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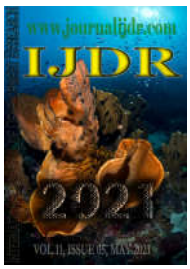

RESEARCH ARTICLE OPEN ACCESS

THE REALISTIC SIMULATIONS AS ACTIVE METHODOLOGY IN MEDICAL EDUCATION: A REFLECTIVE ANALYSIS

Anderson dos S. Barbosa*[1], Cláudio K. P. Costa[2], Mateus A. dos Santos[3], Paula C. G. Serra Azul[1], Marks P. Santos[1], Carla P. Nascimento[1] and Tâmara T. de C. Santos[1]

[a]Docente da Faculdade AGES de Medicina, Jacobina, Bahia, Brasil
[b]Acadêmico da Faculdade AGES de Medicina, Jacobina, Bahia, Brasil
[c]Acadêmico do curso de Medicina da Universidade Tiradentes, Aracaju, Sergipe, Brasil

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Corresponding autho:
Anderson dos S. Barbosa

ABSTRACT

The active methodologies learning has become priorities in the medical school curriculum. Realistic simulation as an active methodology is of great importance in this sense, since it contributes to the development of multiple professional competencies in addition to the integration of theoretical content, technical skills and attitudes preparing the student to experience a consultation in the closest way to reality.The objective of this work was to analyze reflective realistic simulations as an active methodology and how they can contribute and influence medical training and professional life.The literature review was developed through a survey of the bibliography published between the years 2013 to 2020 in journals from the main databases with descriptors: active methodologies; realistic simulation; medical teaching.42 of the 228 articles found selected. Most of the studies found demonstrate that realistic simulations bring a positive relationship to medical education, providing improved training about the practice of medical skills and competences during and after training. Other articles have presented the difficulties encountered in developing this active methodology, mainly in developing countries due to the high costs that are often necessary. Thus, realistic simulations provide students with the potential to improve their performance by being closer to the reality of a service, making them a differential for the training of a future medical professional.

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INTRODUCTION

Active learning emphasizes that knowledge cannot be transmitted, but built. The active methodology was disseminated worldwide by the Discovery Based Learning methodology (DBL)(Neves et al., 2017). Both students and teachers are interested in the DBL methodology, which is a constructivist approach to education, that is, a "learn by doing" method, in which students receive the materials to find the answers (ANDRADE, 2010). Medical students are motivated by goals and tasks that are relevant, or that have application in the real world. When presenting the content, tutors/teachers need to emphasize relevant and high performance activities and correlate the concepts learned with clinical applications. Educational approaches based on data or skills, such as milestones, support student-directed learning. In this way, learning must be designed following the cycle: objectives-teach-evaluate, emphasizing authentic performances and always presenting feedback, so that the student can later carry out his self-assessment (Aquilante et al., 2011).

After instruction, faculty analyzes learning performance data in a systematic way to improve learning and delivery. Within this context, the challenges in medicine related to concerns about patient safety, efficiency of the operating room and restrictions on working hours. The traditional learning style "see one, do one, teach one" has significant disadvantages, as the student is seen as a receiver of information transmitted by the teacher (Pereira et al., 2018), already in today's pressured academic environment, where research on productivity and clinical and surgical efficiencies are prioritized over teaching time(Aquilante et al., 2011). Likewise challenging, Problem-Based Learning (PBL) has a practical, rigorous and structured teaching-learning process in which the student learns while trying to understand or solve a problem. The PBL is structured in "problem, solution, practice, research, questioning, realism, originality and integration", therefore its implementation in clinical environments requires more time, higher costs and more teacher training, and is affected not only by the educational aspects, but also because of the unique priorities of healthcare environments(Brasil, 2014; Silva et al., 2020). The curriculum of brazilian programs follow the 2001 national

