

Original Article

Can ChatGPT Change the Way We Learn Surgery?" A Qualitative Exploration of Surgical Personnel's Experiences and Perceptions of ChatGPT as a Learning Companion in Operation Theatre Practice

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ABSTRACT

Background: Generative artificial intelligence tools such as ChatGPT are increasingly used in health-professions education, but limited qualitative evidence describes how perioperative personnel experience them within workplace-based surgical learning. **Objective:** To explore surgical and perioperative personnel's experiences of ChatGPT as a learning companion, including its perceived educational value, limitations, verification practices, ethical concerns, and potential future role in surgical education. **Methods:** An exploratory qualitative study was conducted among 16 purposively selected surgeons, anesthesia professionals, operation theatre technologists, and operating theatre nurses working in tertiary-care teaching-hospital settings in Pakistan. Individual semi-structured in-depth interviews lasting 25–40 minutes were audio recorded, transcribed verbatim, and analyzed using Braun and Clarke's six-phase thematic analysis. **Results:** Five themes were generated: ChatGPT as a Personalized Learning Companion; Educational Benefits for Surgical Learning and Professional Development; Balancing Trust with Critical Verification; Navigating Challenges and Ethical Responsibilities; and Future Integration of ChatGPT in Surgical Education. Participants valued accessibility, rapid clarification, procedural preparation, and support for self-directed learning but emphasized verification against textbooks, guidelines, evidence, and senior colleagues. Concerns included inaccurate or fabricated information, overdependence, confidentiality, and academic integrity. **Conclusion:** ChatGPT was perceived as a useful supplementary educational resource rather than a replacement for clinical experience or professional mentorship. Responsible integration requires critical verification, AI literacy, ethical safeguards, and institutional guidance. **Keywords:** ChatGPT; Artificial Intelligence; Operation Theatre; Surgical Education; Qualitative Research.

INTRODUCTION

Artificial intelligence (AI) is increasingly influencing healthcare through applications in clinical decision support, diagnostic processes, workflow optimization, research, and professional education (1). Within this broader

development, generative AI and large language models (LLMs) have expanded the role of AI beyond predominantly predictive or analytical applications by enabling systems to generate human-like text, summarize complex information, respond to questions, and support interactive learning (2). ChatGPT, developed by OpenAI, is among the most widely used conversational generative AI tools and has attracted particular attention in healthcare education because it can provide rapid, context-responsive explanations and support self-directed information seeking (3). Its conversational interface allows learners to request clarification, reformulate questions, explore concepts iteratively, and obtain explanations tailored to their immediate learning needs.

The relevance of these capabilities is particularly evident in surgical and perioperative education, where learning involves the simultaneous development of theoretical knowledge, procedural understanding, clinical reasoning, situational awareness, teamwork, and professional judgment. Education within the operating theatre is strongly experiential and commonly occurs through observation, supervised participation, mentorship, case discussion, and repeated exposure to clinical procedures. Formal teaching opportunities may be limited during busy clinical practice, creating a potential role for readily accessible educational resources that can supplement conventional learning. ChatGPT has therefore been explored as an interactive learning aid capable of explaining anatomy and operative concepts, generating clinical scenarios, summarizing educational material, supporting examination preparation, and facilitating discussion of perioperative topics (4). Emerging evidence suggests that generative AI may support learner engagement, knowledge acquisition, and access to educational information in surgical settings when used with appropriate critical oversight (4,5). Large language models have also been examined across perioperative medicine, where their potential educational applications extend to case preparation, procedural understanding, academic activities, and continuing professional development (6).

The educational value of ChatGPT, however, cannot be determined solely by examining its ability to answer examination questions or generate technically plausible responses. Learning in surgery and perioperative practice is socially and professionally situated and depends on how healthcare personnel interpret information, determine its credibility, integrate it with prior knowledge, and decide when additional verification or expert consultation is required. Generative AI may provide rapid and accessible explanations, but it can also produce inaccurate, incomplete, outdated, or fabricated information. Consequently, its educational usefulness depends not only on technological performance but also on users' trust, verification behaviours, professional responsibilities, AI literacy, and understanding of the boundaries between educational support and patient-specific clinical decision-making.

