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Rayan Kamal Salih[1]
Kaleia Collins[2]
Tamzin J. Batteson[3]
Sarah S Garber[4]
Imohimi Eboweme[5]
Daniel Bassler[6]
Susan Smock[7]
Zaria Price[8]

[1] PharmD, College of Pharmacy, Rosalind Franklin University of Medicine and Science, North Chicago, IL, USA, rayan.salih@my.rfums.org
[2] PharmD, College of Pharmacy, Rosalind Franklin University of Medicine and Science, North Chicago, IL, USA, kaleia.collins@my.rfums.org
[3] BSc,Baldwin Interprofessional Inst, College of Pharmacy, Rosalind Franklin University of Medicine and Science, North Chicago, IL, USA, tamzin.batteson@rosalindfranklin.edu
[4] PhD, College of Pharmacy, Rosalind Franklin University of Medicine and Science, North Chicago, IL, USA, sarah.garber@rosalindfranklin.edu
[5] PharmD, College of Pharmacy, Rosalind Franklin University of Medicine and Science, North Chicago, IL, USA, imohimi.eboweme@my.rfums.org
[6] PharmD, College of Pharmacy, Rosalind Franklin University of Medicine and Science, North Chicago, IL, USA, daniel.bassler@my.rfums.org
[7] PharmD, College of Pharmacy, Rosalind Franklin University of Medicine and Science, North Chicago, IL, USA, susan.smock@my.rfums.org
[8] PharmD, College of Pharmacy, Rosalind Franklin University of Medicine and Science, North Chicago, IL, USA, zaria.price@my.rfums.org

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Metacognition in Teams: Thematic Analysis of an Interprofessional Healthcare Simulation

Rayan Kamal Salih https://orcid.org/0000-0002-8140-3359
Kaleia Collins https://orcid.org/0000-0002-3289-8172
Tamzin Batteson https://orcid.org/0000-0003-4525-3602
Sarah S Garber https://orcid.org/0000-0002-4858-5058
Imohimi Eboweme https://orcid.org/0009-0005-3391-3185
Daniel Bassler https://orcid.org/0009-0001-9066-7532
Susan Smock https://orcid.org/0009-0002-1297-8279
Zaria Price https://orcid.org/0009-0000-0351-1875

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ABSTRACT

Metacognition refers to a person's ability to understand and regulate their thinking and learning. For students, metacognitive skills increase awareness of their thought processes. These skills can impact how new and old information is processed, stored in memory, accessed, or applied.

Teams of health professional students from eight disciplines collaborated to assess and care for a standardized patient in a simulated environment. Following each simulation session, student teams debriefed their experiences and learning outcomes. Debriefing conversations from four independent teams were transcribed, and common metacognitive themes were determined by consensus.

The themes that emerged were 1) Collaboration, 2) Peer-to-peer Learning, 3) Problem-solving, and 4) Self-reflection. Together, these themes suggested that participating students applied metacognitive processes during the team-based simulation session debriefs.

Metacognition and metacognitive ability are important learning tools that can be incorporated into interprofessional learning environments through instructional and facilitation strategies. Interprofessional team simulations with standardized patients provide an optimal activity for encouraging critical discourse and other metacognitive processes.

Keywords: Interprofessional, Critical discourse analysis, Graduate healthcare curriculum

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Introduction

Metacognition refers to a person's ability to understand and regulate their thinking and learning. These processes allow individuals to become aware of their thought processes (Schraw, 2001). This awareness impacts how new and old information is connected, processed, and stored in memory and therefore opens possibilities to absorb new knowledge (Schraw, 2001). Metacognition facilitates the understanding of how a given task was approached and completed and is distinct from cognition, which facilitates task performance (Schraw, 2001).

Metacognition and metacognitive ability are important learning tools that can be incorporated into learning environments through specific instructional strategies that prioritize critical thinking and problem-solving skills (Schraw, 2001). Simulated learning environments in health education are fertile venues for students to develop metacognitive skills because these activities require discernment, differential diagnosis, and team debriefs. Such activities demand that students plan using self-regulated cognitive strategies, such as setting goals, selecting and implementing strategies, while monitoring their thought process throughout (Schraw, Kauffman, and Lehman, 2006).

