ACAPT Strategic Initiative Panel on Simulation

Scoping Review of the Literature on the Use of Simulation

in the Professional Education of Student Physical Therapists

Panel Structure and Membership

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May 1, 2021

Introduction and Background

In October 2014, the American Council of Academic Physical Therapy (ACAPT) coordinated a Clinical Education Summit with the support of the American Physical Therapy Association (APTA), the Education Section of the APTA, the Federation of State Boards of Physical Therapy, and the Journal of Physical Therapy Education. The Clinical Education Summit brought together clinical and academic educators to discuss the concerns of the physical therapy clinical education system and develop options to address identified issues within the physical therapist (PT) clinical education system. The Summit goal was to reach agreement on best practices in PT clinical education. Representatives included academic and clinical faculty from 202 of the 212 ACAPT member institutions as well as other key stakeholders. The Summit resulted in a report containing 11 harmonizing recommendations and 3 innovative recommendations. Following the receipt of the report, the ACAPT Board of Directors prioritized the recommendations, integrated the work into the organization's strategic plan, and formed 3 strategic initiative panels to address the highest priority topics. The 3 priority topics were *common terminology for physical therapist education, integrated clinical education,* and *assessment of student readiness*.

The strategic initiative panel that addressed *integrated clinical education* (ICE) determined that simulation-based learning experiences were not integrated experiences and were more closely aligned with the academic portion of the PT education curriculum. This decision was based on the definitions of clinical education and clinical education experiences developed by the strategic initiative panel on *terminology*. The ICE Panel decided that simulation activities were not in the purview of their charge

and suggested that a separate panel investigate simulation and its role in PT education programs. In the summer of 2018, ACAPT put out a call for volunteers to serve on a new Strategic Initiative Panel on *Simulation* [SIPS] in PT education. The SIPS's charge was to investigate the role of simulation in PT education and provide options/best practices for the use of simulation in PT education. In August of 2018, the ACAPT Board selected 9 panel members and designated a chairperson. The first meeting of the SIPS was held in October 2018. At that meeting, SIPS decided to secure data using 2 main sources: data from a scoping review of the literature and survey data from Commission on Accreditation in Physical Therapy Education (CAPTE) accredited institutions. The first report on the use of simulation in the professional education of student physical therapists was released in fall 2020 and is posted on the ACAPT resources page [https://acapt.org/resources/simulation]. This second report is based upon the scoping review of the literature conducted by the SIPS.

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***Charges*:** The ACAPT Strategic Initiative Panel on Simulation (SIPS) in PT education will examine the role of simulation in PT education programs and provide options/best practices for the effective use of simulation in physical therapy curricula. The specific charges to this working panel are:

- **Investigate and describe the current use of simulation within physical therapist and other related health professions education programs;**

- **Describe models/best practices for the use of simulation within physical therapist education programs; and**

- **Explore the role of simulation to meet accreditation standards and required elements, particularly those curriculum elements related to clinical education and interprofessional education.**

Summary of Work to Date:

In October 2018, the first SIPS meeting occurred at the Education Leadership Conference (ELC) in Jacksonville, Florida. The decision was made at that time to secure data from 2 primary sources: a scoping review of the literature and a descriptive survey of all the CAPTE-accredited programs in the U.S. The SIPS members met face-to-face at ELC 2018 and 2019, as well as at the APTA Combined Sections Meeting (CSM) 2019 and 2020. In addition, SIPS members conducted multiple conference calls and videoconferencing sessions from fall of 2018 through fall of 2020 to conduct the scoping review of the literature and develop surveys to query PT education programs about their use of simulation. The first report on the use of simulation in the professional physical therapist education was submitted to ACAPT in October 2020; the report was subsequently posted to their resources page [https://acapt.org/resources/simulation]. This second report represents the SIPS's findings from the scoping review of the literature regarding the use of simulation in the professional education of student physical therapists.

Executive Summary

Charge 1: Investigate and describe the current use of simulation within physical therapist and other related health professional education programs as it relates to or may inform physical therapist education.

The current use of simulation in the professional education of student physical therapists was described in the first SIPS report filed in 2020 [https://acapt.org/resources/simulation]. That report was based upon the findings from our survey of all CAPTE accredited physical therapist education programs.

Charge 2: Describe models/best practices for the use of simulation within physical therapist education programs.

While there is some physical therapy literature indicative of best practices for simulation delivery in professional PT education, there is no comprehensive guidance document specific to the use of simulation in PT education. The *Society for Simulation in Healthcare*, an international organization that serves a wide range of health care professions in efforts to improve performance and reduce errors in patient care through the use of simulation, accepts the standards for best practice in simulation presented by the *International Nursing Association for Clinical Simulation and Learning* (INACSL).[1] In addition, the Association of Standardized Patient Educators (ASPE) has presented standards of best practice to ensure the growth, integrity, and safe application of standardized patient-based education practices.[2] We evaluated the literature related to the use of simulation as an educational strategy in the professional education of student physical therapists and identified whether the s*tandards of best practice for simulation* from INACSL and ASPE were utilized in those studies. While many studies that describe the use of simulation in PT education include elements of best-practice in simulation design and delivery, most studies did not appear to fully utilize those standards. The Panel collectively agrees that the INACSL and Association *of Standardized Patient Educators* (ASPE) guidelines should be strongly considered in PT simulation-based education.

Charge 3: Explore the role of simulation to meet accreditation standards and required elements, particularly those curriculum elements related to clinical education and interprofessional education.

The literature related to the use of simulation as an educational strategy to meet accreditation standards was evaluated, including elements related to clinical education and interprofessional education. This charge was also addressed in our initial report on the use of simulation in U.S. PT professional education programs [https://acapt.org/resources/simulation]. From the literature review, we found that 60 of the 133 publications reviewed (45%) were studies of interprofessional education (IPE) and 43 of those publications (72%) included PT and 2 or more other groups of professional students in the simulation experience. The Panel collectively agrees that there is sufficient evidence to support the use of simulation as 1 method of meeting the CAPTE standards and required elements related to IPE. Research conducted in Australia supports that simulation may be used to replace some clinical education time in physical therapy.[3,4] Currently, CAPTE does not accept the use of simulation as a replacement for clinical time in physical therapy. The overall lack of literature in this area led the Panel to conclude that there is currently insufficient evidence to support the use of simulation to meet CAPTE required elements related to clinical education.

Methodology

Search Methods

An initial electronic search of the literature was conducted between March 15 and April 10, 2019 using the following databases: Ovid MEDLINE, CINAHL, Web of Science, and ERIC. A combination of keywords and database-provided subject headings (when available) were used to execute the searches choosing appropriate Boolean operators. Advanced search techniques such as truncating terms, adjacency search, etc. were also used to improve sensitivity in the search results. In addition, a hand search of relevant cited references and grey literature was conducted. No publication date or language limits were applied to the results. Please refer to Appendix I for a detailed description of the search strategy and terms.

This search strategy yielded 1,359 unique results. A second search of these databases using an identical strategy was completed on February 20, 2020 in order to identify any publications between April 10, 2019 and February 20, 2020. Following de-duplication, this search resulted in an additional 46 citations, yielding an overall total of 1,405 articles. Search results were exported using Endnote bibliographic management software.

Covidence is a software management system designed to support systematic or scoping reviews of the literature. The original Endnote file of 1,359 citations from the first search was not accepted by Covidence when initially uploaded. These citations were subsequently placed into a series of 4 smaller Endnote files, each of which was then uploaded successfully into Covidence. The Endnote file of 46 citations from the second search was uploaded into Covidence at a later date. After uploading the 5 Endnote files, Covidence reported that a total of 1,473 citations had been entered. Covidence subsequently identified and removed 101 duplicates, resulting in 1,372 unique citations for review.

Article Reviews

Five members of the research team screened the 1,372 citations. Two members reviewed the *abstract and title* of each citation for the inclusion/exclusion criteria, such that only studies involving physical therapy students and simulation were retained. Each citation required 2 votes to be included or excluded. All split decisions were resolved by the Chairperson. An additional 1,092 studies that did not meet the inclusion criteria were removed at this stage. Two reviewers then evaluated the *full text articles* of the remaining 280 citations in order to confirm inclusion/exclusion criteria were met. This resulted in the exclusion of another 74 studies (Appendix 1: Article Exclusion Diagram from Covidence). All split decisions were resolved by the Chairperson. The remaining 206 articles were subjected to a full text review and data extraction.

Data Extraction Process

To standardize the review and data extraction process for the remaining 206 articles, the 9-member research team created a review/data extraction tool. All members of the team are content experts in simulation and PT education. The Panel members determined that the data extraction tool within Covidence was not adequate for extracting the data of interest so we created a tool to extract specific information rather than score the articles within Covidence. The data extraction tool was created through an iterative process with all 9 members of the team contributing to the discussions on what information should be extracted and verified. The tool was entered into *QuestionPro* software for data collection and storage. See Appendix 3 for a copy of the data extraction tool. Data from *QuestionPro* were exported into Excel spreadsheets for further analysis.

The full text version of each article was reviewed and the data extracted independently by 2 members of the research team, as assigned by the team Chairperson. Research team members were blinded to the comments from other reviewers and members did not review articles or studies in which they had participated. After the extractions were completed, the group met and determined that not all data collected from the initial article reviews/data extractions could be verified and collated in a meaningful way. The team reduced the number of items to be evaluated, and created a truncated review/data extraction form. At this step we asked reviewers to assess each article for the Kirkpatrick learning level, based on the Kirkpatrick Levels of Evaluation[5], so that we could better assess the quality and type of literature in our review. The articles were reviewed and data were extracted by 2 reviewers using the truncated extraction tool. The data extracted by the 2 reviewers were verified for accuracy; i.e. the data extracted were analyzed by a third team member, or 1 of the original 2 reviewers, to reconcile any differences. During the data extraction phase we identified and removed 35 additional articles that did not meet our inclusion/exclusion criteria; i.e. studies that did not include the use of simulation and/or

physical therapy students were not included. Removal of those 35 articles resulted in a total of 171 unique citations for further analysis.

