

Large Language Models to Support Patient Education and Informed Consent for Uterine Artery Embolization

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BACKGROUND

- Uterine artery embolization (UAE) has become a more popular and effective nonsurgical treatment of women with symptomatic uterine fibroid tumors¹.
- Integrating large language models (LLMs) into patient education pathways can help bridge gaps in knowledge, empower patients to make informed decisions, and enhance the quality of conversations between patients and providers².
- Purpose of this study: to explore the role of artificial intelligence (AI) in supporting and improving patient education and informed consent in radiology; to evaluate the accuracy and quality of information provided by LLMs, taking UAE as a representative procedure.

METHOD

- Three freely accessible and popular LLMs, ChatGPT-5 (OpenAI), Gemini (Google), and Claude Opus 4.1 (Anthropic), were prompted with ten frequently asked patient questions (Table 1) regarding UAE.
- Responses were anonymized and randomized.
- 5 interventional radiologists and 2 minimally invasive gynecologic surgeons independently evaluated responses using a structured Likert scale (1-5) across domains of accuracy, comprehensiveness, readability, compassion, and overall quality.
- Performance within domains was characterized with one-way ANOVA.

Table 1. Prompts asked to LLMs

1. What is uterine artery embolization? How does it work and what conditions does it treat?
2. How effective is uterine artery embolization for fibroids of different sizes and in different locations? What about for adenomyosis?
3. How does uterine artery embolization help with heavy bleeding and pelvic pain?
4. What are the different treatment options for uterine fibroids? What are the advantages and disadvantages of uterine artery embolization compared to other options?
5. What are the risks of uterine artery embolization? What is post-embolization syndrome?
6. Can I still get pregnant after the uterine artery embolization?
7. What is the recovery like after UAE? How much pain should I expect?
8. What follow-up and further care happens after UAE?
9. How long does it take for symptoms to improve and fibroids to shrink after UAE?
10. Can fibroids grow after uterine artery embolization and will I need a repeat uterine artery embolization?

RESULTS

Table 2. Summary of Likert Scale Answers Across LLMs

Category	LLM	Mean	Variance	p-value
Accuracy	Claude	3.80	0.45	0.0012
	Gemini	3.43	0.60	
	ChatGPT	3.86	0.59	
Comprehensiveness	Claude	3.91	0.51	0.00028
	Gemini	3.44	0.57	
	ChatGPT	3.91	0.75	
Readability	Claude	3.69	0.65	0.65973
	Gemini	3.69	0.60	
	ChatGPT	3.80	0.94	
Compassion	Claude	3.23	1.08	0.067284
	Gemini	3.30	0.79	
	ChatGPT	3.60	1.11	
Overall Quality	Claude	3.64	0.41	0.018762
	Gemini	3.44	0.51	
	ChatGPT	3.80	0.74	

Qualitative feedback showed:

- Chat GPT-5 was praised for being succinct, clear, and patient-centered, with comments such as “most readable,” “succinct and easy to understand,” and “overall the best.”
- Claude was viewed as informative and comprehensive, with feedback noting good structure and balance of detail, though sometimes more technical than ideal for patients.
- Gemini had comments sometimes noting vagueness, overly technical explanations, or missing details.
- Key omissions included certain complications (chronic discharge), risk of failure/reintervention, and newer treatment options.
- Specific limitations were noted:
 - Gemini and Claude did not describe radial access.
 - Information on medical treatment, including GnRH antagonists, was limited.
 - LLMs did not provide substantive direction regarding UAE and fertility but stated UAE is less preferred if prioritizing fertility preservation.
 - No discussion of post-procedural red flags warranting emergent care.

- A total of 1,050 ratings were collected (Table 2).
- **Significant differences between LLMs were observed for accuracy (p= 0.0012) and comprehensiveness (p= 0.00028), with GPT-5 (3.86, 3.91) and Claude (3.80, 3.91) outperforming Gemini (3.43, 3.44).**
- **Overall quality had a statistically significant difference (p= 0.0188), with GPT-5 (3.80) outperforming Claude (3.64) and Gemini (3.44).**
- No statistically significant differences were noted for readability (p= 0.6597) or compassion (p= 0.0673), although GPT-5 trended higher in compassion.
- GPT-5 consistently demonstrated the strongest performance, Claude performed comparably in comprehensiveness but lower in overall quality, and Gemini scored lowest within most domains.

CONCLUSION

- LLMs demonstrate potential to support patient education and informed consent for UAE by producing accurate, readable, and comprehensive information outside clinical encounters.
- This highlights the use of AI technology in areas where multiple specialties overlap, and the patient may need to choose from multiple procedural options.
- When used in an AI-assisted, physician-supervised framework, LLMs may help deliver consistent information, empower patients to engage more in shared decision-making, and reduce strain on healthcare systems by addressing patient questions that arise outside clinical encounters.
- MIG doctors emphasized the need for clearer organization, more patient-friendly language, and closer alignment with the specific question being asked.
- LLMs may also improve access to understandable medical information for patients facing language barriers or limited resources for self-education
- Future prospective studies incorporating physician-supervised patient utilization of LLMs are needed to optimize patient-centered implementation of AI.

References:

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