A growing body of literature has examined the role of ChatGPT in medical education, including its perceived benefits, academic applications, limitations, and implications for healthcare learners (7-9). Much of this work has focused on medical students, examination performance, knowledge-based tasks, or comparisons between ChatGPT and conventional educational resources. Comparatively less attention has been given to the experiences of personnel who learn and work within operating-theatre environments, including surgeons, anesthesia personnel, operation theatre technologists, and operating theatre nurses. These professional groups combine formal education with experiential workplace learning and may use ChatGPT differently according to their clinical roles, responsibilities, learning needs, and levels of professional experience.

A qualitative approach is particularly appropriate for investigating this issue because the educational integration of ChatGPT involves experiences and meanings that cannot be adequately represented by performance scores alone. Qualitative inquiry can examine why surgical personnel choose to use generative AI, how they experience it as a learning companion, what they perceive as its educational benefits, how they negotiate uncertainty and potential misinformation, and what ethical and professional concerns shape their use of the technology. Conceptually, the study can be understood through a PICo framework in which the population comprises perioperative and surgical personnel, the interest is their experience and perception of ChatGPT as a learning companion, and the context is learning associated with operating-theatre practice.

Accordingly, this study aimed to explore the experiences and perceptions of surgical and perioperative personnel regarding the use of ChatGPT as a learning companion in operating-theatre practice. Specifically, it sought to understand its perceived educational value for self-directed and professional learning, identify perceived limitations and verification behaviours associated with AI-generated information, examine ethical and professional

concerns surrounding its use, and explore participants' views regarding the responsible future integration of ChatGPT into surgical education.

MATERIALS AND METHODS

An exploratory qualitative study design was used to investigate how surgical and perioperative personnel experienced and perceived ChatGPT as a learning companion in relation to operating-theatre practice. This approach was selected because the study sought to understand participants' experiences, interpretations, perceived educational value, verification behaviours, concerns, and expectations rather than to quantify educational effectiveness. Individual semi-structured in-depth interviews were used to enable participants to describe their experiences in their own words while allowing the interviewer to explore relevant issues through follow-up questions and clarification.

The study was conducted in tertiary-care teaching hospital settings in Pakistan. Purposive sampling was used to recruit healthcare professionals with direct experience of perioperative practice and previous use of ChatGPT for learning or professional purposes. Participants were eligible if they were surgeons, anesthesia personnel, operation theatre technologists, or operating theatre nurses who were directly involved in perioperative patient care, had worked in an operating-theatre environment for at least one year, had previously used ChatGPT in relation to learning or professional activities, and were willing to participate. Healthcare professionals without previous experience of ChatGPT or who were not directly involved in operating-theatre practice were excluded. The purposive strategy was intended to capture perspectives from different professional roles within the perioperative environment and thereby provide variation in experiences of workplace learning and generative AI use.

A total of 16 participants were included, comprising three surgeons, four anesthesia professionals, five operation theatre technologists, and four operating theatre nurses. Recruitment continued until the ongoing analysis indicated that additional interviews were no longer generating substantively new codes or themes relevant to the study objectives. The final sample therefore reflected both the planned inclusion of multiple perioperative professional groups and the information obtained during the iterative process of data collection and analysis.

A semi-structured interview guide consisting of eight open-ended questions was developed after reviewing literature concerning artificial intelligence, ChatGPT, medical education, and surgical learning. The questions explored participants' patterns of ChatGPT use, experiences of learning with the tool, perceived educational benefits, perceived limitations, approaches to verification of AI-generated information, influence on self-directed and professional learning, ethical and practical concerns, and expectations regarding the future role of ChatGPT in surgical education. The semi-structured format allowed the interviewer to use probing questions when clarification or further exploration of an experience was required.

Interviews were conducted either in person within hospital settings or online according to participant availability and preference. Each interview lasted approximately 25–40 minutes. Participants were given an opportunity to describe their experiences freely, and relevant responses were explored through follow-up questions where necessary. All interviews were audio recorded after obtaining permission from the participants. Audio recordings were subsequently transcribed verbatim, and the transcripts were checked against the recordings for accuracy before analysis. Personally identifying information was removed from the analytic material, and participants were assigned anonymized identification codes such as P1, P2, and P3. Audio recordings, transcripts, and associated study documents were stored securely and were accessible only to members of the research team.

