Scoping Review of Simulation-Based Training for Social Determinants of Health Within Residency Programs

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ABSTRACT

Background The topic of social determinants of health (SDH) is increasingly being integrated into medical education, yet there remains a lack of synthesized knowledge regarding how simulation is used to teach SDH in residency training.

Objective To identify the extent and capacity in which simulation is being used to teach medical residents about SDH.

Methods A scoping review was performed in 2023. A search using PubMed, Web of Science, Scopus, and Ovid was performed using keywords related to SDH, simulation, and residency training. The subsequent results were then analyzed to see if they fit the inclusion criteria of being related to SDH, having occurred during residency training, and having used simulation in the curriculum. One researcher (N.T.) reviewed every article, and a second researcher (T.S.) verified a portion of the articles.

Results Sixteen studies met the inclusion criteria. The most used simulation method was patient-based scenarios (7 studies), followed by scenario-based learning, such as poverty simulations (5 studies). Financial instability was the most frequently addressed topic, appearing in 7 studies. Common themes drawn from the studies include a positive learner perception of using simulation to teach SDH (7 studies), perceived increase in resident knowledge of how to address patients' social needs (6 studies), improved ability to identify social risks (4 studies), a better understanding of SDH topics (4 studies), and enhanced knowledge of community resources (4 studies).

Conclusions Simulation can provide various scenarios to learn about SDH in residency, and it is looked favorably upon by learners.

Introduction

It is crucial that health care teams understand and address social determinants of health (SDH) to advocate and appropriately care for their patients. SDH are a part of public health that are defined as "nonmedical factors that influence health outcomes."[1] These include the many environments and conditions that shape one's life, such as work, education, religion, age, residence, and health care access, among others. These factors are integral to health as the World Health Organization states SDH account for 30% to 55% of health outcomes.[2] This intersection of health and social aspects takes many forms, such as the availability/accessibility of groceries, the level of nearby health care systems, or the quality of tap water. However, even with the known importance of this topic, quality SDH education for medical professionals in training remains limited.[3] As this deficit is being recognized, programs are starting to implement new curricula that teach residents how to navigate patients' health and their relevant SDH. Studies have found that when there is an educational focus on SDH, it can lead to positive educational outcomes for trainees, such as increased "applicability of training to underserviced populations, and improved engagement of marginalized community members."[4]

Simulation is emerging in medicine as a way to teach both technical and non-technical skills through the use of procedure-based simulations, objective structured clinical examinations (OSCEs), virtual reality, and more with great potential to improve medical education.[5,6] The definition of simulation used in this article comes from the article "Simulation-Based Medical Teaching and Learning" which states, "Simulation is a generic term that refers to an artificial representation of a real-world process to achieve educational goals through experiential learning."[7] Despite the increasing recognition of SDH in medical education, there is a lack of synthesized knowledge regarding the extent to which simulation is used in residency training for SDH. This gap in research limits insight into how well simulation helps trainees address social determinants in clinical care and hinders the ability of other residency programs to adopt evidence-based simulation methods. This study aims to identify the gaps in existing literature

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Editor's Note: The online supplementary data contains all articles included in the review.

through a framework of reviewing the extent of simulation methods currently employed by residency programs to teach SDH, the SDH topics addressed, and their educational impact and reception by learners.

Methods

Given the emerging and complex nature of simulation-based education for SDH in residency training, a scoping review was deemed the most appropriate method to map the existing literature. A literature search was performed to confirm that no other review with the same objectives had already been published. The researchers created a group of keywords to aid in the search for relevant literature. These keywords were "internship," "residency," "residency training," "graduate medical education," "GME," "medical education," "simulation training," "simulation," "SIM," "social simulation," "simulation based training," "social determinants of health," "SDOH," "SDH," "socioeconomic factors," "health inequities," and "social inequality." A professional librarian then used these keywords and conducted a pilot search through the databases of PubMed, Web of Science, Scopus, and Ovid. This search, conducted in 2023, initially yielded 135 results; however, after adding medical subject heading (MeSH) terms and removing redundancies, the total number of results was 87. The exact search strategies used for each database are shown in TABLE 1.

The generated list of articles was manually reviewed for duplicates, which were subsequently removed. Manuscripts were selected for further examination based on their titles and abstracts, and if they met all the following criteria: the training occurred during residency, it was a primary study that clearly included a simulation-based exercise, and the training was related to SDH. Furthermore, the reference lists of all primary articles were reviewed for possible manuscripts that would fit the criteria. A gray literature review was conducted using the keywords noted above to guide the search.