guidelines for medical courses from the Ministry of Education (MEC). This guideline requires that 35% of the total workload of the medical curriculum be dedicated to the internship in the last two years of the program. In addition, the guidelines suggest that students be exposed to patients of different levels of clinical complexity, difficulty and care. Therefore, the guidelines strongly encourage the use of PBL and suggest that students see patients at the beginning of their medical program(Caldas et al., 2013; Gonçalves et al., 2020). According to Fritsche et al.(Fritsche et al., 2020) realistic simulation (SR) is a component of medical education that has national and international recognition, as it facilitates exercise and scenarios for analysis and especially the training of communicative skills for assuming the realistic role of patients. Therefore, the objective of the work is to carry out a reflective analysis of how realistic simulations as an active methodology can contribute and influence medical training and professional life.

MATERIALS AND METHODS

A literature review was carried out for a reflective analysis based on the systematic search for studies published in the years 2013 to 2020, due to the availability and topicality of research in that period. The data were collected through a survey of the bibliography published in the PUBMED databases; the Virtual Health Library (VHL); SCIELO (Scientific Electronic Library Online); Academic Google; from MEDLINE; LILACS (Latin American and Caribbean Literature in Health Sciences) and the Brazilian Journal of Medical Education. The following descriptors used in the research:*active methodologies*; *realistic simulation*;*medical teaching*. Studies selected based on the title of the papers and abstracts, when present. The inclusion criteria used were: works that answered the guiding question, published between the years 2013 and 2020, published in english, portuguese or spanish, with at least two descriptors in the title. The exclusion criteria: editorials, works that did not answer the question, published after the interval of 10 years, written in other languages and with less than two descriptors in their title. If there was disagreement between the authors on the inclusion and exclusion criteria, a specific discussion carried out on the work in question until a final consensus was determined.

RESULTS

In the period from 2013 to 2020, using the descriptors in the chosen databases, 228 studies found, of which 42 studies were selected that included the search terms. Resulting in a base of references duly cataloged to facilitate the consultation and use of these works. The reading and analysis of these 42 selected studies carried out.However, 17 discarded due to the lack of approach on active methodologies as the main point, to mention only the realistic simulations. The results of the selection of studies for discussion can be seen in Figure 1.

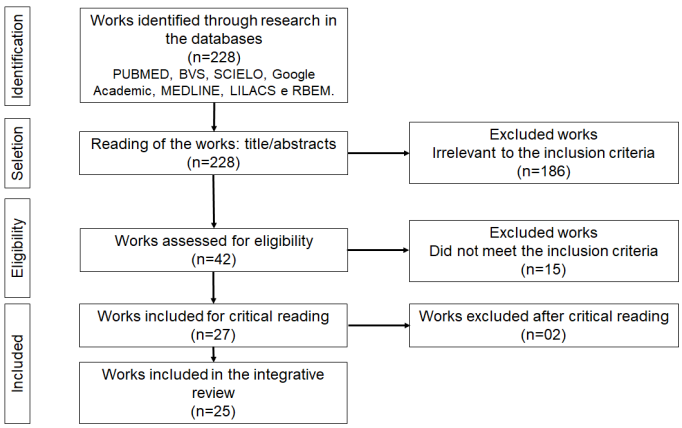

Figure 1. Flowchart of the selection of studies that discussed realistic simulations as an active methodology in medical education. Font: Prepared by the authors

In the evaluated articles (n = 25), consistency was observed in the findings that demonstrate the educational and technical benefits of Realistic Simulation as Active Methodology in Medical Education. Most of the studies found demonstrate that realistic simulations bring a positive relationship to medical education, providing improved training with regard to the practice of medical skills and competences during and after training. Other articles have presented the difficulties encountered in developing this active methodology, especially in developing countries due to the high costs that are often necessary, bringing other alternatives to reduce this problem. For a better visualization, a synthesis elaborated with the articles considered for reflection and formulation of the discussion between authors (Table 1).