Data were analyzed using Braun and Clarke's six-phase approach to thematic analysis, comprising familiarization with the data, generation of initial codes, development of candidate themes, review of themes against the coded data and overall dataset, definition and naming of themes, and production of the analytical report (10). The researchers first engaged with the transcripts to develop familiarity with participants' accounts and identify segments relevant to the study objectives. Relevant segments were coded, and conceptually related codes were subsequently organized into broader patterns of meaning. Candidate themes and subthemes were reviewed in relation to the coded material to assess their internal coherence and distinction from other themes. Themes were then refined and named to represent the principal patterns identified across participants' experiences. Representative quotations were selected from the transcripts to demonstrate the connection between the analytical interpretation and participants' accounts. The final thematic structure consisted of five major themes

addressing personalized learning, educational and professional benefits, critical verification, challenges and ethical responsibilities, and future integration of ChatGPT into surgical education.

Trustworthiness was considered in accordance with the principles of credibility, dependability, confirmability, and transferability described by Lincoln and Guba (11). Credibility was supported through in-depth interviewing, verbatim transcription, verification of transcript accuracy, and the use of participant quotations to demonstrate the relationship between the findings and the underlying accounts. Dependability was supported through the application of a systematic and explicitly defined thematic-analysis process. Confirmability was strengthened by grounding the reported themes in coded interview material and representative participant quotations rather than presenting unsupported researcher interpretations. Transferability was facilitated by describing the professional composition and experience of the study sample and the tertiary-care operating-theatre context in which participants worked. These procedures were used to strengthen transparency and allow readers to evaluate the credibility and applicability of the qualitative findings.

Ethical approval for the study was obtained from the appropriate Institutional Review Board of the University of Lahore before data collection. All participants provided written informed consent and were informed about the purpose of the study, the voluntary nature of participation, their right to withdraw without adverse consequences, the audio-recording procedure, and measures used to maintain confidentiality and anonymity. Participant identities were removed from transcripts and study outputs, and anonymized identification codes were used when reporting quotations. Study records and audio material were maintained securely with access restricted to the research team.

RESULTS

Sixteen surgical and perioperative healthcare professionals participated in the study. The sample included three surgeons (18.8%), four anesthesia professionals (25.0%), five operation theatre technologists (31.3%), and four operating theatre nurses (25.0%). Ten participants (62.5%) were female and six (37.5%) were male. Most participants had substantial professional experience: nine (56.3%) had worked for 6–10 years, five (31.3%) for 1–5 years, and two (12.5%) for more than 10 years. Seven participants (43.8%) held bachelor's degrees, four (25.0%) held master's degrees, and five (31.3%) held fellowship, FCPS, MS, or MD qualifications. Participant characteristics are summarized in Table 1.

Table 1. Characteristics of Participants (n = 16)

Characteristic	Category	n	%
Profession	Surgeons	3	18.8
	Anesthesia professionals	4	25.0
	Operation theatre technologists	5	31.3
	Operating theatre nurses	4	25.0
Gender	Male	6	37.5
	Female	10	62.5
Professional experience	1–5 years	5	31.3
	6–10 years	9	56.3
	>10 years	2	12.5
Highest qualification	Bachelor's degree	7	43.8
	Master's degree	4	25.0
	Fellowship/FCPS/MS/MD	5	31.3

Thematic analysis generated five overarching themes and 24 associated subthemes describing participants' experiences and perceptions of ChatGPT as a learning companion in operating-theatre practice. The themes were: (1) ChatGPT as a Personalized Learning Companion; (2) Educational Benefits for Surgical Learning and Professional Development; (3) Balancing Trust with Critical Verification; (4) Navigating Challenges and Ethical Responsibilities; and (5) Future Integration of ChatGPT in Surgical Education. Across the dataset, participants described ChatGPT as an accessible and flexible educational resource while simultaneously emphasizing that AI-generated information required critical appraisal and verification. The themes and corresponding subthemes are summarized in Table 2.

Theme 1: ChatGPT as a Personalized Learning Companion

Participants described accessibility and immediacy as central features of their experience with ChatGPT. The conversational format enabled them to seek explanations when they encountered difficulty understanding

anatomy, surgical procedures, disease processes, or other perioperative concepts. Rather than waiting for a formal teaching opportunity, participants could ask questions when an educational need arose and request additional clarification when an initial explanation was insufficient.

