Improving Parents' Experience in the Pediatric Emergency Waiting Room: Researching the Most Optimal Design for an Information Tool

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Abstract

To improve parents' experience in the pediatric emergency waiting room by means of an information tool, the information needs of parents and pediatric patients need to be determined. It is necessary to find an optimal design for the information needed to be understandable by and useful to the parents. This paper presents the first step of designing an information tool aiming to improve patient/parent experience, encourage the understanding of the care process, and optimize the patient-caregiver relationship. In order to acquire insight into parents' information needs, exploratory interviews were conducted and benchmark research had been performed. Furthermore, one focus group session with parents was conducted to identify their information needs, determine the format of the information tool, and visualize the best ideas by using paper mock-ups. The focus group concluded that parents prefer an information screen to a smartphone application. The designed mock-up visualizes and explains the care process, and represents one's position in the waiting queue. The mock-up was evaluated through questionnaires.

Keywords:

Emergency Medical Services; Human Factors; Patient-Centered Care

Introduction

Overcrowding is a common problem in Emergency Departments (ED) worldwide [1]. Parents who arrive at the Pediatric Emergency Department (PED) often experience high levels of tension and stress caused by the unfamiliar setting of the PED, the lack of available information and the long waiting times [2]. This may aggravate their experience and influence their relationships with healthcare providers [2]. Providing information about the ED processes of care might improve the patient/parent experience and satisfaction [3,4].

Patient-centered care is important to meet the information needs of parents. The institute of Medicine (IOM) defines patient-centered care as *"Providing care that is respectful of, and responsive to, individual patient preferences, needs and values, and ensuring that patient values guide all clinical decisions"*[5]. Providing patients with information/education concerning their care is part of patient-centered care [6]. To provide this information/education, input from patients is an essential part in order to achieve a patient-centered design. In human factor engineering, the design of products will be made compatible with needs, limitations, and abilities of people [7]. Taking these factors into account, a tool can be used to represent the required information [8]. By using interaction design principles, the information needed can be transformed into a graphical user interface (GUI) that meets the needs, limitations and abilities of patients. A design of the interface that respects end-users' needs and characteristics will eventually contribute to a positive user experience [9].

At the PED of the Academic Hospital of Lille, there is no indication in regard to the waiting process and the waiting time in the waiting room. Therefore, Project WAIT has been initiated. Project WAIT aims to develop a tool to provide pediatric patients and their parents with the information needed during their presence at the PED. The purpose of the tool is to improve patient/parent experience, to encourage the understanding of the care process, and to optimize the patient-caregiver relationship. Initially it was assumed that parents would need an indication of the waiting time. However, it is uncertain what the specific information needs of parents are and how this information should be provided taking interaction design principles into account. This paper focuses on researching the information needs of parents and pediatric patients during their presence at the PED, in order to design a tool that optimally represents their information needs.

Methods

Preparation for the Focus Group

Semi-structured interviews were conducted with one hostess and one experienced volunteer at the PED. They were chosen to be interviewed because they are responsible for informing parents/patients and help them have a comfortable time in the PED. They were asked to give their opinion about the frustration/tension at the PED, the content and design of an information tool, and their suggestions to improve the PED. The interviews were used to lay the foundation for the content of the focus group.

To support the focus group discussions, a list of information and features identified as being useful for parents/children during the waiting period was established based on the results of the interviews combined with existing literature and benchmark research of existing solutions used in PEDs. This list was discussed in group (M.H, J.S. and R.M.) to determine the items that could be relevant in the Lille PED context till a consensus arose. The final list consisted of sixteen types of information/features.

Focus group

One focus group session was conducted to explore the opinions and motives of parents regarding the most optimal information tool for the PED [10]. Parents are the most important target group for the tool, which makes their input very important [7]. Eleven parents were approached to participate in the focus group. The parents had to have at least one child under the age of sixteen, because Lille PED is intended for children up to and including age fifteen. The parents were contacted by telephone.

The focus group aimed to (i) conclude what information the parents would like to see in the tool, (ii) decide what the format of the tool should be: an information screen or a mobile application, and (iii) gather the best visual ideas by using paper mock-ups.

The structure of the focus group was based on the Design Studio method. By using this method, a design direction was created for the first visual version of the needed information in a mock-up [11]. Firstly, the aims of project WAIT were introduced. Then, the focus group was divided into two parts: voting for the best ideas of information and their format, and sketching mock-ups.

Part 1: tools' format and information / features needed

The central question was "What information do you prefer to see in the tool?". The participants were asked to choose items from the list that should be included in the tool. Each participant was able to vote for three items. They were asked to indicate whether they would prefer to see the item on a large-size information screen in the waiting area or on a smartphone application. They could show their preference by means of the color of a post-it: pink post-its indicated a large-size information screen and blue post-its a smartphone application. After voting, they were asked to explain their choices. The items that received the most votes and could be represented in a mock-up, were considered for visualization during the second part of this focus group.

