

Monitoring of an educational innovation program of clinical simulation to learn pediatric and neonatal CPR competencies

Ines Aguirre Sanz¹, Pablo García Molina², Evelin Balaguer López³, Pablo Buck Sainz-Rozas⁴, Pedro García Martínez⁵

¹Faculty of Nursing and Podiatry, University of Valencia, Hospital Universitario y Politécnico La Fe, Valencia, Spain, ²Faculty of Nursing and Podiatry, Hospital Clínico Universitario de Valencia, Valencia, Spain, ³Faculty of Nursing and Podiatry, University of Valencia, Hospital Clínico Universitario de Valencia, Valencia, Spain, ⁴Faculty of Nursing and Podiatry, University of Valencia, Hospital Universitario Vall d'Hebron, Barcelona, Spain, ⁵Nursing School La Fe, Affiliated Centre of the University of Valencia, Health Research Institute La Fe, Valencia, Spain.

How to cite: Aguirre Sanz, I.; García Molina, P.; Balaguer López, E.; Buck Sainz-Rozas, P.; García Martínez, P. (2026). Monitoring of an educational innovation program of clinical simulation to learn pediatric and neonatal CPR competencies In: 12th International Conference on Higher Education Advances (HEAd'26). Valencia, 15-18 June 2026. <https://doi.org/10.4995/HEAd26.2026.21767>

Abstract

This study presents an educational innovation program aimed at learning pediatric and neonatal CPR competency among nursing degree students. The program utilizes clinical simulation, debriefing techniques, and an annual action research methodology to improve knowledge acquisition and student satisfaction. Educational innovation results indicate improvements in knowledge assessment, specifically a higher level of knowledge previous to simulation. Satisfaction started to be measured with a validated DASH questionnaire and has positive outcomes. The study emphasizes the importance of continuous improvement and coordination of the teaching team. This work contributes to the ongoing development of effective CPR training methodologies in nursing education.

Keywords: *Cardiopulmonary Resuscitation; Nursing; Clinical Simulation; Pediatrics; Neonatology; Educational Innovation.*

1. Introduction

Cardiorespiratory arrest (CPR) is defined as a sudden, unexpected and potentially reversible cessation of effective circulation and ventilation. A cardiac arrest can occur inside the hospital with an annual incidence of 1.5 to 2.8 per 1000 hospital admissions or outside the hospital with an annual incidence of 55 per 100.000 inhabitants (Greif et al., 2025)

The European Resuscitation Council regarding CPR education mentions how important it is that everyone has CPR knowledge starting from an early age to higher education, especially healthcare students (Greif et al., 2025). Clinical simulation is a learning methodology based on the creation of an artificial situation that allows people to practice and evaluate their clinical abilities and other skills in a safe environment. There are different types of clinical simulation depending on the materials and fidelity to reality used (Jeffries, 2005). Education based on clinical simulation also has an evaluation called debriefing to analyze and reflect on the actions of the simulation event and improve efficiency in the future. (Maestre & Rudolph).

In the last years higher education has made an effort to adopt new teaching methods, especially healthcare careers have seen the potential of experimental learning such as clinical simulation. Degree Nursing students must develop a series of competencies during their studies, such as recognizing life-threatening situations and knowing how to execute basic and advanced life support maneuvers (Ministerial of Universities, 2025). The faculty of Nursing and Podiatry of University of Valencia, implemented in 2017 a teaching innovation program (García Molina & Balaguer López, 2025) through the subject “Nursing in Child and Adolescent Health” (ESIA)

The CPR teaching program has carried out improvements since its beginning in 2017, based on an annual research methodology that measures the acquisition of knowledge and student satisfaction. Some of the most significant changes were the addition of support interactive teaching materials, new physical simulators and reorganization of the classroom and new physical facilities due to the relocation of the faculty building.

The objective of this educational innovation is to assess the educational impact on the learning of pediatric and neonatal CPR techniques in students in the 2nd year of the Nursing Degree, as well as assess student satisfaction with the teaching methodology used. Therefore, use the data collected to identify elements for improvement in the educational innovation project.

2. Educational innovation

From 2017 to the 2025 academic year, the process of continuous improvement of the proposed educational innovation has configured a work methodology that includes 2 areas of action: educational innovation that affects the teaching team and educational innovation implemented with the students.

The teaching team is made up of teachers from the ESIA subject and collaborating students. from the 3rd and 4th nursing year who participate with educational and organizational tasks. To achieve quality standards in the use of simulators, computer systems and training dynamics, the Project directors carry out a review of materials management, an update of the current algorithms in CPR performance and the teaching methodology to be implemented.

