360ViSi

Review of current literature on simulation training in Health Education

The review is a supporting study to the report on specific needs for simulation tools in Health Education, the Result nr 2.2 of the Work Package 2, Planning and Analysis, in the Project 360ViSi – simulation training by consumer 360° video tools.

The 360ViSi project is a Knowledge Alliances in the Erasmus+ Programme, Key Action 2 – Cooperation for innovation and the exchange of good practices, Project Ref: 612395-EPP-1-2019-1-NO-EPPKA2-KA.

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1 INTRODUCTION

This document aims to identify specific and tested areas in health education in which students might benefit from full simulation training. The outcome will lead to a greater understanding of the field among the teaching staff of higher education institutions. Moreover, we would like to study the possibilities of training health sciences students using 360º virtual environments.

Assessing competencies of nursing students is essential for professional development and educational needs. Simulation-based training provides students with a clinical practice guidance and a systematic feedback that helps them face real life situations (Hsu et. al., 2019).

This report is based on a systematic review which lists the specific areas in which 360° video simulation is particularly relevant.

2 GOALS

2.1 General goal

To assess the simulation training needs of health science students.

2.2 Specific goals

To know the fields of knowledge already used in simulation by Health Sciences students.
To determine the clinical procedures that are suitable for simulation techniques.

3 MATERIAL & METHODS

3.1 PICO Question

In order to carry out the search, a PICO question was proposed:
Concerning health science students, which areas of knowledge are in need of being taught with 360 video simulations?

P: Health care students (MesH nursing students)

I: Simulation training (MESH= patient simulation / audio video demonstration)

C: Not applicable

O: Increasing understanding teaching from the health education (MESH= teaching methods / Educational needs assessment)

3.2 Bibliographic search

The bibliographic search was performed using the Web of Science database (WoS main collection). Mesh terms were used and the Boolean operator AND was used. Articles were filtered giving priority to those published from 2010 to the present day, in all languages. Search date: 03/18/2020.

3.3 Search limits

In order to address the PICO question and the goals of the study, search limits were established. Table 1 describes the search equations.

Table 1. Variation in search characteristics in WoS

TS=(patient simulation) AND TS=(nursing students) AND TS=(Educational needs assessment) (24 results) (Date: 18/03/2020)

3.4 Selection and features of the studies

Once the search was completed, the articles that met the established selection criteria were selected, and those that did not, or presented any of the exclusion criteria were discarded.

3.5 Inclusion criteria

Articles that met the following criteria were included:

- Type of studies: both qualitative and quantitative.

- Type of participants: students of health sciences.

- Studies that use one or more of the following tools: simulation, 360º video, cellular phone applications, APP, interactive video, telecare.

3.6 Exclusion criteria

- Articles that did not refer to the field of health.

- Those which did not use simulation or video intervention.

- Type of study: conference communication, opinion article.

3.7 Results selection

Following the inclusion and exclusion criteria, the studies were chosen. Originally, the number of records found was 24. They were reviewed by screening (reading the title and abstract). Two of them were conference communications. A total of 14 articles were obtained for complete reading. Of these, 2 articles were discarded because they were not found in full text. Thus, the final number of articles selected for the present review was 12.

4 RESULTS

4.1 Search results

The articles identified in the database were screened and chosen for subsequent critical reading, following the steps that appear in the following flow chart.

Figure 1. Article selection according to PRISMA
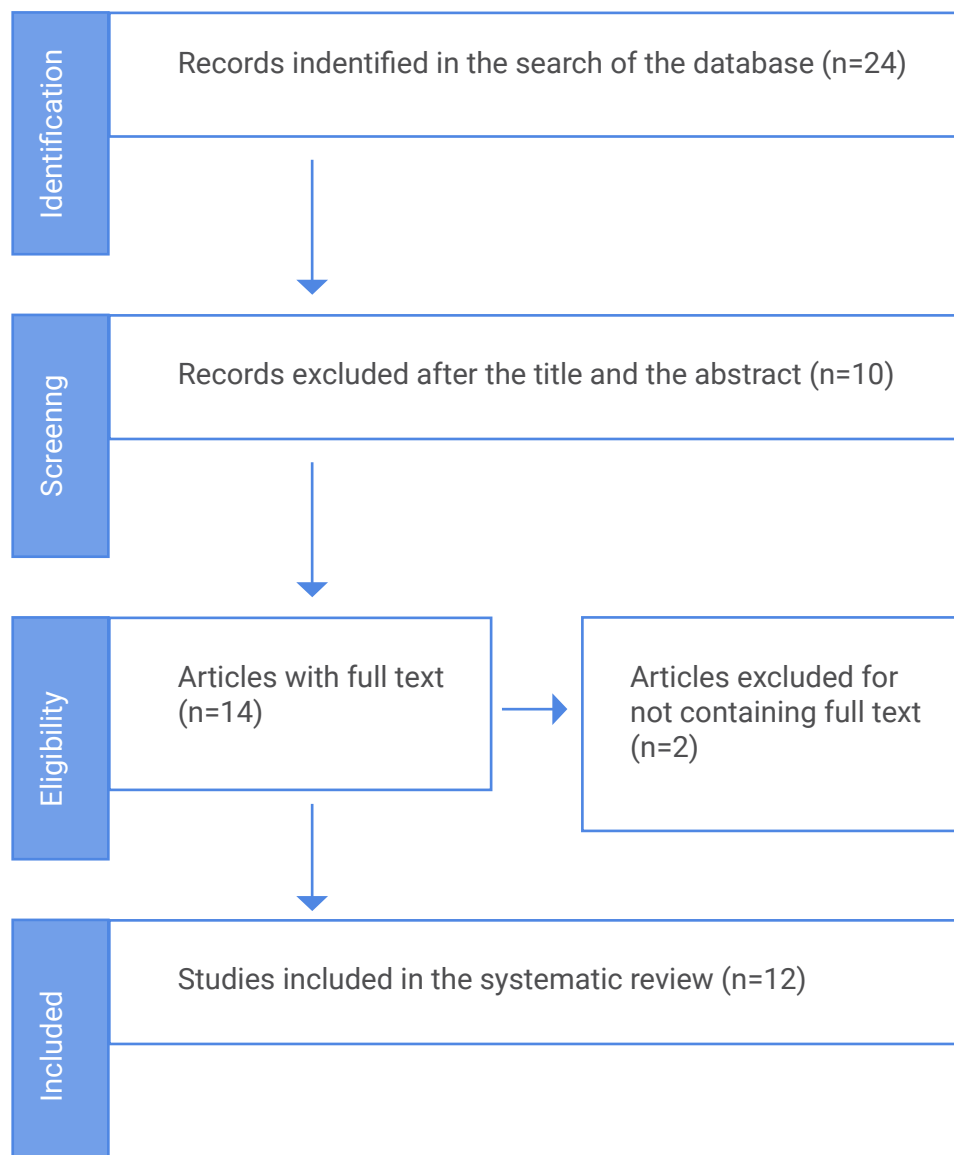
Of the 24 records found after applying the search equation, the title and abstract were read first, with the aim of selecting or excluding them for critical reading with the full text. This process was carried out by three "blinded" researchers.

