Nurse Education in Practice 75 (2024) 103901

Contents lists available at ScienceDirect

Nurse Education in Practice

journal homepage: www.elsevier.com/locate/issn/14715953

Effectiveness of video-assisted debriefing versus oral debriefing in simulation-based interdisciplinary health professions education: A randomized trial

Blanca Rueda-Medina [a,b], José Carlos Reina-Cabello [c], Miriam Buendía-Castro [d], María Encarnación Aguilar-Ferrándiz [b,e], Rocío Gil-Gutiérrez [a,b,f,*], Rosa María Tapia-Haro [b,e], Antonio Casas-Barragán [b,e], María Correa-Rodríguez [a,b]

[a] *Department of Nursing, Faculty of Health Sciences, University of Granada, Granada 18016, Spain*
[b] *Instituto de Investigación Biosanitaria ibs. GRANADA, Granada, Spain*
[c] *Functional Area of Health and Social Policy, Subdelegation of the Government of Almería, Almería, Spain*
[d] *Department of Translation and Interpreting, Faculty of Translation and Interpreting, University of Granada, Granada 18003, Spain*
[e] *Department of Physical Therapy, Faculty of Health Sciences, University of Granada, Granada 18016, Spain*
[f] *Sport and Health University Research Institute (iMUDS), University of Granada, Granada 18016, Spain*

ARTICLE INFO

Keywords:
Clinical simulation
COVID-19
Health science students
Oral debriefing
Personal protective equipment
Video-assisted debriefing

ABSTRACT

Aim: We aimed to compare the debriefing experience, simulation assessment, reflection, anxiety and simulation satisfaction of using oral debriefing versus video-assisted debriefing after a simulated clinical session in an interdisciplinary cohort of health sciences students.

Background: Debriefing is a reflective process that takes place after a clinical simulation and that can be performed either in a traditional way (oral) or using video-assisted debriefing.

Design: A randomized controlled trial was conducted in 143 health sciences students (35.7% male, 61.5% female).

Methods: The simulation scenario was designed to evaluate the procedure for donning and doffing personal protective equipment. Differences in debriefing experience, simulation assessment, reflection, anxiety and satisfaction were assessed.

Results: Regarding debriefing experience, significant differences were observed for the category "learning" (34.9 (6.13) vs. 36.7 (3.89); $p = 0.039$). For simulation assessment, significantly higher scores for all categories were identified in video-assisted debriefing compared with oral debriefing ($p<0.001$). There were also significant differences between the oral debriefing versus video-assisted debriefing for the overall score of reflection ability (86.97 (10.55) vs. 90.74 (9.67); $p=0.028$) as well as for the category "reflective communication" (24.72 (3.77) vs 26.04 (4.07); $p=0.047$). Perceived satisfaction was significantly higher in the video-assisted debriefing group compared with oral debriefing group ($p<0.001$). For anxiety, no significant differences were observed between debriefing groups.

Conclusion: Video-assisted debriefing after a simulated clinical session improves debriefing experience, simulation assessment, reflection and simulation satisfaction, but does not increase anxiety compared with oral debriefing among health sciences students.

1. Introduction

Clinical simulation is an educational method that provides health science students opportunities to practice and enhance their clinical skills in a controlled and safe environment (Lamé and Dixon-Woods, 2020). It involves simulating real-life healthcare scenarios, allowing students to practice and refine their clinical skills without putting real patients at risk (Rueda-Medina et al., 2022; So et al., 2019; Zhang, Wang, et al., 2020). Thus, in simulated environments students can make mistakes, learn from them and improve their skills without any potential

* Corresponding author at: Department of Nursing, Faculty of Health Sciences, University of Granada, Granada 18016, Spain.
E-mail address: rogilgu@ugr.es (R. Gil-Gutiérrez).

https://doi.org/10.1016/j.nepr.2024.103901
Received 4 November 2023; Received in revised form 15 January 2024; Accepted 17 January 2024
Available online 24 January 2024

harm to patients, leading to increased student confidence (Archana et al., 2021).

Debriefing or post-simulation feedback is a reflective process that takes place after a clinical simulation scenario (Abulebda et al., 2023). The use of simulation methods allow real-life-like experiences and debriefing helps to transform the experience into knowledge through examination, reflection and re-evaluation of the scenario (Abulebda et al., 2023; Zhang, Wang, et al., 2020). In simulated environments students can review their performance, discuss their thoughts and actions, emotions and decision-making processes, and learn from the simulation experience (Tanoybu et al., 2019). This process has been proposed as crucial for maximizing the educational benefits of clinical simulation and promoting continuous improvement in clinical skills and practice (Schober et al., 2019).

Previous studies indicate that debriefing in clinical simulation can take different forms, including oral debriefing and video-assisted debriefing (VAD) (Ali and Miller, 2018; Farooq et al., 2017; Zhang, Wang, et al., 2020). Oral debriefing is a traditional method of debriefing that involves a face-to-face discussion between instructors and students (Isaranuwatchai et al., 2017). After a simulation scenario, the facilitator guides the debriefing session, allowing participants to reflect on their actions, thought processes and emotions during the simulation. On the other hand, VAD involves recording the simulation scenario and using the video footage during the debriefing session (Farooq et al., 2017). This method allows participants to review and analyze their actions, interactions and decision-making in a more detailed and objective manner (Hung et al., 2018; Manojlovich et al., 2019). The video footage provides a visual representation of the simulation, allowing participants to observe their performance, non-verbal communication and team dynamics and enhancing the discussion and facilitating learning.

Recently, authors have indicated some potential advantages of VAD in clinical simulation compared with oral debriefing such as to provide an objective and detailed account of the simulation scenario, enabling participants to review their performance and actions with greater accuracy (Hung et al., 2018). Also, it has been proposed that with VAD, students can engage in deeper reflection by watching the simulation on video, facilitating to highlight specific moments or behaviors for feedback and learning (Manojlovich et al., 2019). However, others authors have indicated that VAD may limit real-time interaction and may have negative connotations such as stress, intimidation and reluctance to negative feedback, which can lead to less effective learning (Forbes et al., 2016).

