Human Patient Simulation: Occupational Therapy Student Perceptions

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Abstract

Human patient simulation uses technology to add advancements to learning that traditional learning methods cannot. Many programs are fast-paced and do not provide students with many hands-on experiences before clinical experiences. The literature notes the benefits of human patient simulation in other healthcare programs, yet limited studies exist in occupational therapy. This study examined student perspectives on the use of human patient simulators in occupational therapy curriculum. 146 first year master of occupational therapy students completed an open-ended survey after an evaluation experience with a physiologically based human patient simulator. Responses were collected during four consecutive years. Transcripts were analyzed using qualitative content analysis. Four themes emerged and centered on the value of hands-on learning, team and family dynamics, the human experience, and relevance of clinically applicable skills. Findings indicate that students perceive this type of learning as beneficial before taking the next step towards fieldwork, and programs should consider offering a variety of simulated patient cases throughout the curriculum.

Keywords

Human patient simulation, mannequin, occupational therapy education

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Human Patient Simulation: Occupational Therapy Student Perceptions

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ABSTRACT

Human patient simulation uses technology to add advancements to learning that traditional learning methods cannot. Many programs are fast-paced and do not provide students with many hands-on experiences before clinical experiences. The literature notes the benefits of human patient simulation in other healthcare programs, yet limited studies exist in occupational therapy. This study examined student perspectives on the use of human patient simulators in occupational therapy curriculum. 146 first year master of occupational therapy students completed an open-ended survey after an evaluation experience with a physiologically based human patient simulator. Responses were collected during four consecutive years. Transcripts were analyzed using qualitative content analysis. Four themes emerged and centered on the value of hands-on learning, team and family dynamics, the human experience, and relevance of clinically applicable skills. Findings indicate that students perceive this type of learning as beneficial before taking the next step towards fieldwork, and programs should consider offering a variety of simulated patient cases throughout the curriculum.

Simulation is one educational method to facilitate learning of required curricula. Simulation can include computerized human models that replicate human responses and disease states, live actors role-playing medical scenarios, and even live actors who demonstrate positive and negative professional behaviors (Marken, 2010). Human patient simulators (HPS) are advanced computer technology training devices that are used along with other teaching methods to prepare students for the future (Innocent, 2011). These simulators reinforce learning and judge competency in a controlled

environment that does not compromise patient safety (Innocent, 2011), as well as promote knowledge and hands-on practice that allow students to participate in guided experiences that correlate to real-world interactions (Bethea et al., 2014). Simulated learning experiences take an action-oriented approach to promote the transfer of knowledge to real-world experiences (Walls et al., 2019). In addition to allowing students to practice clinical decision-making skills in a realistic environment, simulated learning enables students and professors to reflect on those experiences immediately afterward in a controlled environment (Howard et al., 2010). The use of HPS promotes cognitive learning, social learning, and constructive learning. Improvements in these types of learning allow for an increase in transfer of knowledge, a realistic environment to practice in, and reflection of the experience (Walls et al., 2019; Zuna & Holt, 2017).

Simulation covers a broad range of technology and can trace its roots back to the first generation of cardiopulmonary resuscitation models developed in the 1960s (Innocent, 2011). Early versions of high-tech human patient simulators (HPS) were introduced in 1995, however, they had a cost of $250,000 (Innocent, 2011). Now that the price has dropped, HPSs have become a realistic teaching method for both students and healthcare professions (Innocent, 2011). The use of a HPS is said to provide a unique and beneficial approach for instructional delivery. Human patient simulators are currently used in health care education because students graduate to work in increasingly technologically sophisticated and complex environments than previous generations (Thomas et al., 2017). Human patient simulators can be adapted to fit any educational program, and students favor using a HPS to help gain "hands-on" experience with complex patient cases (Thomas et al., 2017). Students interact with simulators as they would with live patients to allow for practice of essential skills before caring for humans (Marken, 2010). It allows for students to develop competency in areas such as physical assessment skills and primary care skills (Marken, 2010). However, HPSs can teach more than hands-on physical skills. Simulation scenarios are also well-suited to examine human factors, such as communication among health care providers during an emergency (Hirokawa et al., 2012). Practicing communication between the health care team through a simulated scenario has shown a positive relationship between high-performing nursing students' teams and communicating during evaluations (Hirokawa et al., 2012). Being able to communicate the negative or positive outcomes that have come from interventions will assist the team to partake in actions that are beneficial to the patient (Hirokawa et al., 2012). HPS scenarios also allow students to become more comfortable during difficult situations like dealing with angry patients, giving bad news to patients, or even asking patients personal questions (Marken, 2010).