After this first reading, 10 articles were excluded. Mainly because the type of intervention did not allude to the use of video or simulation as a teaching-learning method (Figure 2).

Figure 2: Reasons for exclusion after abstract reading
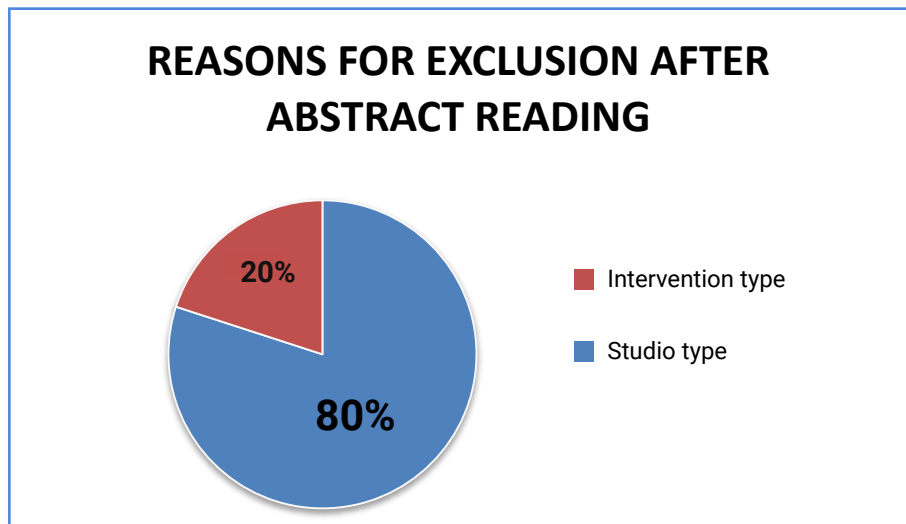
There was an agreement among the three researchers in 90% of the exclusions. Only 10% needed of subsequent discussion between the investigators to reach a final consensus. Regarding the year of publication, there is an increase in publications that address this topic, concentrating 90% of the selected publications between the years 2015 - 2019.

Figure 3: Distribution of the articles according to the year of publication.
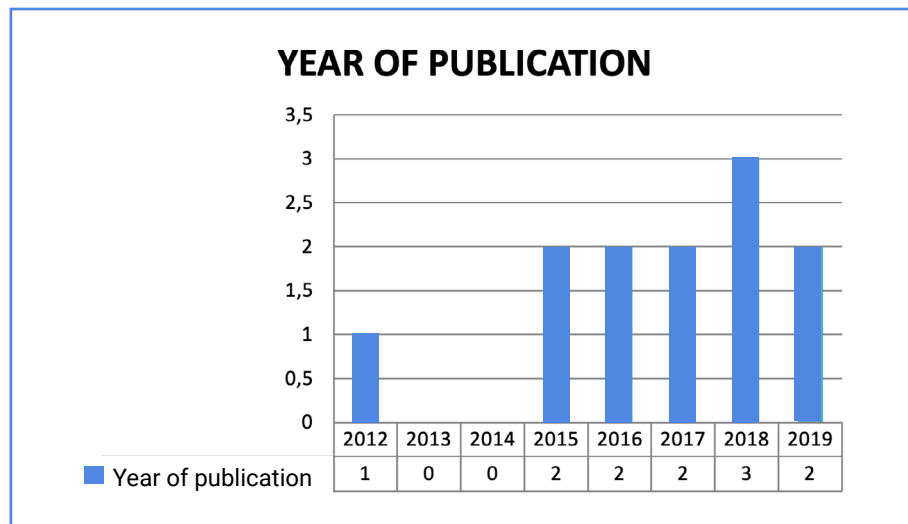

The study design used in the selected articles (Figure 4), has been very heterogeneous, finding that 34% were quasi-experimental studies with a pre-intervention analysis, but without a control group in most of them.

Qualitative studies have been 17% of those selected along with 9% qualitative, in which student satisfaction and learning after the intervention has been evaluated.

