

Ethical tensions in AI-mediated clinical communication: a mixed-methods study of nursing students' perspectives

Xiongwen Yang

Guizhou Provincial People's Hospital

Yi Xiao

Third Affiliated Hospital of Sun Yat-sen University

Di Liu

Guizhou Provincial People's Hospital

Yongpan Sun

Guizhou Provincial People's Hospital

Xiaojiang Zhou

Guizhou Provincial People's Hospital

Jing Yao

Guizhou Provincial People's Hospital

Bo Zhang

Guizhou Provincial People's Hospital

Lin Yang

Guizhou Provincial People's Hospital

Wankai Guo

Guizhou Provincial People's Hospital

Wei Juan Tang

Guizhou Provincial People's Hospital

Xiaomin Tang

Guizhou Provincial People's Hospital

Yajie Wu

Guizhou Provincial People's Hospital

Xinyu Hu

Guizhou Provincial People's Hospital

Fang Wu

Guizhou Provincial People's Hospital

Di Wang

Guizhou Provincial People's Hospital

Chuan Xu

xuchuan89757@163.com

Guizhou Provincial People's Hospital

Research Article

Keywords: Artificial intelligence, AI-mediated communication, Healthcare ethics, Interpretive authority, Professional responsibility, Uncertainty communication

Posted Date: June 29th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10030405/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.
[Read Full License](#)

Additional Declarations: No competing interests reported.

Version of Record: A version of this preprint was published at BMC Medical Ethics on September 9th, 2026. See the published version at <https://doi.org/10.1186/s12910-026-01602-4>.

Abstract

Background

The increasing use of artificial intelligence (AI), particularly large language models (LLMs), is reshaping clinical communication by influencing how patients access, interpret, and act upon medical information. Recent conceptual work has suggested that AI-mediated communication raises ethical questions concerning interpretive authority, professional responsibility, and uncertainty communication. However, empirical evidence regarding how future healthcare professionals understand and respond to these emerging ethical challenges remains limited. This study explored perceptions of AI-mediated clinical communication, with particular attention to interpretive authority, responsibility, and uncertainty.

Methods

An exploratory convergent mixed-methods design was employed. Thirty-two undergraduate nursing students (16 international and 16 local) participated in a theory-informed case-based session involving AI-mediated communication scenarios across a surgical care pathway. Quantitative data were collected using pre–post questionnaires and analysed descriptively. Qualitative written responses were analysed using reflexive thematic analysis and subsequently subjected to structured thematic quantification to facilitate comparison across participant groups. Given the exploratory nature of the study, analyses focused on identifying patterns of perception and interpretation rather than causal effects.

Results

Participants showed higher descriptive mean scores across all three ethical domains following the session, particularly interpretive authority and uncertainty communication. Qualitative analysis identified three higher-order dimensions: perceptions of AI in clinical contexts, ethical and communication tensions in AI-mediated care, and professional roles in AI-mediated communication. Participants recognised challenges associated with patient over-reliance on AI, difficulties in correcting AI-influenced understanding, and tensions arising from the communication of uncertainty. They also described an expanded professional role involving interpretive mediation, trust-building, and contextualisation of AI-generated information. Patterns were broadly consistent across participant groups, although variation was observed in the salience of specific themes.

Conclusions

The findings suggest that AI-mediated clinical communication introduces identifiable ethical tensions concerning authority, responsibility, and uncertainty. Participants recognised that AI-generated explanations may reshape how clinical meaning is interpreted and negotiated while leaving professional

accountability largely intact. By providing empirical evidence informed by a conceptual framework of AI-mediated communication, this study contributes to emerging discussions regarding the ethical implications of AI in healthcare communication and highlights the importance of addressing authority, accountability, and uncertainty within the responsible governance of AI-enabled healthcare communication.

Introduction

Artificial intelligence (AI), particularly large language models (LLMs), is becoming increasingly embedded in healthcare systems, reshaping how clinical information is accessed, interpreted, and communicated[1–3]. In contemporary practice, LLMs are used to translate complex diagnostic reports into patient-friendly explanations, support clinical documentation, and assist patients in understanding health information outside formal clinical encounters[1, 4]. While these developments may enhance accessibility and efficiency, they also raise important ethical questions concerning how clinical information is interpreted, trusted, and acted upon, particularly in contexts characterised by complexity and uncertainty such as surgical care[5, 6].

Clinical communication has traditionally been understood as a relational and interpretive practice in which healthcare professionals play a central role in explaining medical information, contextualising uncertainty, and supporting patient understanding across the care process[7–9]. However, the increasing availability of AI-generated explanations is altering this dynamic. Patients may now encounter algorithmically generated interpretations prior to or alongside professional communication, shaping their expectations, perceptions of risk, and trust in healthcare professionals[10, 11]. As a result, clinical meaning is no longer constructed solely within clinician–patient interactions but emerges through a distributed process involving patients, healthcare professionals, and algorithmic systems[10, 12]. This shift raises ethical questions regarding who has the authority to define clinical meaning, who remains responsible for communicative outcomes, and how uncertainty should be represented when algorithmic explanations influence patient understanding.

Recent scholarship in healthcare ethics, communication studies, and nursing ethics has increasingly suggested that AI-mediated clinical communication should be understood not merely as information transfer but as a process that shapes how clinical meaning is interpreted, negotiated, and legitimised[13–17]. Within this framework, building on broader discussions concerning authority, accountability, and uncertainty in healthcare communication and AI ethics, three interrelated dimensions were used in this study as a conceptual framework: interpretive authority, responsibility, and uncertainty communication[6, 9, 13–16]. Together, these dimensions suggest that AI-mediated communication may redistribute interpretive influence, complicate responsibility structures, and reshape the representation of uncertainty in everyday care[13].

These ethical challenges are particularly salient for healthcare professionals who are responsible for supporting patient understanding and decision-making. Nurses provide an especially informative

professional perspective because they are frequently involved in ongoing communication with patients and are often required to clarify, contextualise, and negotiate information originating from multiple sources[18, 19]. As AI-generated explanations become more widely accessible, nurses may increasingly encounter patients with pre-formed interpretations that require negotiation, correction, or recalibration [20, 21]. In such contexts, nursing practice offers a useful lens through which to examine how AI-mediated communication may affect interpretive mediation, ethical accountability, and the communication of uncertainty in clinical care[13].

Despite growing conceptual discussion regarding AI-mediated communication and healthcare ethics, empirical evidence remains limited concerning how future healthcare professionals understand and respond to these emerging ethical challenges. Although increasing research has examined AI literacy, AI adoption, and educational applications of AI in healthcare, relatively little attention has been paid to how learners perceive the ethical tensions generated when AI becomes involved in clinical communication[22–26, 17]. Addressing this gap is important because future healthcare professionals are likely to practise in environments where patients’ understanding is shaped by multiple sources of information, including AI-generated explanations.

