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Abstract

Pediatric diseases, pain and hospitalization have an important impact on children and their families. This is especially significant when considering common invasive procedures, such as blood drawing. The objectives of the study were to assess the experience of children and families during the blood drawing procedure and suggest methods for improvement. The study was conducted in a children's hospital in Barcelona, Spain, between 2018 and 2020. A mix-method design or combination of qualitative and quantitative methodologies was developed. We carried out a search of the literature, a design thinking approach, and a survey. Results from the qualitative approach identified areas for improvement, such as, the lack of information about the process of blood collection before testing, management of fear or pain, and characteristics of the physical space, among others. Regarding the quantitative approach, 277 persons (patients and families) were interviewed. And, although there were high levels of satisfaction among them about the blood drawing procedure, they also stressed the importance of the information received prior the test, the distraction techniques, and the physical space. From these results, we made different actions like information leaflets and fact sheets, distraction elements in the waiting room (wall vinyl, therapeutic dogs and clowns), and modification of the cabins. Although these results cannot be generalized to the population, they serve as an example of how to improve patient and family experience and include them in the decision-making process. In the current pandemic, further research should be done to adapt these results to the "new normal."

Keywords

Blood drawing, children's hospital, mix-methods, design thinking, patient participation

Introduction

Pain is a complex phenomenon that includes sensory, cognitive, psychological, and behavioral components.¹ All of these factors must be considered when addressing pain, especially in children. This topic is of special interest and a priority in the human rights charter addressed by the World Health Organization.²

Pediatric diseases and hospitalization have an important impact on children and their families. It can serve as a trigger for a series of emotions and behaviors such as fear, anxiety, sadness, crying or aggressiveness, among others.³ For this reason, pain and its associated behaviors is a recurring topic of discussion and concern in children's

hospitals. A child's response to pain may be influenced by external factors, such as the emotions and reactions of their family. This is especially significant when considering invasive procedures that are common, such as phlebotomy or inoculations.

It is important to consider the family's emotions and health habits, which can influence how the child experiences and responds to pain and anxiety before an invasive procedure such as blood drawing.⁴ Some studies have assessed the effect that acute pain produces after an invasive procedure in children, as well as their emotional state in these circumstances, and the need for attention to improve the patient's quality of life.^{5,6}

In this context, distraction is one technique for reduction of anxiety while an invasive procedure is conducted. Studies have looked at the effect of distraction methods to reduce the stress caused by the needle puncture in children as well as their families.⁷ These studies have shown that communication is crucial to reducing anxiety in both children and their families before procedures. Explaining to children and their families about how the technique will be performed helps reduce anticipatory anxiety and contributes to improved management of the fear that the procedure can induce in the child.

In addition, the lack of this preparation or an inadequate approach to pain management in these cases can produce immediate, short-term effects on the patient, such as anticipatory anxiety, behavioral problems, or certain physical symptoms. In turn, it can also produce undesirable effects in the medium and long term, such as generalized fear, increased sensitivity to pain or rejection of professionals, among other effects.^{8,9}

In this situation, different health organizations and scientific societies have highlighted the importance of providing quality information adapted to the patient and families to ensure that they understand what the procedure will consist of, what can be expected and how they can prepare the child to reduce the emotional burden that this situation can induce.^{2,10}

There are a large number of studies assessing the effect of different psychological and non-pharmacological interventions to prepare the child for certain invasive procedures. These include the use of audiovisual technologies and virtual reality¹ or infrared light¹¹; as well as elements of distraction, among them robots,¹² clowns,^{13,14} and other practices.¹⁵ These strategies combined with pharmacological interventions in a multimodal approach are important when considering the child and his/her preferences, as well as increasing their participation in the health decision-making process.¹⁶ However, a systematic review carried out in 2008 concluded that there is not enough scientific evidence to indicate the effectiveness of these interventions.¹⁷

This study focused on the impact of an invasive procedure like blood drawing in children, their experience of pain and anxiety, as well as the different techniques used to improve this process.