Figure 4: Study design of the selected articles.
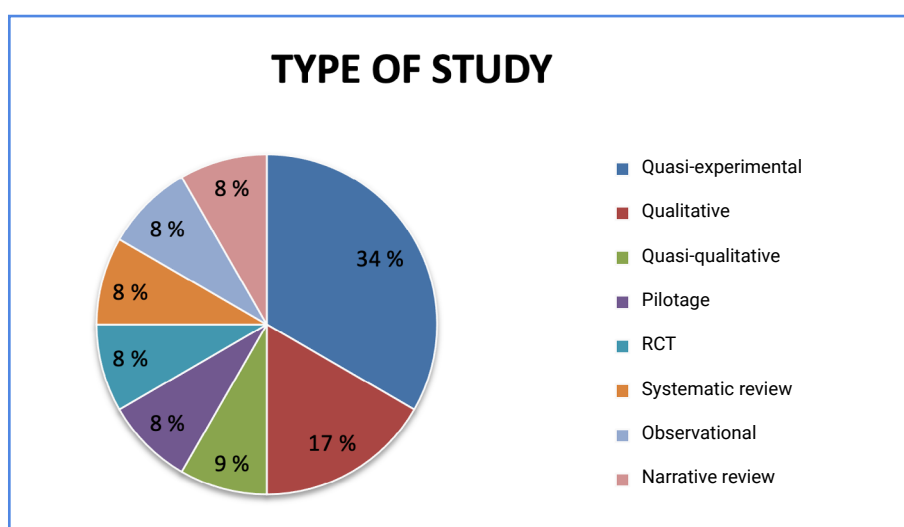
The type of intervention used was, in 75% of the cases, a simulation of a clinical case through actors representing a scene or through the participation of the students and teachers as actors on the stage.

High and low fidelity simulators were also used, but almost always in a scenario simulating a clinical case.

Figure 5: Type of intervention
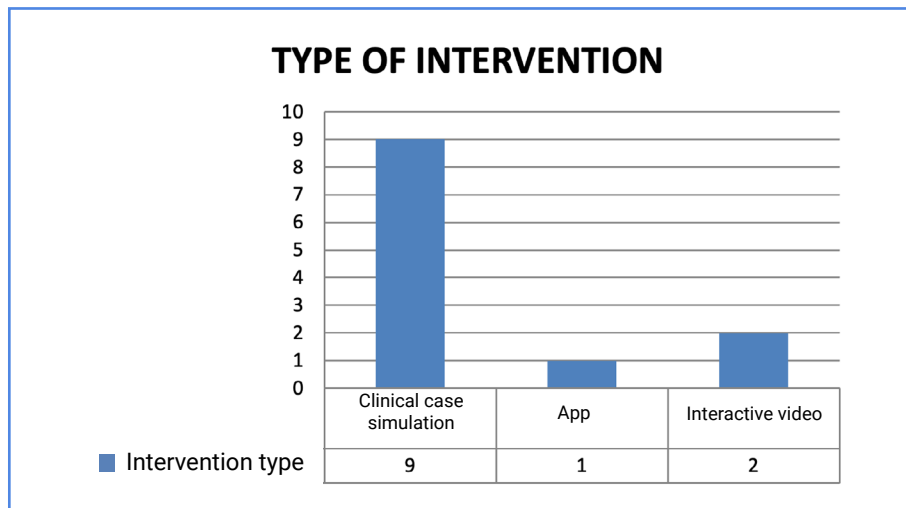
The area of knowledge worked with the students was very heterogeneous, as observed in figure 6. Palliative care and mental health care are the topics mainly worked on in the simulation scenarios. Although scenarios of home care, sexual health, child care, patient safety, clinical interview, and nursing techniques in the physical examination of the patient and arterial puncture have also been considered.

Figure 6: Knowledge area worked with simulation
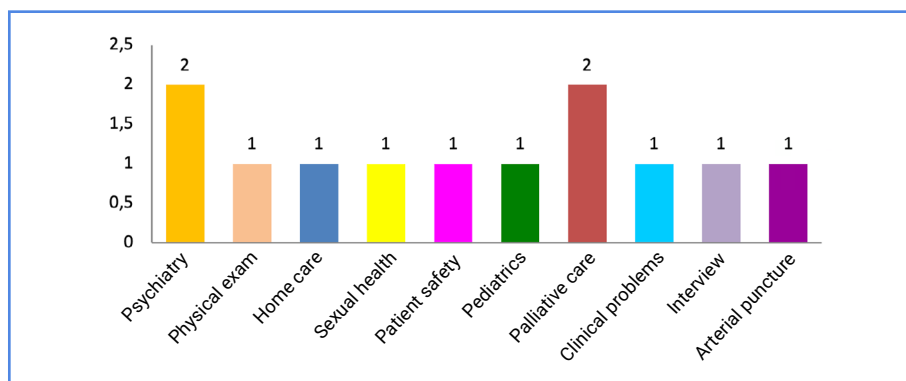
After critical reading of the full text of the articles, a low quality of the studies was observed in 50% of them, as they did not present accuracy in their methodology or analysis of the results.

33% of them showed a medium quality and 17% a high quality in the evidence of their results and conclusions.

Figure 7: Quality of the evidence after critical reading
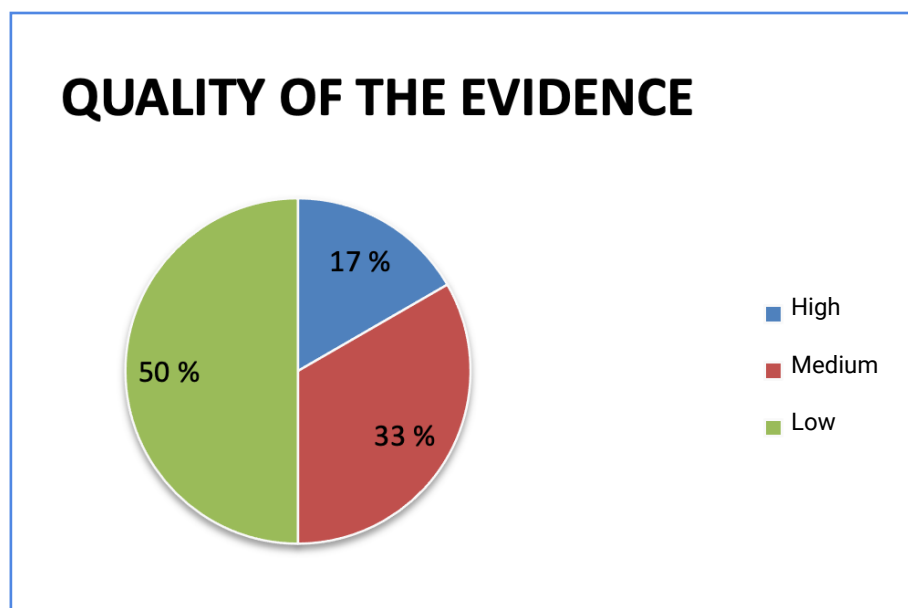
4.2 Search results

The 12 analyzed texts can be divided into various thematic categories that respond to the simulation needs that have become evident after the review:

Security
Within this group we find two types of studies: those that explore patient safety, and those related to improving student skills, which in the end will translate into safety in the procedures towards the patient.