Surgical care provides a particularly useful context for exploring these issues because communication about risk, uncertainty, and postoperative outcomes is central to patient care[6, 27]. In such settings, patients frequently seek additional information beyond formal clinical encounters, making surgical communication an informative context for examining how AI-generated explanations may influence understanding, expectations, and trust[8, 21].

To explore these ethical challenges empirically, we used a structured case-based learning approach to create clinically realistic scenarios in which AI-generated explanations influenced patient understanding across different stages of the surgical pathway. The educational setting served as an empirical context for examining how participants interpreted and responded to ethical tensions arising from AI-mediated communication.

This exploratory mixed-methods study aimed to investigate how nursing students as future healthcare professionals perceive and respond to ethical challenges associated with AI-mediated clinical communication, with particular attention to interpretive authority, responsibility, and uncertainty. Using nursing students as an empirical case, the study sought to generate initial evidence regarding how these emerging ethical tensions are understood and negotiated within professional training contexts.

Methods

Study design

This study adopted an exploratory convergent mixed-methods design informed by a conceptual framework of AI-mediated clinical communication. The framework conceptualises how artificial

intelligence may reshape clinical communication through three ethical dimensions: interpretive authority, responsibility, and uncertainty communication.

The study was designed as an empirical exploration of how future healthcare professionals perceive and respond to ethical challenges arising from AI-mediated clinical communication. A theory-informed case-based discussion session was used as an empirical context through which participants engaged with clinically realistic scenarios involving AI-generated explanations and patient understanding. Quantitative and qualitative data were collected concurrently and analysed separately, with findings subsequently integrated to provide a complementary understanding of participants’ perceptions and interpretations.

Given the exploratory nature of the study, the analysis focused on identifying patterns of ethical understanding and interpretation rather than establishing causal effects.

Participants and setting

A total of 32 undergraduate nursing students participated in the study, including 16 international students and 16 local students (Table 1). All participants were Year 3 students undertaking professional nursing training at Guizhou Provincial People's Hospital. Participants were recruited from scheduled teaching sessions. Participation was voluntary, and written informed consent was obtained prior to data collection.

Table 1
Participant characteristics.

Characteristic	International (n = 16)	Local (n = 16)	Total (n = 32)
Gender, n (%)			
Male	9 (56.3)	2 (12.5)	11 (34.4)
Female	7 (43.7)	14 (87.5)	21 (65.6)
Year of study, n (%)			
Year 3	16 (100.0)	16 (100.0)	32 (100.0)
Previous clinical experience, n (%)			
Yes	0 (0.0)	0 (0.0)	0 (0.0)
No	16 (100.0)	16 (100.0)	32 (100.0)

Nursing students were selected because they represent future healthcare professionals who are likely to encounter AI-mediated communication in clinical practice and who will increasingly be required to navigate ethical challenges associated with AI-generated health information. Although participants had no prior clinical experience, they had completed foundational coursework in nursing theory,

communication, and professional practice, enabling engagement with ethical issues presented in the scenarios.

Empirical context and case scenarios

Participants engaged in a structured case-based discussion session focusing on AI-mediated clinical communication within a surgical care context. The session was explicitly informed by a conceptual framework of interpretive authority, responsibility, and uncertainty communication, which served as analytical lenses for participant discussion and reflection.

The session comprised three sequential components. First, participants received a conceptual introduction (approximately 15 minutes) outlining the increasing use of AI in healthcare communication and introducing key concepts related to AI-mediated communication, including distributed interpretive authority, evolving responsibility, and challenges associated with communicating uncertainty. Second, participants took part in a case-based discussion phase (approximately 45–60 minutes). Three clinical scenarios were presented representing different stages of the surgical pathway: preoperative consultation, postoperative recovery, and discharge planning. In each scenario, patients were described as having accessed AI-generated explanations that differed from professional advice. Participants worked in small groups (4–6 participants) to discuss potential professional responses, with particular attention to explaining risk, addressing misunderstanding, negotiating conflicting interpretations, and maintaining patient trust. Finally, participants engaged in facilitated reflection (approximately 20 minutes). The facilitator guided discussion linking participants' responses to the three ethical dimensions underpinning the study and encouraged reflection on the implications of AI-mediated communication for professional practice. The purpose of the session was not to train the use of specific AI tools but to provide a structured context for examining how participants understood and responded to ethical challenges arising from AI-mediated clinical communication.

A structured overview of the case scenarios and discussion prompts is provided in **Supplementary File S1** to support transparency and reproducibility.

Questionnaire development

A structured questionnaire was developed to assess participants' perceptions of AI-mediated clinical communication and its ethical implications (**Table S1**). The instrument comprised Likert-scale items organised into three conceptual domains: interpretive authority, responsibility, and uncertainty communication, derived from the conceptual framework underpinning the study[13].

Item development was informed by scholarship in healthcare ethics, clinical communication, nursing ethics, and AI-mediated clinical communication[13]. The items were designed to capture participants' perceptions of how AI may influence meaning-making, accountability, and the communication of uncertainty in clinical contexts.

To support content validity, the questionnaire was reviewed by members of the research and teaching team with expertise in healthcare ethics, nursing ethics, clinical communication, and health professions education. Review focused on clarity, relevance, and alignment with the conceptual framework, and minor refinements were made accordingly[28, 29].

All items were rated on a five-point Likert scale ranging from strongly disagree to strongly agree. As the instrument was developed for exploratory empirical research, formal psychometric validation was not conducted. Findings should therefore be interpreted as indicative of patterns of perception rather than validated measurement of underlying constructs. This approach is consistent with exploratory research in emerging areas where context-specific instruments are developed to investigate novel phenomena[30, 31].

Quantitative data collection and analysis

Participants completed the questionnaire immediately before and after the case-based session.

Data were analysed using descriptive statistics. Mean scores were calculated for individual items and for each conceptual domain to examine patterns in participants' perceptions.

Given the small sample size and exploratory design, no inferential statistical testing was performed[30]. Quantitative findings are presented in tabular and graphical formats to illustrate patterns across domains and participant groups. The quantitative component was intended to provide descriptive insight into participants' ethical perceptions rather than to evaluate intervention effectiveness or establish causal relationships[31].

Qualitative data collection

Following the session, participants provided written responses to a set of open-ended questions designed to explore their understanding of AI-mediated clinical communication.

The questions addressed three areas: perceived ethical challenges associated with AI-mediated communication, potential professional responses in such situations, and reflections on the implications of AI-mediated communication for clinical practice.

Responses were intentionally brief and could be expressed using phrases, keywords, or short statements, allowing participants to focus on key ideas rather than formal written expression. All responses were collected immediately following the session to capture participants' immediate reflections.

Qualitative data analysis

Qualitative data were analysed using a thematic analysis approach adapted for brief written responses and informed by the principles of reflexive thematic analysis[32, 33].