Table 2. Themes and Subthemes Generated Through Thematic Analysis

No.	Theme	Subthemes
1	ChatGPT as a Personalized Learning Companion	Easy accessibility; self-directed learning; quick clarification of concepts; time-saving; learning at one's own pace
2	Educational Benefits for Surgical Learning and Professional Development	Case preparation; understanding surgical procedures; examination and presentation preparation; research assistance; continuous professional development
3	Balancing Trust with Critical Verification	Cross-checking information; use of textbooks and clinical guidelines; consultation with senior colleagues; evidence-based learning
4	Navigating Challenges and Ethical Responsibilities	Inaccurate responses; hallucinated information; lack of references; overdependence on AI; patient confidentiality and academic integrity
5	Future Integration of ChatGPT in Surgical Education	Curriculum integration; AI literacy training; institutional policies; responsible use of AI; AI as a supportive educational tool

The accessibility of ChatGPT also supported self-directed learning. Participants described using the tool independently to review previously learned material, clarify unfamiliar terminology, and obtain preliminary explanations before consulting more detailed educational resources. This pattern suggested that ChatGPT was often used as an entry point into a topic rather than as the only source of information.

"ChatGPT is like a pocket teacher; I use it whenever I get stuck in anatomy or surgical steps." (P3)

The ability to obtain rapid explanations was perceived as particularly useful when participants were preparing for clinical activities or revising material within limited time. Participants described using ChatGPT shortly before entering wards or operating-theatre environments, indicating that its perceived value was partly related to the speed with which educational information could be accessed.

"It helps me revise quickly before going to the ward or operation theatre." (P7)

Participants also described a layered approach to learning in which ChatGPT was used to establish an initial understanding before more authoritative or detailed resources were consulted. This use positioned the tool as a facilitator of preliminary comprehension rather than a replacement for conventional educational material.

"I first ask ChatGPT for basic understanding, then I go to textbooks for detail." (P11)

Taken together, these accounts indicated that participants valued ChatGPT primarily for accessibility, flexible pacing, rapid clarification, and support for independent learning. The perceived advantage was therefore not only the availability of information but the ability to interact with that information according to an individual's immediate learning need.

Theme 2: Educational Benefits for Surgical Learning and Professional Development

Participants perceived ChatGPT as useful across several areas of surgical and perioperative learning, particularly case preparation, procedural revision, academic presentation preparation, research-related activities, and continuing professional development. The perceived educational value extended beyond isolated factual questions and included assistance in organizing and simplifying complex professional information. Case and procedure preparation represented an important area of use. Participants described asking ChatGPT to explain the sequence of surgical procedures before participating in or assisting with unfamiliar cases. Such use appeared to help participants develop a preliminary conceptual framework for understanding procedural stages before entering the operating theatre.

"It helped me understand surgical procedures step by step before assisting in theatre." (P2)

The tool was also used to support academic activities. Participants described obtaining help in organizing presentations and structuring educational material, particularly when they needed to convert complex information into an understandable sequence. This was perceived as reducing the time required for preliminary preparation.

"I used it for making presentations and it made the content much easier to structure." (P6)

Research and literature-related support constituted another perceived benefit. Participants reported using ChatGPT for generating research ideas and obtaining summaries of literature. The principal perceived advantage in this context was efficiency, although these activities also intersected with participants' concerns regarding accuracy and verification described under Theme 3.

"For research ideas and literature summaries, it saves a lot of time." (P9)

Participants' accounts therefore suggested that ChatGPT was perceived as supporting multiple dimensions of professional learning, including preparation for clinical exposure, conceptual understanding of surgical procedures, presentation development, preliminary research assistance, and continued knowledge development. Importantly, participants generally positioned these functions as supplementary to conventional learning resources, supervised clinical practice, and professional experience.

Theme 3: Balancing Trust with Critical Verification

Despite describing numerous educational advantages, participants did not consistently regard ChatGPT as an authoritative or independently sufficient source of clinical knowledge. A prominent theme concerned the need to balance the convenience of AI-generated explanations with deliberate verification through established educational and clinical resources. Participants described cross-checking important information against textbooks, clinical guidelines, peer-reviewed sources, or advice from senior colleagues. Verification was particularly important when information related to clinical concepts or could potentially influence professional understanding.

"But I don't believe it totally, always check from textbooks/seniors." (P4)

The accounts indicated that uncertainty itself could trigger additional verification. Participants described situations in which a ChatGPT response appeared plausible but still required comparison with recognized guidance before being accepted.

