Original Paper

Impact of Ambient Scribes on Primary Care Communication Pathways: Qualitative Observation and Interview Study

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Abstract

Background: The administrative burden of manual documentation has been a primary driver of physician burnout and a barrier to patient-centered care. Ambient scribes have emerged as a promising solution that uses passive audio capture and natural language processing to automate clinical note-taking. While their impact on clinical efficiency is frequently studied, there is a lack of research on how these tools have impacted interpersonal communication during clinical encounters.

Objective: This study investigates the communication pathways and interactional shifts that occur when ambient scribes are integrated into primary care, with a focus on how physicians adapt their behavior to accommodate an ambient digital listener.

Methods: We conducted a qualitative study with 17 licensed family practice physicians in the Greater Toronto Area who use ambient scribes in their daily practice. Data collection included observations from in-person clinical shadowing (n=5) and think-aloud walk-throughs (n=12), each followed by semistructured interviews; reported findings are predominantly drawn from interview data. We analyzed the combined dataset using iterative thematic analysis and open coding to identify affordances and constraints along 3 communication pathways: physician-to-patient, physician-to-patient-and-scribe, and physician-to-note.

Results: Along the physician-to-patient pathway, participants reported that ambient scribes increased their capacity to demonstrate active listening, with some reporting greater attentiveness to nonverbal cues, yet introducing the technology to patients to obtain consent consumed limited consultation time, particularly when addressing sensitive health concerns. Along the physician-to-patient-and-scribe pathway, participants appreciated how ambient scribes acted as a forcing function for physicians to verbalize their clinical reasoning to enhance patient comprehension, as well as their scribes' ability to follow and organize nonlinear conversations. However, they reported that scribes frequently omitted implicit information (eg, deictic gestures) or created unintended documentation artifacts (eg, casual remarks about family members) that required post hoc corrections. Along the physician-to-note pathway, participants reported that scribes optimized their note-taking workflows and enabled note manipulation via spoken words for some physicians but recalling patient information to fix transcription errors and support patient follow-ups proved challenging.

Conclusions: Integrating ambient scribes introduces a triadic interactional dynamic into traditionally dyadic patient consultations. Clinicians must continuously navigate the boundaries between patient-facing empathy and scribe-facing precision, deciding when to articulate clinical reasoning aloud and when to exercise verbal discretion regarding sensitive disclosures. While ambient scribes effectively reduce in-encounter computer screen time, they do not eliminate documentation overhead—they redistribute it from real-time typing to postencounter cognitive recall and verbal note curation. To prevent delayed cognitive fatigue from postencounter error verification, we suggest that future ambient scribes should move beyond passive transcription to incorporate interactive recall scaffolding and context-aware error prevention.

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KEYWORDS

ambient scribes; AI scribes; digital scribes; patient-physician communication; cognitive load

Introduction

Clinical documentation has historically been one of the biggest burdens causing physician burnout, driving many to leave the profession [1]. While human medical scribes have been employed to mitigate this burden, their use is often constrained by high costs, training requirements, and turnover [2-4]. Ambient scribes have been developed as a more scalable alternative by automating the note-taking process. These tools leverage a combination of speech transcription software and large language models (LLMs) to translate natural conversations between patients and physicians into structured notes that physicians can directly incorporate into their electronic medical record (EMR) systems [5].

Touted as a solution to improve physicians' clinical efficiency and patient engagement, ambient scribes have been integrated widely across levels of health care delivery, with a growing body of evidence documenting adoption among physicians [6-9]. This growth in adoption is accompanied by recent studies showing improvements in physicians' perceived stress and burnout [10,11], modest gains in encounter efficiency [12,13], and significant reductions in after-hours documentation time [12,14]. Balanced against these gains is the considerable manual editing required to correct transcription errors before EMR submission [7,12,15,16].