Analysis involved an iterative process of familiarisation with the data, initial inductive coding, and subsequent development of broader categories. Codes were generated to capture key ideas expressed in participants' responses and were iteratively reviewed, compared, and refined through discussion among members of the research team.

Theme development involved identifying patterned meanings across the dataset and organising related codes into higher-order conceptual groupings. Although the analysis was informed by the study's conceptual framework, themes were developed inductively from the data rather than imposed a priori. This approach enabled alignment with the ethical focus of the study while preserving sensitivity to participants' perspectives.

The final thematic structure comprised three higher-order dimensions and nine themes reflecting: (1) perceptions of AI in clinical contexts, (2) ethical and communication tensions in AI-mediated care, and (3) professional roles in AI-mediated communication.

Researcher reflexivity

The research team included individuals with backgrounds in nursing education, clinical communication, and healthcare ethics. Throughout analysis, discussions were conducted to reflect on how disciplinary perspectives might influence interpretation of the data. Themes were developed iteratively through team discussion to enhance transparency and reflexivity in the analytic process.

Quantification of qualitative data

To facilitate comparison across participant groups, thematic data were subsequently subjected to a structured quantification process. Each response was coded for the presence and level of expression of each theme using a three-point ordinal scale (0 = not present, 1 = implicitly present, 2 = explicitly and clearly expressed).

Coding criteria were developed collaboratively within the research team to support consistency in interpretation. "Implicit presence" referred to indirect or partially expressed references to a theme, whereas "explicit expression" indicated clear and unambiguous articulation.

Coding was conducted iteratively, and discrepancies were discussed until a shared interpretation was reached. A coding matrix was constructed to summarise theme-level coding across participants. Mean salience scores were then calculated for each theme by participant group to explore patterns of thematic emphasis.

This procedure was used to support transparent comparison of thematic prominence across participant groups while preserving the interpretive focus of the qualitative analysis.

These quantified values were used descriptively to support comparison and visualisation of patterns rather than statistical inference. The purpose of quantification was not to convert qualitative findings into formal quantitative measures but to facilitate comparison of thematic salience across participant groups and ethical dimensions.

This approach is consistent with mixed-methods research practices in which qualitative data are transformed into numerical representations to support pattern identification and comparison[30, 31]. The three-point scale was used to capture variation in the degree of thematic expression rather than simple presence or absence.

Results

Participant characteristics

A total of 32 undergraduate nursing students participated in the study, including 16 international and 16 local students. Participant characteristics are presented in Table 1. All participants were Year 3 nursing students with no previous clinical experience. The sample included both male and female participants and represented a cohort of future healthcare professionals undertaking professional nursing training.

Descriptive changes in perceptions of AI-mediated clinical communication

Descriptive quantitative analysis indicated increased agreement with statements concerning AI-mediated clinical communication across all ethical domains following the case-based session (Table 2, Fig. 2 and Table S2). Mean scores increased from pre- to post-session in both international and local participant groups, suggesting greater recognition of ethical challenges associated with AI-generated health information.

Table 2
Mean scores by ethical domain before and after the case-based session.

Domain	International Pre	International Post	Local Pre	Local Post
General perception of AI impact	3.88	4.38	3.44	4.31
Interpretive authority	3.70	4.08	3.44	3.91
Responsibility	3.75	4.08	3.94	4.13
Uncertainty communication	3.88	4.39	3.73	4.30
Note. G1 was included as a contextual item and was not treated as one of the three ethical domains.				

In the domain of interpretive authority, mean scores increased from 3.70 to 4.08 among international participants and from 3.44 to 3.91 among local participants. This pattern suggests stronger recognition that healthcare professionals may need to interpret, contextualise, and respond to AI-generated explanations encountered by patients. Item-level distributions also demonstrated increased selection of higher Likert response categories (D/E) across both groups (Table 2 and Table S2).

In the responsibility domain, mean scores increased from 3.75 to 4.08 among international participants and from 3.94 to 4.13 among local participants. Although these increases were more modest than those observed in other domains, post-session distributions indicated stronger agreement that professional responsibility for supporting patient understanding remains important even when patients have consulted AI-generated information.

The largest increases were observed in uncertainty communication. Among international participants, mean scores increased from 3.88 to 4.39, while among local participants scores increased from 3.73 to 4.30. This pattern was also reflected in item-level responses, with increased selection of the highest response category (E) across uncertainty-related items.

Overall, both groups demonstrated consistent directional increases across the three ethical domains, with variation in the magnitude of change. These findings are interpreted descriptively as patterns of perception rather than evidence of causal intervention effects.

Thematic findings relating to ethical challenges in AI-mediated clinical communication

Qualitative analysis identified three higher-order dimensions comprising nine themes (Table 3): (1) perceptions of AI in clinical contexts, (2) ethical and communication tensions in AI-mediated care, and (3) professional roles in AI-mediated communication.

Table 3
Ethical themes in AI-mediated clinical communication.

Dimension	Theme	Description	Representative quotation
Perceptions of AI in Clinical Contexts	Over-reliance on AI	Participants perceived that patients may place excessive trust in AI-generated information and rely on it as an authoritative source of health advice.	"Patients may trust AI more than doctors."
	Awareness of AI Limitations	Participants recognised that AI-generated information may lack contextualisation and may not adequately reflect individual patient circumstances.	"AI explanations are too general and may not fit the patient's actual condition."
	AI-induced Misunderstanding	Participants identified the possibility that simplified or incomplete AI-generated explanations could lead to misunderstanding or misinterpretation.	"Patients may misunderstand their condition because AI gives simplified answers."
Ethical and Communication Tensions in AI-mediated Care	Competing Interpretations of Clinical Meaning	Participants described situations in which AI-generated explanations and professional advice may offer conflicting interpretations, creating challenges for communication and trust.	"Patients may question nurses if AI says something different."
	Challenges in Re-negotiating Patient Understanding	Participants highlighted difficulties in correcting beliefs or expectations that have already been shaped by AI-generated information.	"It is hard to change what patients already believe after using AI."
	Negotiating Uncertainty and Risk	Participants recognised tensions arising from the apparent certainty of AI-generated information and the inherent uncertainty of clinical decision-making.	"AI sounds very certain, but in reality there is still risk."
Professional Roles in AI-mediated Communication	Interpretive Mediation	Participants described an expanded professional role involving explanation, contextualisation, and clarification of AI-generated information.	"Nurses need to explain and clarify information based on the patient's situation."

Dimension	Theme	Description	Representative quotation
	Trust-building and Relational Communication	Participants emphasised the importance of maintaining trust through empathy, dialogue, and relationship-centred communication.	"Nurses need to communicate with empathy to maintain trust."
	Communication Competence in AI-mediated Care	Participants identified a need for enhanced communication skills to manage challenges associated with AI-mediated communication.	"We need better communication skills to deal with AI-related situations."