Healthcare professions such as pharmacy, nursing, and medicine have had simulation-based education implemented in their curricula for more than a decade. However, occupational therapy programs are in their early stages of implementation (Bethea et al., 2014). In the field of occupational therapy, it was found that 71% of programs used some degree of patient simulation learning (Bethea et al., 2014). The benefit for occupational therapy students from this type of learning is to readily engage in "hands-on" learning experiences to allow them to practice and apply skills they would not be

able to use during more traditional forms of learning (Thomas et al., 2017). Some examples of important occupational therapy skills for practice using an HPS include safe patient handling skills, bedside manners, and therapeutic use of self as a means to elicit complete answers to assessment questions (Thomas et al., 2017). In fact, Lucas Molitor and Nissen (2020) suggested that Level II fieldwork performance in physical rehabilitation settings can be determined by performance in simulated experiences based upon student exam scores. Further, Schreiber et al. (2020) reported that occupational therapy students perceived value in multimodal learning using high fidelity simulation. Human patient simulation allows students to practice in an environment that feels real but lacks the actual consequences of a mistake (Thomas et al., 2017). This learning method allows the students to engage in a meaningful interaction that forces the practice of their critical thinking and decision-making skills (Thomas et al., 2017).

This study supports findings from previous research regarding occupational therapy student perceptions of HPS and expands upon individual clinical skills toward learning outcomes that centered on working among a team in an acute care situation. However, there is still a need for evidence on the values that come out of this type of experience for occupational therapy curricula (Walls et al., 2019). While HPS has not been readily explored in occupational therapy pedagogical research, occupational therapy programs may better understand the implications and benefits of incorporating HPS learning into the curriculum (Bethea et al., 2014). Accordingly, identifying student perceptions of HPS is a crucial step toward developing effective HPS instruction tailored to occupational therapy students. The purpose of this retrospective qualitative study was to examine student perspectives on the use of HPS in an occupational therapy curriculum.

Methods

Participants
Participants included 146 occupational therapy students throughout four consecutive years in the occupational therapy program from a large Midwestern university.

Human Patient Simulator
Simulated training can vary from low-fidelity to high-fidelity HPS. The technological capabilities of an HPS can differ tremendously. The HPS used in this study was a fully automatic, high-fidelity simulator specifically designed for training in anesthesia, respiratory, and critical care. This simulated experience involved a patient mannequin lying on a hospital bed receiving treatment with oxygen and monitored by a functional pulse oximeter and electrocardiogram using the HPS METI's SimMan® HPS6 Physiologically based Human Patient Simulator.

Description of Simulation
A patient case study based on a middle-aged woman with myocardial infarction was provided to students one week prior to the HPS experience. Case information included basic demographics, a medical history, patient contraindications, and precautions, and preliminary evaluation results outside of the client interview. Learning outcomes related to the HPS case included evaluating occupational performance in activities of daily

living, instrumental activities of daily living, education, work, play, rest, sleep, leisure, and social participation; interpreting evaluation results; documenting need and rationale for occupational therapy services; demonstrating therapeutic use of self; effectively interacting through oral and nonverbal communication with the client and family, and developing a client-centered occupation-based goal that was relevant to one of the top three areas of challenge represented by the HPS.

