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Learning with High Fidelity Simulation

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Abstract *The High-Fidelity Simulation is a fundamental pedagogical method in the nursing student's teaching-learning process. An exploratory and descriptive study was performed by using a qualitative approach in order to understand the Nursing Degree course students' perception about the contribution of the Simulated High-Fidelity Practice for clinical competence learning. The self-filling questionnaire, composed of open questions and the technique of content analysis for the treatment of narrative material according to Bardin, was used. With the clinical scenario development, we emphasize the nursing students' perception in the learning of professional competences in three domains with greater focus in the field of care delivery and management. It was concluded that the High-fidelity Simulation is a fundamental pillar in the nursing students training, which reinforces the existing pedagogical practice. We stress the need to reformulate the scenarios in order to achieve a better learning balance in the different dimensions of their professional competences and to develop evaluation tools.*

Key words *Students, Nursing, Clinical competence, Perception, Simulation practice*

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Introduction

The simulation is defined as a pedagogical method that uses one or more educational techniques or equipment in a simulation experiment aiming to promote, improve or validate the progression of a participant[1]. This learning experience aims to imitate the reality of the clinical environment and is distinguished in three modalities according to the levels of realism and proximity to the reality that is intended to recreate.

High-fidelity simulation enables multiple learning objectives to be achieved in a realistic and secure context for people. During the simulation, students are exposed to different situations that may occur in an hospital or in a community setting, providing them with opportunities to mobilize skills in customer appreciation, make decisions, communicate, work in a team, and manage the care of a simulated patient[2]. The use of high fidelity simulation in the Nursing undergraduate course (CLE) has been growing and the results in student learning suggest innumerable advantages, namely, in the development of clinical reasoning, clinical competence, confidence, application and integration of theory in clinical practice and in the identification of learning needs[3]. Some studies mentioned the importance of learning from mistakes and of repeated practice in a completely safe environment[4,5]. Simulation may also play a key role in students transition to the reality of the nursing experience, reducing the initial shock upon entering clinical practice. Considering that the current mannequins have a high level of realism, they can also contribute to the evaluation of the student's competences in a more robust way[4]. The simulated high-fidelity practice (SHFP) contributes to the satisfaction and motivation of the students, they show receptivity to the use of new technologies and to the training of technical skills in a context similar to that of a real clinical practice. Advantages as shown in the transfer of competences from the simulated context to the reality of clinical practice. Students show satisfaction with the SHFP because it is a recent teaching / learning strategy and because they can objectively perceive their evolution, thus increasing the awareness of their real abilities[6]. When compared to other pedagogical methods, simulated practice presents better results in terms of student satisfaction and student self-confidence[7].

The arguments in favour of the use of high-fidelity simulation in nursing education are based on the advantages of this teaching method. SHFP offers the opportunity for the introduction of innovative practices in the nursing curricula and challenges the teachers to implement them. It requires a significant amount of time and energy to teach and train the teachers, as well as, to prepare clinical scenarios and design learning objectives.

The adoption of SHFP as an institutional project led us to be responsible for its implementation as a pedagogical practice and consequently to the need to evaluate the validity of the clinical scenarios we conceive.

The purpose of any profession is to improve the practice and provide quality services.

Scientific research allows the bridging between the discipline of nursing as a field of knowledge and the professional practice as a field of intervention[8].

Methods

The present study aimed to understand the CLE students' perception of the contribution of SHFP to the learning of their professional competences.

We opted for a descriptive and exploratory qualitative study[8], since it is based on the interpretive approach of the observed reality. Using the individual subjective world to understand the meaning that people construct based on what they experience falls within the scope of this approach, to answer the research question: What are the CLE students' perceptions about the contribution of the SHFP to the learning of their professional competences?

The study included 82 students, from the 3rd year, 2nd semester of CLE-2015, with a mean age of 22 years. of these, 17 are male (20.7%) and 65 are female (79.3%).

An exploratory questionnaire was used as data collection instrument, consisting of five open questions.