Data Analysis

Data extraction and initial analysis was performed on the data from the 171 articles that remained in our data set, which included editorials, abstracts, dissertations, systematic reviews and conference proceedings. Further analysis of the literature excluded editorials, abstracts, dissertations, and conference proceedings and focused on the 133 peer reviewed research articles and the 7 systematic reviews. This decision removed citations where a single study supported publication of 2 articles; e.g. dissertation, or abstract, and a full text article. One hundred and thirty-three full text articles were subjected to in-depth analysis while a separate summary of findings was conducted on the 7 systematic reviews. Sixty of the full text articles included studies of interprofessional education. Data analysis relied on sorting of the data in Excel spreadsheets for a particular characteristic followed by a frequency count of that characteristic.

Results

All Citations: Demographic Summary

The search of the literature for citations related to the professional education of student physical therapists resulted in 171 unique findings. This included 133 full text articles, 13 abstracts, 9 editorials, 6 dissertations, 7 systematic reviews, and 3 conference proceedings (Table 1). Seventy of the citations were interprofessional studies. From a chronological perspective, only 7 full text articles and 2 editorials were published prior to 2000. From 2000 to 2010, an additional 16 full text articles, 3 abstracts, 1 systematic review, one dissertation and 2 conference proceedings were published. From 2011 to 2020 there were 110 full text articles, 10 abstracts, 6 systematic reviews, 5 dissertations, 6 editorials and 1 conference proceeding.

Of the 171 citations, 106 publications were from the U.S., 36 were from Australia, and 10 each were from Canada and Great Britain (Figure 1). Two publications were from Japan while 8 other countries contributed 1 publication. The 171 citations captured in our search of the literature were published in many journals, but 107 of the citations (62.6%) were published in 10 journals (Figure 2). For the vast majority of these studies (n=113/171), we were unable to determine how, or if, these projects were funded (Figure 3). Only 59 of the 171 citations, approximately 1 in 3 studies, demonstrated financial support. Funding sources acknowledged included institutional funding (n=22), government funding (n=17), private funding (n=10) and “other” funding (n=10).

Full Text Articles: Demographic Summary

Further in-depth review of the literature excluded editorials, abstracts, dissertations, systematic reviews and conference proceedings. This decision removed duplicate reviews of a single study; e.g. dissertation or abstract, and a full text article. One hundred and thirty-three full text articles remained for further analysis. Sixty of these citations included studies of interprofessional education.

Table 1 summarizes the characteristics of the citations used in the analysis. Of the 133 full text articles reviewed, only 7 were published prior to 2000. Between 2000 and 2010, 16 full text articles were published, and from 2011 through 2020 an additional 110 full text articles were published. Of those 133 full text articles, 77 were published in the U.S. while 33 were from Australia, 9 from England, 6 from Canada and 2 from Japan (Figure 4). Six other countries contributed 1 article each. For the vast majority of these studies (n=81/133) we were unable to determine the source of funding (Figure 5). Only 52 of 133 published studies (39%) reported financial support. Funding sources included institutional funding (n=18 studies), government funding (n=15 studies), private funding (n=11 studies), and "other" funding (n=8 studies).

As noted previously, 60 of the 133 full text articles concerned interprofessional education (IPE). Students from nursing (n=40), medicine (n=23) and occupational therapy (n=20) were the most common groups to participate in IPE studies with students from physical therapy (Figure 6). Forty-three of the studies included PT students and students from 2 or more other professions. In these 43 IPE studies, 19 studies included students from nursing and medicine while 11 studies included nursing and another profession; e.g. occupational therapy, pharmacy. The remaining 13 IPE studies that included 2 or more professional groups did not include nursing students. Seventeen studies included PT students and students from only 1 other professional group. Of these 17 studies, 10 studies paired PT students with students from nursing, 6 with students from occupational therapy and 1 with students from medicine.

Full Text Articles: Case Types and Settings Summary:

The 133 full text articles were analyzed to determine the content area used for the patient case/s in the simulation experience. The most common type of case used was referred to as "other" and described as "complicated" (n=49) in which the patient did not fit into a single case category/content area (Figure 7). The next 4 most common categorical content areas used were orthopedics (n=48), neurological (n=33), cardiovascular (n=32) and general medicine (n=25). There were a modest number of studies that utilized cases related to the emergency department (n=7), integument (n=5) and pediatrics (n=4). Some studies indicated the use of multiple types of patient cases.

The setting used for the simulation experience(s) was determined from the data set of 133 studies (Figure 8). The most common settings used for the simulation experience were the acute care setting (n=50) and outpatient setting (n=30). Ten studies reported using multiple patient cases in a variety of settings in the simulation experiences. Other settings included intensive care (n=9), emergency department (n=8), home health setting (n=6), community settings (n=1) and hospice care (n=1). We were unable to find sufficient information to describe the setting in 28 studies. We did not find any studies that used a skilled nursing facility as the setting for simulation. We were unable to determine the type of patient case utilized in 7 studies and/or the simulation setting in 28 of the studies reviewed.

Full Text Articles: Best Practices Summary

In 2016, the International Nursing Association for Clinical Simulation and Learning (INACSL) published standards of best practices for conducting simulations with health care professionals and students in health care programs (https://www.inacsl.org/inacsl-standards-of-best-practice-simulation/citations/).[1] In 2017, the *Association of Standardized Patient Educators* (ASPE) published standards of best practices for the use of standardized patients during simulations (https://www.aspeducators.org/).[2] The INACSL standards describe best practices for designing, conducting, and evaluating the simulation experience, while the ASPE standards describe the optimal use of standardized patients while ensuring the quality, professionalism, accountability, collaboration and safe application of standardized patient-based education endeavors.

We reviewed the contents of 133 full text articles on the use of simulation in PT education for the presence of 3 elements of the INACSL standards of best practice: 1) ***needs assessment;*** 2) ***pre-briefing;*** and 3) ***debriefing.*** The INACSL standards state that a *needs assessment* should be conducted prior to developing and running a simulation scenario. Of the 133 articles, only 15.8% (n=21) reported that a needs assessment was conducted (Table 2). *Pre-briefing* refers to providing material relevant to the simulation case to the student before conducting the simulation scenario in order to facilitate preparation and provide context. *Debriefing* refers to a guided, reflective discussion of the simulation experience following the experience. Prebriefing was reported in 45.1% (n=60) and debriefing in 61.7% (n=82) of the 133 articles reviewed (Table 2). Only 7.5% of the studies (n=10) contained all 3 elements: a needs assessment, pre-briefing and debriefing, while 39.1% (n=52) included pre-briefing and debriefing but no needs assessment (Table 2).

Since the INACSL standards were not available prior to 2017, we decided to analyze the use of the 3 elements of the INACSL standards of best practice in relationship to the year of publication, i.e. we determined if investigators used the elements of best practice more often *after* the INACSL guidelines were published in 2016. Of the 133 citations in our data set, 81 were published before publication of the INACSL standards and 52 were published afterward (Table 2). Of the 81 citations published prior to the INACSL standards, 17.3% (n=14) included a *needs assessment* (Figure 9 and Table 2). Of the 52 studies published after the INACSL standards 13.5% (n=7) contained a *needs assessment*. Sixty studies in our data set of 133 citations reported *prebriefing* (45.1%). *Prebriefing* was reported by 39.5% of the studies (n=32) published prior to the INACSL standards while 53.8% of studies (n=28) published after the standards reported *prebriefing* (Figure 9 and Table 2). Eighty-two studies (61.7%) in our set of 133 citations reported using *debriefing. Debriefing* was reported in 54.3% (n=44) of the studies published before the INACSL standards while 73.1% (n=38) of the studies published after the standards reported *debriefing* (Figure 9 and Table 2). About 32% of the articles (n=26) published before the INACSL standards contained pre-briefing and debriefing, but 50% of articles published after the INACSL standards contained both elements. Only 8.6% of the studies (n=7) published prior to the INACSL standards contained all 3 elements while 5.8% of the studies (n=3) published after the standards contained all 3 elements (Figure 9 and Table 2).

Analysis of the data revealed that the INACSL standards of best practice were already used by some authors prior to their formal publication in 2016. For each of the elements of best practice, more than half of the studies that reported using 1 element were published prior to the INACSL standards. Half of studies that reported using both pre-briefing and debriefing were published before the INACSL standards. The majority of studies that included all 3 recommended elements of best practice, while a small number, were also published prior to the INACSL standards. In the studies that were published

after the INACSL standards, many did not include some or all of the best practices identified in the standards. Overall, there appears to be an increasing percentage of publications describing the inclusion of prebriefing and debriefing.

Full Text Articles: Study Objectives

We reviewed the 133 articles for the presence of 4 learning objectives used for simulation experiences in PT education: *task/skill training; clinical reasoning; patient communication* and *intra-professional communication.* Thirty-four percent (n=45) of the studies included *task/skill training* as an objective while 52% (n=69) included *clinical reasoning*. Communication skills were the most commonly reported objective for the simulation with 53% (n=71) of the studies reporting *patient communication* as a simulation objective. Many of the studies included multiple objectives for the simulation experience and a few studies included "other" objectives typically related to a specific topic contained within the simulation scenario; e.g., death and dying, diabetes care or opioid addiction. While *patient communication skills w*ere the most common objective for simulation, *no study reported intra-professional communication in physical therapy as a simulation objective.*

Of the 133 studies, 60 (45%) were studies of interprofessional education (IPE). These 60 IPE studies were analyzed for the presence of additional learning objectives related to the *Interprofessional Education Collaborative* (IPEC) set of core competencies and objectives for conducting interprofessional simulations, which include: *interprofessional communication, values & ethics, teams & teamwork roles & responsibilities and "others"*.[6] The most common simulation objective for IPE studies was *interprofessional communication* (80%; 48/60 studies) while *values & ethics* were included in 19 studies (32%). Objectives for *teams & teamwork* were included in 43 (72%) studies while objectives related to *roles & responsibilities* were included in 38 of the 60 studies (63%). Many of the IPE studies included multiple IPEC core competencies in the objectives for the simulation experiences.