Subtopic: Mental health
A study by Martin et al. from 2019 (Martin et al., 2019) was carried out on first-year nursing students. The study aimed to find out if the stigmatization of the psychiatric patient by the student improved after going through a training program of 8 weeks duration. Seventy-one first-year nursing students were recruited to the study. Students witnessed two clinical simulations, in groups of four and supervised by a instructor. Questionnaires are passed to

them before and after such program. The conclusion is that simulation with psychiatric patients is useful to reduce student anxiety in handling situations related to mental health. On the other hand, Sunngsvist et al. (Sunnqvist et al., 2016) proposed to assess reactions of 4th year nursing students on the use of virtual patients with psychiatric disorders. Specifically, five cases of virtual patients with different psychiatric ailments were exposed to the students. They are asked to carry out a pre-assessment and a post-intervention assessment.

Subtopic: palliative care
In the quasi-experimental study carried out by Grossman (Grossman, 2013), three scenarios of patients requiring palliative / terminal care are proposed, and the students are divided into 4 groups; one in each scenario and another group observing the others. An algorithm of intervention with the patient is provided, and it is concluded that the use of this algorithm is useful, since not all students receive instruction in palliative care during their rotary clinical training.

The systematic review carried out by Kozhevnikov et al. (Kozhevnikov et al. 2018) presents a scenario in which 360° training of students would be important. Students' training is recorded in a robotic simulator or through a sociogram. Also, they highlight the importance of developing communication skills.

Subtopic: telecare
In this qualitative/quantitative study carried out by Lister et al. (Lister et al., 2018) the student's handling capacity in home care is evaluated through a tele-assistance tool with video-conference. The limitations that it presents, such as the transmission of the image or sound, apply to the 360 methodology.

Subtopic: sexual education
Hickerson et al. (Hickerson et al., 2018) propose the use of simulation to improve skills with a LGTBI group, through sexual education and an awareness program. There is an increase in the student's self-confidence to address certain issues concerning this topic.

Subtopic: emergency situation
In this study carried out by Stayt et al. (Stayt et al., 2015), the implementation of the ABCDE methodology for acting before a critical patient is evaluated. High-fidelity simulators are used. There is evidence indicating a significant learning by the student, who will improve performance and safety procedures. In addition, there is an improvement in the perception of safety in student's performance in this type of situation.

Subtopic: patient security
In the quasi-experimental study carried out by Bowling (Bowling, 2015), some procedures related to patient safety are analyzed, such as identifying the patient and administering medication. Seventy-seven students were recruited and divided into a control and experimental group. After going through the simulation program, some errors are found in these basic procedures.

Szyld et al. (Szyld et al., 2017) carried out a video simulation with the aim of improving medical student skills facing certain diseases. It could be completed with the use of 360º technologies, that would allow an increase in the reflective and critical capacity of students, as they are immersive tools enhancing meaningful learning.

Subtheme: Improvement of student skills/knowledge
In the narrative review carried out by Aronowitz et al. (Aronowitz et al., 2017), a clinical simulation with real actors is implemented to nursing students in order to improve clinical examinations. The 360 methodology would provide a considerable reduction in costs, since it would not be necessary to have real actors to ensure student learning.

Hernández-Padilla et al. (Hernandez-Padilla et al., 2016) use a low-fidelity simulation through which learning of arterial puncture, a basic nursing technique, is evaluated. Simulation is demonstrated as an effective tool for acquiring this type of procedural knowledge, and this can be extended with the use of the 360 methodology that contemplates not only the technique itself, but also the context surrounding the performance.

The study of Hsu (Hsu et al., 2019) consists of the implementation and evaluation of an APP for nursing students that raises the possibility of carrying out a physical examination and an evaluation of the patient's state of health. The technical limitations can be solved by using the 360 methodology, which also provides a greater dynamic capacity or interaction with the student, unlike what is proposed in this APP.

5 DISCUSSION

As it has been observed, there are several areas where the use of 360º simulation can be implemented, Mental health or Palliative care stand out among them, in addition to the main area that has been pointed out in this review, which is Patient Safety.

Thus, and with respect to the area of Mental Health, this new learning tool would contribte to improve both the assessment of the psychiatric patient and the provision of care in context, which could achieve the destigmatization of this type of patients as pointed out by various authors (Martin et al., 2019; Sunnqvist et al., 20162, 3).

Regarding the area of care, some studies (Grossman, 2013; Kozhevnikov et al., 2018) point out several possible uses or applications, among which is the communication of bad news, the improvement of the interpersonal skills like active listening and empathy with the patient and their family, or the effective accompaniment in the anticipation of grief and the bereave-ment process. According to the studies consulted, the 360º methodology would also provide the advantage of reducing associated costs, since it is not necessary to have real actors to stage a specific situation for its implementation.

Authors like Lister outline the technical advantages when speaking about the general advantages for the use of 360º technology in simulation in health sciences (Lister et al., 2018) as there is the possibility to zoom an image to better assess their characteristics, for example, a wound, which is not possible with other types of methodological tools such as telecare, in addition to allowing the assessment of other types of environmental characteristics such as temperature or humidity. It would also improve some technical limi-tations observed in certain studies, such as the small font size, the illegibility of the subtitles or the size of the Smartphone screen (Aronowitz et al., 2017; Hernandez-Padilla et al., 2016; Hsu et al. 2019).