Perceptions of AI in clinical contexts

Within the first dimension, participants frequently described patient over-reliance on AI, noting that patients may place strong trust in AI-generated information. One participant stated that "patients may trust AI more than doctors," while another noted that "AI explanations can make patients feel very confident, even when they are not fully correct."

Participants also recognised limitations of AI-generated information, describing it as "too general" and "not specific to the patient's condition." This was closely linked to AI-induced misunderstanding, with participants indicating that AI-generated explanations may lead to confusion or misinterpretation. As one participant expressed, "patients may misunderstand their condition because AI gives simplified answers."

Together, these responses suggest that participants viewed AI-generated information as ethically consequential because it may shape patient confidence, expectations, and interpretation before professional communication occurs.

Ethical and communication tensions in AI-mediated care

The second dimension reflected tensions arising when AI-generated information interacts with professional advice. Participants described situations in which AI-generated explanations and clinical recommendations may generate competing interpretations of clinical meaning. One participant noted that "patients may question nurses if AI says something different."

Participants also highlighted challenges in re-negotiating patient understanding once beliefs or expectations had already been shaped by AI-generated information. For example, one participant wrote that "it is hard to change what patients already believe after using AI."

Negotiating uncertainty and risk emerged as another important theme. Several responses suggested that AI may present information with apparent certainty, making it more difficult for healthcare professionals to explain risk and ambiguity. One participant commented that "AI sounds very certain, but

in reality there is still risk,” while another noted that “patients may not accept uncertainty if they already received a clear answer.”

These findings indicate that participants recognised AI-mediated communication as a setting in which clinical meaning may become contested, requiring healthcare professionals to negotiate competing interpretations while maintaining patient trust.

Professional roles in AI-mediated communication

The third dimension reflected participants’ understanding of evolving professional roles in AI-mediated communication. Participants described an expanded role involving interpretive mediation, in which healthcare professionals explain, contextualise, and clarify AI-generated information according to the patient’s specific circumstances. One participant noted that healthcare professionals must “explain and clarify information based on the patient’s situation.”

Trust-building and relational communication were also emphasised. Participants recognised that correcting or recalibrating AI-influenced patient understanding requires more than information correction and often depends on maintaining trust through communication. One participant stated that “nurses need to communicate with empathy to maintain trust.”

Participants further highlighted the importance of communication competence in AI-mediated care. Many recognised that AI-mediated communication may require more adaptive approaches to explaining information, addressing misunderstanding, and responding to patient concerns. As one participant wrote, “we need better communication skills to deal with AI-related situations.”

Overall, the qualitative findings suggest that participants perceived AI-mediated clinical communication not merely as an informational issue but as a professional and ethical challenge involving interpretation, responsibility, trust, and uncertainty.

Comparison of thematic salience

Quantified thematic data enabled descriptive comparison of thematic salience between international and local participant groups (Fig. 3). Across both groups, over-reliance on AI and interpretive mediation were the most strongly expressed themes, each reaching the highest mean salience score (2.00). This pattern suggests that participants consistently recognised patient reliance on AI-generated information and the need for professional interpretation as central issues in AI-mediated communication.

Local participants demonstrated slightly higher mean salience scores across several themes, including communication competence (1.94 vs 1.44), AI-induced misunderstanding (1.88 vs 1.63), awareness of AI limitations (1.88 vs 1.81), and negotiating uncertainty and risk (1.69 vs 1.38). These findings suggest more explicit articulation of these themes in their written responses.

In contrast, both groups demonstrated similar levels of emphasis on competing interpretations of clinical meaning (1.94 vs 1.88), challenges in re-negotiating patient understanding (1.88 in both groups),

and trust-building and relational communication (1.75 in both groups), indicating shared recognition of several core ethical and communicative challenges.

When organised by higher-order dimensions, the findings suggest broad consistency across participant groups in perceptions of AI, recognition of ethical and communication tensions, and understanding of professional roles in AI-mediated communication. Differences were primarily observed in the degree of thematic expression rather than in the overall pattern of themes identified.

Because the quantification of qualitative data was used descriptively, these comparisons are interpreted as indicators of thematic prominence rather than statistically tested group differences. The prominence of interpretive mediation and over-reliance on AI across both groups aligns closely with the conceptual dimensions proposed in Fig. 1.

Discussion

AI-mediated communication as an ethical challenge

These findings are broadly consistent with emerging scholarship on AI-enabled healthcare communication, professional accountability, and ethical governance of AI in healthcare[13–17]. Drawing on a conceptual framework of interpretive authority, responsibility, and uncertainty communication, the findings suggest that participants viewed AI-mediated communication not simply as a new source of information, but as a process that may reshape how clinical meaning is interpreted, negotiated, and communicated[13].

Across both quantitative and qualitative findings, participants identified tensions concerning the authority of AI-generated explanations, the persistence of professional responsibility, and the challenges of communicating uncertainty when algorithmic outputs appear authoritative or definitive. These findings are broadly consistent with recent conceptual discussions in healthcare and nursing ethics that have highlighted the ethical implications of AI-mediated communication[13].

Taken together, the findings suggest that AI-mediated communication introduces ethical tensions that extend beyond questions of technological implementation and may affect fundamental aspects of healthcare communication. Rather than functioning solely as a tool for information delivery, AI increasingly participates in processes through which patients interpret, evaluate, and make sense of clinical information, raising important questions concerning authority, accountability, and uncertainty.

Interpretive authority and the negotiation of clinical meaning

The findings provide insight into how future healthcare professionals perceive changing patterns of interpretive authority in healthcare communication. Participants recognised that patients may

increasingly engage with AI-generated explanations prior to clinical encounters, potentially influencing expectations and shaping how subsequent professional advice is interpreted[12, 21].

Traditionally, interpretive authority in healthcare communication has been closely associated with professional expertise, through which clinical information is explained, contextualised, and legitimised[34]. Participants' responses suggest that authority in AI-mediated communication may become increasingly distributed. Patients may arrive with pre-existing interpretations generated through interactions with AI systems, requiring healthcare professionals to engage not only in explanation but also in negotiation of meaning.

Importantly, participants did not generally perceive professional authority as being replaced by AI. Rather, their responses suggest that authority may become increasingly contested and negotiated among patients, healthcare professionals, and algorithmic systems. Participants frequently described the need to contextualise, validate, or correct AI-generated explanations, highlighting an expanded interpretive role within clinical communication.

These findings are broadly consistent with broader scholarship suggesting that digital and AI-enabled systems increasingly participate in the construction, interpretation, and legitimisation of clinical knowledge and communication[12, 13, 17]. They further suggest that interpretive authority may increasingly be understood as a dynamic and negotiated process rather than a fixed professional attribute.

Responsibility without control: accountability in AI-mediated communication

Findings relating to responsibility highlight a distinctive ethical tension associated with AI-mediated communication. Although AI-generated explanations may influence patient understanding, participants consistently recognised that healthcare professionals remain responsible for ensuring that patients receive information that is accurate, comprehensible, and appropriate to their circumstances.