DISCUSSION

The paradigm shift from traditional teaching to new methodologies faces the challenges of the current implantation in higher education institutions, mainly in health courses where it is necessary to adequately train professionals in the ethical and moral aspects for social work and work in teams with social responsibility, with the ability to adapt to technological challenges and the relentless search for knowledge(Carabetta Jr, 2016). The active teaching methodology is one of the options that can be applied to higher education in order to improve the training of students, preparing them to solve the problems that will arise in professional activity. According to Moran(2015) “in active learning methodologies, learning takes place from real problems and situations, that is, the same ones that students will experience later in their professional life". Check if an active methodology can or not improving learning is essential, for example, within the difficult circumstances of traditional teaching to study the neural pathways and structures of the spinal cord and brain in the basic discipline of neuroanatomy, simple materials are used to make three-dimensional models that represent the paths and bone marrow, brainstem, cerebellum and brain structures(Costa et al., 2014). According to Kelly et al. (2018) “the use of three-dimensional model constructions, two-dimensional schemes and digital technology in the teaching of neuroanatomy, integrated with an active methodology process, allow students to gain autonomy in their studies and develop a more comprehensive view of the content, to the extent that they felt satisfied to see the final model generated by their efforts, ultimately improve the cognitive aspects of neuroanatomy”. In this way, active methodologies enable students to enhance their free and active knowledge, through participatory and problematizing learning, favoring more significant learning due to the correlation of new learning with their prior knowledge(Pinto et al., 2016). Peer collaboration, sometimes referred to as relational, cooperative, or team-based learning, emphasizes knowledge building, team problem solving, respect, cultural competence and participatory engagement (Carabetta Jr, 2016).

The change in the medical education paradigm is the main objective in the National Curriculum Guidelines (NCG) in Brazil(Brasil, 2014). Graduation in medicine lasts an average of 6 years, while professional activity lasts decades. To progress from novice to expert, medical students need ample opportunities to digest theoretical concepts and practice new skills, with instructive feedback as they progress (Carabetta Jr, 2016). Thus, it is essential to adopt methodologies for a liberating educational practice, geared towards the formation of a professional capable of self-managing their learning process on a continuous basis. Present in NCG, active learning methodologies are very important and become a priority in the curriculum of brazilian medical schools, in addition to medical education dialogues directly with andragogy, a science related to adult education (Rodrigues and Gonçalves, 2013). Currently, the concern of academic institutions and health professionals regarding patient safety and the improvement of their health has increased even more, since some research has shown that in many cases of patient death, human error been identified, which could be avoided. After the identification of this problem, several countries began to use medical realistic simulation (RS) in training both in undergraduate medical

Table 1. List of some of the works selected for reflective analysis with their respective authors, title, year and objective

Authors	Title	Objective
(Andrade et al., 2013)	Student evaluation is an important tool in improving clinical anatomy courses	Evaluate the impact of didactic changes that occurred from the first model adopted from the beginning of the activities of the discipline in 1994 to the format of the employees.
(Silva et al., 2017b)	Work and health education: analysis of Brazilian scientific production between 2011 and 2014	Update the analysis of scientific production on work and health education in Brazil in the period from 2011 to 2014 and analyze the main changes that have occurred in the last four years compared to the production of the previous two decades.
(Magnago et al., 2020)	Realistic Simulation in Patient Safety Teaching: Experience report	To report the teaching-learning experience of patient safety with students of an Undergraduate Nursing Course.
(Caldas et al., 2013)	Rheumatology in a Medical Course with Problem-Based Learning	To present the experience of a Brazilian institution in the teaching of Rheumatology in medical graduation, whose pedagogical project is structured in active learning methodologies.
(Katiúcia et al., 2020)	Active Methodologies in the Context of Medical Education in Brazil	To investigate and synthesize the knowledge of scientific publications about the use of active methodologies in the undergraduate medical course.
(Fritsche et al., 2020)	Use of simulation patients in the third section of the medical examination	After positive results with pilot tests, the objective was to assess whether in the evaluative exams the substitution of real patients for simulated patients in the exam can contribute to a better standardization and objectivity, maintaining the same high level of acceptance in the exam.
(Silva et al., 2017a)	Young Doctor Project: the practical learning of medical students through socio-educational activity	Organize and carry out a socio-educational action (Young Doctor Project) in Contraceptive Methods and STD Prevention, through hybrid education, with the participation of medical students, to promote in-service learning, under supervision.
(Rodrigues and Gonçalves, 2013)	Teaching with research: a training strategy for students of postgraduate in medicine	It aimed to promote and observe, in a participatory way, a scientific activity accompanied by a methodological didactic renewal that would develop the scientific attitude and, at the same time, provide the study on the updating of the pedagogical knowledge of doctors who work as teachers in medical schools.
(Teófilo et al., 2016)	Bets for change in medical education: trajectories of a medical school	The aim of the study was to learn about teaching-learning practices, institutional arrangements and the participation of different actors in an undergraduate medical course in the city of Sobral-CE.