Objectives

The objectives of this study were to assess the experience of children and families during the blood drawing procedure in a children's hospital and suggest methods for improvement.

Methodology

The study was carried out in Sant Joan de Déu children's hospital in Barcelona (Spain) between June 2018 and February 2020. The study was part of a global project focused on continuous improvement that is currently developed in the hospital.¹⁸

In order to achieve the study's objectives, a mix-methods design or combination of qualitative and quantitative methodologies was carried out.¹⁹

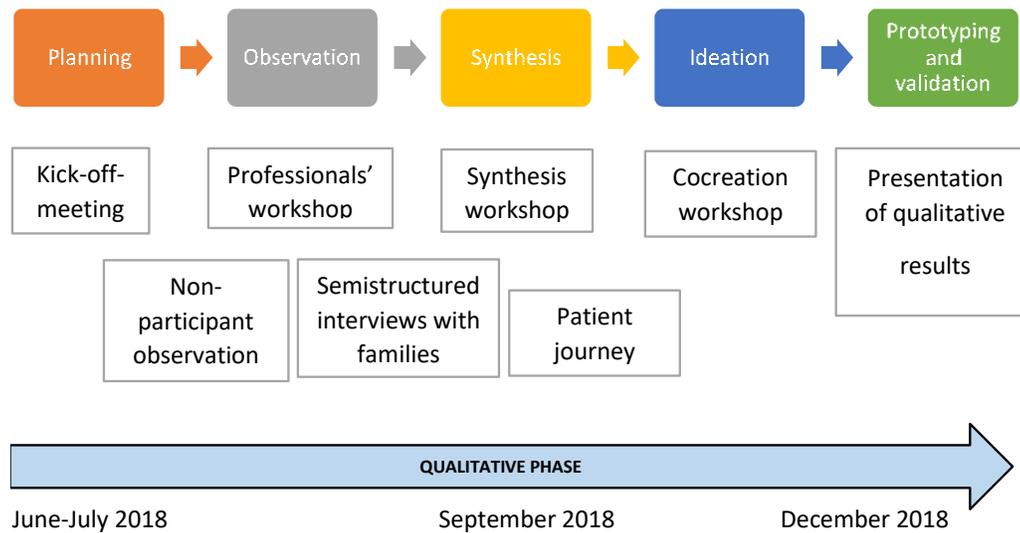
Qualitative approach

Initially, between June and September 2018, we carried out a needs assessment through design thinking techniques^{20,21} (Figure 1). This process was based on five stages: planning, observation, synthesis, ideation and prototyping and validation. Annex A shows the information panel of the process. In the planning phase, we conducted a search in the scientific literature to identify other studies investigating the impact of blood drawing in children. We conducted a literature search in the Medline database for articles published during the last 5 years. A selection of good practices was also made by searching the gray literature both, at the national and international level. Figure 1 also presents the chronology of the different activities carried out in the qualitative approach.

In the observation phase, we held a workshop with hospital health professionals involved in blood drawing in order to understand the study context and define the questions that should be asked in the families interviews. The workshop lasted 3 hours. Nine professionals from the Hospital Laboratory Service (nurses, phlebotomists, technicians, and administrative staff) attended the workshop. The Hospital Laboratory Service carries out an average of 45,000 annual tests for children from birth to 18 years of age. The extraction team consists of 14 professionals who share the total number of scheduled analyses from the hospital and from external and spontaneous consultations.²²

In addition, a member of the research team conducted direct non-participant observation to assess the dynamics perceived in the blood sampling rooms and common areas (waiting room, counter area, staff area).