According to Chao, Chiu, Tsai, Lin, Yang, Ho, ... & Chen (2025), simply collaborating in activities does not necessarily facilitate new learning. However, metacognitive strategies, such as peer-to-peer learning, do support new knowledge being gained. Interprofessional Education has foundationally incorporated peer-to-peer learning within curricula (Romito, Daulton, Stone, & Pfeifle, 2020). Simulation has built-in components of peer-to-peer learning by design. When undertaken as a group, it is expected metacognitive strategies at the individual and group levels would be utilized.

Studies have shown that students who gain metacognitive self-regulatory skills are more academically satisfied and better at learning and retaining knowledge than students who do not have good self-regulatory skills (Zimmerman, 2000). This is particularly important in healthcare as better metacognitive skills result in reduced clinical errors (Church & Carroll, 2023). Metacognitive strategies must be woven into curriculum and instructional design to be accessible to healthcare professional students. Self-regulated learning theory combines metacognition and social-cognitive theory (Schraw, Kauffman, & Lehman, 2006; Schunk, 1996; Bandura & Wessels, 1997). These theories explain how cognition, metacognition, and motivation are necessary in metacognitive self-regulatory ability (Zimmerman, 2000). Healthcare simulation experiences can incorporate essential components of metacognitive skills. Students participating in simulations are required to have a level of knowledge suitable to the task (cognition), the ability to process information at a conscious level to make a diagnosis (metacognition), and finally, motivation to use both of these abilities to reach their goal (differential diagnosis).

Toth et al. (2002) assert that metacognitive ability is crucial for any inquiry-based learning . Healthcare simulation allows teams of students to use inquiry-based learning to assess a scripted standardized patient encounter. Intentionally pairing healthcare simulation with metacognitive abilities provides an advantageous opportunity for clinical educators to understand and assess learning processes and learning outcomes while providing quality educational content.

Schraw and Moshman (1995) updated Flavell's model of metacognition by including not only the regulation of individual knowledge but also a second component, that of team regulation (Schraw and Moshman, 1995). Unlike metacognitive self-regulation, which requires the learner to monitor and evaluate their own learning, team regulation places learners in a collaborative inquiry-driven environment. Self-regulated learning demands that the learner already has high abilities in cognition, metacognition, and motivation, which does not apply to all students . In contrast, teams of students participating in a healthcare simulation activity can accommodate all levels of student learners. In a

simulated activity, students can ask each other questions and exchange thoughts, hypotheses, and diagnoses through communication and negotiation, ultimately learning with and from each other to improve their metacognitive thinking skills (Saab, van Joolingen, & Hought-Walters, 2011; Chi, et al, 1989; Rivas, Saiz, Ossa, 2022).

There is a significant body of research that supports collaboration in healthcare teams as a best practice which may contribute to positive patient outcomes (WHO, 2010) . Collaboration among learners is similarly crucial for positive learning outcomes (Saab, van Joolingen, & Hought-Walters, 2011; Chi, et al, 1989). Simulation activities provide optimal opportunities to enable healthcare students to gain self-regulatory and team-regulatory metacognitive skills that readily transfer into collaborative healthcare practice, thus preparing students to be thoughtful, aware, and deductive practitioners.

This qualitative study focuses on a debriefing session by a team of interprofessional healthcare students, following a team-based simulated patient encounter. The debriefing session provides a robust inquiry-based collaborative learning environment where students can safely practice and hone their regulatory learning collaboration skills. Furthermore, by utilizing a thematic analysis, we may be able to learn more about the possible dynamics between collaborative team practice, metacognition, and patient care through metacognitive strategies such as peer-to-peer learning (Nonose Kanno & Furuta, 2014; Chao, C. T., Chiu, Y. L., Tsai, C. L., Lin, M. W., Yang, C. W., Ho, C. C., ... & Chen, H. L. (2025)..