2.1. Educational innovation with students

Clinical simulation is the fourth stage of educational innovation aimed at students. The first phase includes a two-hour theoretical session in the classroom and introduction of the physical material. The second phase is composed of a telematic self-training process that includes: a) bibliography and consensus documents on pediatric and neonatal CPR that are shared in the virtual classroom, b) the presentation of the theoretical session and, c) two Serious Games focused on the management of the crash cart and the implementation of pediatric Basic Life Support. The third phase of the project includes a pediatric medication management laboratory, which covers the preparation and administration of medication in emergency situations. And the last phase includes clinical simulation with three clinical cases: instrumented CPR in a three-year-old person, CPR in a 1-year-old infant, and advanced CPR in a newborn and subsequent debriefing.

The period dedicated to the simulation laboratory is 2 hours, distributed in 10 minutes for completing the prior knowledge questionnaire, 10 minutes for the presentation of the activity, 60 minutes dedicated to the clinical simulation, 30 minutes for debriefing and 10 minutes for completing the knowledge and satisfaction questionnaire.

During the 2023/2024 academic year, the following improvements were incorporated:

1. The period between the theoretical classes and practical laboratories was reduced so students have recent theoretical classes. In addition, the consideration as part of the global ESIA marks the realization of the exercises before the laboratory.
2. The emphasis of teamwork competencies and definition of roles when performing a CPR. Therefore, the substitution of one question of the knowledge questionnaire (Q11 in table 1) to one about CPR roles (Q12 in table 1).
3. The use of a new validated questionnaire based on the Debriefing Assessment for Simulation in Healthcare (DASH) (Simon R et al., 2010) to measure student satisfaction starting with a pilot group in 2023-2024.

To analyze the impact of the interventions carried out, there are two questionnaires that were used. The knowledge assessment questionnaire is made up of 11 multiple response items that are completed at the beginning and at the end of the simulation. Satisfaction is measured using a scale made up of 20 items that are evaluated using a Likert-type response from 0 to 10. In 2023-2024 satisfaction also started to be measured with a validated questionnaire based on the DASH methodology only with a pilot group of students. It has 22 items that are evaluated using a Likert-type response from 0 to 7. The internal questionnaire was maintained during the transition year so that the team could qualitatively compare the results between the two questionnaires. No relevant differences were observed. The next year 2024-2025 DASH questionnaire was implemented to measure satisfaction for all the groups.

3. Results

The sample was of 199 students in 2022/2023, 238 in 2023/2024 and 200 in 2024/2025. In relation to the learning reflected in the level of knowledge after the simulation, the question that improves the most is question 11 in 2022/23 and question 7 in 2023/24 and 2024/25 (table 1). It is relevant how there is a decrease in accuracy in question 1 and 3. After the latest implementations of the educational changes there has been an increase in the overall score of correctness in the previous knowledge to the laboratory 60,58% in 2023/24 and 64,23% in 2024/25 compared to 52,67% in 2022/23. Final score also improves from 65,07% in 2022/23 to 67,13% of correctness after the intervention in 2023/2024, although 2024/25 it decreases shortly to 66,71% (table 1).

Table 1 :Right questions as a percentage and difference between pre and post knowledge questionnaire

	2022-2023			2023-2024			2024-2025		
	PRE (n=199)	POST (n=190)		PRE (n=238)	POST (n=237)		PRE (n=200)	POST (n=189)	
	%	%	Δ%	%	%	Δ%	%	%	Δ%
Q1. Compressions ratio 15:2	72,86	36,84	-36,02	65,55	46,41	-19,13	70,00	40,74	-29,26
Q2. Adrenalin dose	57,29	67,37	10,08	60,08	56,96	-3,12	73,00	71,96	-1,04
Q3. Depth of Compression	30,15	20,53	-9,62	30,25	26,16	-4,09	47,50	39,68	-7,82
Q4. Instrumental	59,30	58,95	-0,35	71,85	62,87	-8,98	72,50	72,49	-0,01
Q5. Adrenalin mins	52,76	83,68	30,92	60,50	75,11	14,60	60,00	74,07	14,07
Q6. Adrenalin dilution	62,81	88,95	26,13	81,09	92,41	11,31	81,50	84,13	2,63
Q7. Duration of Insufflation	28,64	65,26	36,62	51,68	83,12	31,44	48,00	70,37	22,37
Q8. Revaluation 2 min	59,30	89,47	30,18	63,45	88,61	25,16	73,50	80,42	6,92
Q9. FBAO, Choking	76,38	82,63	6,25	58,82	55,27	-3,55	67,00	79,89	12,89
Q10. Vital Signs	55,78	53,16	-2,62	46,64	62,87	16,23	37,50	39,68	2,18
Q11. Duration of Intubation	24,12	68,95	44,83						
Q12 Team leader				76,47	88,61	12,14	76,00	80,42	4,42
TOTAL	52,67	65,07		60,58	67,13		64,23	66,71	

