PCP-Bot: Feasibility of an LLM Chatbot for Pre-Visit History Collection and Summarization

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BACKGROUND

Pre-visit planning enables clinicians to review patient data before encounters, improving preparedness and care coordination. However, traditional questionnaires are **lengthy, rigid, offer limited response options** and increase visit duration by about 34%, lowering satisfaction [1,2].

Conversational AI built on LLMs can bridge this gap by allowing natural, adaptive dialogue that reflects patient individuality, and dynamically adjust questioning based on the context. However, deployment in healthcare requires strict **guardrails** to prevent unsafe advice or hallucination [3].

We present **PCP-Bot** (Primary Care Previsit planning chatBOT), a proof-of-concept conversational agent for safe, empathetic pre-visit planning.

OBJECTIVES

- ✓ To develop a **safe, and reliable** conversational AI agent (PCP-Bot) for pre-visit planning in primary care.
- ✓ To evaluate the usefulness of PCP-Bot-generated summaries, and physician acceptance using the Technology Acceptance Model (TAM) and the CARES communication metric.

RESEARCH DESIGN

SYSTEM ARCHITECTURE & PROMPTING STRATEGY

- PCP-Bot built on **GPT-4o** with multi-stage prompt chains: **zero-/few-shot** prompting to enforce tone, clarity, and domain adherence; **chain-of-thought** and **decomposition** for stepwise data capture; **role** prompting for professionalism, escalation logic, and empathy [4].
- **RAG** (Retrieval Augmented Generation) for building the clinical context using pre-visit questionnaires, SOCRATES, CAGE frameworks for clinical history-taking [5].

STUDY DESIGN & DATA GENERATION

10 synthetic primary-care scenarios *(Case Scenario Generator#)*; Six researchers simulated 3 scenarios each in a voice-based conversation with PCP-Bot, yielding 30 conversational transcripts and corresponding structured summaries.

EVALUATION

- 10 physicians independently reviewed each summary for **coherence, usefulness, comprehensiveness, readability, relevance,** and **factuality** (no hallucination).
- **Technology Acceptance Model (TAM):** physicians rated the Perceived Usefulness (PU) and 6 researchers rated Perceived Ease of Use (PEU) [6].
- Conversation transcripts were scored for communication quality by an LLM-as-a-judge *(EvaluationBot#)* using the **CARES** (verbal domains only) framework [7].
- **Transcript analysis:** Each conversation transcript was quantitatively analyzed for dialog lengths, word counts of the conversation and summary, enabling correlation testing between dialogue dynamics and summary quality.

RESULTS

- 10 cases x 3 encounters → 30 summaries rated by 10 physicians.
- Physician ratings indicated that the PCP-Bot summaries were clear, clinically pertinent, and largely free of fabricated information (Fig 1).
- Variance decomposition using a three-level mixed-effects model showed that **rater-level variance was minimal** (0–9%).
- Physicians with more favorable ratings across all qualitative dimensions of PCP-Bot summaries tended to score higher on **Technology Acceptance (TAM-PU = 61.33, TAM-PEU = 97.22)** (Fig 3).