"When I do not understand how to do a question, I will double check it on guidelines, but sometimes the answer is correct even if I am unsure." (P8)

Participants also drew a boundary between educational assistance and clinical decision-making. Although ChatGPT could help explain concepts or initiate learning, participants did not perceive its responses as sufficiently reliable to serve as the sole basis for clinical decisions.

"It is useful but not 100% for the clinical decision." (P12)

These accounts demonstrated a recurring pattern of conditional trust. Participants valued the accessibility and explanatory capacity of ChatGPT while maintaining awareness that information generated by the system could require independent confirmation. Verification therefore emerged not as a peripheral behaviour but as a central condition governing responsible educational use.

Theme 4: Navigating Challenges and Ethical Responsibilities

Participants identified several limitations that constrained their trust in ChatGPT, including inaccurate or incomplete responses, potentially fabricated information, inadequate referencing, overreliance on AI, and broader ethical concerns. These limitations reinforced participants' view that generative AI required cautious and professionally responsible use. Accuracy was one of the most prominent concerns. Participants observed that ChatGPT could produce responses that appeared coherent and convincing even when the underlying information was incorrect or incomplete.

"It can provide false or incomplete information at times so caution must be taken." (P1)

The perceived credibility of the language used by ChatGPT was itself considered problematic because confidently expressed information could potentially be accepted without sufficient scrutiny. This concern was reflected in another participant's observation:

"Sometimes it provides very convincing answers, but they are not always accurate."

Participants also expressed concern about excessive reliance on AI. From their perspective, frequent dependence on instant responses could discourage learners from independently engaging with textbooks, evidence-based sources, clinical reasoning, or conventional learning processes.

"There is a danger that student might rely on it rather than learning independently." (P5)

Beyond accuracy and dependence, participants raised broader ethical responsibilities associated with generative AI use. These included maintaining academic integrity, protecting patient confidentiality, and ensuring that AI-generated information was not used uncritically in clinical settings. Participants' concerns positioned professional accountability with the healthcare practitioner rather than with the AI system. ChatGPT was therefore viewed as a resource whose educational benefits depended on users recognizing its limitations and maintaining appropriate professional boundaries.

Theme 5: Future Integration of ChatGPT in Surgical Education

Participants generally expressed a positive but conditional view of the future role of ChatGPT in surgical education. Rather than supporting unrestricted adoption, their accounts emphasized structured integration accompanied by AI literacy, professional oversight, institutional policies, and clear expectations regarding responsible use.

Participants considered generative AI potentially valuable as part of medical and health-professions education when learners were taught how to use it appropriately and critically.

"With right guidance it can be a powerful component of medical education." (P3)

AI literacy emerged as an important requirement for future implementation. Participants indicated that learners and healthcare professionals would require training not simply in accessing ChatGPT but in evaluating its outputs, recognizing potential errors, protecting confidential information, and determining when authoritative clinical resources or expert consultation were necessary.

"Training in the responsible use of AI in learning is required." (P7)

Participants also strongly maintained the distinction between AI-supported learning and conventional professional education. Clinical teachers, mentorship, direct patient care, supervised procedural experience, teamwork, and experiential learning were regarded as essential components of surgical education that could not be replaced by a conversational AI system.

"It should enhance, not supplant, teachers and clinical experience." (P11)

The envisioned future role of ChatGPT was therefore supplementary rather than substitutive. Participants' accounts supported integration within a structured educational environment in which AI-assisted learning is accompanied by appropriate training, institutional guidance, evidence verification, and continued reliance on supervised clinical experience.

Table 3. Themes, Subthemes, Illustrative Codes, and Representative Participant Quotations