Methods and Materials

This research used recorded video from a debriefing session following a simulation activity conducted by a team of interprofessional healthcare students. A description of the simulation activity is provided for context. Note, however, that only the debriefing session was analyzed using a thematic analysis to focus on how the students experienced their roles and interactions as a team during the simulation activity.

Simulation Participants:

Students and faculty facilitators participating in the healthcare simulation activity were recruited from two universities. Participants were recruited using broadcast and program-based email announcements. Participation by all participants was voluntary and not associated with a for-credit course. A team of 6-8 students was organized from a large cohort of students enrolled in a range of health professions to enhance interprofessional learning opportunities. Student participants came from Dentistry (5), Nursing (7), Pharmacy (25), Social Work (13), Physical Therapy (18), Occupational Therapy (11), Osteopathic Medicine (6), and Physician Assistant Studies (17), and ranged in academic year levels from first to third-year students. Student participants were required to attend an orientation session that included didactic content and team building activities.

Two faculty facilitators were recruited from a pool of volunteers that included experienced facilitators and advanced students, who were recently trained in facilitation techniques. All facilitator volunteers were recruited from representative universities. Standardized patients were hired from both universities. Facilitators and actors attended orientation and training sessions.

Simulation Activity:

The student team met with the standardized patient twice over the course of two weeks. The case scenario involved an unhoused youth who presented with both physical and behavioral symptoms. The goals of the student healthcare team were to interview the patient in session one, make decisions regarding a care plan, and present recommendations to the patient in session two. The final team session was a 40-minute facilitated debrief to review the students' learning experiences and takeaways. Further details of this simulation activity can be found in previous literature (Konrad et al., 2017).

All simulation activities and debriefing sessions were conducted and recorded on Zoom™. Although simulation activities were recorded, only the debriefing session was analyzed. Transcripts were created using Panopto™. A transcript of the final debrief session was transferred to an Excel spreadsheet for line-by-line coding and thematic analysis. Students and participating facilitators were identified only by their professional program; no identifying names were used.

Thematic Analysis of Debriefing Session:

Thematic analysis of the Debriefing Session focused on identifying patterns of meaning, or themes, that organically emerge from the data (Braun & Clarke, 2020; Naeem et al., 2023). Repeated themes reveal embedded ideas, concepts, and perspectives from the participants' narratives that contribute to new ideas and insights about a phenomenon. For the purposes of this study, thematic analysis allowed the researchers to gain a fresh perspective on elements of student discourse used during a healthcare simulation activity.

Each member of the analysis team individually coded the transcripts. Meetings of the analysis team were conducted via Zoom™ to compare and discuss individual coding results and reach agreement on emerging themes. Emergent themes had to have 100% agreement between the three coders for them to be finalized. Metacognitive theory drove the analysis from a top-down perspective. One member of the analysis team was experienced in metacognitive research, while the other two were naïve coders. This allowed a system of checks and balances approach to the coding and potential analytic bias.

Findings

Themes emerging in the Debriefing Session

Four themes reflected in discourse during the debriefing session emerged from the thematic analysis. These included the following:

1) Collaboration (working together as a team to provide patient care)
2) Peer-to-Peer Learning (students learning from and with each other)
3) Problem-Solving (the process of finding solutions to a difficult or complex issue)
4) Self-Reflection (meditation or serious thought about one's character, actions, and/or motives).

The next sections elaborate on these emergent themes and offer examples of how they were represented in the transcripts.

Collaboration

Students expressed interest in learning about each other's scopes of practice and how together they would intersect in future patient care. Most students had been primarily exposed to single-discipline curricula interacting with other programs sporadically throughout the didactic years.

The concept of team collaboration brought to light that, while there are differences in scopes of practice, there are also many similarities and overlaps in professional knowledge and skills that can be used to improve patient care. Moreover, students observed collaboration in action, noticing how teamwork had better outcomes when members listened to each other speak and refrained from talking over one another. As one physician assistant student noted (see Table 1).

For students, collaboration entailed many factors, including listening, noticing, and being cooperative as opposed to being competitive. Additional examples of student statements are presented in Table 1.