Fig 1: Average Physician Ratings of PCP-Bot Summaries

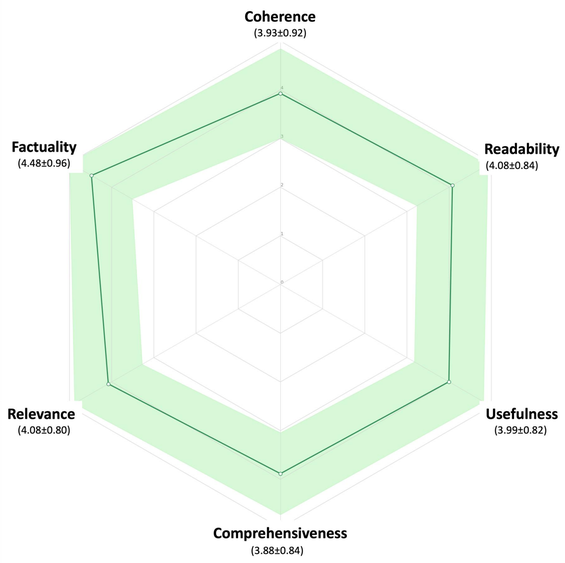
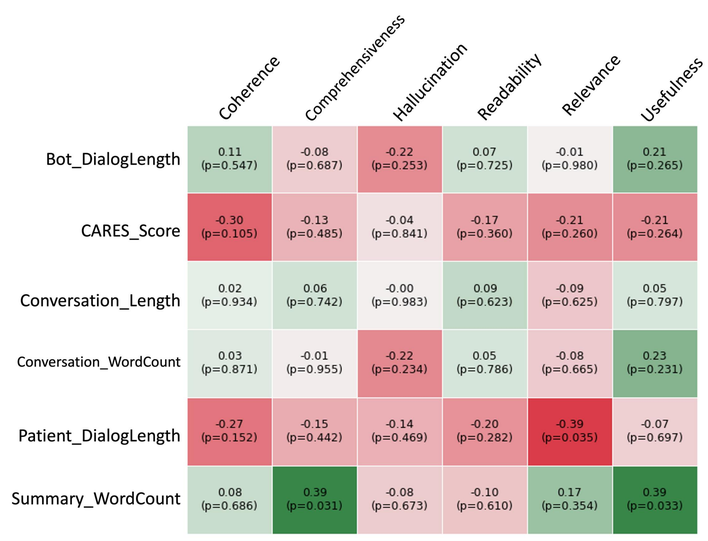
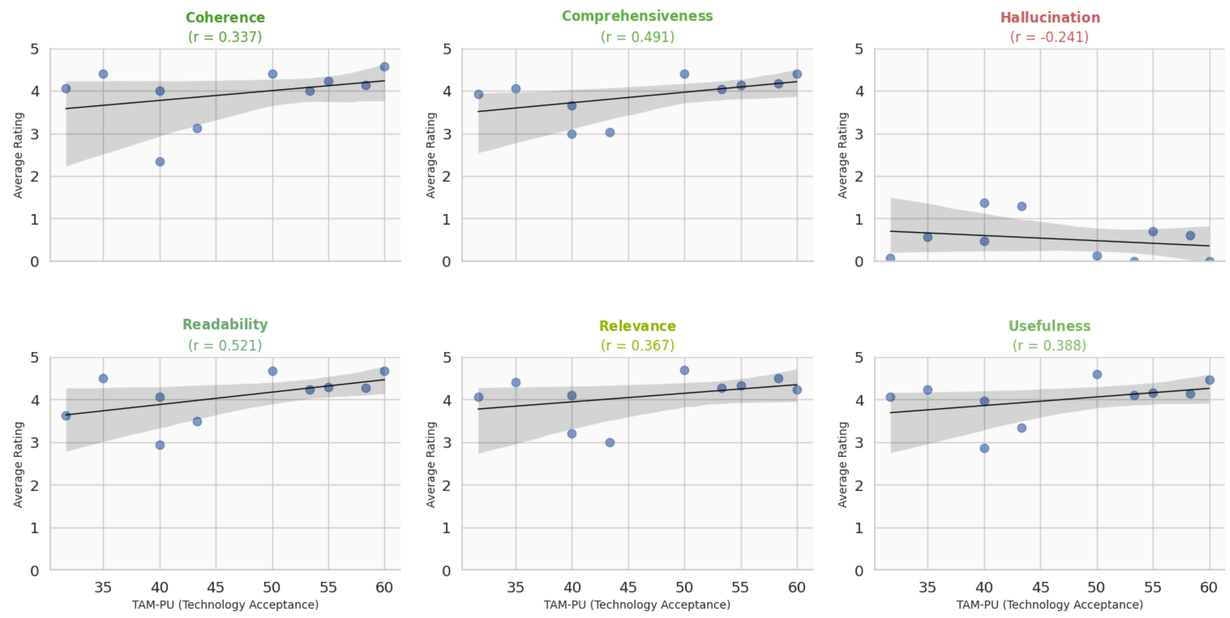


Fig 2: Correlation between Physician Ratings and Transcript Metrics



- The **average conversation length** was *29 ± 4.5 exchanges*, and the **average summary length** was *149.7 ± 29 words*. The **CARES** score averaged *17.9 ± 2.38 out of 20*, reflecting strong perceived clarity, empathy, and support of the conversational outputs.
- Longer summaries were perceived as more informative and clinically valuable: **summary word count** showed a *moderate positive correlation* with *Comprehensiveness* ($r = 0.39$, $p = 0.031$) and *Usefulness* ($r = 0.39$, $p = 0.033$).
- Clinicians found PCP-Bot "time-saving in busy OPDs," producing "clear, effective summaries" that ensure "no small detail is missed" and help patients feel "heard." Some stressed that "patient interaction is crucial" and that the bot should "complement, not replace" the physician's role. Suggestions included adding a review of systems and highlight key concerns.

Fig 3: Correlation between Physician Ratings and Perceived Usefulness of Technology Acceptance Model (TAM-PU) Scale



CONCLUSION & FUTURE WORK

PCP-Bot demonstrates the feasibility of **LLM-based conversational agents** for structured, empathetic, and clinically relevant pre-visit history collection. Our findings suggest that LLMs, when appropriately constrained with **prompt chaining, context retrieval, and communication safety layers**, can produce outputs that align with physician expectations for accuracy and clinical clarity.

Future work will focus on **multilingual capability, real-patient validation**, integration with **EHR workflows**, and development of a framework for **Safe and Trustworthy AI for Clinical Conversations (STACC-ATo)#**.

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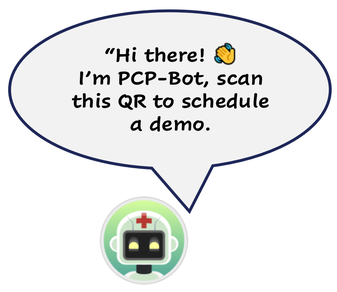

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