Full Text Articles: Kirkpatrick Learning Levels and Outcome Measures

We were interested in determining the *Kirkpatrick Learning Level* and the use of *outcome measures* (OM) in our 133 citations. During the data extraction phase of the study we asked reviewers to assess each full text article for the Kirkpatrick level of learning, based on the Kirkpatrick Levels of Evaluation,[5] so that we could better assess the quality and type of literature in our review. We found that the Kirkpatrick learning level one, *reactions*, was the most common category of learning in the literature reviewed (n=58/133; 43.6%; Figure 10). The second Kirkpatrick level of learning, *knowledge,* was utilized in 52 studies (39.1%) while the third Kirkpatrick level of learning, *behavior*, was found in 10 studies. One study appeared to approach level 4 learning, *outcomes*, while we were unable to determine the Kirkpatrick level of learning in 7 studies.

We found 8 publications that did not report the use of any OM. In the remaining 125 citations we found a variety of OM utilized. Approximately 40% of the studies (50/125) utilized author/study generated OM; e.g., surveys, questionnaires and exams. Focus groups were the second most common means to collect outcome information. Fifteen out of the 133 studies reported the use of focus groups. Focus groups are a data collection method in qualitative research commonly performed to collect subject feedback. The findings are analyzed either through *content analysis*; which looks for simple repeated thoughts and phrases, or *thematic analysis*; which looks for collective themes across participants. Triangulation in qualitative research occurs when qualitative data is presented alongside other data collection for credibility.[7] The data collected for triangulation with the focus group findings could be in the form of additional qualitative or quantitative outcome measures. In 13 of the 15 studies, focus groups were not the sole method of data collection; i.e., other outcome measures provided a means to verify the data in the study by triangulation. Six of the studies that included focus groups used 1 or 2 outcome

measures that are described in the literature. Two studies relied solely on focus group data while 7 studies had additional outcome measures that were author designed; e.g., surveys, quizzes or rubrics.

Focus groups were utilized in the assessment of 15 published studies that included learning at the first 3 Kirkpatrick levels of learning.[5] The most common area of focus group inquiry was to assess Kirkpatrick level 1 - satisfaction/reaction. Multiple studies triangulated their focus groups with satisfaction surveys to assess for level 1 learning. Studies that met Kirkpatrick level 2 combined focus groups with knowledge tests related to the specific patient case used in the simulation experience. These knowledge-based tests included the Opioid Overdose Knowledge Scale, the Pain Knowledge & Belief questionnaire, and questions regarding anatomical knowledge. Focus groups that were part of Kirkpatrick level 3 studies included an outcome measure that allowed for triangulation of the data supporting changes in behavior or performance. For studies that had only a focus group as the sole method of data collection and assessment, the data collection consisted of a single time point. This limited the ability to demonstrate any change in behavior over time for Kirkpatrick level 3 learning, regardless of the qualitative data collected. Kirkpatrick level 3 studies provide more context to simulation experiences in physical therapy education as they are behavior and performance based studies.

We developed a list of standardized outcome measures (S-OM) based upon the presence of some validation of the measure in the literature (Figure 11). There were many OMs that were <u>not</u> included as S-OMs because the OM consisted of specific knowledge based tests; e.g. tests about anatomy, diabetes, opiates, addiction, death & dying, that were not a part of many studies. While these are acceptable and useful OM, they do not directly address the commonalities across simulation as an educational strategy for training student physical therapists.

The use of S-OM was limited; i.e., only 26 of 133 (20%) studies included any S-OM from our list. The most frequently used S-OM was the *Readiness for Interprofessional Learning Scale* (RIPLS; n=11). The second most utilized S-OM was the *Attitudes Toward Health-care Teams* (ATHCT; n=6) while the *Interdisciplinary Education Perception Scale* (IEPS; n=4) was used in 4 studies. The RIPLS, ATHCT and IEPS are a trio of surveys frequently used to assess the impact of simulations conducted for interprofessional education and the use of healthcare teams/teamwork. Many of the other S-OM on our list were used in only 1 or 2 studies.

Systematic Reviews: Summary of Findings

Our search of the literature revealed 7 systematic reviews regarding simulation-based learning experiences (SBLEs) in PT education. The 7 reviews were published between 2010 and 2019. The first review by Veneri (2010) looked at the use of computer-based learning activities in studies published between 1994 and 2003, and included information that is obsolete at this time. The most recent publication by Roberts and Cooper (2019) included information up to October 2018, leaving 2.5 years of publications not included in the review. Notably, our most recent search of the literature indicated that there was an uptick in quality and quantity of simulation publications during this time. Only 3 of the reviews had studies that included only PT students as participants (Robert and Cooper, Mori et al., and Pritchard et al.), while the remaining reviews included primarily nursing or medical students (94%), 1 or 2 studies in each review included PT students. This indicates a dearth of literature in these areas pertaining to PT students and education.

The purposes of the reviews were quite varied (Table 3): investigate the use of serious games; computer assisted learning; simulation as an assessment tool; effectiveness of SP interactions; effectiveness of high-fidelity versus low-fidelity simulation; use of SBLEs for technical skill acquisition, case management, or clinical experiences; and outcome measures used to assess clinical decision-making (CDM), clinical reasoning (CR) and/or critical thinking (CT) in simulation. Across the different reviews, the authors noted a lack of standardization in study design and outcome measures that limited the ability to compare results in each of the studies. All authors noted this was an opportunity for growth for future research. However, some of the reviews found notable results.

Mori et al. found that SBLEs can assist with learning and skill development, assist with decreasing anxiety, and can potentially replace 25% of clinical education experiences (Table 3). Wang et al. found that serious games can be used as a valid teaching methodology. Macauley et al. noted that

several tools are capable of capturing changes in CDM, CR or CT after participating in SBLEs. These results indicate more change at the behavior level on Kirkpatrick Evaluation of Learning Scale (level three) than found in previous systematic reviews. Pritchard et al. found that SP experiences are valuable. Ryall et al. found that simulation is a reliable and valid means of assessment, but recommend against using SPs as the only means of assessment.

Discussion and Recommendations from the Strategic Initiative Panel on Simulation in Physical Therapy Education

Lack of Training in Simulation Best Practices

Our *survey* of entry-level professional education programs in physical therapy (PT) indicated that 86% of PT education programs provide three or more simulation experiences during the degree program. However, 21% of the faculty providing those simulation experiences reported no training in simulation design and implementation, while 37% of faculty reported that they were self-taught. Institution training was reported by 48% of faculty providing simulation experiences, but we do not know what that training specifically entails and training could vary widely by institution. These findings indicate a lack of consistent training in PT faculty around accepted best practice standards for the design, implementation and use of simulation as an educational strategy. Our *scoping review of the literature* also indicated that many of the citations in the literature on the use of simulation in PT education did not report including some or all of the standards of best practice.

Advancing Best Practices in Simulation Through Training

There are well established standards of best practices for designing and implementing simulation-based learning experiences from the *International Nursing Association for Clinical Simulation and Learning* (INACSL).[1] The *Association of Standardized Patient Educators* (ASPE) has provided best practice patterns for the use of standardized patients that were designed to be used in conjunction with the INACSL standards.[2] The *Society of Simulation in Healthcare* (SSH) provides courses designed to help healthcare educators improve the quality of their simulation programs and advance their professional development. Some of the SSH courses are offered jointly with INACSL and ASPE. In addition, SSH offers courses leading to accreditation for organizations offering simulation. These professional development offerings, as well as those from other reputable institutions, are opportunities for the PT education community to move towards consistency in delivering simulation experiences that are designed using best practice standards, allow for substantial and significant interprofessional experiences and result in more consistent and reliable outcomes.

In addition, there are well established guidelines for promoting interprofessional experiences that can be utilized in simulation. The *Interprofessional Education Collaborative* (IPEC) has identified core competencies for interprofessional, team-based practice that IPEC views as key to safe, high quality, accessible, patient-centered care.[6] The Agency for Healthcare Research and Quality (AHRQ), in conjunction with the Department of Defense, developed TeamSTEPPS®, a training program designed for healthcare professionals to improve patient safety, communication and teamwork skills.

The members of the Strategic Initiative Panel on the use of Simulation (SIPS) in PT education believe the standards of best practice from INACSL and ASPE provide appropriate and sufficient guidance for simulation programs in PT. However, we also strongly believe that those standards are not fully and appropriately implemented currently by PT educators and researchers. We believe a significant

part of the problem is due to a lack of formal training in simulation design and delivery. We believe the best way forward, at this time, is to encourage the use of the best practice standards from these groups and to encourage more educators/researchers to participate in the various professional development opportunities offered by SSH, AHRQ and other reputable institutions. In addition, ACAPT, the Academy of PT Education and the APTA should consider offering more courses and opportunities to learn about best practices in simulation design and implementation and perhaps offer courses jointly with these organizations as a means to promote the use of best practice in simulation, as well as interprofessional education.

Lack of Standardized Outcome Measures

Our *survey* of entry-level PT professional education programs indicated that those programs are not regularly utilizing validated, standardized outcome measures (OMs) to assess learning outcomes following simulation experiences in PT education. Our *scoping review of the literature* indicated that while there a few validated, standardized OMs used regularly; e.g., RIPLS, ATHCT and IEPS, these measures are essentially only for interprofessional education experiences and the OMs only assess learning at the lowest Kirkpatrick level (satisfaction). Our *summary of systematic reviews* found that while there are some valid OMs available, they are utilized infrequently in the current PT education literature (see Figure 11 and Table 3). Author-generated OMs were used more frequently than any other form of assessment following simulation experiences in PT education. None of the author generated OMs has documented and published validity, reliability or generalizability. In addition, the use of focus groups was reported frequently as an OM in many studies. However, the use of best practices for qualitative research; e.g., the use of additional OMs to triangulate the findings of the focus groups, was infrequent at best, once again limiting generalizability of the findings.

O'Brian et. al. (2014) outlined 21 rigorous methods and considerations for a credible qualitative study design that utilizes focus groups.[8] Best practice in qualitative research, including focus group interview questions and data collection, should be undertaken through a lens of theoretical framework and clearly demonstrate the limits of transferability of the data beyond the subjects studied. The *Physical Therapy and Rehabilitation Journal* relies on the *Standards for Reporting Qualitative Research* (SRQR).[8] The Panel recommends future studies in simulation education that choose to collect qualitative data method follow the SRQR to allow for improved comparisons across these studies and further the knowledge and understanding of simulation as an educational strategy.