Based on the information obtained from the workshop and the non-participant observation, we carried out 20 semi-structured interviews with families to assess the scope of the problem, the improvements needed and the different types of patients that should be assessed in the study. The selection criteria of families were having children under the age of 18 who were chronic patients, the children had gone through the experience of blood drawing during the current year, and the family agreed to

Figure 1. Qualitative phase: Needs assessment process through design thinking techniques

participate. We conducted a content analysis of the information obtained through the interviews. In the synthesis phase, we conducted a review of the patient's journey²³ to assess the patient's contact points with the health system during the blood drawing process, as well as the pain points or aspects to be improved. The topics of discussion included: lack of information about the process, fear and pain management, multiple decisions to be made by health professionals in a short period of time and lack of space in the blood drawing booths, among other topics.

The ideation phase was developed through a workshop with patients/families to assess the patient's experience and propose areas of improvement. Finally, the development of possible solutions to the issues detected at pain points was performed and patients and families reviewed the prototypes.

Quantitative approach

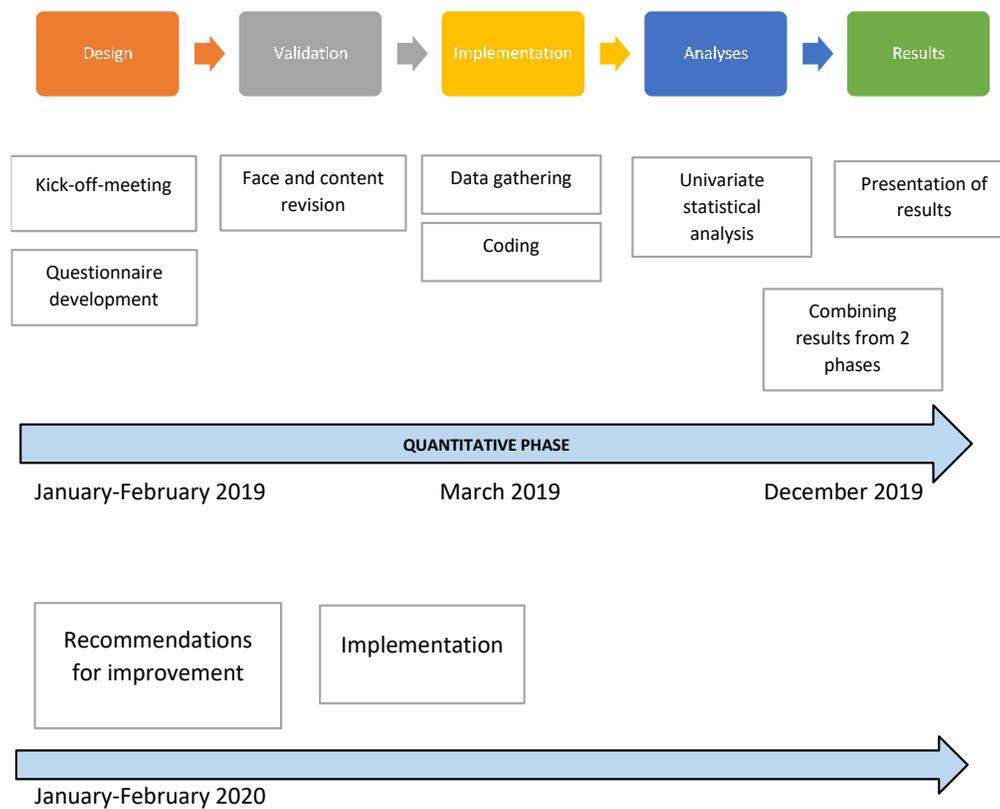
In addition to the qualitative methodology established at the beginning of the study, during 2019, we designed and implemented a survey using a structured questionnaire with closed-ended questions. Figure 2 shows the different steps conducted in the quantitative approach and the chronology of actions. The survey's objective was to assess the opinion of patients and family members about the blood drawing process and thus, complete the qualitative approach conducted at the beginning of the project. The questionnaire asked for information related to appointment schedule, communication before blood drawing, waiting time between patients' arrival to the hospital and time of the procedure, physical environment in the hospital, and professional closeness and empathy.