1. What contributions this experience had to your learning?

2. What skills did you develop during the scenario?

3. What skills did you develop during the Debriefing (post-scenario discussion)?

4. Name three positive aspects of this experiment:

5. Make 3 suggestions to improve this learning methodology

Following the development of the clinical scenario where they were in the role of "nurse" and their *debriefing* the participants were asked to complete a questionnaire.

The scenario, elaborated by the teachers, was based on the development of a clinical situation of nursing care, where the student had to make the care decision through the patient's response. The scenario was previously tested and validated with its application in a group of students who volunteered for this purpose. Three students and two teachers with different roles participated in the development of the scenario. Teachers played the roles of facilitator (counselor who provided stimuli to the nurse student's performance) and of technician who made the voice of the patient and commanded the unfolding of the scene through computer science. The students had the role of "nurse", student (supported the colleague nurse in which he delegated) and of an observer to whom was distributed a checklist facilitating the understanding of the development of the scenario and that allowed the *debriefing* analysis. All students were invited and accepted to participate in the study.

For students to be able to prepare for SHFP, the clinical case and respective study guidelines were distributed to all students one week prior to their implementation through the digital platform. At the beginning of the SHFP, during the briefing the clinical situation was assessed and contextualized, the ward space was presented and the students' doubts were clarified, and the group of students determined the role that each one would play in the scenario. After the development of the clinical scenario, *debriefing* was carried out for a reflection of what happened in the SHFP situation. The student, through stimuli of the teachers participating in the scenario (facilitator or technician), described the reflection about his performance and identified the positive aspects to improve in his learning process. The spoken reflection was focused on the student's perception of what happened in the scenario, identifying strengths and weaknesses in his simulated praxis, analyzing the contribution of simulation to learning and looking for improvement of the performance and development of competencies.

Data collection ran from March to May 2015.

We used the technique of content analysis for the treatment of narrative material[8]. The subsequent analysis and interpretation of the information obtained was carried out through the thematic content analysis according to Bardin[9].

The validity of this study is based on the transparency of the process and the authenticity of the facts demonstrated[8]. An exhaustive description of all the data collected has been made to respect the simple narration of the facts.

In the sense of withdrawing the meaning or expressiveness was analyzed and codified thoroughly the narrative material and constructed tables that allowed to group the information by categories and units of signification. Semantics was used as a categorization criterion, considering the qualities that the terminal categories must possess: mutual exclusion, homogeneity, pertinence, objectivity and fidelity[9]. From the pre-defined categories (Chart 1), in the context of this research, we used the frame of reference proposed by Ordem dos Enfermeiros (OE) (Nurses' Order) in Portugal, for the three domains of competencies in professional nursing practice: provision and management of care; professional ethical-legal responsibility, and professional development[10].

Inserted in an institutional project, the Ethical Principles for the accomplishment of the study, such as free and informed consent were contemplated, and all the participants agreed verbally and unequivocally with the participation in the study, after having been provided the information. Participants were informed that their responses were confidential and anonymous and that they would only be used in this area and may withdraw from participation at any time, thus respecting the principle of confidentiality and anonymity of personal information and respect for privacy[8].

Results

The 82 participating students report that they developed the three competency domains of the generalist nurse[10], both during the scenario and during *debriefing*. These competences integrate the set of knowledge, skills and abilities necessary to mobilize in the context of clinical practice. The competencies developed during the scenario are the domain of professional, ethical and legal responsibility; and care delivery and management (Table 1).

The skills developed during *debriefing* are in the field of professional development (Table 2).

Of the 407 enumeration units extracted from the students' responses, 255 are in the field of care delivery and management, 151 in professional development and only 1 in the field of professional, ethical and legal responsibility. The students considered that the course of the scenario was a significant moment of development of clinical competences, linked to the care process; already the moment of *debriefing* made possible

the reflection of the practice of care, contributing to the professional development.

In the category field of care provision and management emerged the categories Perceptual-cognitive, Instrumental, Interpersonal, Affective and Resource Management. The cognitive-perceptual category refers to the set of competences developed during the SHFP allied to the knowledge domain necessary to the client's appreciation. It involves the indispensable knowledge to use the sense organs (*sensory*), in the observation of the client: *I learned to respect the client's desire Q 107*.