Development of Standardized Outcome Measures for Use in PT Simulations

Standardized OMs are consistently used across multiple other education methodologies in PT education; e.g., Clinical Performance Instrument (CPI). The members of the SIPS in PT education believe strongly that the current lack of standardized OMs is a significant and substantial impediment to research on the use of simulation in the field of PT education, as well as the application of that knowledge to PT education. Without standardized OMs, research into the use of simulation in PT education continues to generate data about simulation experiences that is often not validated, reliable nor generalizable. Developing and utilizing standardized OMs would advance our understanding of the benefits of simulation experiences and monumentally advance the purposeful use of simulation in PT education.

The members of the SIPS suggest that ACAPT, the Academy of PT Education and APTA actively engage the PT education community to promote the development and use of standardized OMs following simulation experiences in PT education. Any development of standardized OMs needs to promote assessments that occur at Kirkpatrick learning levels beyond simple satisfaction surveys and knowledge exams; e.g. level 3 - changes in behavior over time. The consistent use of standardized OMs and best practices would advance our knowledge and understanding of the benefits of simulation experiences as well as how to optimize the use of simulation in PT education. We believe that the training regarding best practices, recommended above, could be used as an opportunity to simultaneously train educators and investigators in the use of standardized OMs to assess the effectiveness of simulation in PT education.

Development of a Simulation Library

The SIPS members suggest that the PT education community develop a "simulation library" that would include materials designed according to the best practice guidelines noted previously in this report. The library would include simulation scenarios that have been designed using best practice guidelines, reviewed by content experts and assessed for reliability and validity; i.e. vetted and/or peer-reviewed. These scenarios would be available to members for use in their simulation programs and potentially save valuable faculty time required to develop, test and validate scenarios. A library of vetted simulation scenarios is occurring in some Nursing groups involved in the use of simulation [Northern California Simulation Alliance (California Simulation Alliance)] and on platforms such as MedEd Portal (https://www.mededportal.org/). Scenarios would be designed following best practice guidelines, peer-review, and testing for validity and reliability prior to publication in the library. Members of the library would be able to access specific scenarios as needed without going through the development process. If peer-reviewed, this may also serve as a method of dissemination and possibly contribute to scholarship efforts of those involved in the scholarship of teaching and learning. If a sufficient number of programs utilized the same scenario and utilized the same standardized OMs, researchers could harvest and utilize the data to more accurately determine the impact of simulation on the professional development of PT students. A simulation library containing vetted scenarios could potentially lead to a large increase in our understanding of the benefits of simulation in PT education. In addition, the library could be used to provide templates on how to develop simulation scenarios, as well as templates to guide the development of pre-briefings and/or debriefing materials that incorporate best practice standards.

Current Use of Simulation to Meet Accreditation Standards

One of the charges from ACAPT to the SIPS was to explore the role of simulation to meet accreditation standards and required elements, particularly those curricular elements related to clinical education and interprofessional education. Simulation is undoubtedly a teaching strategy that can be designed to prepare students to achieve outcomes required for the initial practice of physical therapy. However, members of the SIPS consider simulation to be an approach that should be used in conjunction with and to augment other teaching strategies in order to maximize student learning outcomes and assessment methodologies. SIPS members believe that the majority of the elements in CAPTE standard 7 can be addressed by appropriately designed simulation scenarios or activities. However, SIPS members do not believe the singular use of simulation is a sufficient approach for achieving any of the elements in CAPTE Standard 7 based on current literature.

Of particular note in the scoping review was a serious lack of published articles on the participation of physical therapy assistants (PTA) in simulation experiences. We did not find a single published article on the use of PTA students/clinicians in simulation experiences with PT students. While there are well documented examples of PT students participating in *interprofessional* simulation experiences with students and clinicians in nursing, medicine and occupational therapy, there are no examples in the literature of PTA students/clinicians participating in *intraprofessional* simulation experiences with PT students. This is an area in need of further research.

Future Use of Simulation to Meet Accreditation Standards

Simulation is an educational strategy that can be designed to prepare students to achieve outcomes required for initial practice of physical therapy. SIPS members believe the best approach will be to integrate simulation with other teaching strategies and approaches to optimize PT student outcomes for safe and effective practice. Simulation can be used as a method of assessment as well, and can augment traditional assessments used in a didactic environment. Our scoping review of the literature yielded only two articles[3,4] that advocated the use of simulation to replace clinical education hours. CAPTE does not currently accept the use of simulation to replace clinical education hours in PT education. The SIPS did not find sufficient evidence to recommend replacement of direct clinical experience or time.

The lack of evidence to support the replacement of clinical education time does not mean that simulation is ineffective at providing effective simulated clinical experiences. *Rather, the issue has not been studied sufficiently to answer the "replacement" question for PT education.* The SIPS members believe the PT education community would benefit from a well-designed study to investigate the specific issue of potentially replacing clinical education time with time spent in simulation experiences. Our *survey* of the PT education programs in the U.S. and our *scoping review of the literature* provide a description of the current use of simulation in entry-level PT education. The next step would be to design a study to answer this question. We suggest that ACAPT, the Academy of PT Education and the APTA fund research to address this issue. We would like to suggest that a cohort of approximately 10 programs commit to a research study to answer questions regarding the use of simulation in PT education. The programs would commit to: 1) training faculty in the consistent use of best practices in simulation, 2) using specific simulation scenarios that have been previously vetted, 3) using specific OMs to assess the learning that occurred during the simulation experience, and 4) using specific OMs

related to clinical competency. The consistent training, methodology, OMs, and use of assessments across multiple programs would substantially increase the power and generalizability of the findings needed to answer many questions related to the effective use of simulation in PT education.

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List of all Figures, Tables & Appendices

Figure 1. Country of Origin of Included Citations (n=171).

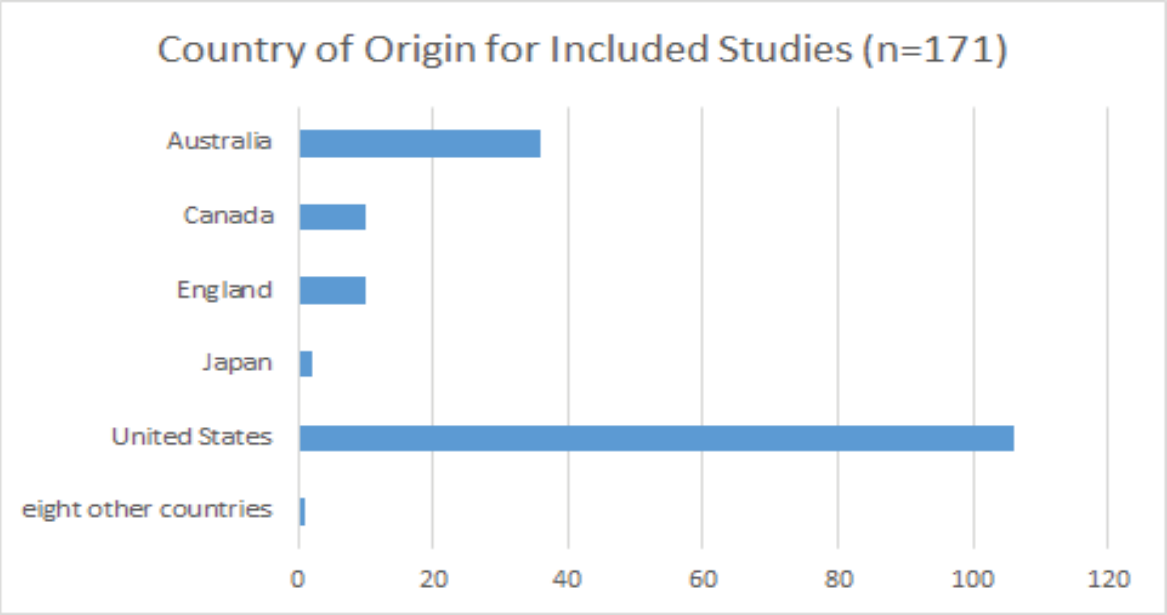


Figure 2. Top 10 Journals Where the 171 Citations Were Most Frequently Published

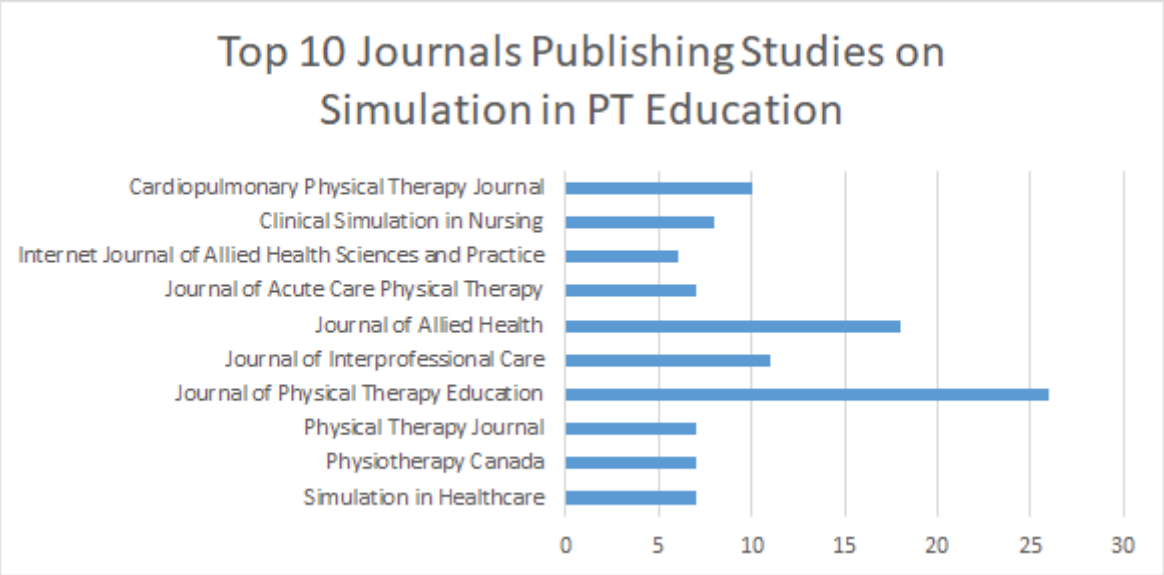


Figure 3. Funding Sources of Citations (n=171)