Scores increased significantly between pre- and post-measurements in the 2022–2023 and 2023–2024 academic years ($p < 0,001$), whereas no statistically significant differences were observed in 2024–2025 ($p = 0,118$). Given that it was not possible to ensure individual-level

correspondence between pre- and post-measurements, comparisons were conducted using Student's t-test for independent samples, assuming independence between groups (Table 2).

Table 2: t-student for independent samples

Year	N (pre)	M1 (SD)	N (post)	M2 (SD)	t(gl)	p	Mean difference	CI 95%
2022- 2023	199	5.79 (1.73)	190	7.16 (1.80)	-7.62 (387)	<.001	-1.36	[-1.72, - 1.01]
2023- 2024	238	6.66 (1.61)	237	7.38 (1.35)	-5.28 (459.34)	<.001	-0.72	[-0.99, - 0.45]
2024- 2025	200	7.07 (1.76)	189	7.34 (1.68)	-1.57 (387)	.118	-0.27	[-0.62, 0.07]

Regarding satisfaction measured with the previous questionnaire, it reaches an average in 2023/24 of 9,3 out of 10, highlighting that in all the items exceed the quality standard of 9 points, compared to 8,4 satisfaction average in 2022/2023. The results of satisfaction measured with the DASH questionnaire introduced in 2023/2024, obtaining an average of 6,3 out of 7 in 2023/24 and 6,4 in 2024/25. Generally, all the items have a minimum mark of 6 out of 7 but items 3 about “the instructor attended to logistical details as necessary such as toilet location, food availability” and 17 about “The instructor used video or recorded data to support analysis and learning” are below 6. The question with better mark is 22 regarding the instructor covering important topics. The section in which students are most satisfied is the one about how the instructor helped them to see how to improve or how to sustain good performance (Table 3). Based on the independent samples t-test results, there is no statistically significant difference in satisfaction levels between the two years ($t(172) = -0,59$; $p = 0,557$). Since the p-value exceeds the 0,05 threshold and the confidence interval includes zero (-0,31; 0,17), the data indicates that user satisfaction has remained stable and unchanged during this period.

4. Conclusion

The last educational innovation changes have shown an increase in the average of correctness before the laboratory but slightly decreased in the final score compared to previous year. The slight decrease in knowledge scores in the 2024/2025 academic year may be associated to two factors: to the lower participation of fourth-year students, and to a greater extent, because the time between theoretical classes and CPR practice was shorter than in previous years. Students had more up-to-date theoretical knowledge, which allowed them to achieve better scores on the pre-test questionnaire than in previous years. Regarding student satisfaction after the implementation of the revised questionnaire, it shows great satisfaction among students. Although certain items, such as Q17, yielded lower results, due to limited time and the inability to record the simulations.

Elements for improvement that have been identified are the necessity for assistance from the residents and meeting with the teaching team before the start of simulations. There exists a limitation in the variability of response rates across the questionnaires, even though participants were reminded of their mandatory completion. Also, the variability in the methodologies used across simulations, along with the absence of additional variables, limits the generalization of the findings.

Simulation is a tool that facilitates the implementation of comprehensive and realistic training. Without the need for high-tech mannequins, the simulation would achieve similar levels of satisfaction. Simulation is a type of role-playing, adapted to the academic content covered, that allows students to take on a professional role and respond to challenges. Therefore, it could be used in the educational fields of teacher training, psychology, and even marketing.