In this context, we aimed to compare the debriefing experience, simulation assessment, reflection, anxiety and simulation satisfaction of using oral debriefing versus VAD after a clinical simulation scenario in an interdisciplinary cohort of health sciences students.

2. Methods

2.1. Study design and participants

A randomized controlled trial was conducted in 143 health sciences students (35.7% male, 61.5% female) from 1st (28%), 2nd (20.3%) and 3rd (49%) academic year taken from the Nursing (32.2%) and Physiotherapy (65%) Degrees of the Faculty of Health Sciences of Granada (University of Granada, Spain). The mean age of the interdisciplinary study cohort was 22.54 ± 6.39 years. Students with no prior exposure to simulation and having no prior knowledge of PPE handling were encouraged to become involved in this study. Participants provided written informed consent after receiving information about the purpose of the study. It was explained to the students that participation was voluntary. Therefore, those who chose not to participate would not be academically disadvantaged. Ethical approval was obtained from the Institutional Review Board of the University of Granada.

2.2. Intervention

Prior to the simulation session, a presentation providing the theoretical background to the scenario was emailed to all students who expressed a desire to participate in the study. This theoretical background included basic information about the study schedule and information about donning and doffing personal protective equipment (PPE) procedures through videos and protocols based on those developed by the Centers for Disease Control and Prevention (CDC) (CDC, 2020) and the World Health Organization 2020 (WHO, 2020). Also, students received information regarding the steps required in performing a cardiopulmonary resuscitation (CPR) guided by an external semiautomatic defibrillator (DESA) trainer (Iberomed SL, Pontevedra, Spain), according to the European Resuscitation Council guidelines (ERC, 2021).

Students were randomized by single randomization method into two different debriefing methods (oral debriefing versus VAD) using the Oxford Minimization and Randomization computer-supported centralized method OxMar (O'Callaghan, 2014). All students carried out the same clinical simulation scenario based on the management of a COVID-19 patient. Students were required to don PPE, including a cap, isolation gown, gloves, goggles and a N95 mask. They then performed CPR using a DESA trainer in a high-fidelity adult patient simulation (CAE Apollo, CAE Healthcare Inc., Canada) and subsequently doffed the PPE. The learning objectives of the simulation were: 1) to execute proper CPR techniques; 2) to manage an infectious-contagious patient without compromising their own safety or that of others; 3) to evaluate the ability to adapt and respond in a dynamic clinical setting influenced by students' decisions during the simulation; 4) to deepen understanding of how effective communication skills contribute to achieving specific health outcomes; and 5) to enhance awareness of communication and teamwork skills.

Sessions followed a concrete structure according to the debriefing method employed:

i) Oral debriefing group: After the simulation, the debriefing was guided by the instructor, who encouraged students to discuss their team performance following a structured gather-analyze-summarize (GAS) method. Participants' emotional reactions and reflections were promoted, as well as strengths and weaknesses of their performance during the scenario. The video recording was not reviewed at any time.

ii) VAD group: After the simulation, students reviewed a video recording of their intervention, and the instructor encouraged them to discuss their team performance following a structured GAS method. The instructor used the video as a tool for discussion, pausing at key moments to analyze participants' actions, solicit their reflections and provide feedback. Although each group of students, depending on their particular characteristics, concerns and experience will determine the debriefing session course, the instructor always made sure to address three key points: PPE donning, performing the technique (CPR procedure in an infectious-contagious patient), PPE doffing and team performance.

To minimize intragroup differences, the same instructor was involved in all simulation sessions and the same scenarios were used in a multi-camera simulation room where all students performed the procedure of donning and doffing PPE. A maximum of 15 participants were admitted in a session. The duration of each scenario with its subsequent debriefing was 90 minutes (15 minutes for the simulated scenario and 75 minutes for the debriefing). After the respective debriefings where techniques employed were evaluated, all participants completed post-test questionnaires to assess debriefing experience, simulation assessment, reflection, perceived stress and debriefing satisfaction, which took approximately 20 minutes. Once the entire intervention was completed and the post-test questionnaires described were completed, to not to contaminate the results, the oral debriefing group, provided they agree, had the opportunity to watch the simulation scenario on video and comment the aspects they consider with the instructor and solve any question. The study was conducted between October 2021 and February

2022. A sociodemographic questionnaire was used to request information on age and gender. Students were requested to complete all questionnaires immediately after the debriefing finished. The study protocol is shown in Fig. 1, following CONSORT 2010 Flow Diagram guidelines (Moher et al., 2012).

2.3. Data collection tools

2.3.1. Debriefing experience

The Debriefing Experience Scale (DES) was used to evaluate the student learning experience in debriefing (Reed, 2012). The scale, divided into 4 subscales (analyzing thoughts and feelings, learning and making connections, facilitator skills in conducting the debriefing and appropriate facilitator guidance), consists of 20 items defining the student debriefing experience by using a Likert rating scale ranging from 1-*strongly disagree* to 5-*strongly agree,* where the sum of the scores for all items of each dimension gives instructors an estimation of the experience of debriefing and the importance they give to this procedure (Farrés-Tarafa et al., 2022). The Cronbach's alpha for the total of the DES for this study cohort was 0.953.

2.3.2. Simulation assessment

The Simulation-based Assessment (SAT) tool examines six core competencies including communication, professionalism, patient management, technical skills, safe practice and critical thinking (Tan et al., 2016). The instructor rated the performance of each student during the simulation scenario (donning PPE, CPR and doffing PPE) by using a 33 items checklist ranging from 1 to 3 points per item (*0-not performed, 1-performed but not competent, 2-performed competently*, respectively). Scores from 1 to 3 indicate "need improvement", scores from 4 to 6 indicate "meet expectation" and scores from 7 to 9 indicate "exceed expectation". The Cronbach's alpha for the SAT scale total scores for this sample was 0.959.

2.3.3. Reflection

The Groningen Reflection Ability Scale (GRAS) was used to measure student personal reflection (Aukes et al., 2007). It consists of 23 items measured on 5-point Likert scale with scores ranging from *totally disagree (1)* to *totally agree (5)* regarding three different categories: self-reflection, empathetic reflection and reflective communication (Rostami et al., 2019). Individual item scores can be summed up to a total GRAS score ranging from 23 – 115. Five items (items 3, 4, 12, 17 and 21) are differently worded or negated, so that they should be reversed when scored. Higher scores indicate high reflection ability. The Cronbach's alpha for the total of the GRAS scale was 0.842.