It includes the knowledge necessary for the *interpretation of the client*, the appreciation of his signs and symptoms, never losing sight of the whole that the client is or integrates. It also encompasses the knowledge necessary for the realization and development of critical thinking, that is, the ability to review, mobilize and consolidate knowledge, to structure clinical reasoning, the capacity for analysis and reflection, the ability to

Quadro 1. Domínios e Categorias pré definidos. Lisboa; 2016.

Dimension	Categorie
Field of provision and management of care	Perceptive-cognitive
	Instrumental
	Interpersonal
	Affective
	Resource management
Professional ethical and legal responsibility	Ethical-deontological
Field of professional development	Reflection centered on self (I)
	Reflection centered on itself in context (action)
	Reflection centered on itself in relation (interaction)
	Reflection centered on the creation of new actions (desire)

Table 1. Skills developed during the scenario. Lisbon; 2016.

Dimension	Categories	Subcategories		Fi (enumeration units)
Field of provision and management of care	Perceptive-cognitive	Sensory / creativity		5
		Interpretation of the client / knowledge		39
		Clinical thinking		65
		Subtotal		109
	Instrumental	Ability to act / intervention		53
		Subtotal		53
	Interpersonal	Customer Interaction		6
		Teamwork / Assertiveness		73
		Subtotal		79
	Affective	Perception of self		6
		Coping		6
		Subtotal		12
	Management of resources	Time / Space		2
		Subtotal		2
			SubTOTAL	255
Professional, ethical and legal responsibility	Ethical-deontological			1
			SubTOTAL	1
			TOTAL	256

Table 2. Skills developed during debriefing. Lisbon; 2016.

Dimension	Categories	Subcategories	Fi (enumeration units)
Field of professional development	Reflection centered on self (I)	Sharing experience	8
		Self-assessment	12
		Subtotal	20
	Reflection centered on itself in context (action)	Performance review	41
		Awareness of action	25
		Subtotal	66
	Reflection centered on itself in relation (interaction)	Interaction with the team	10
		Customer Interaction	13
		Subtotal	23
	Reflection centered on the creation of new actions (desire)	Against the backdrop	1
		Before the action of the student	41
		Subtotal	42
	Total		151

organize, prioritize and plan action as well as the ability to make decisions.

The instrumental category integrates the set of competences related to the operationalization of care, namely, the skills that require psychomotor skills and improved movements and are materialized in autonomous and interdependent nursing interventions. The students consider that the SHFP allowed to train the autonomy and to improve the techniques of nursing, namely in the control of the infection associated to the health care, administration of therapy and the use of individual protection equipment. Through this practice, students report having improved the suitability of the procedures to the context by stating that *I developed aspects related to the administration of therapeutics and health education Q157*, as well as the importance of communicational skills, *both with the client and with the team*.

In the interpersonal category students emphasize interaction with the client where it is possible to train respect, active listening, negotiation and help relationship. With the colleague who helps him, they also reveal that they develop teamwork, delegation of tasks and leadership, allowing the development of know-how.

In the affective category related to the emotional experience of the SHFP experience, the students report that this learning experience allowed to improve: self-criticism and self-confidence *I realized how I can improve the management of my emotions Q17;* the level of *stress* and emotion management, the development of adaptive strategies to the different stimuli that emerged in the context of PSAF, and in the management of existing resources whether they are material, social, community or human.

The competences in the field of professional, ethical and legal responsibility, present in the scenario raised in the student questions of the ethical forum that led him to have to analyze the different dimensions of the scenario, to ponder the consequences of eventual decisions and decision-in-action on the nursing intervention that best respects each of the ethical principles: *The SHFP allowed to be more attentive to the individualization and prioritization in the care to the client Q 114.*

Respect for the patient, his individuality and autonomy are aspects mentioned by the students as being those that generate ethical conflict during the scenario, since not always the client accepted the proposal of nurse intervention, which led the student to seek adjusted interventions to an appropriate ethical response through negotiation.

The Field of professional development emerged in the *debriefing* phase, students report developing a set of reflective skills that allows them to focus attention on themselves as people, in action, in interaction and, at the same time, to prospect in the future.

