BMC Medical Education

RESEARCH Open Access

Pharmacy students' perspectives and training needs on simulation-based interprofessional education at a University in Southwestern Uganda: a qualitative study

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Abstract

Background Pharmacy graduates are expected to collaborate effectively within interprofessional healthcare teams. However, current training lacks structured opportunities for interprofessional learning. Simulation-based interprofessional education (sim-IPE) offers a promising approach to address this gap. This study explored the training needs and perceptions of pharmacy students regarding sim-IPE at Mbarara University of Science and Technology (MUST).

Methods We conducted a formative qualitative study among pharmacy students and faculty at MUST in October 2025. In-depth interviews were conducted with 14 fourth-year pharmacy students, and key informant interviews with three purposively selected faculty members involved in curriculum design. Data was collected using interview guides developed based on the Theoretical Domains Framework. Audio-recorded data were transcribed verbatim, cleaned and analyzed in NVivo version 14 using framework analysis.

Results Four themes emerged. First, the current clinical training was constrained by limited clinical training exposure, preceptor shortages, and siloed learning. Second, barriers to IPE included professional hierarchy, low student confidence, scheduling conflicts, and limited simulation capacity. Third, the enablers for successful implementation included skilled facilitation, curriculum integration, institutional support, and simulation's safe learning environment. Fourth, effective communication skills, pharmaceutical care, and interprofessional collaboration competencies were identified as essential needs for effective participation. Participants anticipated benefits for professional development and patient care from interprofessional learning.

Conclusion Pharmacy students and faculty perceived sim-IPE as a valuable approach for addressing gaps in current clinical training and strengthening readiness for collaborative practice. The main training needs identified were communication skills, role clarity, teamwork, pharmaceutical care competencies, and confidence to contribute within interprofessional teams. Implementation will require attention to professional hierarchy, faculty preparation,

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curriculum integration, scheduling, and simulation resources. These findings provide practical guidance for the design of a contextually appropriate sim-IPE module for undergraduate pharmacy students in Uganda and similar resource-constrained health professions education settings.

Keywords Interprofessional Education, Simulation Training, Pharmacy Education, Clinical Competency, Uganda

Introduction

Globally, health professions students lack adequate interprofessional training to prepare them for effective collaborative patient care [1]. This leads to a fragmented healthcare system where professionals work in silos, thereby compromising patient safety and treatment outcomes [2]. The pharmacy profession has evolved from a product-oriented focus to a patient-centered model, placing pharmacists in multidisciplinary settings [3]. Current pharmacists are expected to collaborate effectively with the healthcare team to manage complex chronic conditions and ensure medication safety [4]. However, current training methods in health professions institutions often fail to mirror these interprofessional environments, leaving graduates ill-equipped for clinical practice [5].

In Uganda, regulatory bodies like the Pharmaceutical Society of Uganda (PSU) expect pharmacy graduates to integrate seamlessly into multidisciplinary teams [6]. However, the training at institutions like Mbarara University of Science and Technology (MUST) remains compartmentalized and clinical rotations often lack structure for interprofessional interaction [7]. The pharmacy students often rotate independently from their medical and nursing peers with distinct learning objectives that prevent meaningful collaboration [7]. Furthermore, logistical challenges such as limited ward space and staffing shortages hinder the feasibility of interprofessional clinical rounds [7]. Consequently, graduates often enter the workforce lacking the confidence and clinical competence necessary for effective interprofessional collaboration.

Simulation-based training has emerged as a best-practice model for addressing challenges with clinical training in health professions institutions [8]. Simulation-based interprofessional education (sim-IPE) provides a safe, hands-on learning experience that fosters teamwork and communication without compromising patient safety [9, 10]. Previous studies show that sim-IPE enhances clinical competence, confidence, and teamwork among medical and nursing students in high-income countries [11, 12]. However, the integration of sim-IPE into pharmacy curricula remains underexplored, especially in low-resource settings like Uganda.

While the benefits are well-documented elsewhere, it is unclear how these interventions can be effectively adapted to meet the specific training needs and resource constraints of Ugandan pharmacy education. Successful implementation of such curricular innovations requires a clear understanding of local training needs, stakeholder readiness, and contextual barriers and enablers. Therefore, this study explored the pharmacy students' and faculty members' perspectives on simulation-based interprofessional education at Mbarara University of Science and Technology. The findings are intended to inform the development of a tailored sim-IPE module designed to enhance the clinical competency and confidence of pharmacy students. This study was guided by the following research questions:

a) How do pharmacy students and faculty describe the current clinical training experiences of pharmacy students?
b) What barriers and enablers do pharmacy students and faculty perceive as influencing the implementation of simulation-based interprofessional education?
c) What competencies and training needs do pharmacy students and faculty consider important for pharmacy students' effective participation in simulation-based interprofessional education?

Methods

Study design

This study employed a qualitative descriptive design to explore pharmacy students' perceptions, expectations, and training needs regarding interprofessional education (IPE) delivered through simulation-based learning. A qualitative descriptive design was appropriate because the study sought to generate a practical and contextually grounded description of participants' experiences, perceived barriers and enablers, and training needs. This design was suited to the formative purpose of the study which was to inform the development of a contextually appropriate sim-IPE module that involves undergraduate pharmacy students.