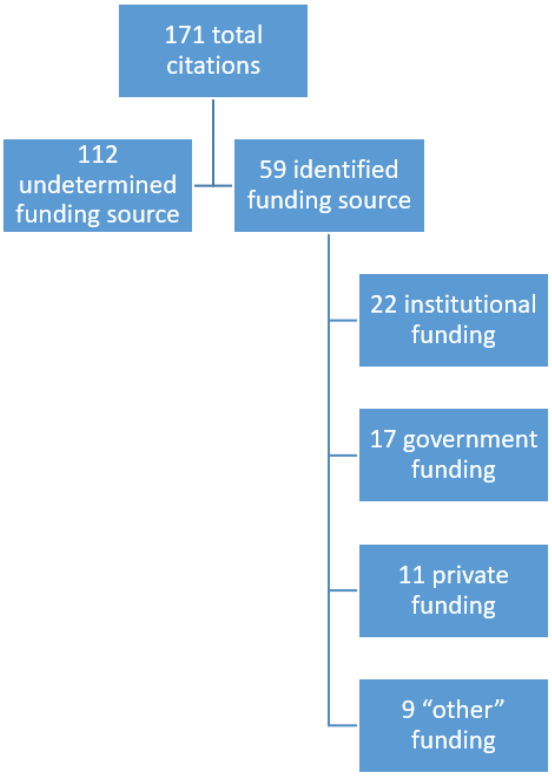


Figure 4. Country of Origin of Full Text Articles (n=133).

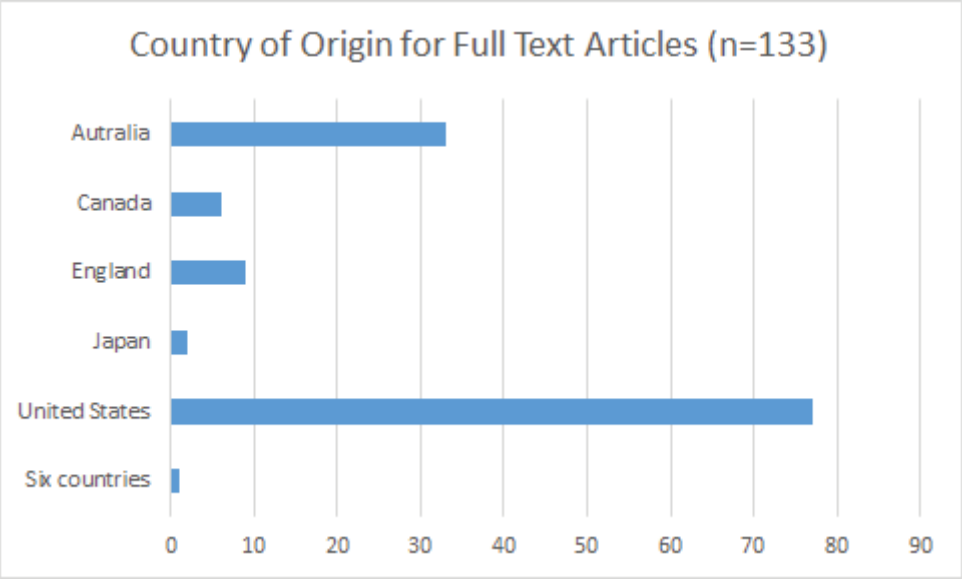


Figure 5. Funding Sources of Full Text Articles (n=133).

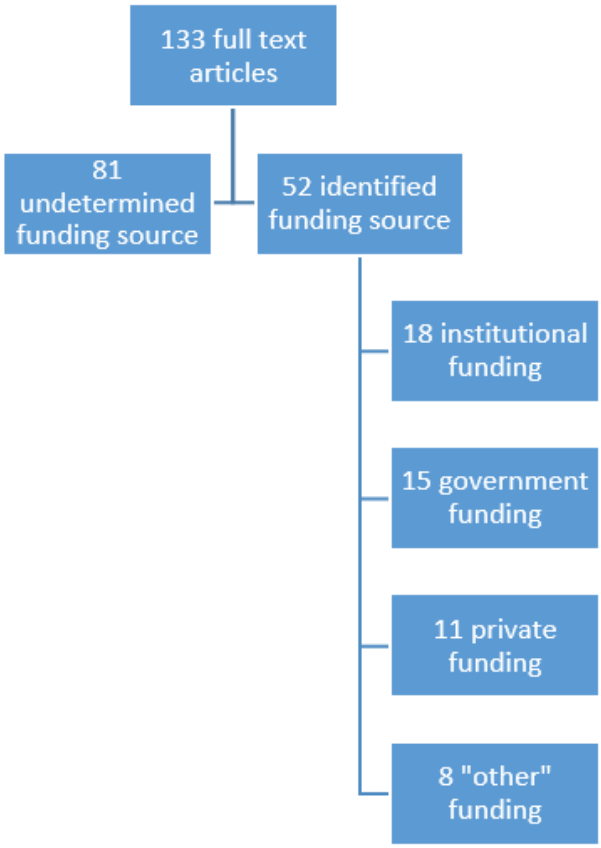


Figure 6. IPE Articles: Participants in Interprofessional Education (IPE) Studies with Physical Therapy Students (n=60).

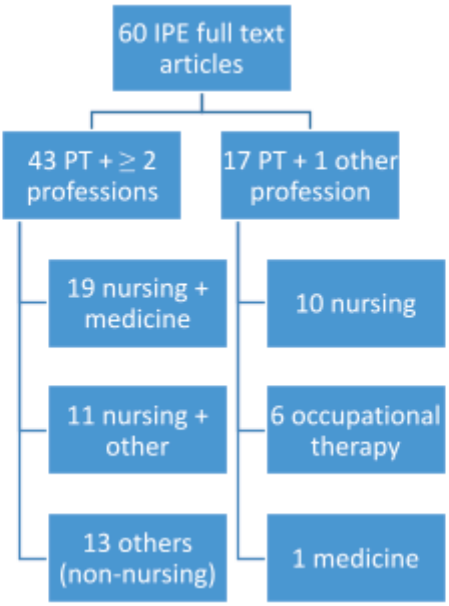
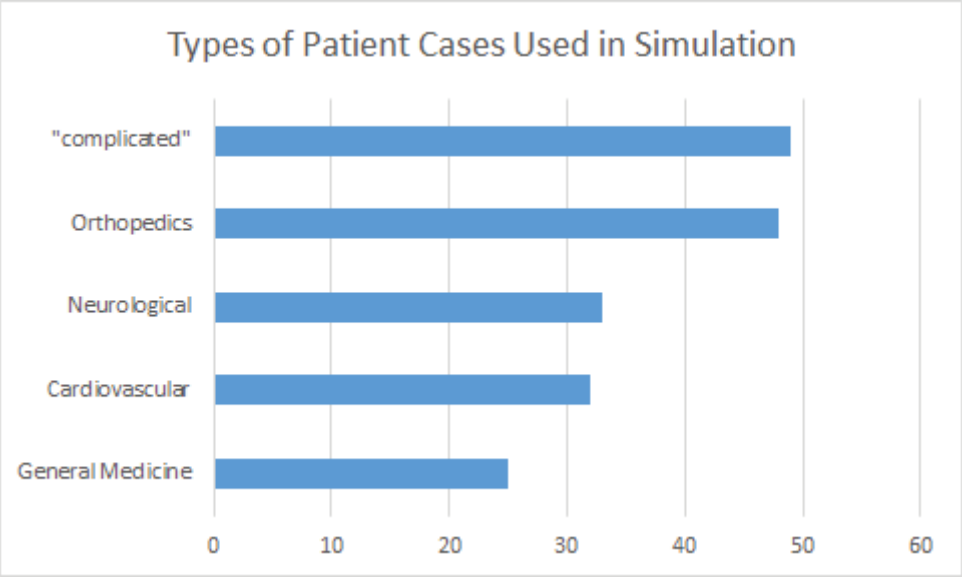


Figure 7. Types of Patient Cases Used in Simulation Experience*



*Some studies included multiple simulations in more than one content area.

Figure 8. Clinical Settings Used in Simulation Experience

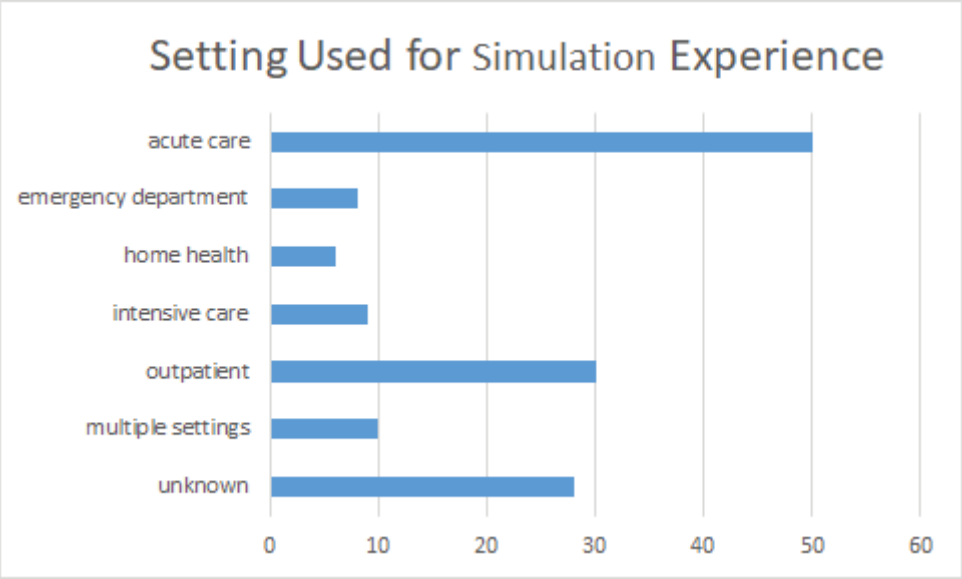


Figure 9. Percentage of Publications that Included the INACSL Best Practice Standards Before versus After Publication of the Standards in 2016. (INACSL = International Nursing Association for Clinical Simulation and Learning).