Other strengths of the 360º simulation would be the significant improvement of the methodologies described in the review with regard to the sound or image.

In addition, this methodology would make it possible to work with a wider range of action situations and a much better control of the ambient/environment, which would undoubtedly contribute to an enhancement of the student's teaching-learning process by diversifying the contexts in which a health science professional can act (Stayt et al., 2015).

In this sense, the 360 methodology would allow to improve the basic processes related to Patient Safety in such a way that a context with a greater number of learning opportunities is implemented through the choice of different action options, as well as feedback on the possible consequences of a bad performance. It would also generate an increase in the reflective and critical ability of students as it is an immersive context that enhances meaningful learning (Bowling et al., 2015; Szyld et al., 2017).

Some limitations have also been found in the present study, among which is the null number of publications that have studied this specific methodology of interactive 360º video in the context of learning in health sciences degrees.

6 CONCLUSIONS

- The most studied areas of knowledge generally focus on increasing patient safety by improving the skills of students in health sciences.

- Home care and palliative and mental health care are areas that need to be reinforced in the training curricula.

- The most commonly used intervention is simulation with both high and low fidelity simulators, as well as with actors representing a scenario.

- No articles have been found that evaluate the intervention with the interactive 360º video tool to improve skills in health sciences students.

1.   Hsu, L.L., Hsiang, H.C., Tseng, Y.H., Huang, S.Y., Hsieh, S.I. (2019). Nursing students' experiences of using a smart phone application for a physical assessment course: A qualitative study. *Japan Journal of Nursing Science*. 16(2):115-24.

2.   Martin, A., Krause, R., Chilton, J., Jacobs, A., Amsalem, D. (2019). Attitudes to psychiatry and to mental illness among nursing students: Adaptation and use of two validated instruments in preclinical education. *Journal of psychiatric and mental health nursing.*

3.   Sunnqvist, C., Karlsson, K., Lindell, L., Fors, U. (2016). Virtual patient simulation in psychiatric care - A pilot study of digital support for collaborate learning. *Nurse education in practice.* 17:30-5.

4.   Grossman, S. (2013). Development of the Palliative Care of Dying Critically Ill Patients Algorithm: Implications for Critical Care Nurses. *Journal of Hospice & Palliative Nursing*. 15(6):355-9.

5.   Kozhevnikov, D., Morrison, L.J., Ellman, M.S. (2018). Simulation training in palliative care: state of the art and future directions. *Advances in Medical Education and Practice*. 9:915-24.

6.   Lister, M., Vaughn, J., Brennan-Cook, J., Molloy, M., Kuszajewski, M., Shaw, R.J. (2018). Telehealth and telenursing using simulation for pre-licensure USA students. *Nurse education in practice.* 29:59-63.

7.   Hickerson, K., Hawkins, L.A., Hoyt-Brennan, A.M. (2018). Sexual Orientation/Gender Identity Cultural Competence: A Simulation Pilot Study. *Clinical Simulation in Nursing*. 16:2-5.

8.   Stayt, L.C., Merriman, C., Ricketts, B., Morton, S., Simpson, T. (2015). Recognizing and managing a deteriorating patient: a randomized controlled trial investigating the effectiveness of clinical simulation in improving clinical performance in undergraduate nursing students. *Journal of advanced nursing.* 71(11):2563-74.

9.   Bowling, A.M. (2015). The Effect of Simulation on Skill Performance: A Need for Change in Pediatric Nursing Education. *Journal of Pediatric Nursing-Nursing Care of Children & Families.* 30(3):439-46.

10. Szyld, D., Uquillas, K., Green, B.R., Yavner, S.D., Song, H., Nick, M.W., et al. (2017). Improving the Clinical Skills Performance of Graduating Medical Students Using "WISE On-Call," a Multimedia Educational Module. *Simulation in Healthcare-Journal of the Society for Simulation in Healthcare*. 12(6):385-92.

11. Aronowitz, T., Aronowitz, S., Mardin-Small, J., Kim, B. (2017). USING OBJECTIVE STRUCTURED CLINICAL EXAMINATION (OSCE) AS EDUCATION IN ADVANCED PRACTICE REGISTERED NURSING EDUCATION. *Journal of Professional Nursing.* 33(2):119-25.

12. Hernandez-Padilla, J.M., Granero-Molina, J., Marquez-Hernandez, V.V., Cortes-Rodriguez, A.E., Fernandez-Sola, C. (2016). Effects of a simulation-based workshop on nursing students' competence in arterial puncture. *Acta Paulista De Enfermagem.* 29(6):678-85.

8 ANNEX

8.1 Summary of the evidence

In this annex, we present the critical reading files of each of the articles reviewed in full text are presented.

Reference	Martín, 2019 (2)
Study	**Design:** Quasi-experimental study (prospective) before and after completing an eight-week basic course in preclinical psychiatry. **Goals:** - Adapt two instruments related to the stigma in a sample of nursing students. - Examine the changes on the results after participating in an eight-week long preclinical psychiatry curriculum. -To Identify opportunities for stigmatization that would serve to refine future iterations in a preclinical nursing psychiatry curriculum. **Period of realization:** It doesn´t show. (2018 or 2019?)
Population	**Number of participants / Group:** 71 nursing students from Yale University, 93% (66) female. Age 24 to 34 years. 3 students over 35 years old. **Participating characteristics:** 66% first-year students.
Intervention	**Demographic survey and use of two instruments:** Attitudes towards psychiatry (ATP-30; Burra et al., 1982) and attitudes in mental health (AMI; Singh, Baxter, Standen, & Duggan, 1998). Prior to this, the course includes lectures, written assignments, small group discussions, and eight observation tasks of the shifts in psychiatric hospitals (including public and private institutions), and additional hours of observation in an emergency room, in an ECT room (electroconvulsive therapy), and in other external patient observations. All students participate in two clinical simulations: Groups of four students at a time, supervised by a professor from the faculty (they take turns throughout the course). One-hour sessions interviewing simulated patients (SP) with experience in the representation of common psychiatric clinical scenarios.