Setting

The study was conducted at the Faculty of Medicine at Mbarara University of Science and Technology (MUST), located in southwestern Uganda. The faculty has several health professions programs that include Medicine, Nursing, Pharmacy, Medical Laboratory Science, and Physiotherapy, offering both undergraduate and graduate programs. Recognizing the value of experiential learning, the University established a simulation-based learning (SBL) center in 2016. This center is well-equipped with

two simulation scenario rooms and debriefing spaces with high- and low-fidelity manikins. While simulation is formally integrated into the medical and nursing curricula, pharmacy students currently lack formal opportunities for SBL. Additionally, some simulation activities were conducted within single professions, and with no structured simulation opportunities that bring multiple health professions together for IPE. Within the pharmacy program, third and fourth-year students routinely participated in ward-based clinical exposure at Mbarara Regional Referral Hospital (MRRH). MRRH is the teaching hospital for MUST. However, this exposure was limited in frequency and occurred with minimal supervision due to staffing constraints. Interprofessional interaction on the wards is largely informal, as students from different disciplines rotate separately and follow distinct learning objectives. This fragmented clinical learning and limited opportunities for structured collaboration informed the exploration of pharmacy students' perspectives on IPE and their expectations for a future sim-IPE module tailored to the MUST environment. The data was collected in October 2025.

Study population and sample size

The study had two categories of participants. In-depth interviews were conducted with 14 final year pharmacy students who had completed their third-year clinical pharmacy course work and hospital-based clinical rotations including placements at MRRH. At the time of data collection, participants had completed at least two semesters of clinical ward rounds and had rotated through Internal medicine, Obstetrics and Gynecology, Pediatrics, Oncology, and Surgical wards at MRRH. These students were invited to participate in the study through their class president. Data saturation was attained by the fourteenth interview, where we received similar responses, with no new information being generated. Additionally, we conducted three key informant interviews with faculty members who were purposively selected based on their expertise in clinical pharmacy education and involvement in curriculum design. This number represents the core faculty directly involved in clinical training and student assessment within the department at the time of this study. Faculty interviews were included to complement student accounts and provide institutional and curricular perspectives on the feasibility of sim-IPE implementation. Data saturation was assessed across the student interviews while key informant interviews were used to support triangulation and contextual interpretation of the findings.

Data collection tools and procedures

This study was guided by the Theoretical Domains Framework (TDF). The TDF brings together constructs from multiple behavior change theories to help identify factors that influence behavior and implementation [13, 14]. It has 14 domains that include knowledge, skills, social/professional role and identity, beliefs about capabilities, beliefs about consequences, environmental context and resources, social influences, emotion, and behavioral regulation [13]. In this study, the TDF was selected because implementation of sim-IPE requires changes in learner, faculty, and institutional factors. These include readiness to collaborate across professional boundaries, confidence to participate in interprofessional learning, role understanding, motivation, and availability of organizational resources.

Two semi-structured interview guides were developed based on the TDF to systematically explore students' and faculty's perceptions, training needs, and readiness for interprofessional collaboration. The framework guided the development of interview questions around potential determinants of participation in simulation-based interprofessional education. The interview guides had questions exploring knowledge and beliefs about IPE, professional role identity, skills and capabilities, motivation, social influences, and environmental context. While the TDF guided data collection, the analysis allowed findings to be organized around patterns that emerged across domains rather than being constrained to the original framework structure. To enhance content validity, the initial guides were reviewed by JNN, a faculty member in the Department of Nursing with experience in qualitative health professions education research. Her role was to assess the clarity, relevance, and alignment of the interview questions with the study objectives and the TDF. Based on this review, the tools were refined to include additional questions on the students' current clinical learning experiences and the available institutional support systems for faculty.

Data was collected by one trained research assistant (RA) with a bachelor's degree in nursing science and a postgraduate diploma in medical education, and more than five years' experience in conducting qualitative interviews. The RA was trained by the principal investigator (PI) on the study protocol, the interview guide, and ethical principles of research. During the interviews, a one-on-one conversational approach was adopted to allow participants to elaborate on their experiences and provide detailed accounts.

Participants were informed that the purpose of the study was to gather their perspectives to inform the design of a curriculum innovation for pharmacy training. Interviews were conducted in quiet, private spaces within the university premises to ensure confidentiality. All participants provided written informed consent and verbal consent for audio recording. The interviews lasted between 30 and 60 min. To ensure rigor, daily debriefing sessions were held between the PI and the RA to review audio files and field notes. These sessions allowed for the

identification of emerging topics and the iterative refinement of probing questions for subsequent interviews.

Data management and analysis

Audio recordings were transcribed verbatim using the Microsoft 365 transcription feature. To ensure data accuracy, the transcripts were reviewed and cleaned by the PI and the RA against the original audio files. Following transcription, the research team read and re-read the transcripts to gain familiarity with the data.

A coding matrix was initially developed based on a priori domains of the TDF while allowing for inductive codes to emerge from participant narratives. The TDF provided an initial analytic structure for identifying potential behavioral, social, and contextual determinants of sim-IPE. The PI and RA independently coded a subset of transcripts and met to compare coding structures, resolving discrepancies through discussion to agree on a final coding tree. Coding and theme development were not restricted to predefined TDF domains. Data were organized using a framework matrix, in which rows represented emerging themes and subthemes and columns represented individual participant responses. Codes were compared across participant accounts, refined in relation to the study objectives, and interpreted with reference to relevant TDF domains where applicable. The final themes were developed in relation to both the study objectives and the TDF constructs with adjustments made where initial categorization required refinement.

Multiple strategies were employed to ensure rigor of this study. Investigator triangulation was achieved by involving the research assistant who had a background in medical education but was not a faculty member in the pharmacy department in the coding and analysis process. This ensured that the interpretation of findings was not solely driven by the PI's perspective. To ensure confirmability, an audit trail was maintained, including field notes and daily debriefing logs. Data saturation was monitored during data collection and confirmed during analysis when no new codes emerged from the final transcripts.

We acknowledged that the PI's status in the department could introduce power dynamics and therefore influence study participants to provide socially desirable responses. To mitigate this bias, all student interviews were conducted by the RA who holds no grading authority over the students. This separation allowed participants to speak freely about their curricular challenges. Furthermore, the PI's insider knowledge of the curriculum was balanced by the RA's external perspective (Nursing background) ensuring that the assumed knowledge was questioned and fully explored during the analysis.