Participants repeatedly emphasised that healthcare professionals continue to bear responsibility for clarifying misunderstandings and supporting patient understanding even when information originates from external AI systems. This perception points toward an important ethical asymmetry: AI systems may influence interpretation and decision-making, while accountability for communicative outcomes remains concentrated within professional practice[13, 34, 35].

Such a pattern raises broader questions regarding responsibility in AI-enabled healthcare. If algorithmic systems increasingly shape patient understanding without assuming corresponding accountability, healthcare professionals may be required to manage consequences arising from information sources over which they have limited control[16, 15, 14].

Although this study did not examine real-world professional behaviour, participants' responses suggest that responsibility remains a central ethical concern in AI-mediated communication. Rather than reducing professional accountability, AI may introduce additional responsibilities associated with interpretation, clarification, and communication.

The ethics of uncertainty communication

The largest descriptive changes in quantitative perceptions were observed in the domain of uncertainty communication, particularly among international participants. Qualitative findings similarly indicated that participants recognised tensions between the apparent certainty of AI-generated explanations and the inherent uncertainty of clinical practice.

This finding highlights an important ethical concern. Contemporary AI systems often generate responses that appear coherent, confident, and definitive, even when underlying evidence remains uncertain, incomplete, or probabilistic[5, 36]. Such representations may create expectations of certainty that are difficult to reconcile with the realities of healthcare decision-making.

Participants frequently recognised that patients may become less willing to accept ambiguity after receiving apparently definitive AI-generated answers. This observation reflects a broader ethical challenge concerning how uncertainty should be represented, interpreted, and communicated when algorithmic systems increasingly participate in healthcare communication.

From an ethical perspective, uncertainty is not merely a limitation of knowledge but an essential component of responsible clinical communication[37, 38]. Supporting patients in understanding ambiguity, probability, and risk is therefore likely to remain a central professional responsibility, even as AI-generated explanations become more prevalent.

The findings suggest that uncertainty communication may become increasingly important within AI-mediated healthcare environments. Future healthcare professionals may need not only to explain information but also to help patients interpret the limits of available knowledge and the uncertainty that remains inherent in many healthcare decisions.

Variation between participant groups

International and local participants demonstrated broadly similar patterns across both quantitative and qualitative findings. Thematic differences were observed primarily in the degree to which particular issues were articulated rather than in the overall pattern of themes identified.

Local participants more explicitly discussed AI-induced misunderstanding, limitations of AI-generated information, communication competence, and uncertainty communication, whereas international participants demonstrated larger descriptive shifts in some quantitative domains, particularly uncertainty communication.

Given the exploratory design, small sample size, and absence of inferential statistical testing, these observations should be interpreted cautiously. Nevertheless, they suggest that educational, cultural, and communicative backgrounds may influence how ethical challenges associated with AI-mediated communication are perceived and expressed. Further research involving larger and more diverse populations is needed to explore these possibilities.

Ethical implications for professional practice

The findings contribute to broader discussions concerning the ethical integration of AI into healthcare communication.

First, they suggest that healthcare professionals may increasingly function as interpreters and mediators rather than sole providers of information. As AI-generated explanations become more widely accessible, professional roles may increasingly involve negotiating competing interpretations and supporting patients in evaluating information originating from multiple sources.

Second, the findings highlight the persistence of professional accountability despite growing algorithmic influence. Healthcare systems may therefore need to consider how responsibility should be conceptualised when communication is increasingly shaped through interactions between human and technological actors.

Third, the findings reinforce the ethical importance of uncertainty communication. Supporting patients in understanding ambiguity, probability, and risk may become increasingly challenging when AI systems generate apparently definitive explanations. Addressing this challenge will be important for maintaining informed decision-making and patient-centred care.

Taken together, these findings suggest that AI-mediated communication should be understood not only as a technological development but also as an ethical transformation of healthcare communication.

Educational implications

Although the primary contribution of this study lies in its exploration of ethical challenges associated with AI-mediated communication, the findings also have implications for health professions education.

Current educational approaches often emphasise AI literacy, technical competencies, or the use of AI as an instructional tool. The present findings suggest that educational programmes may also benefit from addressing how AI reshapes communication, interpretation, responsibility, and uncertainty within clinical practice[22, 25].

The case-based approach used in this study represents one possible mechanism through which learners can engage with these emerging ethical challenges. Further research is required to examine how such approaches may contribute to ethical reasoning and communication competencies in different educational settings[39, 40].

Strengths and limitations

This study has several strengths. The convergent mixed-methods design enabled complementary insights from quantitative and qualitative data, and the consistency observed across data sources strengthens confidence in the overall interpretation of findings.

The study was grounded in a theoretically informed framework that guided both data collection and interpretation. In addition, the use of clinically realistic scenarios across multiple stages of the surgical pathway enhanced the contextual relevance of participant discussions.

Several limitations should also be acknowledged. The study involved a relatively small sample drawn from a single institution, limiting transferability of findings. Quantitative analyses were descriptive, and no inferential statistical testing was performed.

Qualitative data consisted of brief written responses rather than in-depth interviews, which may have constrained the richness of participants' reflections. Although coding was conducted collaboratively, formal measures of inter-rater reliability were not applied.

Finally, the study examined perceptions within a structured discussion context rather than real-world clinical behaviour. Further research is needed to explore how ethical challenges associated with AI-mediated communication are experienced and negotiated in clinical practice.

Future research

Future research should examine how ethical tensions surrounding interpretive authority, responsibility, and uncertainty are negotiated in real-world healthcare settings involving patients, healthcare professionals, and AI systems.

More in-depth qualitative approaches, including interviews and focus groups, may provide richer understanding of how healthcare professionals experience AI-mediated communication in practice. Comparative studies involving different professional groups may also help identify similarities and differences in ethical perceptions across healthcare disciplines.

As AI technologies continue to evolve, ongoing empirical ethics research will be needed to understand how authority, accountability, and uncertainty are reshaped within increasingly AI-enabled healthcare systems.

Conclusion

This exploratory mixed-methods study examined how future healthcare professionals perceive ethical challenges associated with AI-mediated clinical communication through the lens of interpretive authority, responsibility, and uncertainty communication.

The findings suggest that participants viewed AI-mediated communication as more than a technological innovation. Rather, they perceived it as a process that may reshape how clinical meaning is interpreted, negotiated, and communicated. Participants identified tensions associated with patient reliance on AI-

generated information, the persistence of professional responsibility despite algorithmic influence, and the challenges of communicating uncertainty when AI-generated explanations appear definitive.

These findings contribute empirical insight into emerging discussions concerning the ethical implications of AI-mediated communication in healthcare. In particular, they suggest that authority may become increasingly negotiated, responsibility may remain concentrated despite distributed influence, and uncertainty may become more difficult to communicate within AI-influenced communication environments.