Font: Prepared by the authors.

students and even in doctors already trained (Riaz, 2019). The simulated problem situation or realistic simulation (RS) is recognized as an active learning methodology, and in addition to andragogy, it encompasses reflexive learning of concepts. Regardless of the concepts considered, SR as an active methodology has as its main role the centrality of the subject's learning process based on the principle of autonomy and allowing the establishment of different relationships between facts and objects, triggering resignifications and individual capacity in the use of content in real situations(Roman et al., 2017). The RS's have elements that are simulated health problems that must be faced in professional practice and it is interesting, as it takes into account the local culture allowing cultural differences between the RS in different regions (Resende et al., 2020). An aspect frequently mentioned during this practice is that the high-fidelity simulator does not occupy the centrality of the process, but serves to help within the recreation of the real environment. Thus, SR promotes the development of multiple professional competences, among them: knowledge, improvement of technical or non-cognitive skills, crisis management, communication, leadership, teamwork, critical reasoning, responsibility, self-confidence, situational awareness, besides to allow cognitive and motor skills and simultaneous mobilization, while providing a stimulating learning scenario(Brandão et al., 2014; Silva et al., 2017a). Another point that must be taken into account is that RS promotes the integration of theoretical content, technical skills and attitudes, encouraging the student to simultaneously coordinate all the competencies involved in the simulated situation. They may also be associated with greater retention of theoretical content. Reading provides 5% retention in learning, oratory 10%, audiovisual 20%, group discussion 50%, and practical performance led to content retention close to 90%, so the latter is the best option for the development of professional skills (Teófilo et al., 2016). Competence is understood as the ability to mobilize knowledge, skills and attitudes, generating actions capable of solving challenges that arise in professional practice. Ability to control emotions and, at the same time, remain motivated is an essential issue recognized in the National Curriculum Guidelines (NCG). When presented to the RS methodology, some academics experience fear and insecurity, especially when they realize that they may have their technical non-conformities identified during training. However, especially after interrogation, these feelings tend to decrease (Andrade et al., 2013). Simulation allows error to be a unique opportunity for academic learning and improvement.