This selection was done by one reviewer (N.T.), who then shared the results and reasoning with a second reviewer (T.S.), who verified 5 of the final articles. Additionally, the primary reviewer (N.T.) identified a set of articles whose eligibility was less clear and engaged in discussion with the secondary reviewer (T.S.) to reach a consensus on their inclusion.

After collecting the articles that met the inclusion criteria, a thorough analysis of the full manuscripts was done to identify the SDH topics that were covered, as well as the study results, simulation medium, involved residency programs, and other key information such as publication date. One reviewer (N.T.) collected this information in an Excel spreadsheet, which was then shared with a second reviewer (T.S.), who assisted in refining the results into common thematic categories.

This review did not involve human subjects, and all studies are within public records, therefore institutional board review approval was not necessary for this review.

Results

From PubMed, Web of Science, Scopus, and Ovid, 87 articles were identified. Researchers removed 37 duplicate articles, bringing the total to 50 unique articles. An additional 41 manuscripts were excluded because they clearly did not meet the inclusion criteria, leaving 9 articles. One further article was excluded because it was unclear whether it used simulation. Each reference list from the initial 50 articles was analyzed for other studies that met the inclusion criteria, yielding 43 new articles from 1575 references (some of which were duplicates across reference lists). Of these, 7 were found to fit the inclusion criteria. A gray literature review found one additional article that fit the criteria (FIGURE). A total of 16 articles met the research criteria and were included in the review (online supplementary data).

Summary of Key Characteristics

Analysis of the 16 manuscripts revealed that all articles studied residency programs in the United States. The oldest article was published in 2006, while the most recent was published in October 2023. Half (8 of 16, 50%) were based on pediatric categorical and combined pediatric residency programs, while emergency medicine and internal medicine accounted

TABLE 1
Search Strategy Including the Incorporation of Boolean Operators and Medical Subject Heading Terms

Search Strategy	Terms
Using Boolean operators	(Residency training or graduate medical education or GME of medical education) AND (simulation of SIM or social simulation or simulation based training) AND (social determinants of health or SDOH or SDH or socioeconomic factors or health inequities or social inequity)
Using medical subject heading terms (MeSH)	Internship and residency simulation training