As AI-generated explanations become increasingly integrated into healthcare communication, questions concerning who interprets clinical meaning, who remains accountable for patient understanding, and how uncertainty should be communicated are likely to become central ethical considerations rather than peripheral communication concerns. Addressing these challenges will be important for the responsible governance of AI-enabled healthcare communication and the development of ethically robust healthcare systems.

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Review Committee of Guizhou Provincial People's Hospital (Ethics Number: 2026 – 137). Written informed consent was obtained from all participants before data collection. All procedures involving human participants were conducted in accordance with the Declaration of Helsinki and relevant institutional guidelines.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Authors' information

Not applicable.

Funding

This work was supported by the Talent Fund of Guizhou Provincial People's Hospital (Grant No. 2024-16), the Science and Technology Fund Project of the Guizhou Provincial Health Commission (Grant No.

gzwkj2026-295) and the Basic Research Program of the Guizhou Provincial Department of Science and Technology (Qian Ke He Ji Chu) [Grant No. QKH-JC-MS (2025)492]. The funding sources had no role in the study design, analysis, interpretation of data, writing of the manuscript, or the decision to submit the manuscript for publication.

Author Contribution

XY, CX and DW conceptualized and designed the study. XY, CX and DW led the methodological development and formal analysis. XY, YX, DL, YS, XZ, JY, BZ, LY, WG, WT, FW, CX and DW contributed to data curation and analysis of relevant empirical literature and adoption studies. XY, YX, DL, YS and CX drafted the initial manuscript. CX and DW critically reviewed and revised the manuscript for important intellectual content and provided overall supervision. CX and DW were responsible for project administration and funding acquisition. All authors read and approved the final manuscript.

Acknowledgement

The authors used the generative AI tool GPT-5 (OpenAI, San Francisco, CA, USA) for language refinement, grammar correction, and consistency editing of the English manuscript. The tool was not used for conceptualization, ethical analysis, interpretation, or reference generation. All scientific content, analysis, and conclusions were developed, verified, and approved by the authors.

Data Availability

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

References

1. Yang X, Xiao Y, Liu D, Shi H, Deng H, Huang J, et al. Enhancing Physician-Patient Communication in Oncology Using GPT-4 Through Simplified Radiology Reports: Multicenter Quantitative Study. *J Med Internet Res*. 2025;27:e63786. 10.2196/63786.
2. Thirunavukarasu AJ, Ting DSJ, Elangovan K, Gutierrez L, Tan TF, Ting DSW. Large language models in medicine. *Nat Med*. 2023;29(8):1930–40. 10.1038/s41591-023-02448-8.
3. Singhal K, Azizi S, Tu T, Mahdavi SS, Wei J, Chung HW, et al. Large language models encode clinical knowledge. *Nature*. 2023;620(7972):172–80. 10.1038/s41586-023-06291-2.
4. Yang X, Xiao Y, Liu D, Zhang Y, Deng H, Huang J, et al. Enhancing doctor-patient communication using large language models for pathology report interpretation. *BMC Med Inf Decis Mak*. 2025;25(1):36. 10.1186/s12911-024-02838-z.

5. Topol EJ. High-performance medicine: the convergence of human and artificial intelligence. *Nat Med*. 2019;25(1):44–56. 10.1038/s41591-018-0300-7.
6. Han PK, Klein WM, Arora NK. Varieties of uncertainty in health care: a conceptual taxonomy. *Med Decis Mak*. 2011;31(6):828–38. 10.1177/0272989x11393976.
7. Grant JB, Jones J, Candrian C, Oman KS, Reed SM. The role of nursing communication: A critical interpretive synthesis. *Int J Nurs Stud Adv*. 2025;9:100373. 10.1016/j.ijnsa.2025.100373.
8. Kwame A, Petrucka PM. A literature-based study of patient-centered care and communication in nurse-patient interactions: barriers, facilitators, and the way forward. *BMC Nurs*. 2021;20(1):158. 10.1186/s12912-021-00684-2.
9. Han PKJ, Babrow A, Hillen MA, Gulbrandsen P, Smets EM, Ofstad EH. Uncertainty in health care: Towards a more systematic program of research. *Patient Educ Couns*. 2019;102(10):1756–66. 10.1016/j.pec.2019.06.012.
10. Mesko B. The ChatGPT (Generative Artificial Intelligence) Revolution Has Made Artificial Intelligence Approachable for Medical Professionals. *J Med Internet Res*. 2023;25:e48392. 10.2196/48392.
11. Longoni C, Bonezzi A, Morewedge CK. Resistance to Medical Artificial Intelligence. *J Consum Res*. 2019;46(4):629–50. 10.1093/jcr/ucz013.
12. Blease C, Kaptchuk TJ, Bernstein MH, Mandl KD, Halamka JD, DesRoches CM. Artificial Intelligence and the Future of Primary Care: Exploratory Qualitative Study of UK General Practitioners' Views. *J Med Internet Res*. 2019;21(3):e12802. 10.2196/12802.
13. Yang X, Liang Y, Liu Y, Liu D, Yang L, Zhang B, et al. When machines explain medicine: Nursing ethics and clinical communication. *Nurs Ethics*. 2026;0(0):9697330261449460. 10.1177/09697330261449460.
14. Pham T. Ethical and legal considerations in healthcare AI: innovation and policy for safe and fair use. *R Soc Open Sci*. 2025;12(5):241873. 10.1098/rsos.241873.
15. Habli I, Lawton T, Porter Z. Artificial intelligence in health care: accountability and safety. *Bull World Health Organ*. 2020;98(4):251–6. 10.2471/BLT.19.237487.
16. Ning Y, Teixayavong S, Shang Y, Savulescu J, Nagaraj V, Miao D, et al. Generative artificial intelligence and ethical considerations in health care: a scoping review and ethics checklist. *Lancet Digit Health*. 2024;6(11):e848–56. 10.1016/S2589-7500(24)00143-2.
17. Hohenstein J, Kizilcec RF, DiFranzo D, Aghajari Z, Mieczkowski H, Levy K, et al. Artificial intelligence in communication impacts language and social relationships. *Sci Rep*. 2023;13(1):5487. 10.1038/s41598-023-30938-9.
18. Bahari Z, Vosoghi N, Ramazanzadeh N, Moshfeghi S, Aghamohammadi M. Patient trust in nurses: exploring the relationship with care quality and communication skills in emergency departments. *BMC Nurs*. 2024;23(1):595. 10.1186/s12912-024-02241-z.
19. Afriyie D. Effective communication between nurses and patients: an evolutionary concept analysis. *Br J Community Nurs*. 2020;25(9):438–45. 10.12968/bjcn.2020.25.9.438.