The questionnaire consisted of 10 questions. The response categories were a satisfaction scale of five scores with smiling faces that corresponded to the degree of agreement: strongly disagree, disagree, neutral, agree and strongly agree. The questionnaire ended with a general question about the overall satisfaction with the care received, on a numerical scale from 1 to 10, being 1 "very low" and 10 "excellent" level of satisfaction.

Professionals of the Laboratory Service and a group of 10 families of similar characteristics of the future experimental group reviewed the final version of the questionnaire. Through this process, we verified that the questions were clear and understandable and the length of the questionnaire was adequate to facilitate responses. The survey was conducted in person through face-to-face interviews by a group of hospital volunteers specifically trained for this purpose. They carried out the interviews in the waiting room during the second week of February 2019, from 7 a.m. to 2 p.m. At the end of this period, 277 families responded the survey. The information obtained from the survey was recorded in a database created for this purpose and once completed a descriptive univariate statistical analysis was performed with the statistical package SPSS, version 26.

Results

The results obtained from the literature search stressed the need to control aspects that influence the well-being of the patient who goes through a blood drawing procedure. Important aspects were the room physical characteristics, such as the reduction of ambient noise, organizing the

Figure 2. Quantitative phase: Survey design and implementation

signals in the physical space so that they do not get lost or providing adequate light in waiting rooms. Some techniques were providing relaxing or distracting images and spaces, trying to make sure that the waiting times were not very long, facilitating the children's relatives to be with them at all times and ensure the confidentiality and privacy of each patient, among other factors.^{3,4}

Results from the qualitative approach of the study identified four areas of improvement (Table 1): lack of information about the process of blood collection before testing, management of fear and pain of the child before the blood drawing, short time for professionals to make decisions (especially in cases of children with specific concerns) and reduced room dimensions. Table 1 also presents some of the responses expressed by participants (children, families, and professionals).

After detecting the areas which required improvement before and during the blood drawing process, strategies for improvement were devised (Table 2). In relation to the lack of information given to the patient and the family about the blood extraction process, we designed and prepared written materials, reviewed by professionals,

patients and families. The materials consisted of fact sheets and drawings on the extraction process (Annex B) and two informative videos, one that targeted the typical extraction process and another for children with special needs (such as autism or with a neurological problem) who require more personalized attention and preparation.

For the health professionals, it may be important to know the characteristics of the child before the procedure. Therefore, the relevant clinical information about the child was previously included in the analytical request and the Child Life professionals were consulted when necessary²⁴. At the same time, we reviewed the administrative process, and provided the blood-drawing technician with information regarding these special situations. We also instituted scheduled appointments for blood drawing to avoid peak hours when many children can be waiting for blood drawing at the same time.

Strategies to manage fear and pain in the waiting room were instituted. These included adapting the physical spaces with vinyl and television screens that help environmental distraction and having visits by therapy dogs and/or clowns in the waiting areas, which

Table 1. Main findings of the qualitative phase

AREA	Situation	Participants expressed reactions
Information	Lack of information of families on how to prepare the child	"We would have liked information on what the blood drawing process would consist of"
	Sampling errors at home	"24-hour urine? They didn't tell us anything"
	Lack of coordination among professionals	"If you're late, will they catch you anyway?" "Wasn't it necessary to come on an empty stomach? I found out today"
	Lack of information about how and when families will receive the results	
Fear and pain management	Patients do not arrive prepared from home	"He was afraid because he did not know if they would use force to hold him"
	Short visit time for patient to relax before extraction	"I have many reasons for not wanting to draw blood" "She was calm, but she has been getting more and more nervous as we were waiting"
	Variability among professionals when performing the procedure	"What are you going to do to me? Are you going to prick me? I don't want "
	Parents do not know how to prepare children	"We had to get her inside. She had a lot of fear"
	There are no distraction resources	
Multiple decisions in short time	There are fluctuations in the volume of patients	"I would prefer that the visit be made with more time to prepare my son, not everything so quickly"
	The characteristics of the following patient cannot be identified in advance	"Can you put your head back? You shade me and I don't see well" "Problematic patients are not programmed differently"
	Children with special characteristics (autism) have to wait long	"It would be necessary to train the professional on how to treat the patient" "Some parents do not understand the need to immobilize their child" "My mom has sung a song for me and I have been calmer" "I wish there was something to distract me while they prick me" "I didn't want to see the needle"
Reduced cabin area	Mobility difficulties	"The bunk would have to be a little bigger because the older children do not fit"
	Little flexible or adaptable furniture	"Children in wheelchairs do not fit well"
	There is no space to leave the family belongings	"If we stretch the bunk, we cannot go to the other side"
	Lighting, temperature and ventilation problems	"Each cabin has a different layout and sometimes you don't know where things are" "Many times we interrupt when entering because we need material"