Higher education does not currently prepare academics to provide communication to relatives about the patient's death, for example, but a study by Aquilante et al. (2011) reports that simulation with permissive failure, leading to simulated death, improves emotional performance, thus allowing the recognition of limits with high performance, leading to less stress during professional practice. The emotional stability acquired after training with RS pointed out as a fundamental competence in professional practice. Reflections on these feelings and attitudes are essential for improving students' skills, such as empathy and solidarity. The emotional stability competence, improved after simulation, is a factor associated with greater retention of theoretical content and monitoring of safety parameters throughout the professional career(Brasil, 2014). The NCG present several scenarios for the practice of training, in addition to the traditional hospital environment. At the beginning of the medical graduation, other environments are recognized for practical learning, such as the realistic simulation laboratory, while the academic in the last years of his training performs his practice in offices and wards, with the collaboration of real people, but always supervised (Caldas et al., 2013). The authors Costa et al. (Costa et al., 2014) agree that SR's allows access to more uniform practice scenarios, ensuring that essential topics and skills can be worked on equally by all involved. Real practice is an essential aspect of medical graduation, and it does not present itself as an opposition, but as an auxiliary strategy, providing a greater uniformity of educational experiences. The NCG describe the desirable technical skills in each professional setting, from the doctor's office to the intensive care unit. According to Rodrigues & Gonçalves (2013), these simulations offer excellent results for training the orotracheal intubation procedure, for example, and also mentions the difficulty in offering uniform training to anesthesiologists, suggesting RS as a strategy to resolve this issue. The simulation replicates and amplifies real experiences, in a controlled environment, with well-defined learning of objectives and skills.

The NCG outlined a new profile for the brazilian graduate of medical schools, a more reflective professional, committed to bioethics, and capable of self-managing their continuity in Education. The RS have pedagogical characteristics strongly aligned with the NCG and have great potential to contribute to medical education in Brazil. As an active methodology, RS's place the student in centralized learning in the process, allowing self-reflection, aided by instructor guidance,

contributing to improved professional skills (Silva et al., 2017b). Fears and insecurities revealed during the simulation, allowing the academic to recognize and seek the emotional balance necessary for the performance of a good professional practice. Any technical conformity detected during the simulation has no consequences for the real patient, thus reducing the rates of human errors committed in the same, in addition to providing equal training for undergraduates (Costa et al., 2014). Realistic simulations or simulated patients, because they are similar to contact with real patients, initially arouse feelings of fear and anxiety, but after certain experiences with the scenarios, students are more relaxed and comfortable, justifying that the experience led them to reflection and interaction, thus improving the learning process (Brandão et al., 2014; De Souza et al., 2019; Peters et al., 2019). Studies carried out in Germany have shown that the use of SR and standardized case studies in examinations been positively assessed by both examiners and examinees. According to those examined, this model of examination allows a better comparison with reality and can interact with the patient, ask questions, which makes the process more interesting (Fritsche et al., 2020).

The coronavirus pandemic is a current fact that has made the execution of RS quite difficult, since it directed teaching towards Information and Communication Technologies (ICTs), taking the simulations to the opposite of the initial concept of typical realistic aspects, which is the contact with the simulated patient in physical presence. However, it leads everyone to think about a point that will now be much discussed, telemedicine, which is rarely addressed in medical education. According to Peters & Thrien(2020), this new vision of learning due to the need, with the use of digital resources for simulations, prepares students for a new era that can change the health system in the future, which is digital care with patients in certain cases.Another point observed in the application of RS was that the majority of developing countries have difficulties in carrying out the application of this practice due to the reduced amount of resources and the low income. Since, for its development, modern equipment such as high-fidelity mannequins in more advanced simulation centers is necessary and for that, high financial resources are needed (Riaz, 2019). However, still according to Riaz(2019), some more accessible and low-cost options such as lower fidelity simulators and simulated patients can assist in the learning of basic concepts, in addition to the development of technical and non-technical skills. As such, modern medical education environments that integrate current learning technologies and new media enable greater engagement, enhanced collaboration, real-world application, clinical decision-making, distance training, learning analysis and rapid feedback essential for a future medical professional, especially those recently graduated (Caldas et al., 2013).

CONCLUSION

Realistic simulations provide students with the potential to boost their human performance, offering greater confidence to students as they get very near the truth of care, making them important for the formation of a future medical professional and even already medical professionals, but especially those just graduated. During this way, students proactively participate within the learning cycle by actively engaging, monitoring themselves automatically, responding to feedback and adapting to new learning challenges for a future job market.

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