Results	The students had personal experiences with mental health illnesses, from friends, relatives, or for themselves. Almost half (41%) had already experience in the care of mental health patients.

In the ATP-30 Attitudes Toward Psychiatry Survey, three of eight subscale scores improved at the end of the course. In contrast, the AMI results did not change. Compared with the norms published by medical students, nursing students had a higher average score (less stigmatized).

The ATP-30 and AMI can be easily adapted to a population of nursing students and can be useful for the follow-up of specific educational interventions against the stigma of mental illness. |
| **Conclusions** | The course included opportunities for observation and interaction with the patient in a variety of clinical conditions for all students.

Simulation with SPs has been known as a useful tool to reduce anxiety when nurses have contact with psychiatric patients. This tool also incorporates such an interactive live component in this research. The use of video clips of SPs in the classroom provides a realistic picture of mental health care and treatment, and mental status examination.

The students experienced the SP simulation as realistic, such that the lack of change in the AMI may have had more to do either with the "dosage" and timing of the SP components, the instrument's sensitivity to change, or the fact that the simulation of SP has some role, but not enough to change ingrained stigmatized attitudes. |

Comments	The preclinical course of the nursing school needs to be improved with other educational components, including exposure and interaction with individuals with lived experiences of MCH. A strong academic program is not enough to change stigmatized perceptions of mental illness, psychiatric care, and mental health nursing as a profession. Interactive and participatory activities included in this course (such as clinical assignments and SP simulation) needed to be complemented by contact with people who has life experience with mental illness. Nurse educators and practicing nurses who are willing to share their own experiences with mental illness. Illness, including diagnosis, the pursuit of health, treatment, and recovery, can be especially powerful and relevant during nursing.
Quality of the evidence	Medium

Reference	Hsu, 2019 (1)
Study	**Design:** Descriptive qualitative study with in-depth interviews to gain a comprehensive understanding of students' experiences. **Goals:** explore the thoughts and experiences of nursing students who received a smart phone, a physical assessment based on an educational intervention application. **Period of realization:** October 2015 and January 2016
Population	**Number of participants / Group:** 16 nursing students in Taipei City Hospital. 14 (87.5) women. Age 20 to 21 years. **Participating characteristics:** 4 (25%) had work experience related to medicine.
Intervention	A mobile application (APP) designed to train students in physical examination and health assessment (abdominal, respiratory, cardiovascular and neurological). The front-end interface allows user access to clinical scenarios, a hands-on, physical examination images, and user history. The students had two scenarios for practices (case 1 and case 2) and a third evaluation scenario (case 3). Later interviews were conducted and recorded. Interviews with participants were carried out 2-3 weeks after the intervention.

Results	The interviews were focused on five topics from the analysis of the interview transcripts: 1. "the physical evaluation scenarios of the APP are very close to real-life clinical situations", 2. "watch physical evaluation videos through the APP is a quick way to learn what to do", 3." APP is a new way of learning that improves thinking and reflection ", 4." Some nursing students felt it was out of their reach to analyze the scenarios in the APP, "and 5." the APP needs improvements in stability and interactivity "
Conclusions	The mobile application is an effective learning aid that promotes the transfer of knowledge and previous experience of nursing students. With the help of the APP, teachers could provide timely guidance to students.
Comments	Being a qualitative study, this study allows us to assess an aspect that would not be reflected in quantitative studies. It is an interesting study to take into account for the 360 project (even for DigiSim improvements) by comments from students such as the following: "The downside of the APP is that the font size is too small. The subtitles of the video are almost unreadable because the screen is too small. The APP suddenly backtracked before we finished the exam. We had no choice but to start over. I was a bit irritated by having to redo an exam that was almost finished. In addition, using the APP required a wireless connection, which caused us many problems "
Quality of the evidence	Medium

Reference	Lister, 2018 (6)
Study	**Design:** Qualitative-quantitative, prospective study, before and after a telecare simulation in a case of care for the elderly at home. **Goals:** To evaluate the introduction of undergraduate students to tele-nursing through a patient simulation using a telepresence with robot videoconferencing technology. **Period of realization:** not included
Population	**Number of participants/ group:** 73 third-semester undergraduate nursing students. **Participants' characteristics:** Undergraduate students who are enrolled and have not completed their course of study in a nationally accredited nursing program in the US and have not taken the general practice nursing licensing exam. The students completed a virtual home care visit, where they experienced the differences and challenges between tele-nursing and in-person patient care.

Intervention	They modified the scenario of home care for an older adult for the tele-nursing visit. The students used a telepresence robot with two-way video conferencing technology, a screen and a remote control. The telepresence robot allowed to orient a simulated clinical environment, and they observed and interacted with the patient, in the environment of the patient and the family member.
	The students received information about the case 10 minutes before the simulation activity. It included a review of the objectives and concepts of tele-nursing and a brief demonstration of how the technology works. Students completed a five-question Likert scale pre survey.
	After the scenario they participated in a meeting where they discussed their experiences and then voluntarily completed a survey of 23 questions, five identical to the pre-simulation survey.
	Surveys are abbreviated versions of the Simulation Design Scale (SDS) 20-item instrument that assesses the design characteristics of instructor-developed simulations related to simulation feasibility.
	The self-confidence in learning scale (SCLS). is an instrument designed to measure student satisfaction with a simulation activity and self-confidence in learning.
Results	Increased confidence with the necessary knowledge to provide tele-nursing care in the use of telepresence technology.
	The results demonstrate the improvement of the students in their ability to perform wound care and dressing changes, and the use of a depression screening tool ($p < 0.001$).
	Improvements were also found in students' confidence in their ability to communicate through video technology ($p < 0.001$), as well as a better opinion of video, the value of technology in the provision of health services ($P = 0.0139$).
Conclusions	As tele-nursing becomes more prevalent to manage patient care remotely, nursing programs will have to incorporate educational strategies that reflect this change.
	The study has provided simulated learning environments to incorporate remote tele-nursing. Improved student confidence and comfort with new technologies.
	Despite the obstacles that technology presents, the students felt confident in their supposed adaptability, assessment and communication skills to provide care to the elderly patient.