contributed to the distraction and reduction of anxiety in children and their families.

Once in the cubicle, the aim was to provide children with a friendlier physical environment. We put vinyl on the ceiling equal to those in the waiting room where they can search for hidden animals. Other actions were allocating a television screen with cartoons and using a distraction kit that contains objects to play with while the procedure is performed. In addition, the professionals, most with years of experience,²¹ were trained specifically to explain to the child what is being done. In an effort to reduce fear, the tubes and needles necessary for the procedure were placed out of the view of the child, so as not cause fear or anxiety.

As Figure 1 and 2 show, after conducting the qualitative approach and the resulted actions, we began the quantitative phase through the design and implementation of a survey. The statistical analysis of the quantitative data obtained from the survey showed the following results: Of the 277 people interviewed, the vast majority (85%) said they agree or strongly agree that the hospital shows flexibility in the choice of the day and the time to perform the blood draw according to the needs of the family. Regarding the information received about the blood extraction process before performing the test, about the procedure to be followed or to prepare the child physically or emotionally, although most of the people interviewed agreed that the information is adequate, 16-19% of participants (according to the question) said they disagree

Table 2. Improvement actions

AREA	ACTIONS
Information	Information leaflet for families on the blood extraction process
	Children's drawing explaining the procedure
	Teen Fact Sheets
	Informative videos to watch at home before the test
	Update web content
Fear and pain management	Vinyl with games on the wall of the waiting room and in the cabin
	TV with cartoon channel in the waiting room and cabin
	Colored Smarts for the child to choose
	Therapy dogs and clowns in the waiting room
	Distraction kit (stress ball, kaleidoscope, music instruments, etc.)
Multiple decisions in short time	Include relevant aspects in the analytical request (autism, neurological patients, etc.)
	Consult the Child Life team
	Fill out patient profile sheet
Reduced cabin area	Differentiate healthcare circuit from sample management
	Sample cart redesign
	New system for organizing tubes and syringes
	Training professionals in special situations (autism, neurological cases, etc.)

or strongly disagree with the information received (Figure 3).

The characteristics of the waiting room seemed suitable for the majority of respondents: 79% of them said they agree or strongly agree with these characteristics while 16% said they disagree or strongly disagree with the waiting time until they enter the room and take the test. During the blood drawing, most (87%) said they agree or strongly agree with the extraction room and the resources available and almost all (93%) said they agree or strongly agree with the kindness and understanding on the part of the phlebotomy technicians.

In cases in which the child had shown fear or nerves, participants (82%) said they agree or strongly agree that professionals have used distraction and relaxation resources to reduce fear. In 90% of cases, they said they agree or strongly agree that professionals have tried to help the child to be satisfied and calm in the consultation (through positive reinforcement, acknowledging their collaboration and courage).

As for the overall assessment regarding the satisfaction with the care received, on a scale of 1 to 10, being 10 the highest satisfaction level, the mean score of satisfaction obtained was 8.6. (1.5 s.d.)