Table 1: Collaboration

Profession	Transcript Line

Physician Assistant (PA)	I thought it was kind of interesting because a lot of the time we didn't end up, I mean it happened a couple of times, but we didn't end up like talking over each other. It kind of had a nice flow in the sense of like, OK, I knew I was finishing up. So I had some finishing up words or I was like, "Alright, does anybody else have anything to say?" It wasn't like people were trying to, like, rush over each other and talk over each other.
Physical Therapist (PT)	Yeah, I think that's a great idea. Do we want to also talk about her like? I know in the first session we all kind of like picked up . She was like really struggling mentally. So I don't know if anyone wants to come in at the tail end of that last session.
Occupational Therapist (OT) and Physical Therapist (PT)	OT: Do you want to go first, then maybe? PT: Yeah, I can go first, that's okay with me
Pharmacy (PharmD)	…and I'm not sure you could avoid it, but I think we did a good job of trying to explain and take questions throughout it. But I do feel like as we get better at presenting information, as we get better at seeing patients, that this will get better and we won't be just throwing information.

Peer-to-Peer Learning and Health Professional Roles

Students consistently noted the benefits of learning from one another. Peer-to-Peer learning included aspects of perceptions of team dynamics in which students realized the diversity of the team's skills and the extent of other providers' roles and responsibilities. For example, working alongside a social work (SW) student gave team members from other professions a better understanding of the breadth of skills that social workers bring to the healthcare team, and to patient care. The comments of this nursing student offer an example of how learning together expanded the student's previous understanding of the social work field (see Table 2).:

> *"I think [SW] was awesome at motivational interviewing and I definitely learned a lot from him in that aspect. Like [PT] was saying before, learning how many resources that social work can really apply to any situation. And, I really didn't know that there were different fields of social work also. I was kind of narrow focused on them in the hospital."*

The importance of actively learning from classmates in other professions helped dispel misunderstandings and assumptions which if, unaddressed, could do a disservice to patients especially when it interfered with relationship building and patient outcomes.

Students also commented that learning from one another is challenging as it takes time, patience, and intention. As one occupational therapy student observed, knowing the challenges of interprofessional teamwork and facing students in the learning environment, better prepares students for what they will have to manage in the workplace. Learning how to utilize interprofessional activities contributes to more efficient and time-effective future patient care (see Table 2).

Participants appreciated the experiential aspect of learning from one another. They got the opportunity to see how teamwork was applied and observe what other professions did in practice, something many were unaware of so-far and thought they would apply in their future practice. One pharmacy student remarked how after this team learning she was more likely to seek out a social worker in her future practice (see Table 2).

Therefore, learning about each other's expertise and scopes of practice was seen as valuable and was projected as having an influence on future collaborative practice.

Table 2: Peer-to-Peer Learning and Health Professional Roles

Profession	Transcript Content
Nursing (RN)	I think [SW] was awesome at motivational interviewing and I definitely learned a lot from him in that aspect. Like [PT] was saying before, learning how many resources that social work can really apply to any situation. And I really didn't know that there were different fields of social work also. I was kind of narrow focused on them in the hospital.
Occupational Therapy (OT)	I think for me, that kind of made me think about maybe the challenges about having an interprofessional team. Of course, We talk about the great aspects of it. But sometimes that might take a little bit more patience for us to converse more effectively and address things quicker in conversations, maybe get it down by the second session. But we didn't for. So I think that [SP] saying that and pointing that out, I think it's a good learning lesson in terms of working with a team like,Yes, we want to deliver the best care, but also being efficient with our time and with so many perspectives in the room, it sounds like we're kind of beating around the bush almost…. So It was a good learning experience.
Social Work (SW)	You both did an amazing job. I just want to recap quickly, because, [OT] I thought your transitions, and your ending and the fact that you did multiple scopes of practice in a short amount of time while actively listening to the patient and their partner was exceptional.