2.3.4. Anxiety

Anxiety was measured using the State-Trait Anxiety Inventory (STAI) (Spielberger et al., 1986). The STAI is a 20-item self-questionnaire where each item is in the form of a statement to which participants select their agreement on a four-point scale regarding their self-perception measure of anxiety through a 4-point Likert scale ranging from 0 to 3 points for each item. The total score obtained ranges from 20 to 80. Higher scores indicate higher anxiety levels. The Cronbach's alpha for the total of the STAI scale for this study cohort was 0.916.

2.3.5. Simulation satisfaction

Satisfaction with simulation experience was assessed using the Satisfaction with Simulated Clinical Experiences Scale (ESECS) (Baptista et al., 2014), which consists of 17 items grouped into three dimensions (practical, realistic and cognitive) that allow the students to give their opinion on the simulation experience using a 10-point Likert-type scale

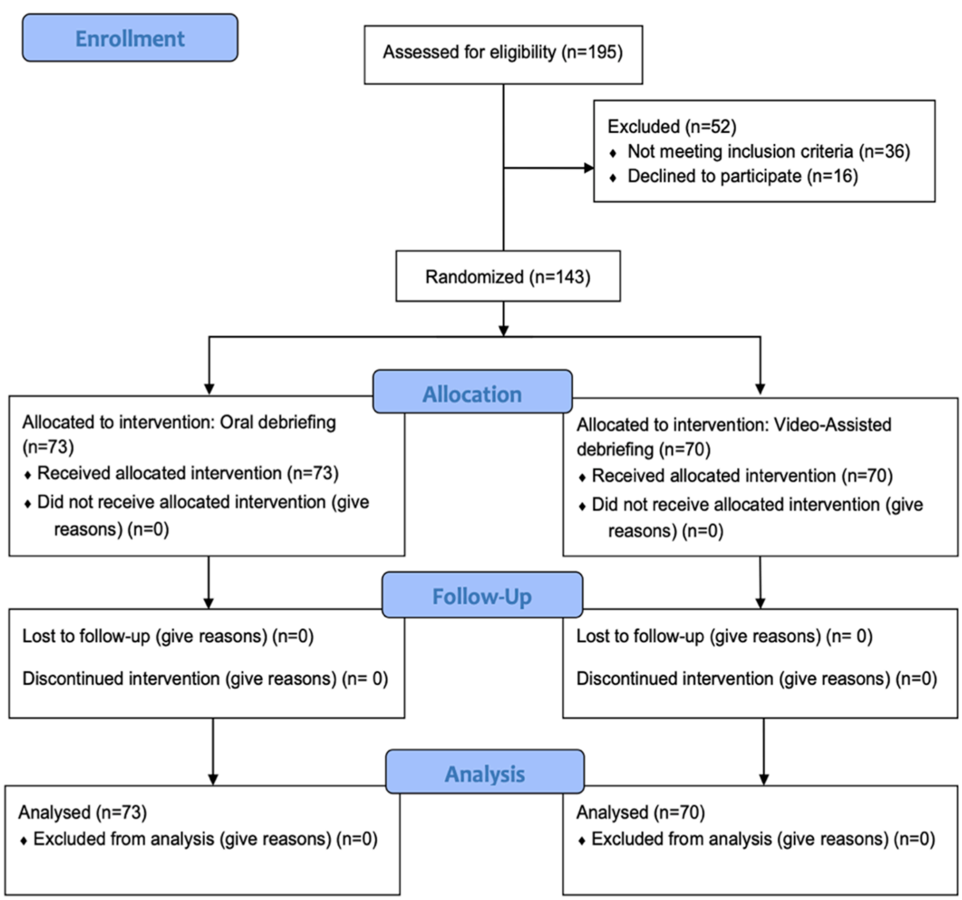

Fig. 1. Study protocol according to CONSORT 2010 Flow Diagram.

ranging from 1 (*lowest level of satisfaction*) to 10 (*highest level of satisfaction*) (Carrero-Planells et al., 2021). The Cronbach's alpha value for the ESECS scale total score for this cohort was 0.959.

2.4. Statistical analysis

Data were analyzed using SPSS® version 22.0 software. Continuous variables were reported as mean (SD) and categorical variables as frequencies and percentages. To compare the two groups (oral debriefing versus VAD), Student's t-test for continuous data and X2 for categorical data were used. P values of <0.05 were considered statistically significant.

3. Results

General characteristics of the total study population and according to the debriefing modalities are shown in Table 1. A total of 143 students (33.1% from the Nursing Degree and 66.9% from the Physiotherapy Degree) participated in the study. Of these, the 63.3% were female and the mean age of the cohort was 22.49 years. Note that the 51% of students received an oral debriefing and the 49% a VAD. Significant differences were found in gender and degree between the two debriefing groups whereas no significant differences were found for age and academic year.

Differences in students' debriefing experience, simulation assessment, reflection, anxiety and debriefing satisfaction scores in the total study cohort and between both debriefing methods are presented in Table 2. Regarding debriefing experience, significant differences were observed for category "learning" (34.9 (6.13) vs. 36.7 (3.89); p = 0.039). For simulation assessment, considering means of the response options, significantly higher scores for all categories were identified in VAD compared with oral debriefing (p<0.001). There were also significant differences between the oral debriefing versus VAD for the overall score of reflection ability (86.97 (10.55) vs. 90.74 (9.67); p=0.028) as well as for the category "reflective communication" (24.72 (3.77) vs 26.04 (4.07); p=0.047). In contrast, for anxiety assessed by the STAI tool, no significant differences were observed according to the debriefing groups. Finally, perceived simulation satisfaction was significantly higher in the VAD group compared with oral debriefing group (p <0.001).

Simulation assessment considering response options as categorical variables in the total study cohort and between both debriefing methods are presented in Table 3. Similar to the results obtained when means of the response options were considered, statistically significant differences were observed for all categories (p<0.001). Students in the VAD group had higher scores compared with students in the oral debriefing group.