Theme	Subthemes illustrated by available quotations	Illustrative initial codes	Representative quotation
ChatGPT as a Personalized Learning Companion	Accessibility; self-directed learning; clarification of concepts	Easy access; instant answers; independent learning	"ChatGPT is like a pocket teacher; I use it whenever I get stuck in anatomy or surgical steps." (P3)
	Time-saving; rapid revision	Flexible learning; quick revision	"It helps me revise quickly before going to the ward or operation theatre." (P7)
	Preliminary understanding; learning at one's own pace	Basic understanding; progression to conventional resources	"I first ask ChatGPT for basic understanding, then I go to textbooks for detail." (P11)
Educational Benefits for Surgical Learning and Professional Development	Case preparation; understanding surgical procedures	Case preparation; procedure revision	"It helped me understand surgical procedures step by step before assisting in theatre." (P2)
	Presentation preparation	Academic preparation; content organization	"I used it for making presentations and it made the content much easier to structure." (P6)
	Research assistance; professional learning	Research support; literature summaries; time-saving	"For research ideas and literature summaries, it saves a lot of time." (P9)
Balancing Trust with Critical Verification	Cross-checking; textbooks; senior consultation	Verification; senior consultation	"But I don't believe it totally, always check from textbooks/seniors." (P4)
	Clinical guidelines; critical appraisal	Guideline verification; uncertainty	"When I do not understand how to do a question, I will double check it on guidelines, but sometimes the answer is correct even if I am unsure." (P8)
	Limits of trust; clinical decision-making	Conditional trust; clinical boundaries	"It is useful but not 100% for the clinical decision." (P12)
Navigating Challenges and Ethical Responsibilities	Inaccurate or incomplete information	Incorrect information; reliability concerns	"It can provide false or incomplete information at times so caution must be taken." (P1)
	Convincing but inaccurate responses	Hallucination; misplaced confidence	"Sometimes it provides very convincing answers, but they are not always accurate."
	Overdependence on AI	Overreliance; reduced independent learning	"There is a danger that student might rely on it rather than learning independently." (P5)
Future Integration of ChatGPT in Surgical Education	Curriculum integration; guided use	Curriculum development; educational integration	"With right guidance it can be a powerful component of medical education." (P3)
	AI literacy; responsible use	AI training; responsible AI use	"Training in the responsible use of AI in learning is required." (P7)
	Supplementary rather than replacement role	Professional mentorship; clinical experience	"It should enhance, not supplant, teachers and clinical experience." (P11)

Overall, the findings demonstrated a consistent conceptual tension between accessibility and caution. Participants valued ChatGPT because it provided rapid explanations, supported independent learning, assisted preparation for

clinical and academic activities, and offered flexible access to information. At the same time, their accounts emphasized that these advantages did not remove the need for textbooks, clinical guidelines, peer-reviewed evidence, senior consultation, professional judgment, and supervised clinical experience. ChatGPT was therefore perceived primarily as a supplementary educational companion whose usefulness depended on critical verification, AI literacy, ethical awareness, and clearly defined professional boundaries.

DISCUSSION

This qualitative study explored how surgical and perioperative personnel experienced ChatGPT as a learning companion within the context of operating-theatre practice. Five interconnected themes characterized participants' accounts: ChatGPT as a personalized learning companion; educational benefits for surgical learning and professional development; balancing trust with critical verification; navigating challenges and ethical responsibilities; and future integration of ChatGPT into surgical education. Collectively, the findings indicate that participants perceived ChatGPT as a readily accessible and flexible educational resource that could support rapid clarification, case preparation, procedural review, academic activities, and self-directed professional learning. However, this perceived usefulness was consistently accompanied by caution regarding accuracy, fabricated or incomplete information, overdependence, confidentiality, academic integrity, and the need to verify important information using established evidence-based resources. The central finding was therefore not unconditional acceptance of generative AI, but a pattern of conditional trust, in which educational convenience was considered valuable only when accompanied by critical appraisal and professional judgment.

Participants' descriptions of ChatGPT as a personalized and readily available learning companion are consistent with the broader literature on generative AI in healthcare education. Previous reviews have identified accessibility, individualized explanations, rapid information retrieval, support for problem-based learning, and assistance with self-directed learning among the potential educational advantages of ChatGPT, while emphasizing that such benefits depend on appropriate use and verification (12). Studies involving medical students similarly suggest that ChatGPT is increasingly incorporated into academic activities because of its ability to provide immediate explanations and conversational interaction, although patterns of use and confidence in the technology remain variable (13). In surgical education specifically, ChatGPT has demonstrated the ability to provide answers to surgical questions at a level that may be useful for learning, but comparisons with conventional information-search strategies have not established that it should replace established educational resources (14). The present findings extend this literature by showing how such perceived accessibility operates within workplace-based perioperative learning, where participants described using the tool for rapid preparation and clarification before clinical or educational activities.