20. Luo A, Qin L, Yuan Y, Yang Z, Liu F, Huang P, et al. The Effect of Online Health Information Seeking on Physician-Patient Relationships: Systematic Review. *J Med Internet Res*. 2022;24(2):e23354. 10.2196/23354.
21. Eysenbach G. The Role of ChatGPT, Generative Language Models, and Artificial Intelligence in Medical Education: A Conversation With ChatGPT and a Call for Papers. *JMIR Med Educ*. 2023;9:e46885. 10.2196/46885.
22. Wei Q, Pan S, Liu X, Hong M, Nong C, Zhang W. The integration of AI in nursing: addressing current applications, challenges, and future directions. *Front Med (Lausanne)*. 2025;12:1545420. 10.3389/fmed.2025.1545420.
23. Bodur G, Cakir H, Turan S, Seren AKH, Goktas P. Artificial intelligence in nursing practice: a qualitative study of nurses' perspectives on opportunities, challenges, and ethical implications. *BMC Nurs*. 2025;24(1):1263. 10.1186/s12912-025-03775-6.
24. Ball Dunlap PA, Michalowski M, Advancing. AI Data Ethics in Nursing: Future Directions for Nursing Practice, Research, and Education. *JMIR Nurs*. 2024;7:e62678. 10.2196/62678.
25. Boscardin CK, Gin B, Golde PB, Hauer KE. ChatGPT and Generative Artificial Intelligence for Medical Education: Potential Impact and Opportunity. *Acad Med*. 2024;99(1):22–7. 10.1097/ACM.0000000000005439.
26. Sengul T, Sarıköse S. Enhancing learning outcomes through AI-driven simulation in nursing education: A systematic review. *Clin Simul Nurs*. 2025;106. 10.1016/j.ecns.2025.101797.
27. Cunha LDM, Han PKJ, Ventura F, Pestana-Santos M, Lomba L, Santos MR. Uncertainty management strategies in clinical reasoning: perceptions of nurses in post-anesthesia care units. *BMC Nurs*. 2025;24(1):605. 10.1186/s12912-025-03193-8.
28. Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. *Res Nurs Health*. 2006;29(5):489–97. 10.1002/nur.20147.
29. DeVellis RF. Scale development: Theory and applications. Scale development: Theory and applications. Thousand Oaks, CA, US: Sage Publications, Inc; 2017.
30. Creswell JW, Clark VLP. Designing and conducting mixed methods research. Designing and conducting mixed methods research. Thousand Oaks, CA, US: Sage Publications, Inc; 2017.
31. Sandelowski M, Voils CI, Knafl G. On Quantitizing. *J Mix Methods Res*. 2009;3(3):208–22. 10.1177/1558689809334210.
32. Braun V, Clarke V. Reflecting on reflexive thematic analysis. *Qualitative Research in Sport. Exerc Health*. 2019;11(4):589–97. 10.1080/2159676x.2019.1628806.
33. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Res Psychol*. 2008;3(2):77–101. 10.1191/1478088706qp063oa.
34. Carstensen K, Kjeldsen AM, Nielsen CP. Distributed leadership in health quality improvement collaboratives. *Health Care Manage Rev*. 2024;49(1):46–58. 10.1097/HMR.0000000000000385.

35. Yang X, Xu C. Ethical Governance of Large Language Models in Health Care: Trust, Responsibility, and Equity in Routine Use. *J Med Internet Res.* 2026;28:e93470. 10.2196/93470.

36. Seneviratne T, Kodikara K, Abeykoon I, Palpola W. Perception of Medical Undergraduates on Artificial Intelligence in Medical Education: Qualitative Exploration. *JMIR Med Educ.* 2025;11:e73798. 10.2196/73798.

37. Qin J, Nan Y, Li Z, Meng J. Effectiveness of Communication Competence in AI Conversational Agents for Health: Systematic Review and Meta-Analysis. *J Med Internet Res.* 2025;27:e76296. 10.2196/76296.

38. Mousavi Shabestari M, Jabbarzadeh Tabrizi F, Roshangar F, Ghahramanian A, Zamanzadeh V, Sarbakhsh P, et al. Nurses' perception of uncertainty in clinical decision-making: A qualitative study. *Heliyon.* 2024;10(16):e36228. 10.1016/j.heliyon.2024.e36228.

39. Cucci F, Marasciulo D, Romani M, Soldano G, Cascio D, De Nunzio G, et al. The Contribution of Artificial Intelligence in Nursing Education: A Scoping Review of the Literature. *Nurs Rep.* 2025;15(8). 10.3390/nursrep15080283.

40. Liaw SY, Tan JZ, Lim S, Zhou W, Yap J, Ratan R, et al. Artificial intelligence in virtual reality simulation for interprofessional communication training: Mixed method study. *Nurse Educ Today.* 2023;122:105718. 10.1016/j.nedt.2023.105718.

Figures

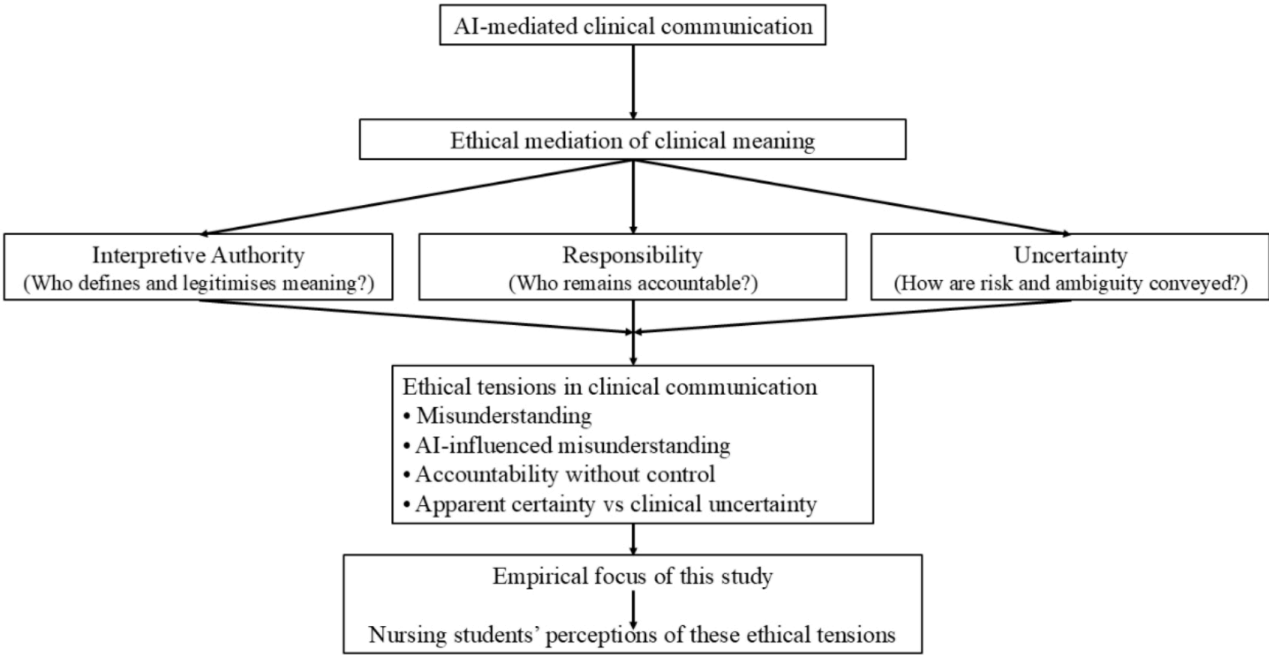


Figure 1

Conceptual framework of ethical tensions in AI-mediated clinical communication.