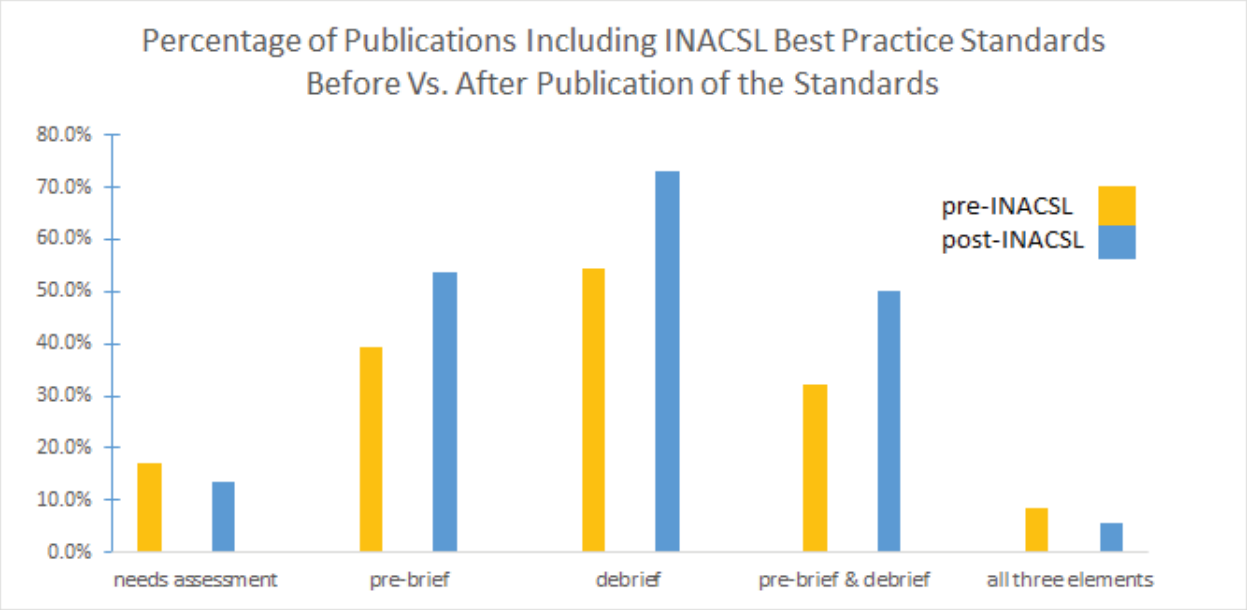


Figure 10. Kirkpatrick Level of Learning for Each Full Text Article (n=133).

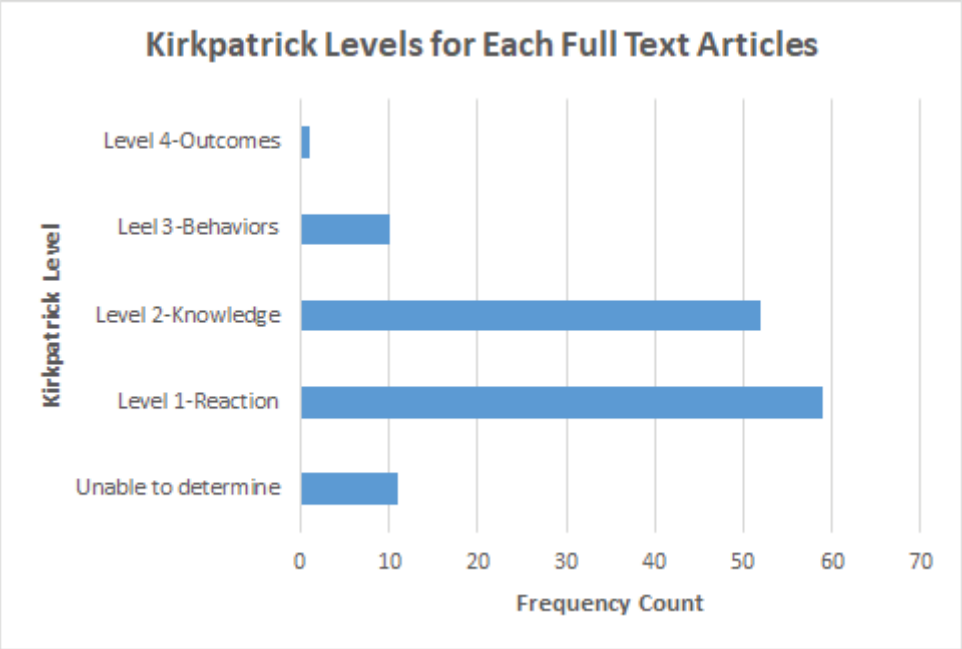


Figure 11. Standardized Outcome Measures in Simulation Experiences

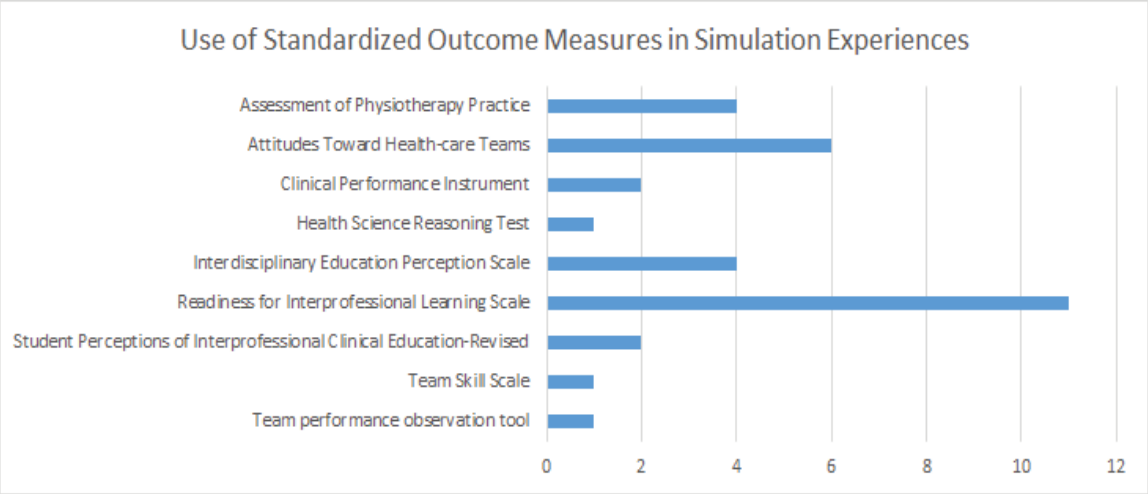


Table 1. Types of Literature Included in Final Review (n=171)

Year Published	Full Text Articles	Abstracts	Systematic Reviews	Dissertations	Editorials	Conference Proceedings	Total
Prior to 2000	7				2		9
2000-2010	16	3	1	1		2	23
2011-2020	110	10	6	5	7	1	139
Total	133	13	7	6	9	3	171

Table 2. INACSL Best Practices: Inclusion of Key Elements in Simulation Studies.

	Number of publications pre-INACSL standards (prior to 2017; n=81)	Number of publications post-INACSL standards (2017-2020; n=52)	All Full Text Articles Including Elements (N=133)
Needs Assessment	14 (17.3%)	7 (13.5%)	21 (15.8)%
Prebriefing	32 (39.5%)	28 (53.8%)	60 (45.1%)
Debriefing	44 (54.3%)	38 (73.1%)	82 (61.7%)
Prebrief + Debrief	26 (32.1%)	26 (50.0%)	52 (39.1%)
All 3 elements	7 (8.6%)	3 (5.8%)	10 (7.5%)

INACSL = International Nursing Association for Clinical Simulation and Learning

Table 3. Summary of findings from Systematic Reviews.

Author	Purpose	Results	Recommendations
Roberts & Cooper (2019)	● Evaluate the effectiveness of high fidelity simulation versus low fidelity simulation on practical/clinical skip development	● Only 6 studies and no similarities between them	Limited due to the disparity between the 6 included studies
Macauley, Brudvig, Kadakia & Bonneville (2017)	● Review literature to determine if simulation can impact CDM, CR or CT ● Assess quality of evidence for effectiveness of CDM, CR, CT ● Compared SBL to usual teaching methods for development of CDM, CR, or CT ● Identify and characterize assessment tools in CDM, CR, or CT	● Some studies showed increases in CDM, CR, or CT after participating in SBL ● 7 studies showed increases in CDM, CR or CT with SBLE compared to usual education activities ● Differences in CDM, CR, or CT were noted in several studies after 3, 5, 6 or 14 SBLEs, but not in 2	Standardized tools used for evaluating CDM, CR, or CT included: Assessment of Physiotherapy Practice, Health Sciences Reasoning Test, Yoon's Critical Thinking Disposition Tool, CA Critical Thinking Disposition Inventory, California Critical Thinking Skills Test, Clinical Decision-making Nursing Scale, Lasater Clinical Judgment Rubric, Holistic Critical Thinking Scoring Rubric.
Pritchard, Blackstock, Nestel, & Keating (2016)	● "What is known about the effects of SP interaction in entry-level PT programs, on any outcome relevant to learning, compared with no SP interaction or an alternative education strategy?"	● No difference in outcomes between pooled groups where 25% of clinical placement was substituted with SP interaction ● Benefits to using SPs over peer role play (value of experience, anxiety) ● Meta-analysis data showed higher post-SP interaction scores between pre- and post- test design studies	● SP interactions are valuable, but how much is difficult to say based on PT literature, especially compared to alternate learning activities ● Cost may be a barrier to implementing the use of SPs