The second theme highlighted the perceived usefulness of ChatGPT for case preparation, procedural understanding, presentations, research-related activities, and continuing professional development. These findings suggest that participants used the tool for more than examination-oriented question answering. Instead, ChatGPT was incorporated into several stages of professional learning, including initial orientation to unfamiliar procedures, organization of academic material, and preliminary exploration of research topics. This broader educational role is supported by evidence showing that large language models can generate structured feedback in surgical scenarios. Jarry Trujillo et al. found that ChatGPT-generated feedback based on written surgical situations was considered useful by surgical residents and could perform comparably with surgeon-generated feedback on several evaluation dimensions (15). Such findings provide support for the potential use of generative AI in structured educational activities, but they should not be interpreted as evidence that conversational AI can substitute for supervised procedural training. Technical skill acquisition, clinical reasoning, situational awareness, teamwork, direct observation, feedback from experienced practitioners, and repeated supervised practice remain fundamental to competence development in surgery and perioperative care.

A particularly important finding was participants' emphasis on verification. Although ChatGPT was perceived as useful, participants described checking important outputs against textbooks, clinical guidelines, peer-reviewed evidence, or senior colleagues. This behaviour reflects recognition of a fundamental limitation of generative AI: fluent and persuasive responses are not necessarily accurate. Surgical performance studies provide empirical support for this caution. Tran et al. reported that ChatGPT correctly answered 62% of a set of general surgery examination-preparation questions and performed less reliably on questions requiring more complex clinical

decision-making; some incorrect responses were nevertheless accompanied by coherent and confidently expressed explanations (16). Consequently, the educational value of ChatGPT may depend less on accepting its outputs as authoritative answers and more on using those outputs as prompts for further inquiry, comparison, and critical appraisal. The verification behaviours reported in the present study may therefore represent an important form of emerging AI literacy among healthcare professionals.

This distinction between educational support and clinical decision-making is especially important in the operating-theatre environment. Participants generally positioned ChatGPT as an aid for understanding, revision, or preparation rather than as an independent source of patient-specific clinical decisions. The difference has practical significance because errors in a learning context may reinforce misconceptions, whereas errors transferred into clinical decision-making may have direct implications for patient safety. Large language models may generate plausible explanations without reliable indication of uncertainty, and their responses can vary according to model version, prompting strategy, context, and available information. The present findings therefore support a layered approach in which generative AI may initiate or facilitate learning, but clinically consequential information is verified using authoritative evidence, institutional guidance, or appropriately qualified professionals.

The fourth theme concerned inaccurate information, hallucination, insufficient referencing, dependence on AI, patient confidentiality, and academic integrity. These concerns are consistent with systematic evaluations of ChatGPT in healthcare, which have highlighted inaccurate content, fabricated or incorrect citations, transparency concerns, plagiarism, bias, privacy and cybersecurity risks, and uncertainty regarding accountability (12). Ethical analyses of generative AI in healthcare have similarly emphasized that broad ethical principles need to be translated into practical safeguards for privacy, transparency, responsibility, human oversight, and safe use (17). In surgical education, these considerations are particularly relevant because learners may interact with highly specific clinical information. Generative AI should therefore be used without entering identifiable patient information or other confidential clinical data into systems that are not institutionally approved for such use. Academic applications also require explicit expectations concerning authorship, attribution, assessment integrity, and disclosure of AI assistance.

Participants' concerns about overdependence further suggest that convenience may become educationally counterproductive if learners substitute generated answers for active reasoning, source appraisal, or engagement with foundational material. The educational challenge is therefore not simply to provide access to AI tools, but to establish how they should be used within an appropriate learning sequence. One potentially useful model is to treat ChatGPT as an initial explanatory or questioning tool followed by independent verification, reflection, discussion with educators, and application through supervised clinical experience. Such an approach would preserve the accessibility of generative AI while maintaining the cognitive and experiential processes required for professional development.

The fifth theme indicated generally positive attitudes toward future integration of ChatGPT into surgical education, provided that integration is structured and accompanied by AI literacy training and institutional guidance. Participants did not envisage AI as a substitute for teachers, senior clinicians, or clinical experience. Instead, their accounts suggested a supplementary role within a broader educational ecosystem. Emerging work on AI competency development in medical education similarly emphasizes the need for competencies that extend beyond technical familiarity to include practical use, critical evaluation, limitations, ethical considerations, and appropriate clinical application (18). For perioperative education, AI literacy could therefore include understanding how generative models produce responses, recognizing hallucinations and unsupported references, constructing appropriate prompts, checking generated information against primary or authoritative sources, protecting patient confidentiality, and recognizing circumstances in which AI should not influence clinical decisions.