The students were instructed to form groups of five to six and to establish a strategy for dividing the group, so all members had the same number of questions to ask during the interview using the Table of Occupations in the Occupational Therapy Practice Framework III (American Occupational Therapy Association [AOTA], 2014). Each student could bring their questions, and they were also required to listen to other group members, to ask questions and to intervene as necessary to obtain the most accurate answer to each item. Student groups received 20 minutes to complete the interview. Each student was required to ask a similar number of questions and record their answers, as well as answers from their classmate's questions. Students were then escorted to a classroom where they used the remaining time to individually construct a patient assessment and write goals reflecting the top three client priorities.

One trained faculty member sat in the room and portrayed the role of the patient's daughter. The professor sat in an adjoining room separated by a one-way mirror with a microphone and was the voice of the HPS mannequin. This allowed the professor to interact with students in a manner that required follow up questions via the speaker system and provided students with an opportunity to ask questions of the client's daughter, as well. Within one week of completing the simulation, students were provided with individual written feedback based on their patient assessment and goal writing. The faculty involved in this simulation also debriefed the class with general feedback to the entire class on areas that were notably challenging to the class as a whole and focused a portion of that class period on addressing these issues.

Questionnaire
All students completed a questionnaire after the class ended, and final grades were given. The questionnaire consisted of nine open-ended questions focusing on student perceptions of learning using the HPS to enhance future experiences within the program. See Table 1.

Table 1

Student Questionnaire: Perceptions of Learning Using the HPS

Please answer in as much detail as possible and provide examples.
What areas of learning do you feel this session addressed in your personal style of learning and your classmates?
Do you think future occupational therapy students would benefit from this type of learning?
Do you think additional objectives are needed to enhance this type of learning?
What would you change about the HPS experience?
Are there other types of case studies and diagnoses that would be beneficial for this experience?
What are additional ways this learning session could feel more real?
Was feedback on your performance beneficial?
What was your overall experience in working with your classmates and the HPS?
Would other courses be appropriate to incorporate with the HPS?

Data Collection and Analysis

The university's Institutional Review Board approved the analysis of the retrospective data. The course professor and trained research assistant organized all data into an excel spreadsheet without identifiers. Qualitative content analysis using a data-driven inductive approach was implemented (Boyatzis, 1998) to establish codes and common themes derived from the data (Hsieh & Shannon, 2005). The two researchers independently read the transcription and assigned codes for commonly occurring themes. With repeated readings, similar codes were grouped into main themes. Researchers then met to discuss their findings, which revealed a consensus level of 95%, which is greater than the accepted 80% agreement outlined in thematic analysis literature (Miles et al., 2020). Discordant codes were discussed, and further refined until researchers reached complete agreement.

Results

Three distinct overall themes emerged from the qualitative analysis of student perceptions of the use of HPS: (1) clinically applicable learning, (2) team and family dynamics, and (3) the human experience.

Clinically Applicable Learning

Clinically applicable learning in this study was defined by participants as learning by doing, where students had the ability to engage and interact with the patient and produce an evaluation and measurable goal. Results from this theme revealed participants utilizing and further developing practical skills needed in the field of occupational therapy. Students involved in the HPS experience noted that clinically applicable learning allowed them to practice interaction skills so they could be prepared for real clients in the near future.

Having the HPS in a mock hospital room added a component of realism lacking in other practical experiences. This allowed them to practice clinically applicable skills needed for the real world: *"This is as close to real-world as it comes, without being an actual real-world experience. It allows for real patient reactions and family planning upon discharge."* Simulation scenarios allowed for experiences in the classroom that would otherwise not be completed until fieldwork: *"I feel it will definitely help having this kind of learning in the OT program. It was a real hands-on experience and gave me a look into what it feels like to be in the real-world working as an OT."* The HPS also allowed students to clinically apply their knowledge in a safe environment: *"Any applicable experiences can be helpful and make us better clinicians."*