Problem-Solving

Changes in metacognitive processes brought about by challenges to previously held assumptions or the attainment of new knowledge were particularly evident in problem-solving. Participants reflected upon times during the simulation when, if they could, they would go back and change what they said or suggested . One social work student stated (see Table 3):

> *"So, once I did start clarifying these things that have happened and how they work, that seemed to kind of move things along in that direction. So, I wish I would have done that earlier."*

A challenge noted by students in problem-solving noted by students is the burden of responsibility felt by certain providers, mostly physicians. Working in teams offers students opportunities to experience the benefits of collaborative problem solving and how it can reduce burnout and promote resilience. An osteopathic medicine student reflected on how knowing that others can share the rigors of problem-solving can make a difference in reducing stress (see Table 3).

These statements illustrate how students' metacognitive processes clarified phenomena and initiated a shift in perspective that uprooted previously held beliefs or understandings, having the effect of bringing together a student's pre-knowledge and new knowledge in a recognizable pattern to advance knowledge and enrich problem-solving capacities. Such learning contributes to cognitive recall of new knowledge that can be applied to similar situations faced in the future.

Table 3: Problem-Solving

Profession	Transcript Content
Social Work (SW)	*"So, once I did start clarifying these things that have happened and how they work, that seemed to kind of move things along in that direction. So, I wish I would have done that earlier."*

Osteopathic Medicine (DO)	I think I learned that even though my school's curriculum tries to cover as many of the aspects of caring for a patient as possible, and we do talk about like the softer side of medicine. We don't have infrastructure for actually directly dealing with those things. So, while I might know that someone would have issues transporting or their health care, I don't have a way of addressing that getting the resource for them and all of that. It was nice to see that there are other professions who focus on that. And I think I learned that my role in health care might not be to address all those things directly, even though they're super important.
Osteopathic Medicine (DO)	Well, initially, I don't think that we had a super clear process. We tried to create one virtually over a Google doc, but we kind of just went in, guns blazing, . And it was a little bit disjointed also because [SP],* didn't really know us and wasn't giving us much to work with. And I think Once we understood what each person's role was and we had the time to debrief over Zoom, we were able to figure out a flow that would make sense for the next meeting. I think that's why the next meeting went a little bit more smoothly.

*SP = Standardized Patient

Self-Reflection

Participants recalled instances during the simulations when their previous thoughts and assumptions were positively challenged and new learning took place. Comparing their thought processes to those of their teammates resulted in productive self-reflection and curiosity about how others learn and practice: For example, a dental student noted (see Table 4):

> *"...watching everyone else interact [with the patient] was really helpful in learning how other [professions] are asking questions, [and what] their kind of train of thought [was]. Their training is slightly different [than mine]. So, it's nice to see other [professional] train[s] of thought and how they ask questions."*

Other examples of self-reflection occurred during collaborative care planning. Students described the interplay of their existing and new knowledge when looking back on their approach to determining the patient's care plan. Alex prompted empathy and uncertainty because of the complexity of their situation. Students struggled with not knowing what the best next steps would be to serve them. Bias was an issue that surfaced in response to the case scenario. Not many students had worked with transgender patients, nor had they encountered content about their health and healthcare in the curriculum. This study provides examples of how the opinions of a nursing student and an allopathic medicine student changed throughout the simulation, dispelling prior bias (see Table 4).

The value of learning with and from one another, especially when uncertain, is reflected upon in an interchange between an osteopathic student and a physician assistant student, as shown in Table 4. Both students gained new knowledge by watching students from other programs interact with standardized patients.

Table 4:Self-Reflection

Dental Student (DS)	"…watching everyone else interact [with the patient] was really helpful in learning how other [professions] are asking questions, [and what] their kind of train of thought [was]. Their training is slightly different [than mine]. So, it's nice to see other [professional] train[s] of thought and how they ask questions."