These findings have several practical implications for health-professions education. Institutions considering the incorporation of generative AI into surgical or perioperative training should move beyond either unrestricted use or complete prohibition. Educational policies could instead define acceptable and unacceptable uses, establish standards for protecting confidential clinical information, require verification of clinically important information, and clarify expectations regarding AI-assisted academic work. Faculty development is also important because educators require sufficient AI literacy to supervise learners, discuss limitations, and model appropriate verification practices. Structured learning activities could incorporate critical comparison of AI-generated

explanations with guidelines, textbooks, or peer-reviewed evidence, thereby transforming potential inaccuracies into opportunities to develop evidence appraisal and digital professionalism.

The study also contributes a perspective that differs from much of the existing literature because participants were practicing surgical and perioperative personnel rather than exclusively undergraduate medical students. Their experiences were situated within a workplace where learning occurs alongside patient care, interprofessional communication, procedural preparation, and continuing professional development. This context may influence both the perceived usefulness and perceived risks of ChatGPT. For example, rapid access to simplified explanations may be particularly attractive in time-constrained clinical environments, while awareness of professional accountability may simultaneously encourage verification. The multidisciplinary inclusion of surgeons, anesthesia professionals, operation theatre technologists, and operating theatre nurses therefore provides useful insight into how generative AI may be perceived across the wider perioperative workforce.

Several limitations should be considered when interpreting the findings. The study involved a relatively small purposively selected sample of 16 participants from tertiary-care teaching-hospital settings in Pakistan; consequently, the findings are intended to provide contextualized qualitative understanding rather than population-level estimates. Participants were required to have previous experience using ChatGPT, meaning that the study primarily represents the perspectives of existing users and may not capture the views of perioperative professionals who avoid or reject generative AI. The findings were based on self-reported experiences and may therefore have been influenced by recall or social-desirability effects. In addition, the study evaluated perceived educational value rather than objectively measured improvements in knowledge, clinical reasoning, technical performance, or patient outcomes. The evolving capabilities of generative AI also mean that experiences associated with a particular period or version of ChatGPT may not remain unchanged as models, interfaces, institutional policies, and user familiarity develop.

Future research should include more diverse professional groups, institutions, geographic settings, and participants with different levels of experience with generative AI. Comparative qualitative studies could examine differences between professional roles, junior and senior practitioners, frequent and occasional users, and users and non-users. Mixed-methods and longitudinal research could additionally determine whether perceived educational benefits translate into measurable improvements in knowledge retention, clinical reasoning, evidence-appraisal skills, or professional development. Research should also evaluate structured AI-literacy interventions, institutional governance approaches, and educational models in which ChatGPT-generated information is systematically compared with authoritative clinical sources.

Overall, the findings suggest that the educational significance of ChatGPT in operating-theatre practice lies not in replacing conventional surgical education, but in providing an accessible and interactive layer of support around it. Its perceived usefulness appears to depend on a combination of accessibility, learner autonomy, critical verification, professional accountability, and continued reliance on human mentorship and supervised clinical experience. Responsible integration should therefore prioritize the development of AI-literate healthcare professionals who can use generative AI efficiently while remaining capable of questioning, verifying, and appropriately rejecting its outputs.

CONCLUSION

Surgical and perioperative personnel perceived ChatGPT as a useful supplementary learning companion that supported rapid clarification of concepts, self-directed learning, case and procedural preparation, academic activities, and continuing professional development. Its perceived value was nevertheless conditional on critical verification because participants recognized the possibility of inaccurate, incomplete, or fabricated information and expressed concerns regarding overdependence, confidentiality, and academic integrity. ChatGPT should therefore complement rather than replace textbooks, clinical guidelines, peer-reviewed evidence, professional mentorship, and supervised operating-theatre experience. Responsible integration into surgical education requires practical AI-literacy training, clear institutional policies, protection of patient information, and explicit expectations regarding verification and professional accountability. Future educational strategies should focus not simply on increasing access to generative AI, but on enabling surgical personnel to use such tools critically, ethically, and within appropriate clinical and educational boundaries.

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