

DietaDialisisQuiz. A multiplayer competitive serious game for learning during dialysis

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Introducción

When a patient with chronic kidney disease (CKD) reaches the final stages, in which he or she needs renal replacement therapy, one of the widely used options is haemodialysis. This treatment, which is ambulatory in specialised centres, usually takes 4 hours in average, 3 times per week^{1,2}.

Patients on haemodialysis: education and entertainment needs

Not only for the kidney disease but also for the dialysis treatment, patients on haemodialysis present numerous needs, which must be addressed by the nursing staff and include: difficulty in adhering to the renal diet, lack of knowledge, problems of social isolation and leisure or entertainment needs during the duration of the dialysis, amongst others, according to the literature cited^{3,4}.

The renal diet applies different restrictions and adjustments of macronutrients, of which the restriction of water intake is foremost, to avoid fluid overload and pulmonary edema which are life-threatening factors; an increase of daily proteins, to avoid malnutrition, such as different ions, emphasis on sodium restrictions; potassium restriction, as an excess will cause a life-threatening emergency; and phosphorus for its severe consequences on the renal patients' morbidity and mortality^{1,5,6}.

Nevertheless, in spite of that proper adherence to the renal diet will increase the benefits of the renal therapy

and decrease the health-system costs linked to a higher morbidity, the fact is that the diet adherence is at 50% in developed countries⁷, thus proving the importance of promoting the nurse's educational function as long as possible⁸.

Considering the lack of knowledge on the health condition faced by patients and regardless of the ailments they are suffering from, new technologies are taking a stronger stance as sources of information that can help the patients get more empowered in relation to their health: the concept Health 2.0 has appeared. Different websites, blogs, apps, or educational games instruct, teach or advise patients about different illnesses, even though there are cases where the evidence on which the information is based, is questionable. In the case of renal patients, there is a wide range of games, blogs and apps that can be useful^{9,10}.

Because the patients on ambulatory dialysis therapy deal with a treatment routine that happens three times a week for 3 or 4 hours, this becomes repetitive. The patient gets into a process of adaptation that starts with the search for a distraction or social support but which, as the time on treatment passes, evolves towards social isolation, opposition or confrontation¹¹. The duration of the sessions offers an opportunity to the nursing staff for an interpersonal relationship with the patient to provide entertainment and health education. Apart from the journeys and the number of weekly sessions, the duration of each session worsens the perception that the patients have about the disease and the experience with treatment, as many patients state that hours take very long. The literature consulted shows the patients' positive response towards suggestions on leisure during the treatment sessions^{3,11}.

The literature consulted shows that patients on dialysis treatment have educational needs, lack of knowledge and of entertainment; and that, there is a time lapse during the renal replacement treatment that could be used by the nursing staff to satisfy the renal patients' needs.

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Serious Games in the health-care system: entertainment that educates

Serious games are videogames that, using the appealing factors of digital leisure, such as interactivity and experimentation without effect on real life, seek to educate and train the player on real subject matter to develop. By using an entertaining interactive tool with feedback, reinforcement or penalty features, we can achieve learning about a given matter, train specific skills or improve problem-solving capacity through the use of determined resources. The serious games differ from other "new technology" because the educator is who develops the contents and marks the learning curve, unlike websites, blogs or applications, which expose the contents with little space for interaction^{9,12,16}.

The advantages of using serious games evidenced by the literature reviewed are: increase of desire towards learning; safety to train skills in a virtual world without effect on the real world; ease to transfer information and motivation towards changes in attitude; improved decision-making skills, improved social skills, increase of creativity and spatial and motor skills^{9,12,16,19}. As drawbacks we find isolated cases of epilepsy and abuse – no addiction²⁰.

Serious games have experienced great expansion into different areas of knowledge and among them are the health sciences. Both by way of serious games and also using other virtual environments, new technologies are there for the health-carers' and patients' education and training^{9,13,15,21}; especially in the field of nephrology there are applications as RenalHelp, Nefrodiet or Pukunoios, which help the renal patient. However, this study has not found any serious game addressed to renal patients in the literature consulted.

Our goal is

By the bibliography consulted, this work suggests creating a competitive multiplayer serious game to be used by renal patients during the hours of dialysis, with the aim of satisfying the educational needs, focused on the renal diet and the needs for entertainment through a group game.

Material and Method

A literature search was conducted to establish the reality of use of serious games in the health care. Also, a review on the necessary features that a game must include and what kind of game to offer to different player

profiles was carried out. The review showed several elements that serious games must include: the game has to be fun; this is essential, so that the player does not quit; it must include motivation and feedback elements and must be coherent towards the target audience, coherence between the content, the development and the user profile (age, usual player or not, preference, education level)¹⁷⁻¹⁹. Moreover, it was analysed the use of multiplayer commercial games suggested by several authors, for its capacity to increase motivation and improve social behaviours^{9,18,19}.

A second literature search was carried out to collect advice and recommendations about the renal diet for patients on replacement treatment, and find enough information about safe and dangerous food, how to prepare them, what amounts to put in the diet or how consumption affects patients. The information collected was used to make questions and answers regarding the diet of renal patients on dialysis.

Specifically designed for the patient on dialysis, the game is developed on mobile phones, as they are versatile and compact devices, with simple menus that are easy to use with one hand, big buttons easy to distinguish and soft colours to make it nice and comfortable. According to the literature consulted, the game contains motivational elements, such as different colours and sounds for right and wrong answers and a ranking with score to encourage competition.

The questions and answers prepared were loaded on a server to which the game connects via WIFI; the use of a server is convenient because it allows to update, modify, add or delete questions at any time without need to access each mobile device. It even allows changing the subject to learn by modifying completely the content to ask.

Results

As a conclusion, it was established to design a competitive multiplayer serious game, which could be played by people with no experience in videogames, based on questions and answers targeting an adult audience, to be played during the dialysis period and whose subject matter will be the renal diet.

Upon switching on the mobile device, a launcher (interface that launches the apps) activates allowing access only to the game, avoiding user misunderstandings and removing barriers like those that happen to be the conventional operating-systems menus. The first mobile phone accessing the app initiates the game (**Figure 1**)



Figure 1. App starting screen.

to which the devices starting the app immediately thereafter connect, with a total of four players (**Figure 2**).

During the game there are two modes: classical quiz mode and quick round mode, where questions appear randomly with four possible answers and only a right one. The questions are the same for every player at any time. On the classical quiz mode, which appears in the first place, the players must answer each question within a given time and every player giving a right answer scores.

After finishing the first mode questions, the game goes automatically to the quick round, where only the fastest player giving the right answer scores and passes to the next question until the game gets to an end. Once it is over, a ranking appears showing the players' scores (**Figure 3**).

Each game mode is made up of 30 questions so that it does not feel too long or short. A question number indicating the stage of the game is shown on the top left of the screen (**Figure 2**) and the passing from one mode to the other is done through a short break announcing the quick round.



Figure 2. Four players connected.

The game can be played as many times as desired and the questions appear randomly to avoid repetition of contents in a pre-set order.



Figure 3. Final ranking.

The costs arisen from the development of the game and the launcher and the purchase of mobile phones are to be paid by the author of this study, without external financing.

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