Part 2: Sketching mock-ups

In the second part, the participants were asked to draw mock-ups of the best solution for the tool. To give them inspiration, a few examples of existing initiatives were shown (ex. Infokids [2] and Q-Nomy's Dr. Avatar [12]). Firstly, the participants were divided into two equal subgroups. In each group the participants were asked to individually draw the information chosen during the previous part on a mock-up. Each participant had to explain his/her individual mock-up to her/his subgroup. Based on the subgroup discussion, each subgroup had to draw a new mock-up. Secondly, each subgroup was asked to present and explain their mock-up to the whole group. Finally, they were asked to find a compromise between the best ideas emanating from the two subgroups and to collectively design the final mock-up. The final result of the focus group consisted of one mock-up designed by the whole group.

Digitalization of the mock-ups

Experts in the field of ergonomics revised the mock-up of the focus group and the mock-up was digitalized in Figma Desktop App release 85. The interface of the mock-up takes into account the interaction design principles of Bastien and Scapin [13]. The digitalized mock-up consisted in one main screen and of two versions of a second screen.

Evaluation of the mock-ups

To validate that the digitalized mock-up meets parents' expectations, an online questionnaire was sent by email to the participants of the focus group and to persons who know Lille PED but who did not take part to the focus group session. The purpose of the questionnaire was to investigate whether the mock-up was understandable, playful, clear, satisfying, and contained relevant information, using a 5-point Likert scale and free input fields. To begin with, screen 1 was evaluated. Subsequently, the respondents were asked to evaluate two versions of screen 2 and give their preference to one version. A total of 14 persons were asked to fill in the questionnaire: 6 persons for the participants and 8 persons for the non-participants group. Non-parametric statistics (Wilcoxon test) were used to test the differences in scoring between the groups and versions.

Results

Focus group

A total of 6 parents participated in the focus group, 5 of which had previously visited the PED at CHU de Lille.

Part 1: tools' format and information / features needed

The first part of the focus group has shown that the participants preferred a large-size information screen to a mobile application to provide information. Of the 18 votes in total, 17 were for a large-size information screen. One of the most important arguments made by the participants was that, on a large-size screen, information is visible for everyone, including the healthcare staff. It was also considered important that there is no need to access your smartphone, because the information is displayed on a screen. One example of an argument against the use of a smartphone application was that parents are occupied with their child and there is hardly any time to check this device regularly for information when they are at the PED. Furthermore, it was indicated that a number of people do not have a smartphone and that it should not be necessary to download an application only for the PED.

Table 1 described the types of information / features the participants voted for. The idea of a serious game received the most votes (n=4), because the participants were of the opinion that it was essential to distract / entertain the children at the PED. The participants also considered it important to have insight into the waiting time at each step of the care process and insight into the predicted overall waiting time (respectively n=3 and n=2). This insight could be used to comfort the parents and their children. In addition, there was an interest in explaining the care process (n=2, using videos or animations n=1) and the different exams (n=1). This way, the parents would know what to expect and could prepare themselves optimally. Different colors to indicate the urgency of a patient should also be used (n=2). In this manner it is understandable why other patients have priority and it is easier to put your own situation into perspective. However, using these colors are also very personal because it says something about your medical condition. Besides, the participants believed that the parents should be able to identify themselves in the care process and see what their position is in the waiting queue (n=2). Some types of information did not get any vote.

Part 2: mock-ups sketching

Based on the votes and the feasibility to sketch, the following information were considered as most important to sketch on a mock-up of an information screen: waiting time, information

about the ED processes of care, and position in the waiting queue. The use of different colors to indicate urgency was also taken into account. The serious game and the videos were not kept for the mock-up, because they were not sketchable on paper.

Table 1. Types of information / features voted for sorted according to the number of votes received.

Nb of votes	Type of information/feature
4	Serious game
3	Waiting time at each stage of ED care process
2	Predictions of waiting time
2	Explain different stages of ED care process
2	Use different colours/numbers to indicate urgency
2	See position in the waiting queue
1	The structure of the tool is based on the different stages of the ED care process
1	Using animations/videos to explain different exam methods
1	Using animations/videos to explain the different stages of the care process

In the mock-up designed by the focus group, the following most important information needs were visualized:

1. Information divided into two screens: one that represents the care path to be followed and one that represents more information about the waiting process (Figure 1 and Figure 2)

2. Explanation of the care process: using videos to understand the different steps of the care process.

3. Visualization of the care process: provide insight into the process to be followed.

4. See your position in the waiting queue: be able to identify yourself and see your progression, while respecting privacy.