Table 1
General characteristics of the participants and according to the debriefing modalities.

		Total (N=143)	Oral debriefing (N=73)	Video-Assisted debriefing (N=70)	P value
Gender	Female	88 (63.3)	54 (61.4)	34 (38.6)	0.001
Age		22.49 (6.42)	23.37 (8.25)	21.59 (3.62)	0.103
Degree	Nursing	46 (33.1)	31 (67.4)	15 (32.6)	0.005
	Physiotherapy	93 (66.9)	39 (41.9)	54 (58.1)	
Academic Year	First	40 (28.8)	24 (60)	16 (40)	0.281
	Second	29 (20.9)	15 (51.7)	14 (48.3)	
	Third	70 (50.4)	31 (44.3)	39 (55.7)	

Data expressed as frequencies and percentage and as mean and standard deviation (SD).

Table 2
Students' debriefing experience, simulation assessment (mean of the response option), reflection, anxiety and simulation satisfaction in the total population and according to the debriefing methods.

	Total (N=143)	Oral debriefing (N=73)	Video-Assisted debriefing (N=70)	P value
Debriefing experience				
Analyzing	17.45 (2.61)	17.08 (2.89)	17.84 (2.24)	0.082
Learning	35.78 (5.22)	34.9 (6.13)	36.7 (3.89)	**0.039**
Facilitator skill	22.25 (3.51)	21.94 (3.79)	22.59 (3.21)	0.278
Appropriate facilitator	13.78 (2.15)	13.44 (2.53)	14.14 (1.63)	0.051
Overall score	89.27 (12.10)	87.37 (13.97)	91.27 (9.48)	0.054
Simulation assessment				
Communication	7.38 (1.87)	6.73 (2.06)	8.07 (1.35)	**<0.001**
Professionalism	7.39(1.87)	6.77 (2.14)	8.04 (1.27)	**<0.001**
Patient management	7.38 (1.93)	6.68 (2.21)	8.1 (1.24)	**<0.001**
Technical skills	7.26 (1.92)	6.58 (2.18)	7.97 (1.3)	**<0.001**
Safe practice	7.57 (1.80)	6.88 (2.05)	8.29 (1.13)	**<0.001**
Critical thinking	7.39 (1.82)	6.78 (1.97)	8.03 (1.41)	**<0.001**
Overall score	44.37 (10.23)	40.41 (11.46)	48.5 (6.67)	**<0.001**
Reflection				
Self-reflection	39.79 (4.73)	39.04 (5.06)	40.58 (4.27)	0.051
Empathic reflection	23.65 (2.88)	23.2 (3.01)	24.1 (2.69)	0.060
Reflective communication	25.37 (3.96)	24.72 (3.77)	26.04 (4.07)	**0.047**
Overall score	88.81 (10.27)	86.97 (10.55)	90.74 (9.67)	**0.028**
Anxiety	55.49 (6.94)	55.42 (7.54)	55.57 (6.33)	0.970
Perceived satisfaction	8.85 (1.63)	8.34 (2)	9.39 (0.86)	**<0.001**

Data expressed in mean and standard deviation (DE).

4. Discussion

In this study, we assessed the effectiveness in terms of debriefing experience, simulation assessment, reflection, anxiety and simulation satisfaction between health science students who received oral debriefing and VAD after a simulated clinical session. We found that VAD improves the debriefing experience, the simulation assessment, the reflection and the simulation satisfaction, but did no increase anxiety compared with oral debriefing among an interdisciplinary cohort of health sciences students. Similar to our findings, previous authors examined the potential effectiveness of VAD compared with oral debriefing in different study cohorts (Farooq et al., 2017; Grant et al., 2014; Ostovar et al., 2018; Sawyer et al., 2012; Zhang, Wang, et al., 2020). These studies differ in the analyzed cohort as well as the evaluated task. For example, three of these studies were carried out with undergraduate students (Grant et al., 2014; Ostovar et al., 2018; Zhang, Wang, et al., 2020) whereas two of them used professionals (Farooq et al., 2017; Sawyer et al., 2012). The sample size was also variable, ranging from 30 to 145 individuals. Our work has been carried out with 143 undergraduate students, which is in the higher end of the known studies. Nevertheless, these studies focus only in nursing and medicine students or professionals and up to our knowledge, this work is the first one including also Physiotherapy students. In some of the studies, only

Table 3
Students' simulation assessment in the total study population and according to the debriefing modalities (response options as categorical variables).

	Answer	Total	Oral debriefing	Video Assisted debriefing	P value
Communication	Need Improvement	10	9 (90)	1 (10)	**0.002**
	Meet expectation	28	9 (32.1)	19 (67.9)	
	Exceed expectation	105	45 (42.9)	60 (57.1)	
Professionalism	Need Improvement	6	6 (100)	0 (0)	< **0.001**
	Meet expectation	34	25 (73.5)	9 (26.5)	
	Exceed expectation	103	42 (40.8)	61 (59.2)	
Patient management	Need Improvement	8	8 (100)	0 (0)	< **0.001**
	Meet expectation	28	21 (75)	7 (25)	
	Exceed expectation	107	44 (58.9)	63 (41.1)	
Technical skills	Need Improvement	8	8 (100)	0 (0)	< **0.001**
	Meet expectation	31	22 (71)	9 (29)	
	Exceed expectation	104	43 (41.3)	61 (58.7)	
Safe practice	Need Improvement	6	6 (100)	0 (0)	**0.001**
	Meet expectation	26	19 (73.1)	7 (26.9)	
	Exceed expectation	111	48 (43.2)	63 (56.8)	
Critical thinking	Need Improvement	4	3 (75)	1 (25)	< **0.001**
	Meet expectation	39	31 (79.5)	8 (20.5)	
	Exceed expectation	100	39 (39)	61 (61)	

Data expressed as frequencies and percentages.

the performance was measured (Farooq et al., 2017; Grant et al., 2014; Sawyer et al., 2012), but other studies took in consideration other variables like studentś satisfaction and self-confidence (Ostovar et al., 2018) or stress (Zhang, Wang, et al., 2020). It should be noted that our work includes not only the performance review, but other relevant factors as anxiety, self-confidence, perceived satisfaction, reflection and simulation assessment.