The HPS allowed students to apply skills they would not be able to with traditional classroom or laboratory learning: *"This activity provided a hands-on learning experience and introduced us as students to how we will need to be able to interact professionally in the future with our clients."* Students discussed how this experience opened a chance to work with a client that could be very similar to real world experiences. This opportunity allowed the students to interact with a challenging patient and to practice what to do when questions were not answered thoroughly or when family members were not on the same page as the therapist. The intricacies of family dynamics placed students in a unique situation. In most cases, students would not be able to problem-solve through these types of challenges until practicing in their clinical rotations. Therefore, the importance of communication skills was seen as an essential part of this experience. Rather than practicing with patients in fieldwork, students were able to recognize what it felt like to problem solve those difficult scenarios with a mannequin: *"It gave my classmates and me a chance to see how clients don't always give detailed or straight forward answers and that sometimes the family members have different views of the client. I feel this is a good learning experience."* Many students enjoyed clinically applicable experiences because they allowed chances to apply what they were learning from the books: *"I LOVE "hands-on" work as opposed to learning from a book. It was much easier to learn, understand & digest."* Students also stated this experience allowed for these skills to be practiced before they were thrown in real clinical experience. *"Critical thinking- this aids in my learning because you have to listen and respond to pt. Even if you prepare questions in advance, you still may need to modify your questions/responses."*

The experience took what the students learned in the classroom one step closer to real-life experiences: *"The patient simulator really put a real-life perspective on the topics covered in class. It gave me insight of what it feels to be in the shoes of a therapist and how you must think in the presence of a patient and their family member."* The HPS was a new experience for many students. This novel feeling mimicked what it felt like for a student to go unprepared into the clinical setting: *"I thought it was a huge learning experience & good practice for the future. I thought my group worked well together and was prepared as best as possible. The HPS was awkward and intimidating because it was my first time doing anything like that. I learned a lot from it, about myself, and what I personally need to work on for the future."* Students repeatedly request more "clinically applicable" experiences with complex patients throughout the curriculum and noted that

the HPS experience provided them with that expressed need: *"I think getting as much experience as possible with patients is a really good thing to prepare us for fieldwork and our careers."*

Team and Family Dynamics

Team and family dynamics in this study were defined by participants as interactions between family members and the occupational therapist. Students explained that the simulator experience was a useful addition to their learning experience. Being able to work with and communicate with others is a particularly important part of working as an OT, and this was showcased throughout many comments such as the following: *"I liked it because it's like working with co-workers in the future."*

Many students reflected on the HPS experience as one that came with many benefits, while others noted the importance of problem-solving as a team: *"It promoted strong group work and interaction. We had to problem solve and work together to come up with the best approach to the interview. It personally forced me to step out of my comfort zone and lead. It forced my group mates to step out of their comfort zone as well and work as a team."*

Additional students commented on the fact that teamwork played a considerable part in this experience and noted that the HPS provided a benefit in practicing skills in a team setting. Not only is teamwork essential to accomplish with classmates and colleagues, but to also master interprofessional skills: *"Teamwork was definitely important during this activity. We fed off each other in the simulation and collaborated prior. I think acting out scenarios are helpful because doing it is different than just talking about how to do it."*

The Human Experience

The human experience in this study was defined by participants as a critically important piece of education – getting more opportunities to interact with patients, following up and receiving feedback based on their performance. When interacting with the patient, the instructor was the patient's voice that came from a loudspeaker from a room located behind a one-way mirror so that students could not see. Therefore, while the patient was a simulator, there was a human element infused into the experience. In addition, the patient's daughter was acted by the part of a clinician who sat in the room and helped answer assessment questions asked by the students. This environment added an extremely valuable element to the scenario and assisted in developing and practicing clinically applicable skills: *"I personally feel HPS was as close to being a human as possible."* This human element was noted by many students as a common theme and thread throughout their feedback on this experience.

Another key aspect of using the HPS was allowing students to hear and receive feedback about their performances to improve their skills for the future: *"Getting feedback from a vetted OT and experienced professional is crucial for learning."* Students valued this part of the assignment most and stressed how feedback on both their performance during the assessment and their assessment write up was critical

toward their learning. Students also viewed the HPS as an option for educators to use technology to portray a range of more experiences for the students: *"I think having a variety of case studies and diagnoses ranging from physical to cognitive and mental disabilities would be helpful because the way we'd approach the cases would be different and dependent on the case."* Bringing the human element of each case and diagnosis into the classroom was seen as a powerful method of learning, coupled with feedback on each student's performance. As students interacted with the patient and the patient's daughter, notes were gathered and provided at the next class period. Students were surprised to hear that some of the things they said and did were noted as behaviors that should be addressed in the future to avoid being offensive or inappropriate.