Discussion

This study is part of the hospital's continuous improvement strategy and an example of how to engage

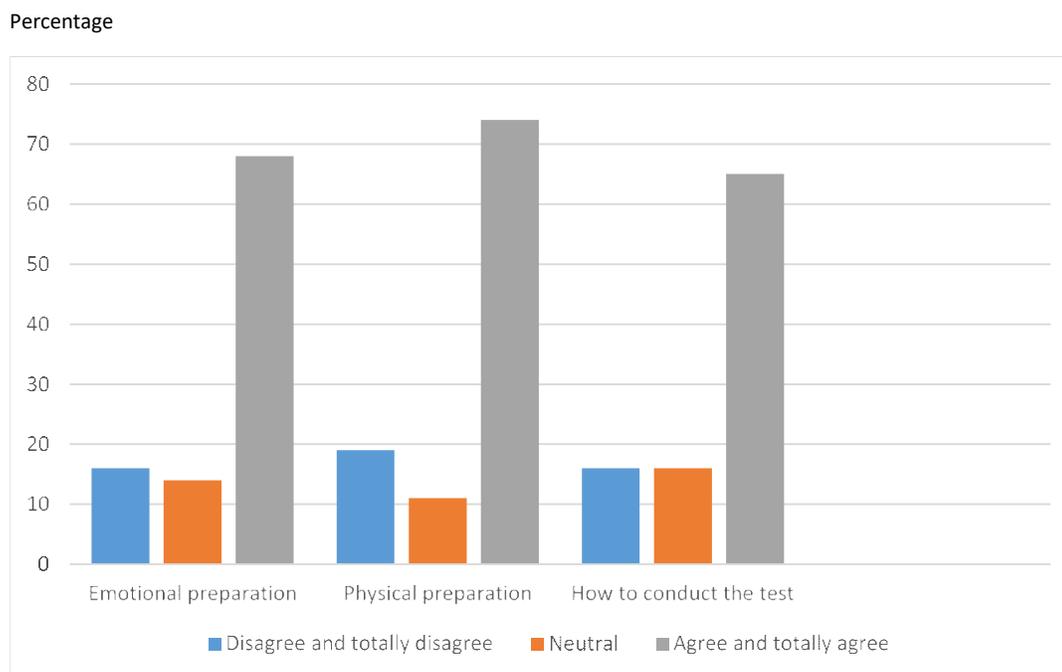
and take into account the patient's participation in the health decision-making process.

In order to engage patients, they should have access to rigorous and valid information in a plain language so they can make informed decisions about their care, as well as be included in the decisions about their health, treatments and wellbeing.²⁵ In a children's hospital, parents are also part of this process.

One of the procedures that most concern children is the puncture. The mix-methods approach used in this study allowed us the possibility of deepening the subject of interest through qualitative and quantitative techniques.¹⁹ These techniques are complementary and provide greater understanding of the issue of patient and family experience in the blood drawing procedure.

Phlebotomists should maintain a delicate balance between the time dedicated to each patient and the overall rhythm of the blood extraction process. Without falling into an automatic or impersonal act, it is necessary to choose wisely, which cases require more time be spent preparing the patient. Although the study was based on a good general level of satisfaction among patients/families and on the Laboratory Service team's experience, the study has revealed areas of improvement.

From the qualitative approach, we detected that the main areas of improvement were the information children and families have before the procedure, the management of the child's fear and pain, the information professionals

Figure 3. Patient/family satisfaction with the received information before conducting the test (blood drawing)

n=277

need about the child before the procedure, and the characteristics of the physical space to wait for and conduct the procedure. The specific actions developed to improve these areas helped to increase the patient and family experience as well as the health professional overall satisfaction.

In the quantitative approach, we conducted a survey in a convenience sample of patients and families who went through a process of a blood drawing during the study period. Therefore, although the results of the study cannot be generalized to the general population of children going through the same process, they can serve as a good example of how to incorporate patients and families into the decision-making process and the improvement of health services. The realization of this study also allowed us to appreciate the need for multidisciplinary and teamwork, including the patient and his/her family, to improve the patient's experience.