Results

Participant characteristics

The study enrolled seventeen participants, including fourteen final-year pharmacy students and three faculty members from the Department of Pharmacy. The student participants comprised eight males and six females with age ranging from 21 to 34 years. The faculty participants ($n = 3$) were male, aged 33 to 35 years, and all held a master's degrees in pharmacy. Their teaching experience in the department of pharmacy ranged from three to nine years. All three were involved in curriculum design and student assessment. While none had direct experience with simulation-based interprofessional education, two faculty members had received training in simulation-based teaching and learning.

Themes

The study findings are presented under four themes examining participants' training needs and perceptions regarding simulation-based interprofessional education. The first theme, current clinical training, establishes the baseline context by describing existing clinical experiences and their limitations. The second theme, barriers to interprofessional education, identifies key implementation obstacles around professional, psychological, structural, and attitudinal domains. The third theme, enablers for successful implementation, captures conditions participants viewed as necessary for effective adoption of sim-IPE. The fourth theme, essential competencies and perceived benefits, describes the skills that participants considered prerequisites for meaningful participation and the outcomes they anticipate from such training (Table 1).

Theme 1: current clinical training

Participants described their current clinical training experiences as foundational yet substantially constrained by structural and systemic limitations. This theme encompasses three interrelated subthemes: limited clinical exposure, insufficient educational support, and existing interprofessional education experiences.

Limited clinical exposure Both students and faculty consistently identified inadequate clinical exposure as a primary concern in current training. Students reported highly restricted ward time, with clinical rotations occurring once a week due to alternating schedules and competing academic demands.

> *"For me, since I'm interested in treatment and therapy, I think the time is very limited. If we went to the ward every day for five days a week, each patient encounter would challenge us to go and read. But when we only go on Tuesday, the best we can do is*

Table 1 Summary of themes and subthemes

Theme	Subtheme
Current clinical training	Limited clinical exposure
	Insufficient educational support
	Interprofessional education experiences
Barriers to interprofessional education	Professional hierarchy and power dynamics
	Individual psychological barriers
	Structural and resource barriers
	Attitude barriers
Enablers for successful sim-IPE implementation	Educational design requirements
	Institutional support
	Simulation-specific advantages
Essential competencies and perceived benefits of IPE	Communication skills
	Clinical competencies
	Collaborative competencies
	Expected professional development benefits
	Expected patient-level benefits

spot a patient, get their file, and write about them, which is not fair." (Participant 2, female student)
"One day in a week is not enough. Ideally we are supposed to have it daily, but in this case the preceptor periods are only one day in a week, but the students have the luxury of going back to the clinical rotations every single day of the week. However, they also need time for classroom learning, and other assignments that take a lot of their time." (Key informant 2, faculty)

When students attended clinical sites, opportunities for meaningful patient interaction were often limited. Some students found themselves assigned to non-clinical activities such as supply chain tasks, with minimal time dedicated to direct patient engagement.

"And when we went to the placements at hospitals, we were mostly pushed into the supply chain and they told us to go to the store. They gave us more time in the stores and we didn't get more time to interact with patients." (Participant 6, male student)

Physical constraints further compromise clinical learning opportunities. Participants described overcrowded ward sessions where large numbers of students overwhelmed available space and resources, hindering meaningful engagement.

"Even in terms of resources, if there are over 50 people at one station, some are standing and trying to listen. It ceases to be a learning session if people cannot properly engage." (Participant 11, male student)

Insufficient educational support Participants identified multiple gaps in the educational infrastructure supporting clinical learning. The shortage of preceptors emerged as a critical barrier, with students frequently attending clinical sites without adequate supervision or guidance.

"But of course, going to the hospital ward when you don't have a preceptor is challenging as a clinical pharmacy student. You don't know where to start from. The doctors have medical students to attend to. As a pharmacy student, you need a clinical pharmacist to guide you as well." (Participant 7, male student)

"Another challenge I see is the preceptors. We have very few. For example, in the clinical pharmacy unit, we are like two people who are dedicated to going to the hospital. Meaning that we rely on support staff from the hospital, for example, who are also pharmacists there. They give us their time when they can and when their duties allow them. But when they are also constrained on time, we are unable to task them. So, students end up going to the ward and sometimes there's no one to precept them. And they don't learn as much as we expect." (Key informant 2, male faculty)

Beyond preceptor availability, participants described current training as siloed within pharmacy practice, offering limited opportunities to learn alongside or from other health professions.

"The limitation to the current training, of course, is the fact that it mostly provides information concerning pharmacy practice. And it doesn't really provide them with a chance to work with other healthcare professionals. This equally limits the student's knowledge base to only the conditions that the preceptor had at that time." (Key informant 1, faculty)

The absence of structured feedback compounded these challenges. Without adequate supervision, students lacked a mechanism to identify and correct their errors. Faculty also raised concerns about patient safety, noting that the students' limited clinical experience made close supervision essential.

> *"It doesn't make sense for students to be there on their own. Like, they make their errors, yes, but they're not able to know what errors they've made." (Participant 4, female student)*

> *"Equally, the patient safety, considering the fact these students are just new, they having their first clinical exposure, some of them may not have the right skills to handle these patients. So, there is also an aspect of patient safety that may not be clear..." (Key informant 1, faculty)*

Interprofessional education experiences Despite the challenges described above, participants recognized value in existing learning experiences that incorporated interprofessional elements. Students highlighted community-based placements as particularly beneficial for fostering teamwork across disciplines.