Discussion

The purpose of this study was to examine student perspectives on the use of HPS in an occupational therapy curriculum. The need for this experience came about after some fieldwork coordinators reported that students were uncomfortable with the sights and sounds of an acute care, hospital room setting. Upon completion of the HPS experience, findings revealed three distinct themes that centered on the importance of clinically applicable learning, team and family dynamics, as well as encouraging exposure of the human experience. Students perceived learning to be clinically applicable through having the opportunity to learn by doing and practicing and further developing clinical skills in a simulated environment. Perceptions on team and family dynamics took learning one step closer to real-life scenarios where students interacted on the spot with both the client and family member while working together with a team of therapists toward completion of a full evaluation. Finally, the human experience was perhaps one of the most critical pieces where students provided suggestions on how to improve simulation, as well as ways to incorporate it throughout the program.

Realistic, Hands on Environment

A realistic environment for simulation was a critical component of the student experience. The literature discusses that the environment should be as realistic as possible for the students to get the most out of the simulation (Walls et al., 2019). It allows the chance to practice real skills and activities and improve the transfer of knowledge (Walls et al., 2019), as well as students to become more active in their learning thereby encouraging them to participate more fully (Lapkin & Levett-Jones, 2011). The HPS enables educators to produce an experience for their students to practice clinical judgment in real-time based on what they see from the simulated patient (Walls et al., 2019). These scenarios allow students to be exposed to time-sensitive and critical clinical situations that, generally, as students, they would have to observe in the clinical environment (Lapkin & Levett-Jones, 2011). The HPS provided students a chance to work as an occupational therapist while still in the classroom. It allowed for repeated practice of a newly learned skill, assessments, and the use of critical thinking, all in a non-threatening environment (Lapkin & Levett-Jones, 2011). The HPS provided a unique means of preparing students one step closer to becoming clinicians. While it is important to assess student perceptions and use them to further

develop and modify curriculum, future research in HPS must go beyond student perceptions and into applied practice to assess fieldwork readiness, interprofessional and skilled occupational therapy practice.

Confidence, Anxiety, and Safety
Students noted that a safe environment was prominent during the HPS experience and allowed them to practice new skills while feeling comfortable. Research has found that patient simulators are also an effective teaching method for high-risk procedures that do not typically occur in clinical practice (Innocent, 2011). Lapkin and Levett-Jones (2011) discussed that it is better to practice bettering oneself in an environment where mistakes can be made and encouraged so that students can learn from them without risking patients, which was directly in line with how occupational therapy students felt following their experience with the HPS. In a recent literature review, pharmacy students reported that using the simulation enhanced their learning, the realistic setting was enjoyable, and it increased their confidence (Smith & Benedict, 2015). When the students were asked about the simulation experience, 70-94% said they would like more simulation incorporated in their studies or they would participate again if it was available (Smith & Benedict, 2015). Confidence and perceived value was also noted in Schreiber et al.'s (2020) study. Occupational therapy students in the study reported value in adding HPS cases covering a wide range of conditions throughout the academic program. In fact, Molitor and Nissen (2020) suggested the need and importance of incorporating simulation learning in occupational therapy curriculum as a means to specifically address therapeutic rapport, communication skills and treatment planning, which fall in line with the specific learning objectives outlined for the simulation experience designed for this research study.

Students in this study overwhelmingly felt this experience helped them to gain the necessary competence and confidence before patient exposure. Given this knowledge, having patient simulators in the classroom could also benefit students by introducing technology that might be training them in the near future. However, being able to practice learned skills on the HPS allowed students to better practice retrieving what they learned from their books and lectures. Studies have shown that the HPS has had success in easing students' levels of anxiety when faced with high-risk situations (Howard et al., 2010). This is one of the benefits of the HPS because it can expose the students to challenging scenarios in a safe environment so that real patients receive no harm from potential mistakes that students might make (Howard et al., 2010). Students also find it difficult to practice when they do not feel confident. Students reported that the HPS gave them a safe environment to practice and will decrease the number of potential mistakes in the future. Calming one's nerves and feeling confident comes with practice.