Comments	The simulation of a clinical case in the care of an old woman at home, with an injury and a psychiatric problem (depression) is a very complete case to take into account. Furthermore, the limitations of the study are interesting for the elaboration of cases in 360º. On the other hand, it would be necessary to consider the training of students in nursing tele-assistance (with the chronic population that exists in Spain, and the current moment of confinement… it could be specialized care in the future). Limitations include the barriers of tele-nursing. The telepresence robot is currently limited to transmitting sight and sound. These reported limitations indicate the need to develop and explore new technologies (360º) to deal with these difficulties (eg Zoom to see the wound). Perhaps future technological improvements can address temperature, humidity, or other variables found in the environment.
Quality of the evidence	Medium

Reference	Hickerson, 2018 (7)
Study	**Design:** Simulation pilot program. Observational. **Goals:** a. Create an atmosphere that makes patients feel respected, safe, and encouraged to share their views. b. Communicate using open and inclusive language. c. Use skills to obtain a complete sexual health history. d. Use skills to encourage compliance with the rules of safe sex recommendations. and. Increase students' sense of confidence and competence after participation. **Period of realization:** Summer 2016.
Population	**Number of participants/ group:** 230 students of the higher-level course in Community Nursing and Public Health. **Participating characteristics:** Students from the University of Pennsylvania. Class content, assigned reading and simulation to implement the pilot program. To reduce the gap between LGBT nursing education, a program was created for the Community and Public Health Nursing course that runs for 14 weeks in the students' final year. This study has more than 200 clinical, simulation and experience hours.

Intervention	The simulation center instructors have been specifically trained in innovative technologies, simulation methodologies, and information strategies.
	90-minute conference given by an expert in Sexual and Gender Health in children and adolescents. The content focused on the gender and development of sexuality in childhood, language, terms and definitions, practices of health care providers and biases in caring for LGBT children and adolescents and their families. The speaker provided more examples of how the nurse can provide competent and holistic care to LGBT patients and their families.
	In the classroom, the students and the expert further discussed assigned research articles, practices, and personal experiences.
	Home care simulation.
	They carry out a post survey to evaluate satisfaction, perceptions related to realism, and self-assessed competence.
Results	Student assessment revealed increased confidence in assessing and caring for LGBT patients. The students used a Likert scale of one to five, and rated the simulation as realistic (4.9 out of 5) and enriching (4.97 out of 5). The students also reported that after the simulation they were more able to use open technology and inclusive language with LGBT patients; students, felt more confident that they could establish a respectful atmosphere for patients; and were more confident in discussing safe sex practices with LGBT patients (4.65 out of 5.0).
Conclusions	The specific health care needs of the LGBT community are not fully met due to gaps in nurse education. These gaps may be inherent in the typical nursing curriculum, due to a shortage of expert teachers and a shortage of teaching moments. Therefore, a simulation program may be the optimal solution. In the pilot simulation they addressed issues of sexuality and LGBT content. Through conference-based seminars, and simulations with invited panel discussions (with members of the LGBT community). Although this was a brief encounter, students report increased knowledge, preparation, and skills that allow for interviewing and providing a safe space.

Comments	The simulation guide used for the LGBT program is presented. It is a publication (pilot) of the program. They show how a topic rarely covered in the curriculum can be addressed in simulation scenarios with actors from the LGBT community itself.
Quality of the evidence	Low

Reference	Sunnqvist, 2016 (3)
Study	**Design:** Qualitative study **Goals:** To know the opinion of 4th year nursing students about the use of the virtual patient as a learning methodology. **Period of realization:** 2012
Population	**Number of participants / group:** 24 student volunteers **Participates characteristics:** 4th year nursing students. The volunteers were divided into two groups, one that would work with virtual patients (VP) and the other with normal theoretical teaching. The groups consisted of 24 students chosen by convenience criteria (volunteers are offered). They were assigned five virtual patients with different psychiatric pathologies in order to practice mental health care for about 10 weeks before the exam.
Intervention	**Exam in both groups:** -VP group: 2 new VPs are presented to them so they can choose 1 -Control Group oral / written exam 1 case Both groups: 1 week after oral / written exam **Also, evaluation on:** -Interaction system (ease of the tool, innovation and technical problems) -Production of knowledge (critical thinking, reflection and feedback). -potential for development in psychiatric care Students who do not pass the exam are given another one later ** (considerable number that does not coincide with the students' evaluations).

Results	Qualitative positive aspects: -home training -VP: new pedagogical model -independence -communication training -constant reflection and feedback.
Conclusions	Virtual patient: pedagogical model that promotes independent development of students' knowledge, critical and reflective thinking, problem solving.
Comments	-Small sample -Methodological weakness to measure results.
Quality of the evidence	Low

Reference	Stayt, 2015 (8)
Study	**Design:** Single-blind pre- and post-test multicenter RCT (2 centers). **Goals:** To compare the use of a systemic approach (ABCDE) to recognize the deterioration of the acute patient by means of simulation or traditional system. -Assess the relationship between self-perceived self-efficacy and competition compared to actual performance. -assess the student's satisfaction with the teaching method to which they were randomly assigned. Study carried out in 2013.
Population	**Participants:** 98 students in 2 groups from 18-50 years, (x=27,89). 89,7% women -Control group: 48 -Intervention group: 50 **Participants' characteristics:** First-year students from two different universities.
Intervention	-Control group: One hour of traditional class on assessment and management of the patient (ABCDE). 2 groups of 25 students: -Experimental group: two hours of simulation in the laboratory with 1 instructor for every 6 students. High fidelity simulator. Pre- and post-test evaluation of self-perceived self-efficacy.
Results	Both groups show a significant increase in the perception of their self-efficacy in the post-test in relation to the pre-test, but the difference between the control and intervention group is not significant.