> *"Actually, LCP [Leadership and Community Placement] was a good placement because it improved our learning experience, because it linked all of us as health professions students. We worked in teams and were able to come up with projects which could be useful in the communities where we went." (Participant 6, male student)*

Theme 2: barriers to interprofessional education

This theme captures the challenges participants identified as hindering effective interprofessional collaboration and education. Four interrelated subthemes emerged: professional hierarchy and power dynamics, individual psychological barriers, structural and resource barriers, and attitude barriers. These findings reflect both students' and faculty's perceptions of the obstacles that would need to be addressed for successful implementation of a simulation-based IPE module.

Professional hierarchy and power dynamics Participants consistently described professional hierarchy as a significant barrier to interprofessional collaboration. Students and faculty noted that certain professions exhibited superiority complexes that undermined teamwork and mutual respect.

> *"Of course, one of challenges is self-importance among certain individuals who think that if you are correcting them or giving your idea, you are trying to undermine them." (Participant 11, male student)*

Faculty elaborated that the challenge extended beyond individual attitudes to a systemic lack of role clarity within clinical settings. Other health professionals, unfamiliar with the scope of pharmacy practice, were often uncertain how to incorporate pharmacy students into clinical teams.

> *"Everyone knows what a nurse is supposed to do on the ward. Everyone knows what a physician does. But other professionals have not yet understood the exact role of pharmacy students. Even if they don't have any bias, they simply don't know how to guide them." (Key informant 3, faculty)*

Territorial behavior and ego issues further complicated interprofessional interactions. Students described experiences where their clinical input was dismissed regardless of its validity. Faculty acknowledged that ego could compromise patient care, particularly when errors were identified.

> *"However much you give your insight, input, you really see that there's something they deem lacking maybe in your knowledge... If they have decided that we are not taking in your idea, they won't take it." (Participant 7, male student)*

> *"Some prescribers take it in bad faith when you point out a mistake. In most cases, they refuse to change because of ego, but this is definitely to the detriment of the patient." (Key informant 3, faculty)*

Participants emphasized that addressing these issues would require a fundamental cultural and paradigm shift in how healthcare professions view one another.

> *"We need a very serious culture and paradigm shift in terms of appreciation of each other's role as part of the healthcare team. We find that some professions find relevance more than others." (Key informant 1, faculty)*

Faculty also called for self-reflection within the pharmacy profession, acknowledging that pharmacists needed to demonstrate their value more visibly.

> *"But also sometimes, you know, it's always common for us to point out and say, you know, it's for undermining us, but then what are we doing different to make them gain respect for us?... I'm not saying that we say that yes, the doctors need to change and*

appreciate us more, but we also need to give them a reason to appreciate us more." (Key informant 1, faculty)

Individual psychological barriers Beyond systemic and professional barriers, participants identified individual psychological factors that could hinder effective interprofessional collaboration. Low confidence emerged as a major concern, with students expressing uncertainty about their clinical abilities and readiness to contribute meaningfully in interprofessional settings.

"On a scale of 10, I would rate my clinical confidence at 6. Because I feel like I always have this mentality that I still have a lot to learn from people." (Participant 3, male student)

Fear of negative responses was also identified as a barrier. Some students described reluctance to contribute in team discussions due to concerns about how others might react, particularly when their input contradicted a colleague's opinion.

"Personally, the reason I don't like to contribute much is that when I disagree with someone's contribution, they might say something rude to me. That would make me reluctant to contribute the next time." (Participant 1, female student)

Structural and resource barriers Participants identified time constraints and scheduling conflicts as major structural obstacles to interprofessional education. Students and faculty noted that different health professions attended wards at different times, limiting opportunities for collaborative learning.

"I think it's the way the university is set up. It would be better if, when they make the timetable, year four pharmacy students and year four medicine students are scheduled to be in the hospital at the same time. We should be going to the ward together." (Participant 6, male student)

"The timetable as it stands right now, I think we should dedicate morning hours for clinical training entirely, so that students are given their whole morning hours, whether you're in nursing, physiotherapy, pharmacy, or medicine, the morning hours are blocked for clinical training." (Key informant 2, faculty)

The participants also noted that the teaching policies reinforced departmental silos with no formal mechanism for faculty to engage in cross-departmental teaching.

"The system has been designed to confine my workload entirely within my department. There is no policy that says staff should take 70% of their load in their department and 30% in another department. If such a policy existed, there would be a legal framework allowing faculty to teach outside their department. But for now, it's not there." (Key informant 2, faculty)

Limited simulation capacity was also a significant concern. Students reported minimal exposure to simulation-based learning within the pharmacy program, noting that such opportunities appeared to be available only to medical students.

"I have not had any simulation experience. I think there was something for medicine, I saw a poster about a grand round involving simulation. But in pharmacy, we have not had any." (Participant 3, male student)

Faculty acknowledged that current simulation facilities could not accommodate the large student numbers required for interprofessional simulation.

"The first challenge is space. We would like to bring all students together, but the current simulation lab is too small to accommodate everyone." (Key informant 2, faculty)

Faculty training needs emerged as a critical gap. Participants noted that facilitators lacked adequate preparation to deliver simulation-based interprofessional education.

"Facilitators also need to go through training, so that when they take us through a session, they are clear and consistent with what they are presenting. Sometimes, they get to a point and freeze, unsure what to do next." (Participant 11, male student)

Faculty also acknowledged that capacity building would be essential before implementation.

"I believe everyone would benefit from initial capacity building before the program is rolled out. If you engage in interprofessional education, even as a teacher, you should be confident enough to guide everyone, not just your own cadre." (Key informant 3, faculty)

Attitude barriers According to participant responses, there is variability in student motivation and interest in collaborative learning. Some students observed that peers did not share their enthusiasm for clinical training.

"In my clinical rotation group, at most one person has the same level of motivation as me. The motivation may be there in others, but it's not as strong." (Participant 10, female student)

Faculty identified broader attitudinal challenges, noting that the relevance of interprofessional education was not yet widely appreciated.