		● Learning with SPs felt more real, and therefore more valuable to students	
Ryall, Judd & Gordon (2016)	● "Evaluate the evidence related to the use of simulation as an assessment tool for technical skills within healthcare education"	● High-fidelity human patient simulator assessments had good reliability & validity, low generalizability. Increased scenarios increased reliability (not increased raters)- 10-12 scenarios with 2-4 raters ● Expert raters and criterion raters were more reliable than SPs ● Virtual reality can differentiate between those that need further training prior to practicing on people ● Written and simulation exams assess different things ● One rater is sufficient to assess technical skills, were 2 raters were better for non-technical skills	● Clinical competence should not be used by SP-based assessments alone ● Combining simulation and written exams give different assessments (knowledge and psychomotor skills.) ● Standardizing assessments created a consistent evaluation ● Simulation provides the opportunity to say new graduate is competent prior to patient care
Wang, DeMaria, Goldberg, & Katz (2016)	● Investigate the available evidence on serious games for healthcare professionals, developmental processes implemented, identify a number of effective games and	● Created a list of game genres: management simulation, puzzle, quiz, training simulation, adaptation, board	● Majority of the games focused on medical and nursing students, except cranial nerves and pathology games included PTs

	assess the evaluation methodologies used.	game, platform, adventure ● 79% of games determined to be a valid teaching intervention	
Mori, Carnahan, & Herold (2015)	● Search for studies using SBLEs compared to usual education, assessed interventions, & had at least a post-test. ● Focused search on technical skills, case management, and clinical experiences.	A. SBLE used for specific skills (8) B. Interactive computer games or programmed SBLEs (3) C. Simulation for managing a case presentation (5) D. Using simulation represent clinical education (7)	● SBLEs can facilitate learning and skill development, assist with clinical reasoning, decrease anxiety, and potentially replace 25% of clinical education experiences. ● Important to consider relationship between task difficulty, practice & feedback in SBLEs
Veneri (2010)	● Review the literature regarding computer assisted learning	● Outdated with respect to current practice and technology	● Outdated- included studies from 1994 – 2003, looking at the use of CD-ROMs, various computer hardware and software that can be used in PT education

Abbreviations: CDM= clinical decision-making, CR= clinical reasoning, CT= critical thinking, PT=physical therapy, SBLE= Simulation-based learning experience

Appendix 1: Detailed Description of the Search Strategies and Terms Used

A. Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) 1946 to April 09, 2019

	Query	Results
1	simulat$.ti,ab,kf.	476,090
2	(standard$ adj3 patient$).ti,ab.	30,167
3	(mannequin$ or manikin$).ti,ab,kf.	4,205
4	models, anatomic/ or manikins/ or visible human projects/ or patient-specific modeling/ or virtual reality/	24,639
5	simulation training/ or high fidelity simulation training/ or patient simulation/	7,262
6	or/1-5	524,242
7	students/ or students, health occupations/	55,001
8	education/ or curriculum/ or competency-based education/ or problem-based learning/ or teaching/ or programmed instruction as topic/ or education, professional/ or clinical clerkship/ or preceptorship/	142,282
9	Learning/ or teaching/	102,652
10	education.fs.	264,074
11	or/7-10	436,217
12	(physical therap$ or physio-therap$ or physiotherap$).ti,ab,kf. or PT.ti,ab.	91,551
13	physical therapists/ or Physical Therapist Assistants/ or exp Physical Therapy Modalities/	143,281
14	or/12-13	214,167

15	exp Educational Measurement/ or Clinical Decision-Making/ or exp Patient Care/	1,032,878
16	(achiev$ or competen$ or professional$ or outcome$ or assess$).ti,ab,kf.	4,711,202
17	exp credentialing/	52,974
18	(pre-qualify$ or pre-licens$ or licens$ or affiliat$ or score$ or exam$ or perform$).ti,ab,kf. or NPTE.ti,ab.	5,956,261
19	interprofessional relations/ or interdisciplinary studies/ or interdisciplinary communication/ or intersectoral collaboration/ or patient care team/ or hospital rapid response team/	119,381
20	(interprofessional$ or interdisciplin$ or team$ or multidisciplin$ or collaborat$).ti,ab,kf.	338,007
21	(clinical adj5 placement$).ti,ab. or readiness.ti,ab,kf.	17,480
22	or/15-21	9,452,678
23	6 and 11 and 14 and 22	157

B. Cumulative Index of Nursing and Allied Health (CINAHL® Complete) 1937 –

	Query	Results
1	((MH "Computer Simulation+") OR (MH "Models, Anatomic") OR (MH "Simulations+")) OR (simulat* OR mannequin* OR manikin*) OR standard* N3 patient* OR ("visible human project*" OR "patient-specific modeling")	89,955
2	((MH "Physical Therapist Assistants") OR (MH "Physical Therapy Service") OR (MH "Physical Therapy+")) OR (physical therap* OR physio-therap* OR physiotherap*)	154,213

3	TI PT OR AB PT OR TI DPT OR AB DPT	7,368
4	2 OR 3	158,859
5	((MH "Education") OR (MH "Curriculum+") OR (MH "Education, Clinical") OR (MH "Learning Environment+") OR (MH "Learning Methods+") OR (MH "Students") OR (MH "Teaching") OR (MH "Models, Educational") OR (MH "Students, Graduate+") OR (MH "Students, Health Occupations") OR (MH "Students, Allied Health+")) OR (student* OR educat* OR curriculum* OR learn* OR teach* OR train* OR Instruct* OR preceptorship* OR "clinical clerkship")	989,187
6	S1 AND S4 AND S5	1,078
7	(((MH "Collaboration") OR (MH "Interprofessional Relations+") OR (MH "Professional-Client Relations") OR (MH "Professional-Patient Relations+") OR (MH "Student-Patient Relations") OR (MH "Researcher-Subject Relations") OR (MH "Professional-Student Relations"))) OR (interprofessional* OR interdisciplin* OR team* OR multidisciplin* OR collaborat*)	312,705
8	(MH "Patient Care+") OR (MH "Decision Making, Clinical") OR (MH "Patient Care+")	688,449
9	(MH "Credentialing+") OR (credential* OR pre-qualify* OR pre-licens* OR licens* OR accredit* OR affiliat* OR score* OR exam* OR perform*) OR clinical N3 placement*	1,178,438
10	(MH "Educational Measurement+") OR (("educational Measurement*" OR "Academic Performance" OR "Academic Success" OR "Professional Competence" OR "Clinical Competence" OR "Test Taking Skills" OR "Patient Care" OR "Clinical Decision-Making" OR achiev* OR competen* OR professional* OR outcome* OR assess*))	1,845,136
11	7 OR 8 OR 9 OR 10	2,782,874

12	6 AND 11	933

C. Educational Resources Information Center (Proquest ERIC) 1966 –

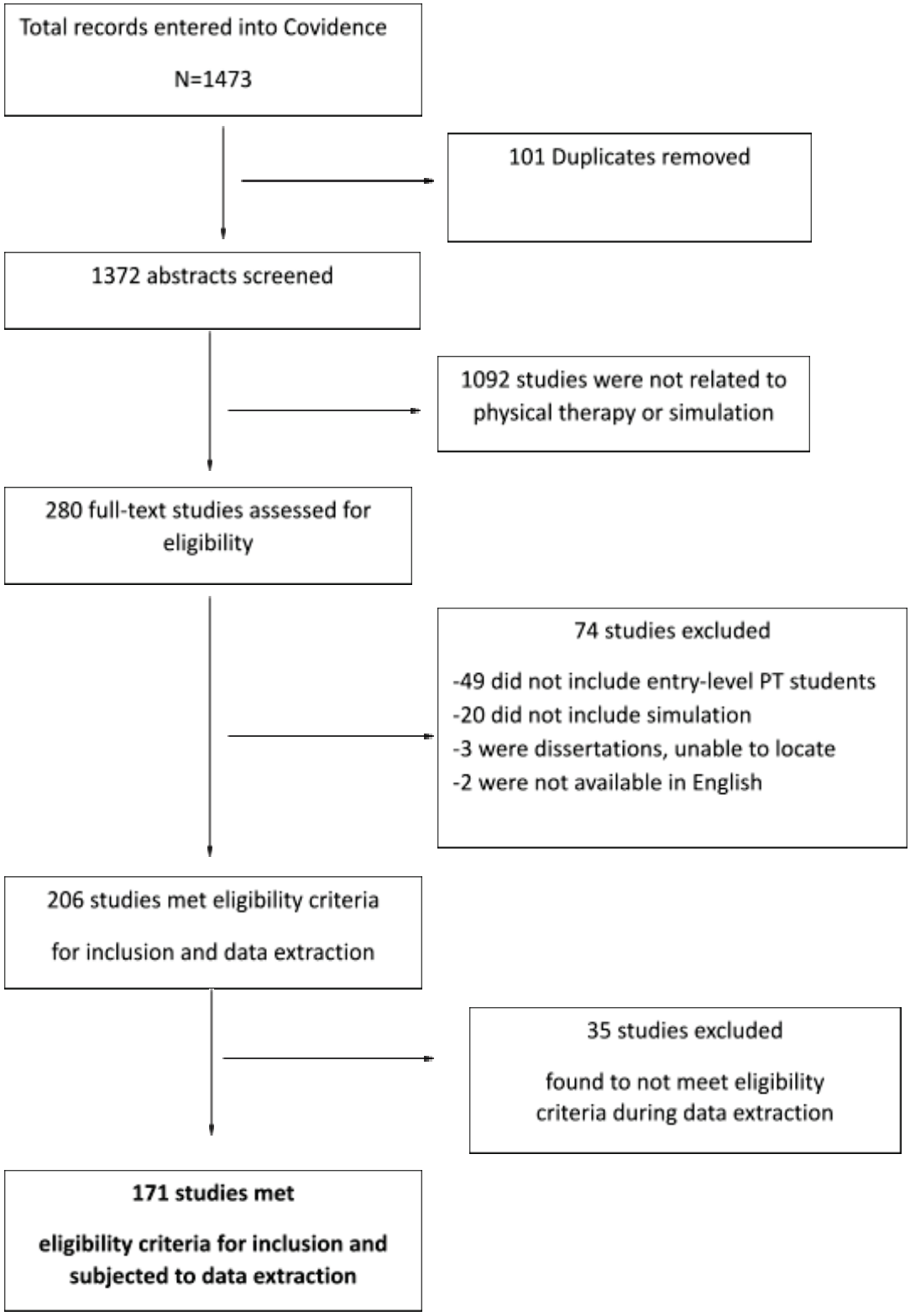
Query		Results
1	((simulat* OR mannequin* OR manikin*) OR (standard* NEAR/3 patient*) OR "visible human project*" OR "patient-specific modeling" OR "virtual realit*") AND (student* OR educat* OR curriculum* OR learn* OR teach* OR train* OR Instruct* OR preceptorship* OR "clinical clerkship") AND (("physical therap*" OR " physio-therap*" OR "physiotherap*") OR ab(PT OR DPT) OR ti(PT OR DPT))	44
2	("educational Measurements" OR "Academic Performance" OR "Academic Success" OR "Professional Competence" OR "Clinical Competence" OR "Test Taking Skills" OR "Patient Care" OR "Clinical Decision-Making" OR achiev* OR competen* OR professional* OR outcome* OR assess*) OR ((interprofessional* OR interdisciplin* OR team* OR multidisciplin* OR collaborat* OR readiness) OR ti(clinical NEAR/3 placement*) OR ab(clinical NEAR/3 placement*)) OR ((credential* OR pre-qualify* OR pre-licens* OR licens* OR accredit* OR affiliat* OR score* OR exam* OR perform*) OR ti(NPTE) OR ab(NPTE))	956,021
3	1 AND 2	37