Nursing (RN)	I was a little apprehensive. I remember starting with the motivational interviewing Zoom that we had about doing that over Zoom, and I just didn't know how that was gonna go. And big part of nursing is like developing a therapeutic relationship. I just really wasn't sure how that was gonna play out on Zoom. And definitely From our first interactions, and [PA] can attest, with our first picture of Alex, he was slumped down, on mute. I was thinking, oh, I do not know how to approach this. So we've definitely grown. And I think it definitely went well.
Allopathic Medicine (MD)	I think completely understandable to be in that position, like surrounded by so many health care professionals and trying to get an idea of what this is. I can understand that it's absolutely frustrating. And At the same time, I was trying to jog in my head, so what are our next steps like? How do you comfort a patient like this without knowing so much about the exact treatment process or what actually works for this patient? So I think it just showcased like a good challenge for us to kind of understand and delve in deep into our own professions and figure out how we can alleviate some symptoms without having a definitive answer.
Osteopathic Medicine (DO) and Physician Assistant (PA)	[DO]: I think all the tests were a little bit overwhelming, but there's really no nice way to do it. [PA]: That was really good. I really feel like I learned a lot just watching you guys do that. I like the flow of it. And yeah, there's a lot of tests. But it does need to be done and it actually goes by quicker than you think.

Discussion

Metacognition in Action

Flavell first described metacognition as "one's knowledge about and regulation of one's cognitive processes" (Flavell, 1979). It is often described as an individual's ability to assess his or her thinking and actual skill level or understanding in an area (Stanton, Sebesta, & Dunlosky, 2021). Metacognition is an essential skill that encourages critical thinking and lifelong learning. Metacognition also helps students understand their comprehension and problem-solving skills (Medina, Castleberry, & Persky, 2017). Thematic analysis was used to identify emerging themes indicative of metacognitive processes that occurred during the debriefing sessions of the student team after a healthcare simulation activity.

In this study, students explicitly recalled instances when their team member used their professional knowledge and scope of practice to assist in understanding and making recommendations for the care of a standardized patient. Examples of metacognition in action were identified as participants engaged in meaningful and reflective discussion of the thought processes that emerged during their simulation experiences. The student participants moved from themes of communication to peer-to-peer learning, problem-solving and, finally, self-reflection, indicating a metacognitive flow. Throughout the debriefing session, participants could identify what they did not know and then communicate their new understanding, building on their old knowledge, applying new knowledge and critical thinking to the novel situation.

Providing opportunities for students to practice, build, and strengthen metacognitive skills throughout the course of their health professions education is important. Learners who use metacognitive skills gain a better understanding of how they learn and can capitalize on this knowledge, becoming better clinicians as well as better members of interprofessional healthcare teams working in collaborative settings. Emergent themes from this study discourse, (Collaboration, Peer-to-Peer Learning, Problem-solving, and Self Reflection) aligned well with identified components of metacognitive regulation (Zohar & Barzilai, 2013).

Limitations

Theme identification depends in part on whether participants feel safe enough to freely and candidly share their experiences. Development of psychological safety takes time and requires strong facilitation and guidance. The debriefing sessions used here were led primarily by the student members of the team, and participation was lively and informative. However, each debriefing session was necessarily unique. We believe that the research findings are valid and contribute to advancing knowledge of metacognition and metacognitive processes that occur in a team-based learning environment.

Future Research

Future research is needed to better understand the role of metacognition in interprofessional healthcare team-based learning and to develop strategies that improve students' capacities to reflect upon, recall, and apply their learning. Simulation debriefings provide opportunities to analyze the metacognitive components of student discourse. Future research can replicate such analysis using interprofessional healthcare simulations as well as other learning activities that engage interprofessional team debriefing to gain more knowledge about metacognitive regulation and processes in professional development.

Conclusion

Metacognition and metacognitive ability are important learning tools that can be incorporated into healthcare learning environments through instructional and facilitation strategies. Interprofessional healthcare team simulations with standardized patients provide an optimal activity for encouraging critical discourse and other metacognitive processes.

Critical thinking and knowledge comprehension are essential skills for healthcare practice. The development of metacognitive skills as an objective of health professions curricula appears to help students actively examine their knowledge, develop critical thinking, bolster self-reflection skills, and blend new knowledge into their learning process.

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Data Availability Declaration

Data Availability Upon Formal Request: The primary datasets utilized in this study are not publicly accessible due to certain constraints. The primary datasets are available to researchers upon a formal request. The authors have emphasized maintaining the integrity of the data and its analytical rigor. To access the datasets or seek further clarifications, kindly reach out to Ms. Batteson or Dr. Garber. Our aim is to foster collaborative academic efforts while upholding the highest standards of research integrity.