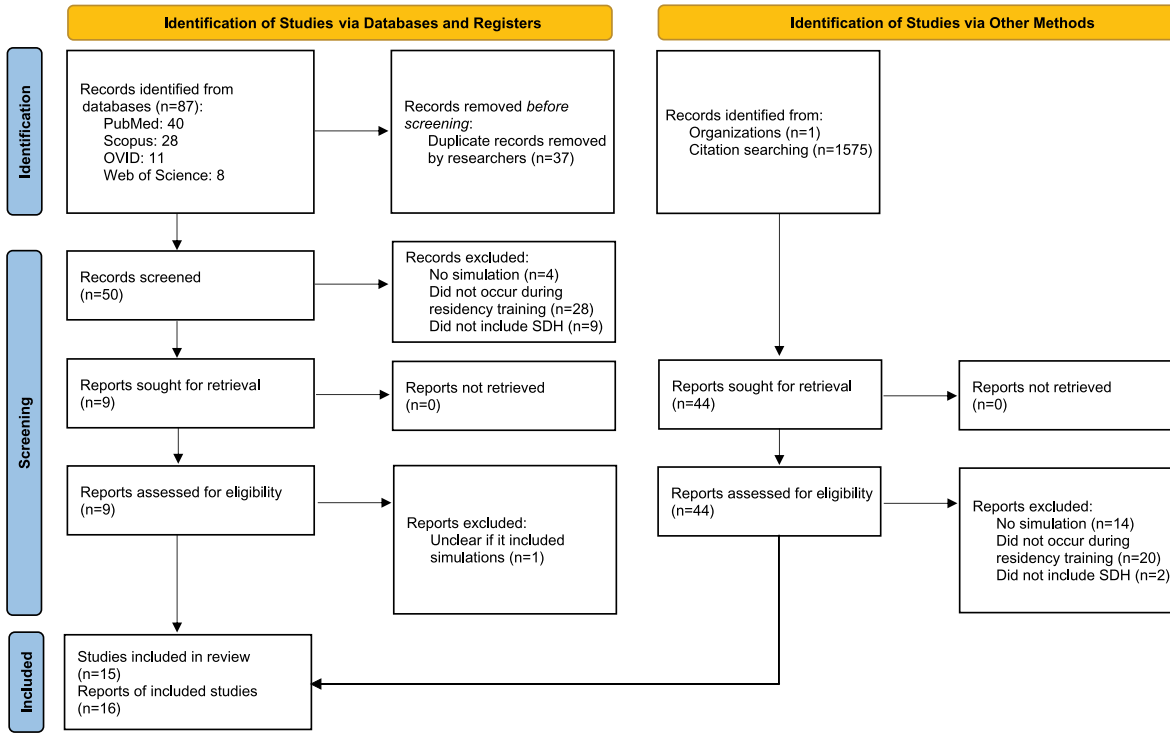

FIGURE
PRISMA Flow Diagram of the Literature Search and Selection Process
Abbreviation: SDH, social determinants of health.

for 3 and 2 studies, respectively. Two of the articles involved residents from multiple specialties (TABLE 2).

Simulation Methods

A variety of methods were used to incorporate simulation into curricula for residents. The most predominant method was the utilization of in-person case-based medical scenarios, including observed structured clinical examination (OSCEs) with standardized patients, mannequins, or peers that would participate as actors. This form of simulation was used in 7 out of 16 (44%) instances.[6,8-13] Scenario-based learning, using methods such as a poverty simulation was implemented 5 times, with 3 of those using the Missouri Community Action Networks Poverty Simulation.[14-18] In this type of simulation, residents stepped into the roles of community members to better understand their perspectives, in contrast to case-based scenarios where residents acted as medical professionals within the simulation. The remaining articles described methods that utilized virtual neighborhood tours, online/virtual simulated cases, and a virtual reality simulated case.[19-22] In addition to the simulated cases, some curricula incorporated other educational techniques such as live didactics, asynchronous learning, and group discussions.

TABLE 2
Specialties Represented in the Reviewed Articles

Residency Program	No. of Articles
Pediatrics (categorical and combined)	9
Emergency medicine	3
Internal medicine	2
Multiple specialties	2

SDH Topics Covered

These programs included multiple SDH topics in their simulations. The most frequent topic covered was financial instability, with 7 out of 16 (44%) articles stating that their curricula included education on poverty.[10,14-18,20] Housing insecurity and language barriers were each covered in 5 of the curricula reviewed.[10-13,15] Simulations involving education on racism and microaggressions were featured in 3 of the articles.[10-12] Additionally, transgender care, general distrust in medicine, stereotyping/bias, and religious beliefs were each found in 2 simulations.[6,11] Multiple other topics were covered in only one of the articles, including food insecurity, limited access to health care, adverse childhood experiences, and more (TABLE 3). Further details of the structure of the simulations can be seen in the online supplementary data.

TABLE 3
Number of Social Determinants of Health Topics Found in Articles

Social Determinants of Health Topics	No. of Articles
Financial instability	7
Housing insecurity	5
Language barriers	5
Racism and microaggressions	3
Transgender care	2
Distrust in medicine	2
Stereotyping/bias	2
Religious beliefs	2
Food insecurity	1
Limited access to health care	1
Adverse childhood experiences	1

Resident Learning Outcomes

The results from each article were analyzed for significant takeaways and possible themes connecting the articles within the categories of attitudes, knowledge, and skills of residents.

Resident Attitudes: Seven out of 16 articles (44%) stated that participants overall had a positive perception of the use of simulation for the education of SDH. Regarding these simulations, residents are quoted describing them as, "valuable," "educational," "well-executed," and "enlightening."[6,8,11-13,15,17] Three of the studies showed that residents felt their simulation was immersive, had educational value, and would recommend it to future trainees (TABLE 4).[6,8,13-16,19,21] Two articles reported a perceived increase in empathy and one article found an increase in intercultural sensitivity.[8,18,20]

Resident Knowledge: Six out of 16 (37.5%) articles stated that the residents felt more confident and more knowledgeable about how to care for a patient's social needs after the simulation.[9-11,13,14,22] Additionally, 4 manuscripts found that residents reported a significantly better understanding of SDH topics, and 4 of the articles showed that residents felt significantly better in their ability to identify social risks in patients.[9-11,14,16,18,20] Four articles found that after simulations, residents had a better knowledge of community resources.[9,14,18,20] Further post-simulation results established in only 1 article include a greater understanding of how to order cost-conscious tests and a greater understanding of how to work with an interdisciplinary team.[10,22]

Resident Skills: There were a limited number of articles that analyzed residents' skills. One article noted perceived improvements in working effectively with interpreters.[8]