Our research evidenced that VAD enhances the perceived simulation assessment among students, and it is especially relevant because it highlights the greater effectiveness of VAD compared with oral debriefing. This finding is consistent with previous authors that have already concluded that VAD improves performance both individually and in teams (Skåre et al., 2018). In fact, a previous study comparing performance in cardiopulmonary resuscitation (CPR) after receiving VAD or oral debriefing demonstrated that CPR was performed more effectively in students who received VAD (Dine et al., 2008). Similar to a prior study (Zhang, Wang, et al., 2020), we found that students who received VAD had higher scores in the learning category of the DES, which assess the debriefing experience. One reason that may explain this finding might be the objective and detailed record of the simulation scenario that video recordings provide and that enable students to review their performance with greater accuracy (Hung et al., 2018; Manojlovich et al., 2019; Zhang, Wang, et al., 2020). Moreover, VAD provides concrete examples and visual feedback, and instructors can use specific moments from the video to illustrate areas that require improvement. The VAD can also increase student engagement in the assessment process because students tend to be more actively involved when they can see their own actions and the actions of others on the screen (Schertzer and Waseem, 2023), although this has not been fully investigated (Roh and Jang, 2017).

Assessing the reflective ability of students after the scenario is crucial in clinical simulation as it may promote critical thinking, self-assessment, self-awareness and identification of learning needs (Salik and Paige, 2023; Zhang, Mörelius, et al., 2020). By promoting reflective skills, participants can maximize their learning potential. Similar to previous studies (Bussard, 2016; Kava et al., 2022), our findings support that VAD after a simulation session is a useful method of facilitating reflection in health science students. It can be explained because by watching the video footage of their simulation performance, students can engage in deeper self-reflection. They can analyze their actions and identify gaps in their knowledge or skills. Furthermore, VAD may serve as an objective documentation of students' simulation performance, enabling them to reflect on their progress (Schertzer and Waseem, 2023).

On the other hand, we found that VAD improved the satisfaction with simulation experience. This finding is consistent with prior research (Soucisse et al., 2017). We can hypothesize some reasons that may explain this result. First, video recordings allow students to re-experience the scenario; this visual element enhances the realism of the debriefing process, making it more engaging and impactful for students and, consequently, improving the satisfaction (Cleary et al., 2020). Secondly, VAD involves active participation from students (Salik and Paige, 2023) as they can actively review and analyze the video footage of their performance, leading to higher levels of satisfaction with the debriefing process (Cheng et al., 2015).

In line with other research (Zhang, Wang et al., 2020), we reported that VAD is well-tolerated and does not exacerbate anxiety among students. In our study, students were aware that their simulation performance would be recorded for debriefing purposes. We supposed that this prior knowledge may allow them to mentally prepare and become familiar with the process, reducing potential stress or anxiety associated with being filmed. Moreover, we considered that the role of the instructors is crucial in the debriefing process (Zhang et al., 2019), since they may create a supportive and non-judgmental atmosphere, ensuring that participants feel comfortable (Kolbe et al., 2020; Rudolph et al., 2014). This is a key aspect that can help alleviate any stress or anxiety that students may experience during the video recording. In addition, it is important that the instructor clarify that main goal of VAD is to promote learning, reflection and improvement rather than to evaluate or judge students' performance (Seelandt et al., 2021). This emphasis on learning rather than assessment can also help to reduce stress and anxiety levels.

Overall, although there are inconclusive findings regarding the superiority of VAD over OD, the results of this study support that VAD may have several benefits such the observation of the performance and the filling of learning gaps (Schertzer and Waseem, 2020) and, therefore, could be considered as the gold-standard type of debriefing (Zhang, Mörelius et al., 2020). We support that VAD in clinical simulation offers many advantages, but it is important to acknowledge that there are some potential disadvantages to consider. VAD implies technical challenges since video recording and playback may require specialized equipment and technology (Stephanian et al., 2015). Also, reviewing video footage during the debriefing process can be time-consuming and may extend the duration of the debriefing session, which can tire students (Nascimento et al., 2020). This additional time commitment may be a limitation, particularly in busy educational settings. Although we found that VAD did not increase anxiety by students, the presence of video recordings may increase the pressure and self-consciousness among students (Arafeh et al., 2010; Rossignol, 2017). Watching video recordings of their own performance can evoke emotional reactions in students that may feel embarrassed, criticized or uncomfortable seeing themselves on video. For this reason, as we previously indicated, it is essential to create a supportive and non-judgmental debriefing environment.

This study has some limitations that should be addressed. Firstly, the health science students enrolled in this study were received specific theoretical background to manage PPE in this specific context (CPR guided by a DESA trainer) and therefore, our findings might not be generalized to other clinical scenarios (e.g urinary catheterization procedure, intravenous therapy techniques, etc.). However, it should be highlighted that the correct use of PPE for infectious diseases is crucial for protecting healthcare workers, preventing disease transmission and ensuring patient safety (Brown et al., 2019). By teaching proper PPE usage, future healthcare workers can effectively protect themselves, reducing the risk of contracting the disease. By incorporating PPE training into clinical simulation, healthcare professionals and students can gain practical experience, develop skills and reinforce their understanding of PPE use (Dabrowski et al., 2020; Jen et al., 2022). In fact, it has been proposed that teaching the use of PPE through clinical simulation can be an effective and practical approach (Lockhart et al., 2020; Salway et al., 2020; Tan et al., 2020). It offers a dynamic and interactive approach that promotes patient and provider safety. Additionally, in this study, we found that the VAD after a simulated clinical session based on PPE improves the effectiveness of debriefing compared with oral debriefing in our study population. Secondly, since the sample was entirely constituted by health science students, the effects reported in this trial might not be generalizable to other domains and degrees. In contrast, the strengths of this study included that this was a prospective, randomized controlled trial and aleatory group allocation avoided distorting results based on participants' personal characteristics. It also should be highlighted that the same experienced teacher completed all the teaching sessions to reduce the confounding effect derived from multiple teachers. The interdisciplinary nature of the study studies including physiotherapy and nursing students should be also noted, since interdisciplinary approaches are nowadays highly demanded and are encouraged by the major accrediting bodies for nursing, such as the American Association of Critical-Care Nurses (AACN).