Author Contributions

Rayan Kamal Salih spearheaded the conceptualization, designed the research methodology, and supervised the entire project along with Tamzin J. Batteson and Sarah S Garber. Rayan Kamal Salih, Kaleia Collins, Imohimi Eboweme, Daniel Bassler, Susan Smock, and Zaria Price were responsible for the data collection, analysis, and interpretation, bringing analytical rigor to the study. Rayan Kamal Salih took the lead in drafting the manuscript, ensuring its alignment with scholarly standards, and revising it for intellectual depth. All authors collaboratively discussed the results, provided critical insights, and contributed to the final manuscript. All authors have read, approved, and take joint accountability for the presented work's accuracy and integrity.

Author(s)' statements on ethics and conflict of interest

Ethics statement: We hereby declare that research/publication ethics and citing principles have been considered in all the stages of the study. We take full responsibility for the content of the paper in case of dispute.

Although this was a study solely of the video-taped debriefing session of the simulation, The participants were, as part of the simulation activity, informed electronically of the nature of the simulation program and expectations. Participants were assured that there would be no ramifications if they decided to opt-out at any time. Participants consented to being recorded during simulation activities and debriefing sessions.

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Conflict of Interest Declaration: No author has any conflicts of interest to declare.

Biographical notes:

Rayan Kamal Salih, PharmD: Rayan is a pharmacist, life science communicator, and health policy researcher with a deep interest in ensuring patient access to innovative therapies. She completed a postdoctoral fellowship focused on Health Policy & Health Policy & Communications at the National Pharmaceutical Council (NPC) and Rutgers University.

Scopus Author Identifier Number: 59354838200

Web of Science Researcher ID: OHT-6512-2025

Google Scholar Researcher ID: NA

Tamzin J. Batteson, BSc: Tamzin currently focuses her research on implementing metacognitive theory into aspects of interprofessional healthcare education through simulation and diagnostic reasoning and error.

Scopus Author Identifier Number: 55617995200

Web of Science Researcher ID: NA

Google Scholar Researcher ID: NA

Kaleia Collins, PharmD: Kaleia is a recent pharmacy graduate from the College of Pharmacy at Rosalind Franklin University of Medicine and Science. Her research interests include medication safety, quality improvement, and pharmacy leadership development.

Scopus Author Identifier Number: NA

Web of Science Researcher ID: NA

Google Scholar Researcher ID: NA

Sarah S Garber, PhD: Sarah is currently the Director of Interprofessional Studies and Professor in the College of Pharmacy, Rosalind Franklin University of Medicine and Science. Her current research has focuses of metacognitive learning within interprofessional team activity.

Scopus Author Identifier Number: NA

Web of Science Researcher ID: NA

Google Scholar Researcher ID: NA

Imohimi Eboweme, PharmD: Imohimi is a recent pharmacy graduate from the College of Pharmacy at Rosalind Franklin University of Medicine and Science. His research interests include pharmacy leadership development.

Scopus Author Identifier Number: NA

Web of Science Researcher ID: NA

Google Scholar Researcher ID: NA

Daniel Bassler, PharmD: Daniel is a recent pharmacy graduate from the College of Pharmacy at Rosalind Franklin University of Medicine and Science. His research interests include medication safety, quality improvement, and pharmacy leadership development.

Scopus Author Identifier Number: NA

Web of Science Researcher ID: NA

Google Scholar Researcher ID: NA

Susan Smock, PharmD: Susan is a recent pharmacy graduate from the College of Pharmacy at Rosalind Franklin University of Medicine and Science. Her research interests include quality improvement, and pharmacy leadership development.

Scopus Author Identifier Number: NA

Web of Science Researcher ID: NA

Google Scholar Researcher ID: NA

Zaria Price, PharmD: Zaria is a recent pharmacy graduate from the College of Pharmacy at Rosalind Franklin University of Medicine and Science. Her research interests include interprofessional education, medication safety, quality improvement, and pharmacy leadership development.

Scopus Author Identifier Number: NA

Web of Science Researcher ID: NA

Google Scholar Researcher ID: NA