by identifying the information that needs to be verified and then offering the organs to the proper hospital. And the third simulation represents the logistics of transportation. The first thing the player has to do when starting this simulation is the synchronization of the extraction time of every organ and transplant team involved. To achieve this, the player needs to make several calls to the transplant coordinator of each recipient hospital and to the donor's hospital. Depending on whether the organ or transplant team needs to be transported by plane, the player has to call the airline to be sure that there are planes available and to know at what time they will be ready to pick up the team.

After synchronizing the extraction time, the player has to wait until the donor coordinator calls to inform him/her of the beginning of the extraction and then he/she needs to call every transplant coordinator involved. This process is repeated for the suitability of organs and the rest of the steps until the transplantation is completed. Because time is a very important factor in the whole process, the game element of player lives has been included to emphasize it. Each life lasts 6 minutes, and each simulation has 3 lives, so the player will have 18 minutes to complete the full simulation properly. Lives can also decrease if the player makes critical mistakes.

These 3 game-like simulations have already been used twice as part of the educational program for transplant coordinators in Spain.

DISCUSSION

Educational simulations in the medical arena have been proven to be effective. They provide students with the opportunity to enhance knowledge and skill acquisition in

a safe environment. By using screen-based simulations, the NTO will profit from the benefits of the case-based teaching system combined with the benefits of simulations and games.⁶

We already know that in these kinds of games we learn from practicing, with direct feedback in an entertaining and low-risk environment.^{7,8} Also, it is said that by allowing active learning experiences, educational games stimulate higher thinking such as analysis, synthesis, and evaluation. We can also say that while playing and learning, the stress and anxiety of the real-life experience is notably reduced and as a result the level of retention may increase.

These 3 game-like simulations have already been used in 2 NTO courses in 2013. With the feedback given by NTO trainers and students, our next step is to improve these simulations. These improvements include the simulation of random calls to better represent the pressure NTO nursing personnel experience every day. NTO experts also requested the inclusion of pancreas allocation and transportation in the second and third simulation. To make the set of teaching cases more representative, a child case will be included to help students better understand this specific distribution process. Finally, we will enrich 2 of the educational cases, modifying the donor's hospital information to include a hospital in Catalonia and another hospital in Andalusia to improve the coverage of organ distribution, because these 2 Spanish regions have slightly different distribution processes.

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