In the self-centered reflection category, the students understand that they improve reflection on themselves, for the opportunity to express their feelings during the SHFP and to evaluate their way of being: [The SHFP] *allowed to develop*

the capacity to accept the criticism Q 103, as well as the ability to *share experiences* and to *self-evaluate*, which allowed to increase the knowledge about himself and about his capacities.

In the category reflection centered on itself in context, the students reveal that the SHFP encouraged them to *analyze their performance*, either about the positive or negative aspects, or in the decision-making process. This analysis has contributed to a better *awareness of action*, of the various stages of the care process and of the existing resources, especially about incidents and errors: [The SHFP allowed to have the] *perception of the slips that turn out to be acts shaped to what we see and learned in Clinical Teaching Q166.* Reinforcing the importance of complying with procedures and protocols as a guarantor of the safety of care and contributing to the expansion of knowledge and skills in the management of unforeseen situations.

In the category reflection centered on himself in relation evidences the student in interaction with the peers, for the students, the interrelation competences in clinical context were an aspect to emphasize. The SHFP allowed to emphasize the importance of the dynamics created in the group of students as an aspect that can facilitate learning and the importance of valuing communication with the client as a dimension of care: [SHFP contributed to] *enhance interdisciplinary communication Q 172*.

Students understand that they have perfected *team interaction* and customer communication skills. This last one is considered by the students as a tool of the process of care that allows better appreciate of the person, value their complaints and clarify the information provided.

In the category reflection centered on the creation of new actions the students try new ways of intervening in situations similar to those that lived at the time of the scenario or propose changes in the structure of the scenario in which they participated: [The SHFP allowed] *to identify aspects to be improved in future situations Q109.*

In the discourse of the participants it is emphasized that these reflections improve critical thinking, consolidate learning, improve posture, reinforce confidence, reduce anxiety and enable cognitive and emotional development.

Discussion

For the CLE students participating in this study, the realism and the fidelity of the scenarios contributed to the development of clinical skills. The SHFP and its potential have proved to be a diversified learning strategy, with different dimensions, active and innovative[11].

Participants were involved in a scenario that replicates a clinical situation, which allows them to increase their confidence, autonomy and satisfaction, and to develop communication, leadership and teamwork knowledge and skills[12-15]. This learning provides important subsidies in the three domains of competences of general care nurses defended by OE of Portugal: care delivery and management, ethical and legal responsibility, professional development[10,16].

In the field of care delivery and management, students emphasize cognitive-perceptual skills with a focus on acquiring new knowledge, intellectual development, skill and attitudes. This category includes knowledge, understanding, application, analysis, synthesis and evaluation[17].

During this process, the student resorted to critical thinking and developed the clinical judgment, considering , that the simulation required the implementation of the care process. This result is consistent with that of other investigations that show that the SHFP allows to develop the critical thinking[18-19] and clinical judgment[20-21]. It also enables the effective development of transferable and transformational leadership skills and thus improves critical thinking and clinical thinking of students in more complex care situations[18].

In the management of care, students also emphasize the development of technical skills[14,18,22-24], through the improvement of reflexes, perception, physical abilities, improved movements and non-verbal communication, in techniques such as the administration of therapy. This category includes manipulation, articulation and naturalization[17].

The clinical scenario was perceived as a moment that allows the development of communication skills, especially with the patient[15], and can become an equally useful methodology in the development of communication skills in the multidisciplinary team [18-25]. The students showed difficulties in recognizing the client's problems and in the systematized communication of these data to other professionals, mainly by telephone, which reinforces the need for training and the evaluation of the levels of proficiency in this field[26]. Research has shown that PSAF increases confidence in the ability to communicate with patients as well as to meet their needs[15].

As far as teamwork and assertiveness are concerned, there are 73 enumeration units, which

shows that they value the development of interpersonal relationships and negotiation during the execution of the scenario. This category should be explored in future studies, because the possibilities and difficulties for building skills based on teamwork is a field to deepen in health care[27], given that health work is essentially teamwork[28]. It should be noted that research has shown that simulation improves team behaviors in different clinical contexts and crisis management[18].