Conclusions	Importance of the subject of patient safety.
	More longitudinal studies are needed.
Comments	Good study with not conclusive data.
Quality of the evidence	High

Reference	Bowling, 2015 (9)
Study	**Objective:** To identify if the performance of the students improved after a real simulation situation of a case vs cases in paper format. **Areas:** -Identification of the patient -Administration of medication -Communication of significant changes (SBAR scale) in the patient's condition to the doctor Quasi-experimental with pre- and post-test evaluation.
Population	77 students of the pediatric nursing course divided into 2 groups. 52% <21 33% 23-30 18%> 31 84% women -Experimental group: 10 groups of 3 students, simulation with a pediatric patient (respiratory distress, asthma). 30 minutes stage + 20 debreafing -Control group: 9 groups of 3,4 or 5 students. Random (does not describe how).
Intervention	Simulation scenario vs written case. Pre- and post-test evaluation with objective structured clinical mini exam. The level of knowledge, self-confidence and the student's ability in acting are valued.
Results	Significant differences in each group (better post-intervention) but no significant difference between control and intervention group. -Identification of the patient: increase in post-test, mainly in the experimental group. -Errors in medication administration and lack of knowledge retention.

Conclusions	Students routinely fail to provide safe patient care in areas such as identification, administration of medication, and use of the SBAR scale.
Comments	Be part of a larger study that assesses -self confidence in learning. -knowledge test -demographic questionnaire.
Quality of the evidence	Medium

Reference	Grossman, 2012 (4)
Study	**Quasi-experimental Objective:** To develop and implement an algorithm for the care of a critical palliative patient to facilitate a positive death.
Population	50 students (90.74% women). 21-23 years 7 are randomly assigned * to each of the scenarios. The rest participate as observers * does not specify randomization criteria
Intervention	3 scenarios are proposed: -54-year-old woman in ICU for sepsis in the context of lymphoma -33-year-old male with cystic fibrosis pneumonia -Woman aged 34 who as a result of treatment for rheumatoid arthritis develops several episodes of heart attack. Not for resus. Pre- and post-test evaluation is performed. The algorithm is applied in the resolution of each scenario.
Results	A significant difference is highlighted in the post-test assessment, which would mean that the application of the algorithm is useful.

Conclusions	The use of the algorithm in the care of critical patients is confirmed.
Comments	Poor methodological approach, unclear results.
Quality of the evidence	Low

Reference	Kozhevnikov, 2018 (5)
Study	**Design:** Systematic review **Goals:** Collect experiences in simulation, on palliative care skills for medical and nursing students. **Period of realization:** -
Population	Simulation-based health sciences (SBME) students: medicine, nursing, social work, and spiritual caregivers / chaplains.
Intervention	Palliative Care Skills Training Simulation
Results	The encounter with the patient was the most widely used simulation method (68%). 15% used an advanced robotic simulator and 10% a role-playing game or sociodrama. The most common topics addressed are; treatment preference (50%), bad news communication (41%) and empathic communication (40%). Management of symptoms was only addressed in 13% of the studies.

Conclusions	Simulation with patients allows to adapt the desired skills and the level of learning, but it is very expensive because they would have to incorporate specialists in palliative care in the development of the program to have a focused feedback
Comments	In 22% of the studies, the simulation outcome was not measured. They recommend the development of interprofessional skills, and symptom management and pain assessment. Articles on oncology were excluded. It can be used to justify the need for simulation with real patients in a 360º video scenario and to be able to work with the contents not covered.
Quality of the evidence	High

Reference	Szyld, 2017 (10)
Study	**Design::** Post-intervention observational study. **Goals:** Determine if student achievement improves after completing this module.
Population	Medical students, prior to residency. (n = 164).
Intervention	Interactive on-screen study plan on the most common clinical problems (WISE OnCall): oliguria, hypertension, neurological changes. Sequential approach: 1: overview of the problem. 2: video simulation illustrating the evaluation of a clinical situation. 3: practical cases that allow interaction and obtain feedback.
Results	Performance improved for all after completing the online training module.
Conclusions	A brief educational intervention based on an interactive program significantly improved the clinical skills of medical students before starting residency. Improve patient safety.

Comments	They are not nursing students. There is no control group.
Quality of the evidence	Low

Reference	Aronowitz, 2017 (11)
Study	**Design:** Narrative review **Goals:** Through the use of simulation, show how nursing students can practice and be evaluated within their clinical practice role in a safe and controlled environment. **Date:** 2012-2014
Population	Nursing students.
Intervention	Simulation of encounters with patient actors. OSCE: clinical examinations of short simulation stations (5-10 min).
Results	Clinical exams can be used as a simulation tool throughout the curriculum. Cases should be more complex as students progress through the curriculum.
Conclusions	OSCEs can be used as education and as evaluation.

Comments	It proposes to use simulation methods as clinical hours and not only within the educational and evaluative process.
Quality of the evidence	Low

Reference	Hernández-Padilla, 2016 (12)
Study	**Design:** Quasi-experimental study of a pre-test/post-test group **Goals:** To assess whether a short simulation-based workshop on radial artery puncture would improve the competence of nursing students. **Date:** 2014 - 2015
Population	Nursing students of 3rd. year (n = 111).
Intervention	Simulation in arterial puncture (1.5 hours) that includes: - video conferencing - live demo - self appraisal - simulated practice led in pairs - individual feedback. Two validated tools were used to assess puncture skills: APSAT / AP-MCQ.
Results	61.1% of the participants showed the level of competence required to safely practice radial artery puncture.
Conclusions	Well-planned and evidence-based training sessions using low-tech simulators could help educators achieve good educational outcomes and promote patient safety.

Comments	Simulated practice is a puncture practice on a low-fidelity simulator.
Quality of the evidence	Medium