Note. The framework conceptualises AI-mediated clinical communication as a form of ethical mediation that reshapes interpretive authority, responsibility, and uncertainty communication. In this study, the framework informed the design of case-based scenarios and the analysis of participants’ perceptions.

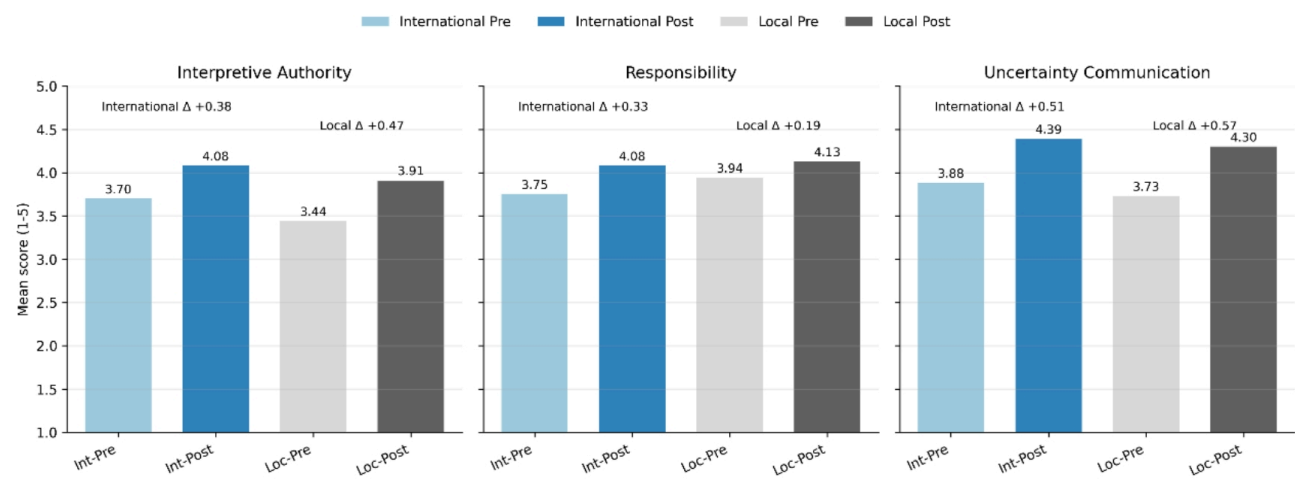


Figure 2

Mean scores across ethical domains before and after the case-based session.

Note. Scores were calculated from five-point Likert-scale responses (1 = strongly disagree to 5 = strongly agree). Values are presented descriptively to illustrate patterns of perception across the three ethical domains of AI-mediated clinical communication and should not be interpreted as evidence of causal intervention effects. Error bars are not shown because the purpose of the figure is descriptive illustration of domain-level mean patterns rather than statistical estimation.

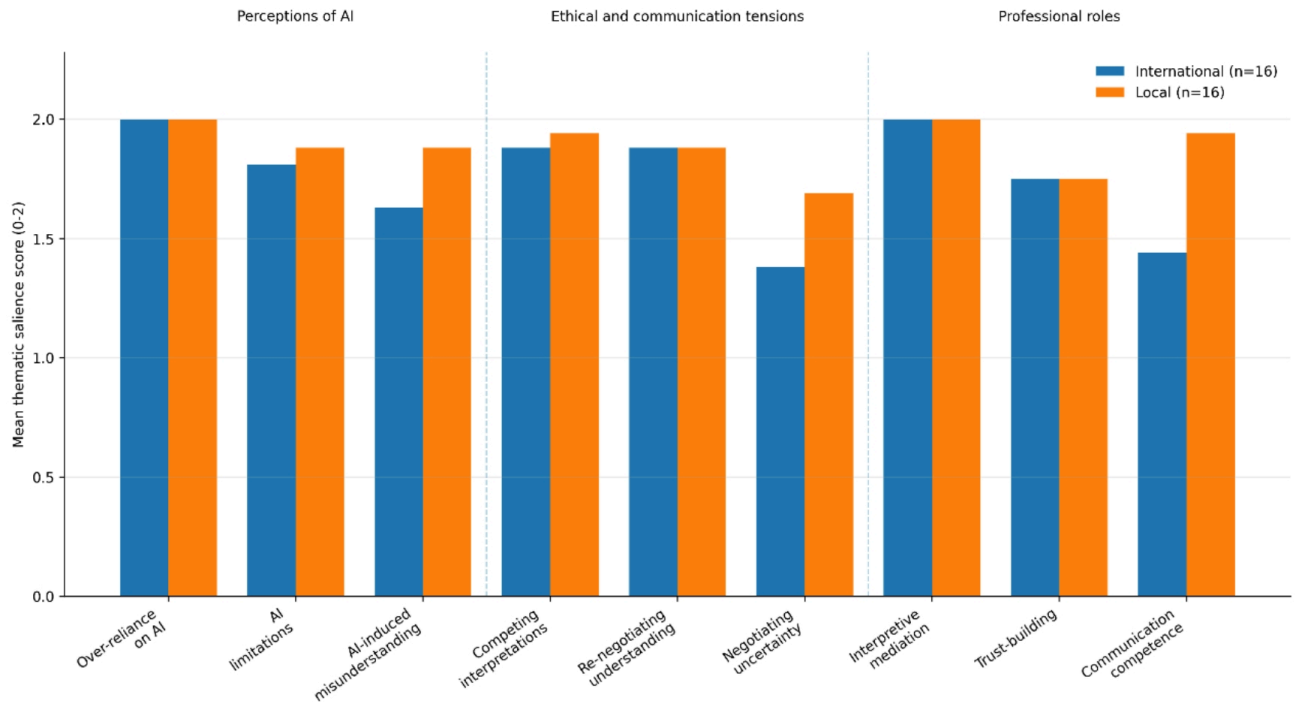


Figure 3

Mean thematic salience scores across ethical themes and participant groups.

Note. Mean thematic salience scores were calculated from coded qualitative responses using a three-point ordinal scale (0 = theme not present, 1 = theme implicitly present, 2 = theme explicitly present). Values represent descriptive indicators of thematic prominence within each participant group and are intended to support comparison and visualisation of qualitative patterns rather than statistical inference.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SupplementaryTableS1.docx](#)
- [SupplementaryTableS2.xlsx](#)
- [SupplementaryFileS1.pdf](#)