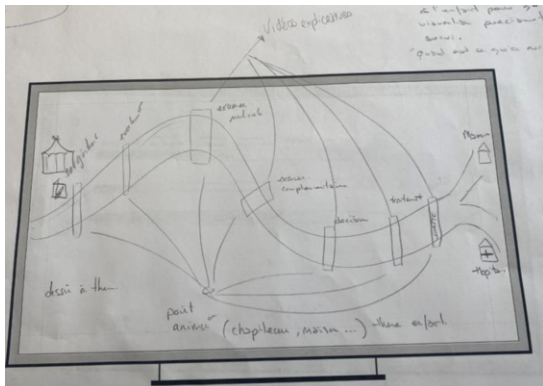5. The general ambiance of the screen must be playful for the children.

Figure 1. Final mock-up sketched during the focus group representing the care path to be followed (screen 1).

In the focus group it was decided to represent the steps of the care process by buildings and the children by avatars. In this manner the interface is gender-neutral and will be interesting for all children at the PED. A discussion point of the group was whether to display the waiting time or not. Eventually, they chose not to represent the waiting time because the exact waiting time is difficult to calculate, and frustration will only increase when the waiting time is displayed incorrectly.
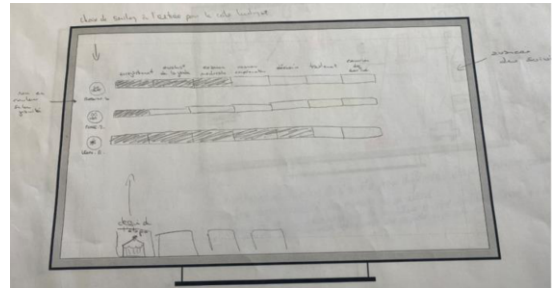

Figure 2. Final mock-up sketched during the focus group representing the waiting process.

Digitalization of the mock-ups

The final mock-up is based on the sketches of the focus group. Screen 1 represents the care path to be followed. This screen alternates with videos that explain the different steps of the care process. To make the interface more realistic, screen 1 has a day and a night version (Figure 3 and Figure 4). Visualization of the care process is maintained by a road that shows the way through the care process. Each step of the care process is visualized by a building and a sign that displays the name of the step. Each child is represented by an avatar; the background of the avatar indicates the child's urgency by means of a color. The anonymity of the patients is maintained by the chosen avatar and nickname; the children can choose an avatar and a nickname when they see the nurse for the first time. Their avatar leads them through the care process and is connected to the child by a unique identification barcode. The screen has a cartoon style: some elements of nature can be found on the screen to make the general ambiance playful. However, not too many elements have been added, for the screen not to be overwhelmed by too much information.

Figure 3. Digitalized screen 1 - day version

In addition to screen 1, screen 2 (Figure 5) represents information about your position in the waiting queue at each step of the care process and the number of patients at the concerning step. The order of the patients at each step is based on the urgency: patients with the highest priority are first in line, which leads to a better guidance. The priority is visible in the avatars' background: 1 (red) is the highest priority and 5 (blue) is the lowest priority. In the header, a legend of the different buildings is visible. This way the user does not need to remember the

meaning of every building. The total number of patients and the priority colours can also be found in the header.

Figure 4. Digitalized screen 1 - night version

For both screens, gamification principles were taken into account by making the ambiance of the screen playful [14,15]: graphics are used, and from time to time an ambulance will drive on the road and will drop off more urgent children to indicate that some children have a higher priority.
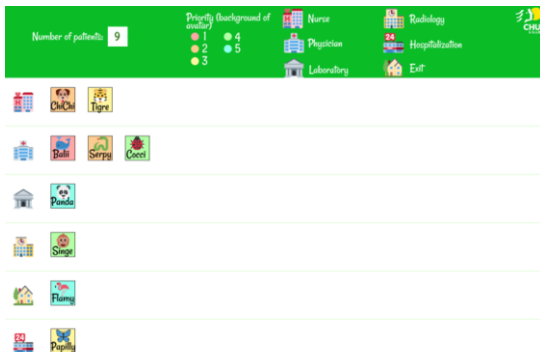

Figure 5. Digitalized version of screen 2.

Evaluation of the mock-ups

There were 5 respondents in the participants group and 5 respondents in the non-participants group. Both groups are rather or very much in agreement with the 6 items evaluating screen 1. They find the screen understandable (average score 3.9 out of 5), with a clear description of the path through the care process (3.4), presenting relevant information (4.7), with an ambient design suitable for PEDs (4.4). This screen satisfies them (4). The two groups differed statistically on the item "the screen is playful/happy" (W=25; p<0.01), with respondents who participated in the focus group finding less playful/happy, but nonetheless positively, the graphical user interface than non-participants (average scores respectively 3,8 and 5).