As already mentioned, these results are part of the first phase of an umbrella study. Among the improvement proposals that emerged from the data analysis, we began to work in those that could be more effective. Currently, new proposals are being evaluated to implement with the new regulations in the face of the coronavirus pandemic experienced in recent months.²⁶

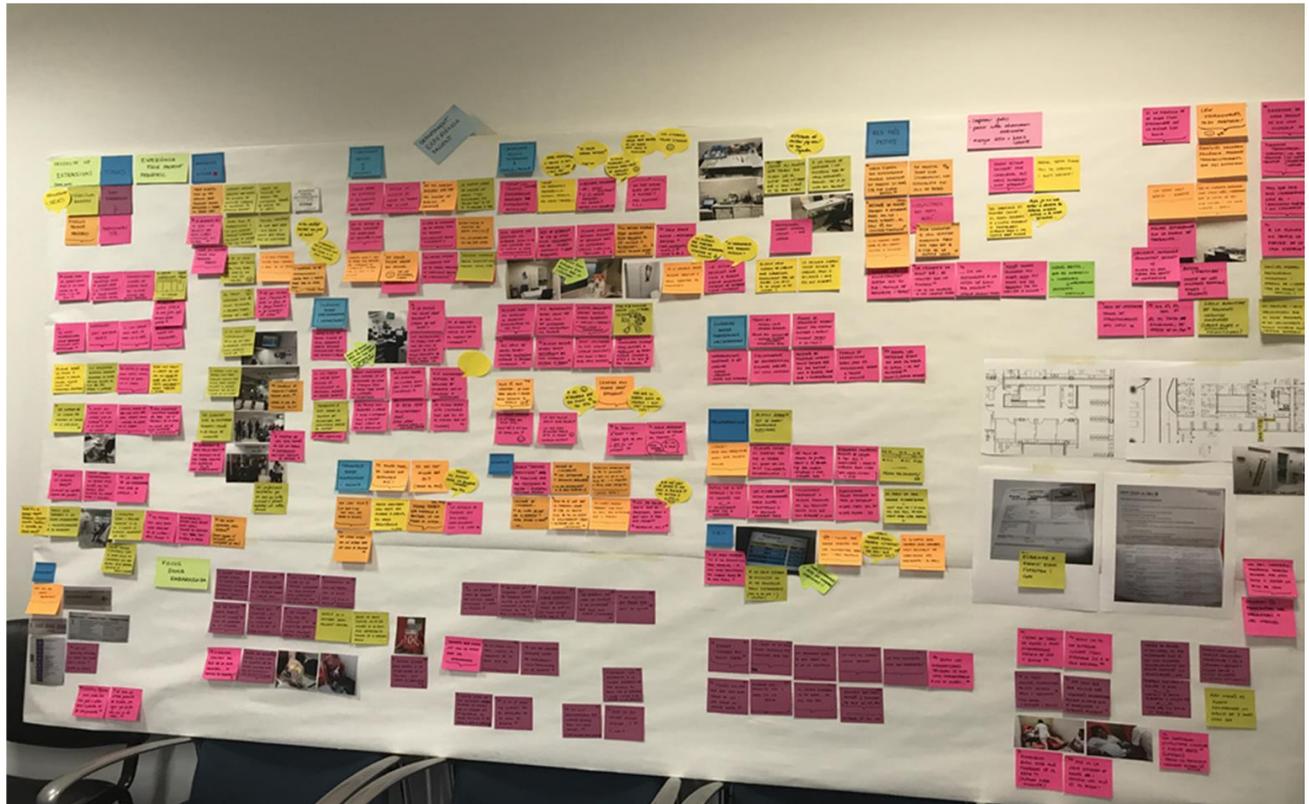
In the current situation with the coronavirus pandemic, it would be necessary to conduct further research in order to gather more insights in this topic and improve the current study results in special situations.

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Annex A. Information panel of the design thinking process



Annex B. Fact sheets and drawings of the blood drawing process