In conclusion, VAD after a simulated clinical session has shown to improve the debriefing experience, the simulation assessment, the reflection and simulation satisfaction, but do not increase anxiety compared with oral debriefing in an interdisciplinary cohort of health sciences students. These findings are useful for educators who can use the information from this study to promote VAD after simulation sessions, as it appears to improve the effectiveness of debriefing. Further research is required to validate the use of this debriefing approach in other contexts.

Funding

*Funding for open access charge: Univeresidad de Granada/CBUA.

CRediT authorship contribution statement

Correa-Rodríguez María: Writing – review & editing, Writing – original draft, Supervision, Resources, Funding acquisition, Formal analysis, Conceptualization. **Tapia-Haro Rosa María:** Writing – review & editing, Resources, Methodology, Investigation, Formal analysis, Conceptualization. **Casas-Barragán Antonio:** Writing – review & editing, Resources, Methodology, Investigation, Formal analysis, Conceptualization. **Aguilar-Ferrándiz María Encarnación:** Writing – review & editing, Resources, Methodology, Formal analysis, Conceptualization. **Gil-Gutiérrez Rocío:** Writing – review & editing, Writing – original draft, Methodology, Investigation. **Reina-Cabello José Carlos:** Writing – review & editing, Resources, Methodology, Data curation, Conceptualization. **Buendía-Castro Miriam:** Writing – review & editing, Resources, Methodology, Data curation, Conceptualization. **Rueda-Medina Blanca:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Abulebda, K., Auerbach, M., Limaiem, F., 2023. Debriefing Techniques Utilized in Medical Simulation. En StatPearls. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK546660/.

Ali, A.A., Miller, E.T., 2018. Effectiveness of video-assisted debriefing in health education: an integrative review. J. Nurs. Educ. *57* (1), 14–20. https://doi.org/10.3928/01484834-20180102-04.

Arafeh, J.M.R., Hansen, S.S., Nichols, A., 2010. Debriefing in simulated-based learning. J. Perinat. Neonatal Nurs. *24* (4), 302–309. https://doi.org/10.1097/JPN.0b013e3181f6b5ec.

Archana, S., Nilakantam, S.R., Hathur, B., Dayananda, M., 2021. The need and art of establishing skill and simulation centers to strengthen skill-based medical education: learning insights and experience. Ann. Afr. Med. *20* (4), 247–254. https://doi.org/10.4103/aam.aam_53_20.

Aukes, L.C., Geertsma, J., Cohen-Schotanus, J., Zwierstra, R.P., Slaets, J.P.J., 2007. The development of a scale to measure personal reflection in medical practice and education. Med. Teach. *29* (2-3), 177–182. https://doi.org/10.1080/01421590701299272.

Baptista, R.C.N., Martins, J.C.A., Pereira, M.F.C.R., Mazzo, A., 2014. Students' satisfaction with simulated clinical experiences: validation of an assessment scale. Rev. Lat. Am. Enferm. *22* (5), 709–715. https://doi.org/10.1590/0104-1169.3295.2471.

Brown, L., Munro, J., Rogers, S., 2019. Use of personal protective equipment in nursing practice. Nurs. Stand. *34* (5), 59–66. https://doi.org/10.7748/ns.2019.e11260.

Bussard, M.E., 2016. Self-reflection of video-recorded high-fidelity simulations and development of clinical judgment. J. Nurs. Educ. *55* (9), 522–527. https://doi.org/10.3928/01484834-20160816-06.

Carrero-Planells, A., Pol-Castañeda, S., Alamillos-Guardiola, M.C., Prieto-Alomar, A., Tomás-Sánchez, M., Moreno-Mulet, C., 2021. Students and teachers' satisfaction and perspectives on high-fidelity simulation for learning fundamental nursing procedures: a mixed-method study. Nurse Educ. Today *104*, 104981. https://doi.org/10.1016/j.nedt.2021.104981.

CDC, 2020. Coronavirus Disease 2019 (COVID-19). Centers for Disease Control and Prevention. https://www.cdc.gov/coronavirus/2019-ncov/communication/print-resources.html.

Cheng, A., Palaganas, J., Eppich, W., Rudolph, J., Robinson, T., Grant, V., 2015. Co-debriefing for simulation-based education: a primer for facilitators. Simul. Healthc. J. Soc. Simul. Healthc. *10* (2), 69–75. https://doi.org/10.1097/SIH.0000000000000077.

Cleary, T.J., Battista, A., Konopasky, A., Ramani, D., Durning, S.J., Artino, A.R., 2020. Effects of live and video simulation on clinical reasoning performance and reflection. Adv. Simul. *5*, 17 https://doi.org/10.1186/s41077-020-00133-1.

Dabrowski, M., Steliga, A., Dabrowska, A., Smereka, J., Szarpak, L., 2020. Use simulation to improve the effectiveness of PPE in COVID-19. Disaster Emerg. Med. J. *5* (3), 171–173. https://doi.org/10.5603/DEMJ.a2020.0028.

Dine, C.J., Gersh, R.E., Leary, M., Riegel, B.J., Bellini, L.M., Abella, B.S., 2008. Improving cardiopulmonary resuscitation quality and resuscitation training by combining audiovisual feedback and debriefing. Crit. Care Med. *36* (10), 2817–2822. https://doi.org/10.1097/CCM.0b013e318186fe37.

European Resuscitation Council (ERC), 2021. ERC Guidelines. (https://cprguidelines.eu/).

Farooq, O., Thorley-Dickinson, V.A., Dieckmann, P., Kasfiki, E.V., Omer, R.M.I.A., Purva, M., 2017. Comparison of oral and video debriefing and its effect on knowledge acquisition following simulation-based learning. BMJ Simul. Technol. Enhanc. Learn. *3* (2), 48–53. https://doi.org/10.1136/bmjstel-2015-000070.

Farrés-Tarafa, M., Julian, D.B., Lorenzo-Seva, U., Hurtado-Pardos, B., Raurell-Torredà, M., Casas, I., Carballedo-Pulido, J., Roldán-Merino, J., 2022. Cultural adaptation, translation and validation of the Spanish version Debriefing Experience Scale. PLoS ONE *17* (5), e0267956. https://doi.org/10.1371/journal.pone.0267956.