As for the second screen, no significant differences were found between both versions on the 5 items whether the respondent groups were considered separately or together: both interfaces were found understandable (average score 4.25 of 5), presenting relevant information (4.4), playful/happy (3.75), with a design ambiance fitting the PED (4.15), and providing satisfaction (4.05). Nevertheless, some differences were observed between the judgments of the two groups on some items. The group of "non participants" tends to give higher scores than the group of participants about the understandability (W=22.5; p<0.05), the

relevance of information (W=22.5; p<0.05) and the satisfaction (W=22; p<0.05) for version 1 and on the ambiance (W=22; p<0.05) and the satisfaction (W=22.5; p<0.05) for version 2.

Finally, there was a clear preference for the second version of screen 2: 9 respondents out of 10 preferred this screen because it "is more quickly to understand compared to version 1".

Discussion

The purpose of this research was to determine the information needs of parents of PED patients and find out the most optimal design for an information tool to be used in the PED at Lille Academic Hospital.

Main findings

The focus group concluded that there is a need for seeing one's position in the waiting queue, being able to identify oneself, and the use of colors to indicate urgency, which is also identified in similar research [2,16]. The final mock-up of this research visualizes the care path to be followed in the form of a map of a small town where the stages of care take the form of buildings, all with a childlike design (screen 1). A second screen provides more details on the waiting process (screen 2). By providing information that explains the ED processes of care, the patient/parent experience and satisfaction might improve [2–4], which is why explanatory videos about the care processes will be shown alternating with the two screens.

The choice to use a large information screen was unexpected because it seems to go against the current trend of individualizing information on a smartphone [2,12]. This choice would allow all people waiting in the emergency room to share the same view of the PED service and its occupation.

Initially, it was envisioned that the waiting time would be presented as indicated by the literature [2,4,17]. However, participants realized that waiting times can change as a result of changes in patient prioritization, which in turn is determined by the arrival of other patients or changes in patients' conditions [18]. In order to ensure that a change in waiting time would not cause frustration and/or anger, participants made the decision not to display the wait time on the screen.

Overall, the results of the evaluation of the digitalized mock-up show that the graphical user interface is judged understandable, presenting relevant information, and presenting clearly the path through the care process. Participants also deemed that the design of the interface was suitable for the PED and playful. All in all, both screens satisfied them. It can be noticed that respondents who did not participate to the focus group were more positive about the mock-up on several items compared to the participants. This may have been caused by the fact that the participants, who were involved in the process, had high expectations of the product, which could have led to a disagreement of the changes we made in the mock-up.

Limitations

In the first part of the focus group, participants considered it essential that the children should be kept occupied by means of a serious game. The idea of a serious game was not included in this research because of the difficulty to sketch and develop a game, which can be seen as a limitation of this research, but which will be included in the continuation of project WAIT.

Originally, two more focus group sessions were planned to ensure the completeness of the data collected [11]. Unfortunately, due to the restrictions of circulation and meetings imposed to

limit the dissemination of COVID-19 in France, the other sessions could not take place. Although it is possible to conduct online focus groups with remote participants, this option was not chosen because of technical biases that would have limited the interactions between participants and thus their collective creativity [19].

The results of the evaluation of the tool with people who did not participate in the focus group showed that the outcome of the focus group was appreciated. However, this evaluation is not sufficient because it only assesses the respondents' perception. It is for this reason that in the following stages of the project, evaluations of the actual usefulness, completeness and understanding of the information presented and the graphic interface will be carried out.

Future research

Based on the results of the evaluation, the following adaptations were made in the first screen: the night version is made less dark, and the start of the care path is highlighted to make it more visible. In the next steps of the project, the content of the pedagogical videos should be determined and the mock-ups will be presented to the PEDs' clinicians to get their opinions on this tool that is ultimately intended to optimize the patient-caregiver relationship. Once the clinicians' feedback received the mock-ups requirements will be considered to develop a prototype that will be installed for evaluation in Lille Academic Hospital's PED. In parallel, the development of serious games to occupy and educate PED patients and their parents at the same time will be studied.

Conclusions

The most important information needs of the parents are having an explanation of the care process, a visualization of the care process and being able to see their position in the waiting queue. These needs are translated into a GUI by taking interaction design principles into account.

Based on this research, the most optimal tool consisted of two screens: one screen with the care process to be followed, and one screen with additional information about your position in the waiting process. The screen that shows the care process by means of a graphical map alternate with explanation videos regarding the waiting process. The other screen shows your position in the waiting queue at the concerning step of the care process in order of priority.

Acknowledgements

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