"I think I would call it the attitude that people have towards interprofessional education. Some people have not yet seen the relevance of different professions. So, there is a little bit of strife there." (Key informant 1, faculty)

Faculty mindset and resistance to change poses additional challenges. Some faculty were described as dismissive of simulation-based approaches, viewing them as impractical compared to real clinical experiences.

"How many faculty are taking simulation seriously and providing the right training to the students? Most faculty would say it is a waste of time. Why simulate it when you can't have it in real life? But faculty buy-in would be a very big limitation in terms of simulation strength." (Key informant 1, faculty)

Theme 3: enablers for successful simulation-based IPE implementation

This theme captures participants' perspectives on the conditions necessary for effective implementation of a simulation-based interprofessional education module. Three interrelated subthemes emerged: educational design requirements, institutional and system support, and simulation-specific advantages. These findings reflect both students' and faculty's views on what would facilitate successful adoption of sim-IPE within the existing training context.

Educational design requirements Participants emphasized the importance of skilled facilitation and consistent faculty supervision for effective simulation-based learning. Students noted that accountability mechanisms were essential to ensure meaningful participation.

"All students should always sign attendance; there should be follow-up of attendance of students. Because if a simulated session is there, a certain cohort signs and a certain cohort doesn't sign. It doesn't make any sense for me to wake up from my bed, just go and attend, and no one is following you up." (Participant 7, male student)

Students also stressed that facilitators should demonstrate both expertise and passion for teaching.

"The person should be knowledgeable about what they are teaching us… someone who speaks from the heart, and they're very passionate about what they're doing." (Participant 14, female student)

Faculty suggested that each department should have dedicated personnel trained in simulation-based learning delivery.

"For this model to work, each department should have someone who has been specifically trained in delivering simulation-based learning." (Key informant 3, faculty)

Combined or joint lectures were proposed as a mechanism to model interprofessional collaboration. Faculty described how different professions could contribute complementary perspectives on the same clinical topic.

"Is it possible, for example, to say that tomorrow we are discussing pneumonia … We have pharmacists, nurses, and doctors come together in a general lecture that is delivered by all of them … Because tomorrow, if a pharmacist is teaching pneumonia, then they are going to focus on the drug. If a nurse is teaching pneumonia, they are going to focus on patient care. If a doctor is teaching pneumonia, they are going to focus on the diagnosis and treatment outcome." (Key informant 1, faculty)

Faculty cross-teaching was identified as another way to model interprofessional values for students.

"I can be asked to go and teach another department in areas where they think I can deliver… And that gives the students a sense of like, oh, actually we can be taught by someone from another department… So that these are things that help students build that mentality." (Key informant 2, faculty)

Participants recommended early introduction of interprofessional values, ideally from the first year of training. Students felt that early exposure would facilitate professional identity formation. Faculty also supported embedding these values throughout the biomedical sciences curriculum.

"I think what you can do is to instill interprofessional collaboration when people are still starting to be professionals… I feel like if you start with it when you're still in those early stages, it would be much

easier for you even after you've graduated." (Participant 10, female student)

"There should be values, number one, that we inculcate right from the start of the first-year training, the biomedicals. Remember they share the biomedicals together. So these values should be emphasized throughout the training." (Key informant 2, faculty)

Small group sizes were considered essential for effective engagement. Students observed that large groups reduced participation and learning quality.

"Group size matters. The larger the number, the less effective the group will be. Some people will just sit back and not learn." (Participant 14, female student)

Participants highlighted the importance of preparatory and debriefing sessions to support students' readiness for interprofessional interactions.

"One of the solutions which could be put in place is maybe, teaching or preparing us before we go for this simulation. We need to have like a preamble… They say you're going, but you are going to meet different people. And it all goes back to how to communicate with these people." (Participant 12, male student)

Institutional support Participants identified administrative commitment as foundational to successful implementation of sim-based IPE. Students emphasized that institutional leadership at the Faculty of Medicine must prioritize interprofessional education and ensure equitable opportunities across all programs.

"The first recommendation surely should come from the Faculty of Medicine because they oversee the whole medical education within the university. If the Faculty doesn't give equal time or equal benefit to all students, it will be so difficult." (Participant 7, male student)

Beyond leadership commitment, participants identified the need for policy reform to enable cross-departmental collaboration. Faculty recommended that workload policies be revised to formally permit teaching across departments, thereby removing a key structural barrier to interprofessional education.

Curriculum integration and harmonization were also viewed as essential for sustainable implementation. Students recommended that interprofessional learning activities be formally embedded within the curriculum, with clear expectations about when and how students would engage with other health professions.

"Interprofessional learning should be formally recognized in the curriculum. For example, during a rotation, a nurse could explain what they do. This needs to be clearly stipulated in the curriculum." (Participant 12, male student)

Faculty identified the university's ongoing curriculum transformation as a strategic opportunity to embed simulation-based interprofessional education. The shift toward competency-based education was seen as particularly conducive to integrating simulation learning.

"The university is undergoing a transformation for the curriculum… where every course we are delivering must have a component of competence inbuilt, the skills and the knowledge… So it's a good step that they can start from the curriculum, make it completely competence-based, and now that could address the question of simulations." (Key informant 2, faculty)

Faculty emphasized that implementation should follow a systematic approach, beginning with curriculum harmonization before establishing simulation activities. They cautioned that without proper sequencing, even promising initiatives could fail.

"Implementation does not start from the simulation center. It starts from what I call the 'software', the curriculum. This is being done as a good step, but it needs to be focused and harmonized, including discussions about timetabling. After that, we can move to the next step. Without a systematic approach, even a good idea can fail or be dropped along the way." (Key informant 2, faculty)

Sustainable funding was identified as a critical enabler for simulation-based IPE. Students recognized that establishing simulation infrastructure required substantial investment and suggested that government and external organizations should contribute, given the potential to improve the quality of health professionals.