Collaborative Team Effort
Findings from this study revealed that the required team collaboration in preparation for and during the assessment process with the HPS promoted highly collaborative group work, simulated working with co-workers as a therapist, while also forcing students to move out of their comfort zone and work together with others. Throughout the

curriculum group work is required and peer evaluations follow each project; however, in this learning experience students are immersed into a group setting and must function as a cohesive unit in order to complete the task. This immersion leaves them feeling more confident in their abilities to communicate more effectively while working in a team setting. In fact, students reported they were more collaborative and confident after the simulation was completed. This increased confidence with communication skills in a team setting was specifically noted as a benefit to high fidelity simulation that carried over to fieldwork settings as well (Gibbs et al., 2017). Failure to communicate effectively can impact patient safety and the environment around them. It is essential to master this skill for overall better care and therefore, communication is said to be a very important influence on health care team effectiveness (Hirokawa et al., 2012). Communication between the healthcare team can affect the outcomes of the patients regardless of the health care setting (Hirokawa et al., 2012). Using simulation scenarios to have students intervene on a patient's behalf has been shown to be effective by numerous studies (Hirokawa et al., 2012). Simulation was also used as a means to practice interprofessional training to help healthcare professional students understand each professional's differing roles in different settings and to learn teamwork, which was similar to findings in Thomas et al., 2017. Furthermore, teamwork with the HPS better prepares them as they get closer to going out on fieldwork. Occupational therapists work hand in hand with many other professions, and it is essential to be open to working together so that patients receive the best care.

Limitations
Study findings were limited to the small sample of occupational therapy students in one geographic area and are not generalizable to all occupational therapy students and contexts. Survey research with student groups presents limitations as well. For example, some students may feel reluctant to answer honestly or may not feel comfortable answering questions in a hostile manner. These limitations were addressed by providing the surveys after grading for the semester class was completed, and by making the survey responses anonymous. Future research to examine a broader sample of occupational therapy students in addition to different conditions and cases with HPS will provide a complete analysis of the use of HPS in occupational therapy curriculum.

Implications for Occupational Therapy Education
Occupational therapy students perceive human patient simulation as beneficial to their learning. Education using the HPS allows educators to provide immediate feedback on their students' performance. It also provides students with the opportunity for remediation and to continue practicing a skill until the task is completed correctly (Robinson et al., 2011). Many students reported that incorporating HPS in addition to the curricula has enhanced their knowledge and increased their confidence by making it realistic and enjoyable (Robinson et al., 2011). The HPS allows students to practice and apply skills that traditional forms of learning, like reading and lecturing, do not allow (Thomas et al., 2017). With the HPS, students can be exposed to a variety of realistic experiences and are usually driven by specific patient cases to encourage the students to think critically (Robinson et al., 2011). According to the research on the benefits of

the HPS, this technology could play a vital role in the occupational therapy curricula. On a practical level, students suggested that having a patient actor in an acute care room setting could potentially be as effective as the HPS. This study contributes to the lack of pedagogical research on using an HPS in occupational therapy education. Findings provide an opportunity to establish a dialogue regarding the advantages of simulation augmented instruction in occupational therapy education programs and the use of patient actors in mock hospital rooms.

Conclusion

The purpose of the retrospective study was to identify how the use of HPS can potentially enhance occupational therapy curriculum. Students reflected on the HPS experience by commenting on how it enhances many aspects of the material that traditional learning cannot. Students mainly reflected on the benefits of hands-on learning and practicing clinically applicable skills in the classroom. In this simulation, the students practiced the do's and don'ts of evaluating a patient. After receiving feedback upon completion, many students requested additional opportunities to interact with the simulator throughout the semester. Students also wanted to do more than just evaluate. Many of them commented on how they would like an opportunity to perform assessments on the HPS throughout a variety of courses during the program to be even more hands-on and prepared for fieldwork.

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