Discussion

The proper understanding and preparedness of SDH by residents is necessary for holistic care of patients. This scoping review brings insight into the current state of how simulation is being utilized for teaching SDH in residency programs. According to this review, pediatric programs (categorical and combined) are engaging with simulation in this context the most frequently. Next is emergency medicine, which is followed by internal medicine and programs that involve residents from multiple specialties. The exact reasoning is unclear for why pediatric and emergency medicine programs utilize SDH simulation the most, but potential explanations may include how routinely these specialties must engage with SDH in their patient populations, higher motivation to publish research on SDH, increased flexibility in their residency curricula, and pre-existing simulation infrastructure. This review found that the use of simulation to teach SDH is more predominant in certain specialties; however, any program

TABLE 4
Article Count by Studied Outcome

Evaluated Outcomes	No. of Articles That Had a Significant Result
Positive resident perception of the use of simulation for SDH	7
Increased self-reported knowledge on how to care for patient's SDH	6
Increased self-reported knowledge on how to identify social risks	4
Increased self-reported knowledge of community resources	4
Increased self-reported understanding of SDH topics	4
Residents would recommend simulation to future trainees	3
Residents felt there was educational value to the simulation	3
Residents thought the simulation felt immersive	3

Abbreviation: SDH, social determinants of health.

seeking to incorporate SDH education into its curriculum may consider simulation as a viable teaching method.

The adoption of simulations can be done through a variety of formats. As demonstrated in this review, a range of topics were addressed through OSCEs, virtual reality, and poverty simulations, all of which received positive feedback from residents. In 7 out of 16 (44%) articles, survey responses indicated favorable learner perceptions of using simulation to teach SDH. Broader reviews of medical education have shown similar simulation methods, such as virtual reality and standardized patients, but also include animal models, high-fidelity mannequins, and hybrid simulations.[5,23,24] High-fidelity mannequins are advanced patient simulators that replicate physiological conditions, while hybrid simulations combine mannequins with standardized patients. These methods may be less applicable to SDH education, as social issues can be challenging to convey through mannequins alone. Nonetheless, residency programs seeking to incorporate SDH content into their curricula may benefit from the range of simulation approaches identified in this review, which have been well received by learners based on self-reported outcomes.

However, it should be noted that incorporating SDH-focused simulations into a curriculum may come at the loss of time invested in other areas of training. While most of the reviewed articles demonstrate an increase in self-reported resident knowledge—an encouraging find—there is still a lack of research showing an improvement in resident skills. The evaluation of the simulations in this review varied throughout, with the majority using pre-/post-simulation surveys. Investment into higher quality studies, such as blinded third-party assessments, would allow for more definitive conclusions on the value of simulation and is a necessary next step to persuade programs to adopt these simulations into their curricula. In other areas of medical education, particularly surgical education where simulations are widely used to enhance technical ability, it is evident that it is possible to have more robust assessments of simulation.[25,26] This can be done by assessing skill with standardized scoring (such as during OSCEs), giving learners direct constructive feedback after observation, the use of Kirkpatrick's 4-Level Training Evaluation Model, and evaluating the long-term impact of simulation on both patient outcomes and clinical practice.[5] One aspect of Kirkpatrick's 4-Level Training Evaluation Model does use pre-/post-surveys, which is similar to the studies in this review; however, there is still potential for more comprehensive evaluation. By adopting more rigorous and standardized evaluation methods, future research can better determine the true impact of simulation on learner development and patient care related to SDH. Doing so may provide evidence that simulation is an effective tool for skill development, and therefore SDH simulation training may be a valuable addition to residency curricula.

There are several limitations that should be considered when contemplating this review. There is a possibility that the prevalence of simulation education is greater and was either not written about or published outside of the databases used. Another limitation includes how themes were drawn from articles, even if multiple educational interventions beyond simulation were used. Therefore, these results must be taken in the context that other educational methods may have helped produce some of the positive reflections found in the study. Additionally, 2 articles were drawn from the same simulation study; however, since they focused on different aspects of the results, both were reviewed independently.[19,20] With that in mind, this could be seen as unnecessarily increasing the total number of articles and certain results. One final limitation is that there was only one reviewer (N.T.) who analyzed every article. This researcher frequently shared findings with the team, and another researcher (T.S.) verified a portion of the articles; however, additional researchers reviewing the entirety of articles would increase confidence in the results and reduce bias.

Conclusions

This review found that simulation can be implemented through diverse formats, can address a wide range of SDH topics, and is generally well received by learners.

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