"The challenge is, number one is cost. Setting it up, it's not something that is really easy. That's why most universities will opt for you to go to patients and learn from them. Because having a building and then putting all these demos and bringing all the things that are being used in, it's like procuring for another hospital." (Participant 5, female student)

Faculty acknowledged that government funding alone would be insufficient and recommended leveraging capacity grants through university collaborations.

"The other option is getting capacity grants, for example, and some of these capacity grants come from collaborators from other universities. The government by itself cannot do it. So, I think we need to leverage on the grants that we get for different departments or the faculty, and apply for a grant so that they can be able to get these grants from outside and support simulation learning." (Key informant 2, faculty)

Simulation-specific advantages Participants consistently identified the safe learning environment as a primary advantage of simulation-based education. Students described feeling anxious about making errors with real patients. Faculty elaborated that simulation provided room for error while building confidence through repeated practice.

"Because when we go to the hospital, we are scared because we know this is a human being. We are not supposed to make an error." (Participant 3, male student)

"Simulation provides a safe platform for the student to be able to do all that, while not compromising the health of the patient. So, to me, simulation will be a great way to have this interprofessional training done and provides a safe environment for both the patient and the student themselves." (Key informant 1, faculty)

Faculty described how simulation would enable uninterrupted teaching, free from clinical emergencies that disrupted ward-based learning.

"It gives us ability to deploy our skills in full because now we have a setting that is not interrupted by clinical work… while we are trying to screen through the medications and trying to talk to the caretaker… and we are now in the middle of discussing some of these drug therapy problems. The patient began seizing, and we had to interrupt that." (Key informant 2, faculty)

Faculty also noted that simulation could address gaps in clinical exposure by recreating conditions not currently present in the local context.

"If you have a condition that is not present in Uganda right now, you can easily simulate it and have patients and students understand it and work with it." (Key informant 1, faculty)

Peer learning opportunities were also highlighted as a distinctive advantage of simulation-based interprofessional education.

"It can help all people learn and since it is a simulated case, I think it gives also a better room for peer-to-peer learning. Leave alone the preceptors that are on ward. So, if we have these simulation models, maybe even without supervision, you can have different nurses, doctors, pharmacists going on the same model and they learn from one another, which you might not do on a patient because the patient might not be a playground." (Key informant 3, faculty)

Theme 4: essential competencies and perceived benefits of IPE

This theme captures participants' perspectives on the competencies they believed were essential for meaningful participation in a simulation-based interprofessional education module. Students and faculty identified specific skills they felt learners would need to engage effectively with peers from other health professions in simulated clinical scenarios, as well as the benefits they anticipated from such training. These insights provide guidance for defining learning objectives and informing the pedagogical design of the proposed sim-IPE module. Five interrelated subthemes emerged: communication skills, clinical competencies, collaborative skills, expected professional development benefits, and expected patient-level benefits.

Communication skills Participants identified respectful communication and mutual respect as foundational to interprofessional collaboration. Students emphasized the importance of tone and humility when engaging with colleagues from different professions.

"First of all, you need to learn how to speak to somebody else if you need to seek knowledge, not to be too boastful or too proud… when you're talking to somebody and you expect to learn from that person and the person is supposed to learn from you. There's a tone and a way you speak to a person." (Participant 3, male student)

Faculty emphasized that effective interprofessional communication encompassed mutual respect, non-judgmental attitudes, and the capacity for constructive criticism. These competencies were considered particularly important given the hierarchical nature of clinical environments, where students must navigate power differentials when communicating with senior professionals.

"If you find someone has written a wrong dose… you who has identified it, for example, how do you communicate? Because someone has endeavored to write their prescription, then they have 15 years' experience. You're just a student, for example, you are coming to say, Professor, here you made a mistake." (Key informant 3, faculty)

Active listening was identified as essential for effective teamwork. Students described this as involving attentive observation of team members' actions and contributing to ensure no aspect of patient care was missed.

"The next communication skill I need is active listening, observing what team members are doing, what they are being told to do, and what is supposed to be done. I need to observe, contribute, and ensure that no stage is missed for the patient." (Participant 12, male student)

Clinical competencies Participants highlighted drug knowledge application and pharmaceutical expertise as core clinical competencies. Faculty emphasized that pharmacy students must demonstrate proficiency in medication management and the ability to identify drug therapy problems.

"For pharmacy students, it's very important for them to have ability to work with drugs. Pharmacists are drug experts. So, you'd want them to be competent in drug information, what drugs are the patients taking, and then the drug information as far as what drug does what frequency and all those things." (Key informant 1, faculty)

"We expect them to have drug therapy problem diagnostic skills, meaning they can be able to look at a medication profile and tell us or troubleshoot potential drug therapy problems… And then secondly, we also expect them to be familiar with patient interviews, very important skill." (Key informant 2, faculty)

Students recognized their distinctive contribution to interprofessional teams as grounded in specialized pharmacological knowledge.

"My skill is being able to give the right drug, the right dose, and monitor the patient throughout admission and even after discharge. So, I feel like maybe doctors and nurses can do that, but they may not have the knowledge that we have to know how these drugs manifest in our bodies." (Participant 3, male student)

Collaborative skills Teamwork was recognized as fundamental to interprofessional practice. Students articulated the interconnected nature of healthcare delivery, describing patient care as a sequential process requiring coordination across multiple professionals.

"We need to realize that no unit operates in isolation. When I walk into a clinic, the receptionist welcomes me, the clinician writes a lab request, the laboratory person performs the tests, then ultimately the patient reaches the dispensing point. It's a cascade… it's a team effort." (Participant 8, male student)

Closely linked to teamwork was role clarity, the understanding of one's own responsibilities and those of other team members. Students described how interprofessional experiences helped them appreciate the distinct contributions of different professions and anticipate future collaborative needs.