D. Web of Science Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=1900-2019

Query	Results

1	((simulat* OR mannequin* OR manikin) OR TOPIC: (standard* NEAR/3 patient*) OR TOPIC: ("visible human project*" OR "patient-specific modeling" OR "virtual realit*")) AND TOPIC: ((student* OR educat* OR curriculum* OR learn* OR teach* OR train* OR Instruct* OR preceptorship* OR "clinical clerkship*")) AND TOPIC: (("physical therap*" OR " physio-therap*" OR "physiotherap*") OR TOPIC: (PT OR DPT)) = 216	216
2	("educational Measurements" OR "Academic Performance" OR "Academic Success" OR "Professional Competence" OR "Clinical Competence" OR "Test Taking Skills" OR "Patient Care" OR "Clinical Decision-Making" OR achiev* OR competen* OR professional* OR outcome* OR assess*) OR TOPIC: (interprofessional* OR interdisciplin* OR team* OR multidisciplin* OR collaborat* OR readiness) OR TOPIC: (clinical NEAR/3 placement*) OR TOPIC: (credential* OR pre-qualify* OR pre-licens* OR licens* OR accredit* OR affiliat* OR score* OR exam* OR perform*) OR TOPIC: (NPTE)	13,541,664
3	1 AND 2	193

Appendix 2: Article Exclusion Diagram from Covidence



Appendix 3: Data Extraction Tool

Identification

1. Article ID Number

2. First Author Last Name:

3. Which country was the study completed in?

1. US
2. Canada
3. Australia
4. England
5. Other _____

Year Article Published:

Which reviewer is completing this form?

1. First reviewer
2. Second reviewer

Sponsorship source

1. Internal institutional funding
2. Government funding
3. Private funding
4. Unknown/unable to determine
5. Other _____
6. N/A

Type of Citation Reviewed

1. Full text article
2. Abstract
3. Editorial/descriptive article
4. Other _____

Methods

List all institutions that participated in the study (one institution and department per line):

Row 2

Row 3

Row 4

Row 5

Are PT students included in the study?

1. Yes
2. No

Stated purpose of the study:

Methods (provide a brief description of the methods):

Population

Stage of professional development for PT students included in study (select all that apply):

1. 1st year
2. 2nd year
3. 3rd year
4. Unknown
5. Other _____

Is this an IPE study?

1. Yes
2. No

Indicate other health professionals included in the study and stage in professional development:

	Included in Study	Included in Study	Included in Study
Medicine	❍	❍	❍
Nursing	❍	❍	❍
Nurse practitioner	❍	❍	❍
Occupational therapy	❍	❍	❍
Pharmacy	❍	❍	❍
Physician assistant	❍	❍	❍

Speech	❍	❍	❍
Social work	❍	❍	❍
Other	❍	❍	❍

Indicate other health professionals included in the study and stage in professional development:

	Stage in Professional Development
Medicine	1st year 2nd year 3rd year 4th year Postgrad Unknown
Nursing	1st year 2nd year 3rd year 4th year Postgrad Unknown

Nurse practitioner	1st year 2nd year 3rd year 4th year Postgrad Unknown
Occupational therapy	1st year 2nd year 3rd year 4th year Postgrad Unknown
Pharmacy	1st year 2nd year 3rd year 4th year Postgrad Unknown

Physician assistant	1st year 2nd year 3rd year 4th year Postgrad Unknown
Speech	1st year 2nd year 3rd year 4th year Postgrad Unknown
Social work	1st year 2nd year 3rd year 4th year Postgrad Unknown

Other	1st year 2nd year 3rd year 4th year Postgrad Unknown

If selected "other" in the previous question, please list the other healthcare profession included in the study and the stage in professional development. Please skip this question if this does not apply to this study.

Please list any other inclusion criteria used in the study:

Exclusion Criteria (state criteria used in the study for excluding subjects):

Baseline group differences (note any group differences if stated, e.g., control vs. experimental groups)

Sample size:

Interventions

Were the following simulation-based learning experience components included in the study intervention?

	Yes	No	Unknown
Prebriefing	❑	❑	❑
Debriefing	❑	❑	❑

If debriefing was included, what was the length of time spent debriefing versus time spent in simulation experience?

1. Debriefing time significantly less than the time in simulation
2. Debriefing time roughly equal to time in simulation
3. Debriefing time significantly greater than time spent in simulation
4. Unknown/Not specified
5. N/A

If debriefing was included, what type of training did the debriefers complete?

1. Formal training
2. Informal training
3. Unknown
4. NA

If IPE study, were the debriefers from more than one profession?

1. Yes
2. No
3. Unknown
4. N/A

Please indicate below which type(s) of patient simulator(s) were used in the simulation-based learning experience.

	Yes	No	N/A
Manikin	❑	❑	❑
Standardized/simulated patient (actor)	❑	❑	❑

Peer/classmate	❑	❑	❑
Task trainer(s)	❑	❑	❑
Virtual or augmented reality	❑	❑	❑
Other	❑	❑	❑

If you selected "other" above, please describe:

Were confederates/embedded participants used in the simulation experience?

1. Yes
2. No
3. Unknown/not mentioned

Please select the number of simulations in which each student actively participated.

1. 1
2. 2
3. 3
4. 4
5. 5+
6. Unknown

Select the type(s) of patient case(s) simulated (select all that apply):

1. Cardiovascular
2. Emergency
3. General Medicine
4. Integumentary
5. Orthopedics
6. Neurological
7. Pediatric
8. Pulmonary
9. Other _____
10. N/A

Select the type of setting(s) simulated in the simulation(s) (select all that apply):

1. Acute care (general medicine, surgical, or cardiac)
2. Emergency department
3. Home health
4. Inpatient rehab (long term care)
5. Intensive care
6. Outpatient
7. Skilled nursing facility
8. Other _____
9. N/A

Was a needs assessment conducted prior to the simulation experience?

1. Yes
2. No
3. Unknown

What was/were the main objective(s) of the simulation experience? (Select all that apply.)

	Yes	No	Unknown
Task/skill training (e.g. blood pressure reading)	❑	❑	❑
Clinical reasoning skills	❑	❑	❑
Patient interview/communication skills	❑	❑	❑
Intraprofessional communication skills (PT/PTA)	❑	❑	❑
Interprofessional communication skills	❑	❑	❑
Values/ethics/professionalism	❑	❑	❑
Teams & teamwork skills	❑	❑	❑
Roles & responsibilities	❑	❑	❑
Main objectives not reported	❑	❑	❑
Other	❑	❑	❑

If you selected "other" above, please describe:

Please select the level of fidelity for the simulation experience:

	High	Low	Unable to determine
Fidelity of the physical setting in simulation	❑	❑	❑
Level of psychological fildelity	❑	❑	❑

Results

Was outcome data collected within this study?

1. Yes
2. No

Please enter the following information about each outcome measure used in the study. If you did not use all 5 outcome measures listed below, please indicate that the empty item line by naming the measure "n/a".Note: This question is not mandatory due to the nature of the question, but please do NOT skip this question.

	Name of Measure
Outcome Measure 1	
Outcome Measure 2	
Outcome Measure 3	
Outcome Measure 4	
Outcome Measure 5	

Please enter the following information about each outcome measure used in the study. If you did not use all 5 outcome measures listed below, please indicate that the empty item line by naming the measure "n/a".Note: This question is not mandatory due to the nature of the question, but please do NOT skip this question.

	Type of Measure
Outcome Measure 1	Survey Likert scale Observation Test/quiz Rubric

Outcome Measure 2	Survey Likert scale Observation Test/quiz Rubric
Outcome Measure 3	Survey Likert scale Observation Test/quiz Rubric
Outcome Measure 4	Survey Likert scale Observation Test/quiz Rubric
Outcome Measure 5	Survey Likert scale Observation Test/quiz Rubric

Please enter the following information about each outcome measure used in the study. If you did not use all 5 outcome measures listed below, please indicate that the empty item line by naming the measure "n/a".Note: This question is not mandatory due to the nature of the question, but please do NOT skip this question.

	Unit of Measure
Outcome Measure 1	Continuous [interval & ratio] Categorical [nominal & ordinal] Qualitative No data collected (editorial) Unknown
Outcome Measure 2	Continuous [interval & ratio] Categorical [nominal & ordinal] Qualitative No data collected (editorial) Unknown
Outcome Measure 3	Continuous [interval & ratio] Categorical [nominal & ordinal] Qualitative No data collected (editorial) Unknown
Outcome Measure 4	Continuous [interval & ratio] Categorical [nominal & ordinal] Qualitative No data collected (editorial) Unknown

Outcome Measure 5	Continuous [interval & ratio] Categorical [nominal & ordinal] Qualitative No data collected (editorial) Unknown

If you had any additional outcome measures beyond the 5 measures provided above, please list outcome information in this comment box:

Significant findings/results/outcomes:

Feedback was provided to simulation participants served as:

	Yes	No	Unable to determine	N/A
Formative learning experience	❑	❑	❑	❑
Summative learning experience	❑	❑	❑	❑
Simulation was repeated following feedback	❑	❑	❑	❑

If simulation was repeated following feedback/debriefing, describe impact of repetition:

Any other comments?