Table 3: Average assessment of the satisfaction (DASH) of the participants in the innovation

	2023-24	2024-25	Average
	N=43	N=131	
The instructor set the stage for an engaging learning experience			
1. The instructor introduced him/herself, described the simulation environment, what would be expected during the activity, and introduced the learning objectives.	6,30	6,25	6,28
2. The instructor explained the strengths and weaknesses of the simulation and what I could do to get the most out of simulated clinical experiences.	6,23	6,21	6,22
3. The instructor attended to logistical details as necessary such as toilet location, food availability	5,86	5,86	5,86
4. The instructor made me feel stimulated to share my thoughts and questions about the upcoming simulation and debriefing and reassured me that I wouldn't be shamed or humiliated in the process	6,35	6,44	6,39
The instructor maintained an engaging context for learning.			
5. The instructor clarified the purpose of the debriefing, what was expected of me, and the instructor's role in the debriefing.	6,40	6,38	6,39
6. The instructor acknowledged concerns about realism and helped me learn even though the case(s) were simulated.	6,40	6,41	6,40
7. I felt that the instructor respected the participants.	6,44	6,50	6,47
8. The focus was on learning and not on making people feel bad about making mistakes.	6,30	6,47	6,38
9. Participants could share thoughts and emotions without fear of being shamed or humiliated.	6,49	6,57	6,53

The instructor structured the debriefing in an organized way.			
10. The conversation progressed logically rather than jumping around from point to point	6,42	6,54	6,48
11. Near the beginning of the debriefing, I was encouraged to share my genuine reactions to the case(s) and the instructor seemed to take my remarks seriously.	6,42	6,37	6,39
12. At the end of the debriefing, there was a summary phase where the instructor helped tie observations together and relate the case(s) to ways I can improve my future clinical practice.	6,21	6,27	6,24
The instructor provoked in-depth discussions that led me to reflect on my performance.			
13. At the end of the debriefing, there was a synthesis phase in which the instructor helped to bring together the observations and relate the case(s) to ways of improving my future clinical practice.	6,44	6,53	6,48
14. The instructor used concrete examples—not just abstract or generalized comments—to get me to think about my performance.	6,49	6,42	6,45
15. The instructor's point of view was clear; I didn't have to guess what the instructor was thinking.	6,37	6,40	6,39
16. The instructor listened and made people feel heard by trying to include everyone, paraphrasing, and using non verbal actions like eye contact and nodding, etc.	6,40	6,49	6,44
17. The instructor used video or recorded data to support analysis and learning.	6,02	5,87	5,95
18. If someone got upset during the debriefing, the instructor was respectful and constructive in trying to help them deal with it.	6,23	6,48	6,36
The instructor identified what I did well or poorly – and why.			
19. I received concrete feedback on my performance or that of my team based on the instructor's honest and accurate view.	6,42	6,50	6,46
20. The instructor helped explore what I was thinking or trying to accomplish at key moments.	6,30	6,44	6,37
The instructor helped me see how to improve or how to sustain good performance			
21. The instructor helped me learn how to improve weak areas or how to repeat good performance.	6,37	6,54	6,45
22. The instructor made sure we covered important topics.	6,58	6,62	6,60
Average	6,34	6,39	6,36

References

García Molina, P., & Balaguer López, E. . (2025). Guia docent 34379: Infermeria en la salut infantil i de l'adolescent (Curs 2025 26). . In Universitat de València.

- Greif, R., Lauridsen, K. G., Djärv, T., Ek, J. E., Monnelly, V., Monsieurs, K. G., Nikolaou, N., Olasveengen, T. M., Semeraro, F., Spartinou, A., Yeung, J., Baldi, E., Biarent, D., Djakow, J., van Gils, M., van Goor, S., Gräsner, J. T., Hogeveen, M., Karageorgos, V., ... Nolan, J. P. (2025). European Resuscitation Council Guidelines 2025 Executive Summary. *Resuscitation*, 215. <https://doi.org/10.1016/j.resuscitation.2025.110770>
- Jeffries, P. R. (2005). A framework for designing, implementing, and evaluating simulations used as teaching strategies in nursing. *Nursing Education Perspectives*, 26(2), 96–103. <https://pubmed.ncbi.nlm.nih.gov/15921126/>
- Maestre, J. M., & Rudolph, J. W. (2015). Teorías y estilos de debriefing: el método con buen juicio como herramienta de evaluación formativa en salud. *Revista Española de Cardiología*, 68(4), 282–285. <https://doi.org/10.1016/J.RECESP.2014.05.018>
- Ministerio de Universidades. (2025). Impreso Solicitud para la verificación de títulos oficiales. Graduado o Graduada en Enfermería por la Universitat de València (Estudi General). . https://www.uv.es/pop/docs-M/INFORMES/MEMORIA/2162_MV.pdf
- Simon R, Raemer DB, & Rudolph JW. (2010). Debriefing Assessment for Simulation in Healthcare (DASH) Student Version, Short form. <https://harvardmedsim.org/wp-content/uploads/2017/01/DASH.SV.Short.2010.Final.pdf>.