"This multidisciplinary effort that we are having with our peers enables us that even when you go out there in the field, I will know that I will need a medical doctor for this, I will need a nurse for this, I will need a laboratory technologist for this, I will need a pharmacist for this." (Participant 11, male student)

Faculty reinforced that effective collaboration required each professional to understand their own scope while respecting and actively involving colleagues from other disciplines.

"In that interprofessional education, as they are teaching you, definitely you have to know what you are supposed to do. How can you help? How can you be a team player in that?" (Key informant 3, faculty)

Expected professional development benefits Participants anticipated that simulation-based IPE would facilitate cross-disciplinary learning. While health professions share foundational knowledge, each develops specialized expertise, and interprofessional education was seen as enabling knowledge transfer across these boundaries.

"Interprofessional education is valuable because each profession brings specialists who can contribute to teaching and guidance. It enables knowledge transfer across disciplines." (key informant 3, faculty)

Confidence building was also expected as a key outcome. Students described how being recognized as a valued team member would motivate active participation, while

faculty anticipated that simulation practice would prepare students for real clinical encounters.

> *"You will know that you are important, that the team needs you. When somebody looks up to you, it gives you the zeal to show up and speak out." (Participant 3, male student)*

Finally, participants anticipated that exposure to diverse professional perspectives would enhance clinical reasoning. Students illustrated how different professions approach the same clinical problem through distinct lenses.

> *"I think it also gives you a different way of looking at things… For you, you would be thinking maybe every pain needs what? A painkiller. But a physiotherapist will tell you, you just need to do a few exercises or therapeutic massage, and the pain will be healed." (Participant 14, female student)*

Expected patient-level benefits Improved quality of care was identified as the ultimate benefit of interprofessional collaboration. Participants anticipated that teamwork across specialties would optimize patient outcomes, with simulation-based training translating directly to enhanced ward performance.

> *"First, I think the benefit of this is that the patient gets the best care. They get the best out of every specialty because they're working together. So, they advise each other for the interest of the patient." (Participant 4, female student)*

Reduced medication errors were also expected, as students would learn from mistakes within safe simulation environments before encountering real patients.

> *"If you do simulation-based learning, the errors that students make in the hospital will reduce. We learn from our mistakes, and it is better to make those mistakes during simulation." (Participant 3, male student)*

Discussion

This study explored perceptions and training needs regarding a simulation-based interprofessional education module among pharmacy students and faculty. Participants identified substantial gaps in current clinical training, including limited ward exposure, inadequate preceptorship, and siloed learning. Key barriers to participation in IPE by pharmacy students included professional hierarchy, low student confidence, unharmonized schedules, and limited simulation capacity, while the enablers include skilled facilitation, curriculum integration, institutional support, and the safe learning environment that the simulation provides. Participants identified respectful communication, core pharmaceutical knowledge, and teamwork as key competencies for effective participation in IPE, anticipating benefits for both professional development and patient care.

The study found that the current clinical training of pharmacy students is substantially constrained by limited clinical exposure, preceptor shortages, and siloed learning confined to pharmacy practice. These findings align with evidence from clinical pharmacy education globally, where preceptor shortages and time constraints have been documented as significant barriers to experiential learning [15, 16]. The shortage of preceptors for clinical training of pharmacy students in this setting could be due to the few number of educators specialized in clinical pharmacy [17]. Those available must balance their time with other demanding roles such as research and classroom teaching. Elsewhere, researchers have addressed preceptor shortages with novel blended clinical rotations [18] and simulation based education [19]. A previous study at the same institution also revealed that most training occurs through lectures and tutor-led demonstrations with little opportunities for interprofessional practice [7]. These challenges reflect systemic issues within pharmacy education rather than institution-specific deficiencies. There is need for innovative educational approaches, such as simulation-based learning, that can provide controlled and consistent clinical experiences independent of preceptor availability.

Participants identified professional hierarchy, low student confidence, unharmonized schedules, and limited simulation capacity of pharmacy faculty as key barriers to participation in simulation-based IPE. A qualitative study at Mbarara University identified similar obstacles, including communication gaps between departments, absence of curriculum integration, and inadequate resources [7]. Studies show that patient management is often dominated by doctors due to socialization patterns in health professions education, creating hierarchical structures that undermine collaborative practice [20, 21]. The professional hierarchy described by participants in this study can be understood through the lens of epistemic injustice. Bueter and Jukola argue that medical dominance in multi-professional teams leads to institutional epistemic injustice, whereby the perspectives of non-physician professionals experience systematic and unfair credibility deflation [22]. This shows why pharmacy students in our study described having their clinical input dismissed regardless of its validity. They reported that their contributions were devalued not because of the quality of their reasoning but because of their position within the professional hierarchy. Furthermore, this epistemic inequity

could potentially explain the low confidence and fear of negative responses reported by the pharmacy students. A recent realist synthesis found that IPE may be particularly challenging for students who lack confidence in their abilities to communicate and work effectively in teams [23]. This suggests that educators must focus on building these foundational skills before introducing complex interprofessional activities. Addressing these barriers will require not only curriculum reform but also deliberate efforts to shift institutional culture, including faculty development programs that model interprofessional collaboration and policies that legitimize cross-departmental teaching.