Forbes, H., Bucknall, T.K., Hutchinson, A.M., 2016. Piloting the feasibility of head-mounted video technology to augment student feedback during simulated clinical decision-making: an observational design pilot study. Nurse Educ. Today *39*, 116–121. https://doi.org/10.1016/J.NEDT.2016.01.012.

Grant, J.S., Dawkins, D., Molhook, L., Keltner, N.L., Vance, D.E., 2014. Comparing the effectiveness of video-assisted oral debriefing and oral debriefing alone on behaviors by undergraduate nursing students during high-fidelity simulation. Nurse Educ. Pract. *14* (5), 479–484. https://doi.org/10.1016/j.nepr.2014.05.003.

Hung, L., Phinney, A., Chaudhury, H., Rodney, P., 2018. Using video-reflexive ethnography to engage hospital staff to improve dementia care. Glob. Qual. Nurs. Res. *5*, 2333393618785095 https://doi.org/10.1177/2333393618785095.

Isaranuwatchai, W., Alam, F., Hoch, J., Boet, S., 2017. A cost-effectiveness analysis of self-debriefing versus instructor debriefing for simulated crises in perioperative medicine in Canada. J. Educ. Eval. Health Prof. *13*, 44. https://doi.org/10.3352/jeehp.2016.13.44.

Jen, H.-J., Chou, K.-R., Chang, C.-Y., 2022. Fostering nursing staff competence in personal protective equipment education during COVID-19: a mobile-video online