The SHFP, in the management of care, enabled the development of the affective component. Students understand that they have developed and refined behaviors and attitudes, and have become closer to the responsibilities and values inherent in the profession. This category includes receivership, response, valorization, organization and characterization[17]. This component contributes to the fact that the simulation creates a learning environment that enabled the acquisition of knowledge and the development of skills, safety and trust[18,29].

The SHFP allows the development of competences in the field of professional, ethical and legal responsibility[10], because it is a transformative training experience that helps the participants to understand the ethical-legal content of the nursing profession, especially in the *debriefing* phase[30]. Based on the comments about the scenario and the intervention of the teachers, it is possible to identify and deconstruct the ethical dimension that is present in the simulated care situation. However, the lack of expressiveness of the discourse in this domain should be the result of a reflection on the way in which the scenarios are constructed and developed, because the learning of nursing care implies that students appropriate and value the importance of the ethical and legal content of their practice[30]. The simulation context promotes safety of care and reduces the risk of error in clinical practice due to the impact it has on better care, error management and safety promotion[31] and this dimension was not visible in the participants' discourse.

It was also a perception of participants who learned skills in the field of professional development, especially at the debriefing stage. These focus on the ability to reflect on the various areas in which they were involved. In their view, the learning experience has been facilitated by sharing with peers. This sharing has increased awareness of themselves and their strengths and weaknesses, essential conditions for more effective communication. These results are corroborated in another study[5], where the authors refer as advantages of learning during the simulation and *debriefing*, feedback received on their performance, validation of their emotions and feelings and the development of their skills to communicate.

The responses value learning through reflection on action by discussing strategies for customer care and the reconstruction of this projected action in their future practice. Learning from error was emphasized in the study as a positive aspect of learning, a lesson that has been effectively learned and that allows us to develop strategies to avoid it in the future with real clients. As with other studies, they feel that their effectiveness has improved, as the learning environment has made it possible to intervene without risk to the patient, which translates into an increase in confidence and safety in interventions[6,15,22-24].

Assessing competence is a complex process and although there is already evidence on the development of competencies in simulation environments, it is imperative to associate the competences developed in SHFP with the development of competences during clinical teaching[29].

Conclusions

The SHFP is an essential methodology in the training of nursing students, which reinforces the existing pedagogical practice in the studied context. It allows the learning of the principal areas of competence that integrate the profile of competencies proposed by the Order of Nurses in Portugal.

The nursing students who participated in this study consider that the SHFP allowed the development of competencies and it is verified that the different moments of the scenario contributed to competencies of different domains: during the scenario, these are of the domain of professional, ethical and legal responsibility and the provision and management of care; during *debriefing* the skills developed which are in the field of professional development.

In the analysis of students' discourse, in the field of care delivery and management, the following categories stand out: cognitive-perceptive (sensorial / creativity, client interpretation / knowledge, clinical thinking), instrumental (acting capacity / intervention), interpersonal (client, interaction / assertiveness), affective (self-perception and coping) and management of resources in time and space.

In relation to *debriefing*, students value self – centered reflection – self, – centered reflection

– action (with performance analysis and action awareness), self – centered reflection – interaction with the team and the client) and the reflection centered on the creation of new actions – desire (not only in relation to the scenario, but also to their own action).

The domain of professional, ethical and legal responsibility is one that seems to have a lesser expression in the enumeration units, which highlights the need to review the scenarios to balance learning in the different dimensions of competencies.

The study design does not allow us to extrapolate the results to other realities, but the understanding of the students' perceptions about the developed competences allows us to conclude that this pedagogical methodology has potentialities and that it is necessary to continue investigating this teaching practice in order to improve and adjust the methodology to the needs of the students and the gradual requirement of the competences to be developed in the different years of the CLE, as well as to develop instruments that facilitate the evaluation and monitoring of the impact of the introduced changes.

Collaborations

MHCV Presado, S Colaço, H Rafael, CL Baixinho, I Fèlix, C Saraiva and I Rebelo participated in the design, study design and data collection. The authors MHCV Presado, H Rafael and S Colaço performed the treatment and analysis of data and CL Baixinho, MHCV Pressado, H Rafael, S Colaço e C Saraiva assumed the drafting and revision of the article.

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