Participants identified skilled facilitation, curriculum integration, institutional support, and simulation's safe learning environment as key enablers for successful implementation. Additionally, communication, pharmaceutical care, and collaborative competencies were identified as essential for effective participation. These findings align with international best practice standards for simulation-based learning and interprofessional education [24]. The INACSL Standards of Best Practice emphasize that sim-IPE requires administrative support, adequate resources, curricular integration, and facilitators trained in interprofessional pedagogy who can model collaborative practice [25]. The communication competencies identified by participants (respectful communication, active listening, and the ability to navigate hierarchical interactions) are foundational to interprofessional collaboration. Training healthcare professionals early to communicate effectively within teams must therefore be a cornerstone of their collaborative learning experiences [26]. Pharmaceutical care skills such as identification of drug therapy problems, medication profile assessment, and patient interviewing, reflect the unique contribution of pharmacy students to interprofessional teams. Pharmacists are increasingly recognized as medication experts whose input improves patient safety and therapeutic outcomes [27]. It is therefore important to strengthen these skills among the pharmacy students before their engagement in IPE. Collaborative competencies like teamwork and role clarity were also viewed as essential for meaningful participation. This aligns with evidence that effective interprofessional teams require members who understand both their own scope and the capabilities of colleagues [28]. These competencies provide clear learning objectives for the design of the proposed simulation-based IPE module at MUST. Addressing these training needs through structured simulation experiences may better prepare pharmacy students and other healthcare professional students for collaborative practice in real clinical settings.

Although this study was conducted at a single Ugandan university, several findings reflect implementation challenges reported in broader IPE and simulation-based education literature. Professional hierarchy, unclear roles, limited faculty capacity, scheduling constraints, and the need for curriculum integration have also been identified in studies of interprofessional and simulation-based learning in other health professions education settings [7, 23, 25, 28]. Similarly, the competencies prioritized by participants such as respectful communication, role clarity, teamwork, and profession-specific clinical expertise, are consistent with the expectations for interprofessional collaborative practice [25, 26, 28]. These similarities suggest that the findings may be transferable to other pharmacy programs and resource-constrained universities seeking to introduce structured sim-IPE. The study therefore contributes to practical lessons for curriculum planners. These include the need for early role clarification, faculty development, harmonized timetabling, and simulation scenarios that allow pharmacy students to practice their medication-related expertise within collaborative teams.

Limitations

This study has some limitations that should be considered when interpreting the findings. First, the study was conducted at a single institution, which may limit the transferability of findings to other pharmacy programs in Uganda or similar contexts. Second, the study included only pharmacy students and faculty, limiting insight into how other health professions perceive collaboration with pharmacists. Nevertheless, prior research at MUST has explored the perspectives of medical and nursing students regarding IPE [7]. The current study, therefore, complements existing evidence by addressing an identified gap in understanding pharmacy-specific training needs. Finally, despite efforts to mitigate social desirability bias by using an independent research assistant for student interviews, participants may still have provided responses they perceived as favorable.

Conclusions

This study found that pharmacy students' current clinical training was constrained by limited clinical exposure, inadequate preceptorship, and limited structured opportunities for interprofessional learning. Pharmacy students and faculty perceived simulation-based interprofessional education as a valuable approach for strengthening collaborative practice but identified several barriers to implementation. The perceived barriers included professional hierarchy, low student confidence, scheduling constraints, limited faculty capacity, and inadequate simulation resources. Key enablers include skilled facilitation, institutional support, curriculum integration, harmonized timetabling, and the safe learning environment provided by simulation. The main training needs identified were respectful communication, role clarity,

teamwork, application of pharmaceutical care knowledge, patient interviewing, identification of drug therapy problems, and confidence to contribute within interprofessional teams.

These findings suggest that a contextually appropriate sim-IPE module for undergraduate pharmacy students should include structured communication training, role clarification exercises, collaborative clinical scenarios, and facilitated debriefing. Future research should evaluate the impact of sim-IPE on pharmacy students' clinical competence and readiness for collaborative practice.

Abbreviations

INACSL	International Nursing Association for Clinical Simulation and Learning
IPE	Interprofessional Education
IPEC	Interprofessional Education Collaborative
LCP	Leadership and Community Placement
MUST	Mbarara University of Science and Technology
PI	Principal Investigator
PSU	Pharmaceutical Society of Uganda
RA	Research Assistant
SBL	Simulation-Based Learning
sim-IPE	Simulation-based Interprofessional Education
TDF	Theoretical Domains Framework

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12909-026-09769-5.

Supplementary Material 1.

Acknowledgements

We are grateful to the final-year pharmacy students and faculty members from the Department of Pharmacy at Mbarara University of Science and Technology who generously shared their time and perspectives for this study. We also thank the Department of Pharmacy and the Faculty of Medicine at MUST for their support during the conduct of this research.

Authors' contributions

All the authors named in this manuscript have contributed greatly to this work and meet the criteria for authorship. JK and SGW conceptualized the study. JK, JN, and SGW designed the study. PM collected the data under the supervision of JK. JK and PM analyzed the data. JK, FA, EJL, EM, and SM drafted the manuscript. RM and SGW substantively revised the manuscript. All authors read and approved of the final manuscript.

Funding

Not applicable.

Data availability

All data generated or analyzed during this study are included in this published article and its supplementary information files.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the research and ethics committee of Mbarara University of Science and Technology with approval number (MUST-2025-382). The study was conducted in accordance with the Declaration of Helsinki and relevant institutional guidelines. Participation in the study was voluntary, and participants were informed of their right to withdraw at any time without consequence. Written informed consent was obtained from all participants before data collection. Additionally, verbal consent was obtained for audio recording of interviews before each interview.

Consent for publication

Not applicable.

Competing interests

The principal investigator teaches and assesses students in the Department of Pharmacy at Mbarara University of Science and Technology where the study was conducted. To mitigate potential bias arising from this relationship, all student interviews were conducted by an independent research assistant with no grading authority over the participants. During data analysis, investigator triangulation was employed whereby the principal investigator and the research assistant independently coded transcripts and compared coding structures, resolving discrepancies through discussion.

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Received: 6 March 2026 / Accepted: 18 June 2026
Published online: 20 June 2026

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