learning approach. Int. J. Environ. Res. Public Health *19* (15), 9238. https://doi.org/10.3390/ijerph19159238.
Kava, L., Jones, K., Ehrman, R., Smylie, L., McRae, M., Dubey, E., Reed, B., Messman, A., 2022. Video-assisted self-reflection of resuscitations for resident education and improvement of leadership skills: a pilot study. Perspect. Med. Educ. *11* (2), 80–85. https://doi.org/10.1007/s40037-021-00690-9.
Kolbe, M., Eppich, W., Rudolph, J., Meguerdichian, M., Catena, H., Cripps, A., Grant, V., Cheng, A., 2020. Managing psychological safety in debriefings: a dynamic balancing act. BMJ Simul. Technol. Enhanc. Learn. *6* (3), 164–171. https://doi.org/10.1136/bmjstel-2019-000470.
Lamé, G., Dixon-Woods, M., 2020. Using clinical simulation to study how to improve quality and safety in healthcare. BMJ Simul. Technol. Enhanc. Learn. *6* (2), 87–94. https://doi.org/10.1136/bmjstel-2018-000370.
Lockhart, S.L., Naidu, J.J., Badh, C.S., Duggan, L.V., 2020. Simulation as a tool for assessing and evolving your current personal protective equipment: lessons learned during the coronavirus disease (COVID-19) pandemic. Can. J. Anaesth. J. Can. d'anesth. *67* (7), 895–896. https://doi.org/10.1007/s12630-020-01638-z.
Manojlovich, M., Frankel, R.M., Harrod, M., Heshmati, A., Hofer, T., Umberfield, E., Krein, S., 2019. Formative evaluation of the video reflexive ethnography method, as applied to the physician-nurse dyad. BMJ Qual. Saf. *28* (2), 160–166. https://doi.org/10.1136/bmjqs-2017-007728.
Moher, D., Hopewell, S., Schulz, K.F., Montori, V., Gøtzsche, P.C., Devereaux, P.J., Elbourne, D., Egger, M., Altman, D.G., CONSORT, 2012. CONSORT 2010 explanation and elaboration: Updated guidelines for reporting parallel group randomised trials. Int. J. Surg. *10* (1), 28–55. https://doi.org/10.1016/j.ijsu.2011.10.001.
Nascimento, J. da S.G., Pereira, I.M., Regino, D. da S.G., Silva, A.R. da, Oliveira, J.L.G. de, Dalri, M.C.B., 2020. Video-assisted debriefing technique for nursing simulation: how to proceed? Rev. Gaúcha Enferm. *42*, e20190361 https://doi.org/10.1590/1983-1447.2021.20190361.
O'Callaghan, C.A., 2014. OxMaR: open source free software for online minimization and randomization for clinical trials. PLoS One *9* (10), e110761. https://doi.org/10.1371/journal.pone.0110761.
Ostovar, S., Allahbakhshian, A., Gholizadeh, L., Dizaji, S.L., Sarbakhsh, P., Ghahramanian, A., 2018. Comparison of the effects of debriefing methods on psychomotor skills, self-confidence and satisfaction in novice nursing students: a quasi-experimental study. J. Adv. Pharm. Technol. Res. *9* (3), 107–112. https://doi.org/10.4103/japtr.JAPTR_291_18.
Reed, S.J., 2012. Debriefing experience scale: development of a tool to evaluate the student learning experience in debriefing. Clin. Simul. Nurs. *8* (6), e211–e217. https://doi.org/10.1016/J.ECNS.2011.11.002.
Roh, Y.S., Jang, K.I., 2017. Survey of factors influencing learner engagement with simulation debriefing among nursing students. Nurs. Health Sci. *19* (4), 485–491. https://doi.org/10.1111/nhs.12371.
Rossignol, M., 2017. Effects of video-assisted debriefing compared with standard oral debriefing. Clin. Simul. Nurs. *13*, 145–153. https://doi.org/10.1016/j.ecns.2016.12.001.
Rostami, A., Keshmiri, F., Askari, R., Jambarsang, S., Shafiei, M., 2019. Validation of Groningen reflection ability scale questionnaire and evaluation of reflection ability level of health care management students. Evid. Based Health Policy Manag. Econ. *3* https://doi.org/10.18502/jebhpme.v3i4.2071.
Rudolph, J.W., Raemer, D.B., Simon, R., 2014. Establishing a safe container for learning in simulation: the role of the presimulation briefing. Simul. Healthc. J. Soc. Simul. Healthc. *9* (6), 339–349. https://doi.org/10.1097/SIH.0000000000000047.
Rueda-Medina, B., Aguilar-Ferrándiz, M.E., Esteban-Burgos, A.A., Tapia Haro, R.M., Casas-Barragán, A., Velando-Soriano, A., Gil-Gutiérrez, R., Correa-Rodríguez, M., 2022. Impact of non-face-to-face teaching with passive training on personal protective equipment use in health science students: a randomized controlled trial. Int. J. Environ. Res. Public Health *19* (19). https://doi.org/10.3390/ijerph191912981.
Salik, I., Paige, J.T., 2023. Debriefing the Interprofessional Team in Medical Simulation. StatPearls. StatPearls Publishing http://www.ncbi.nlm.nih.gov/books/NBK554526/.
Salway, R.J., Williams, T., Londono, C., Roblin, P., Koenig, K., Arquilla, B., 2020. Comparing training techniques in personal protective equipment use. Prehosp. Disaster Med. *35* (4), 364–371. https://doi.org/10.1017/S1049023×20000564.
Sawyer, T., Sierocka-Castaneda, A., Chan, D., Berg, B., Lustik, M., Thompson, M., 2012. The effectiveness of video-assisted debriefing versus oral debriefing alone at improving neonatal resuscitation performance: a randomized trial. Simul. Healthc. J. Soc. Simul. Healthc. *7* (4), 213–221. https://doi.org/10.1097/SIH.0b013e3182578eae.
Schertzer, K., Waseem, M., 2020. Use of video during debriefing in medical simulation. StatPearls.
Schertzer, K., Waseem, M., 2023. Use of Video During Debriefing in Medical Simulation. StatPearls. StatPearls Publishing http://www.ncbi.nlm.nih.gov/books/NBK554619/.
Schober, P., Kistemaker, K.R.J., Sijani, F., Schwarte, L.A., van Groeningen, D., Krage, R., 2019. Effects of post-scenario debriefing versus stop-and-go debriefing in medical simulation training on skill acquisition and learning experience: a randomized controlled trial. BMC Med. Educ. *19* (1), 334 https://doi.org/10.1186/s12909-019-1772-y.
Seelandt, J.C., Walker, K., Kolbe, M., 2021. A debriefer must be neutral and other debriefing myths: A systemic inquiry-based qualitative study of taken-for-granted beliefs about clinical post-event debriefing. Adv. Simul. *6* (1), 7 https://doi.org/10.1186/s41077-021-00161-5.
Skåre, C., Calisch, T.E., Sæter, E., Rajka, T., Boldingh, A.M., Nakstad, B., Niles, D.E., Kramer-Johansen, J., Olasveengen, T.M., 2018. Implementation and effectiveness of a video-based debriefing programme for neonatal resuscitation. Acta Anaesthesiol. Scand. *62* (3), 394–403. https://doi.org/10.1111/aas.13050.
So, H.Y., Chen, P.P., Wong, G.K.C., Chan, T.T.N., 2019. Simulation in medical education. J. R. Coll. Physicians Edinb. *49* (1), 52–57. https://doi.org/10.4997/JRCPE.2019.112.
Soucisse, M.L., Boulva, K., Sideris, L., Drolet, P., Morin, M., Dubé, P., 2017. Video coaching as an efficient teaching method for surgical residents—a randomized controlled trial. J. Surg. Educ. *74* (2), 365–371. https://doi.org/10.1016/j.jsurg.2016.09.002.
Spielberger, C.D., Gorsuch, R.L., Lushene, R.E., Lushene, R.E., 1986. Tea. Cuestionario de ansiedad estado-rango: Manual.
Stephanian, D., Sawyer, T., Reid, J., Stone, K., Roberts, J., Thompson, D., Pendergrass, T., 2015. Synchronous Mobile Audio-Visual Recording Technology (SMART) cart for healthcare simulation debriefing. Simul. Gaming *46* (6), 857–867. https://doi.org/10.1177/1046878115617711.
Steps to Put on Personal Protective Equipment (PPE). World Health Organization [accessed on 24 July 2022]; 2020 Available online: https://www.who.int/bangladesh/emergencies/coronavirus-disease-(covid-19)-update/steps-to-put-on-personal-protective-equipment-(ppe).
Tan, K.K., Palham, S., Ignacio, J., Dawood, R.B., Mackey, S., Lim, F.P., Liaw, S.Y., 2016. The evaluation of nursing competency in a simulation-based assessment: tool development and students' experiences. Asian J. Scholarsh. Teach. Learn. 6 (2), 221–245.
Tan, W., Ye, Y., Yang, Y., Chen, Z., Yang, X., Zhu, C., Chen, D., Tan, J., Zhen, C., 2020. Whole-process emergency training of personal protective equipment helps healthcare workers against COVID-19: design and effect. J. Occup. Environ. Med. *62* (6), 420–423. https://doi.org/10.1097/JOM.0000000000001877.
Tanoybu, I., Labben, I., Guédira, S., Drolet, P., Perron, R., Robitaille, A., Géorgescu, M., 2019. The impact of a high fidelity simulation-based debriefing course on the Debriefing Assessment for Simulation in Healthcare (DASH)© score of novice instructors. J. Adv. Med. Educ. Prof. *7* (4), 159–164. https://doi.org/10.30476/jamp.2019.74583.0.
Zhang, H., Mörelius, E., Goh, S.H.L., Wang, W., 2019. Effectiveness of video-assisted debriefing in simulation-based health professions education: a systematic review of quantitative evidence. Nurse Educ. *44* (3), E1–E6. https://doi.org/10.1097/NNE.0000000000000562.
Zhang, H., Mörelius, E., Goh, S.H.L., Wang, W., 2020. Developing a structured three-phase video-assisted debriefing to enhance prelicensure nursing students' debriefing experiences, reflective abilities and professional competencies: a proof-of-concept study. Nurse Educ. Pract. *44* (October 2019), 102740 https://doi.org/10.1016/j.nepr.2020.102740.
Zhang, H., Wang, W., Goh, S.H.L., Wu, X.V., Mörelius, E., 2020. The impact of a three-phase video-assisted debriefing on nursing students' debriefing experiences, perceived stress and facilitators' practices: a mixed methods study. Nurse Educ. Today *90* (March). https://doi.org/10.1016/j.nedt.2020.104460.