However, research on the impact of ambient scribes on physicians' interactions with patients remains limited. Before adopting scribes, physicians have often needed to multitask between note-taking and patient conversations during encounters. Striking a balance between these competing demands while simultaneously formulating a differential diagnosis imposes a substantial cognitive burden [17,18]. Even when human scribes are available, they can struggle with using physicians' preferred terminology and interpreting the nuance of complex medical encounters [19]. Therefore, working with a human scribe and a patient in the same conversation creates a triadic conversation for physicians to manage [20]. Similar patterns may exist with ambient scribes, but this topic has yet to be explored in the literature.

We adopt a qualitative interpretivist lens centered on interactional dynamics—rather than a quantitative pragmatist lens centered on efficiency—to examine how ambient scribes are actively reshaping clinical practice. We ground our inquiry in the concepts of affordances and constraints [21]; affordances refer to the action possibilities and interactional opportunities enabled when an ambient scribe is present during consultations, while constraints represent the interactional frictions or behavioral boundaries imposed by an ambient scribe. Specifically, we address the following research questions: (1) How do ambient scribes alter physician-to-patient communication in the presence of a scribe? (2) How do physicians balance patient- and scribe-facing communication during encounters? (3) How do scribes reshape physicians' note-taking practices?

Our work contributes to a better understanding of how ambient scribes reconfigure the interpersonal dynamics of care. We unpack the choices that physicians make and the microadaptations they adopt when deciding how to integrate ambient scribes into their workflows. These insights help bridge the gap between technological capabilities and clinical practice, ensuring that such technologies support clinical efficiency without compromising patient-physician rapport or communication quality.

Methods

Setting and Recruitment

Our study took place in the Greater Toronto Area in Ontario, Canada, between September and November 2024. Using a convenience sampling approach, we advertised our study to licensed family practice physicians through health organization mailing lists and online forums catered to primary care family medicine. Beyond standard eligibility criteria such as English comprehension and the ability to provide informed consent, participants were required to have either current or experience with an ambient scribe and be in active clinical practice throughout the study period. No requirements were placed on the specific product that they used, as some were endorsed by clinics and others were selected independently.

Of the 29 individuals who completed the prestudy screening survey, 17 were enrolled; 5 were excluded for having no ambient scribe experience, and 7 either could not accommodate the available interview times or did not respond to follow-up emails. This sample size was deemed sufficient based on a retrospective saturation assessment conducted after data collection closed [22,23]. Upon completing inductive coding of the full dataset, we determined that thematic saturation had been reached since no new codes were introduced during the final 5 sessions.

Study Design

We used an interpretivist qualitative approach to examine how ambient scribes influence patient encounters and documentation practices. This paradigm was chosen because it allows for an in-depth understanding of clinicians' lived experiences. The primary data came from semistructured interviews with personalized questions informed by data gathered through 1 of 2 observational methods: clinical shadowing or live think-aloud walk-throughs. This multimethod approach allowed for methodological triangulation, ensuring that observable clinical realities were directly contextualized by participants' deeper reflective insights. While clinical shadowing was conveyed to be the preferred option for its higher fidelity, it could not always be accommodated due to logistical constraints. As a complementary alternative, walk-throughs provided opportunities for participants to systematically deconstruct complex procedures and reflect on edge cases.

After completing a brief prestudy survey to provide demographic information and preliminary data on their ambient scribe use, participants chose between 2 enrollment options: clinical

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shadowing or a walk-through. The observation instruments and interview scripts for both options are included in the Multimedia Appendices 1-3. All interviews were conducted virtually over Zoom so that they could be transcribed for analysis.

Option 1: Clinical Shadowing and Interview

Participants who were able and willing to accommodate on-site observers were shadowed in person by 2 researchers for up to 4 hours. The researchers were permitted to observe individual patient encounters from the time consenting patients entered the examination room to the time they left and the participants completed their documentation. The researchers took notes using an observation instrument with explicit fields for capturing the appointment type, scribe setup, verbal and nonverbal communication cues, visual attention, and postappointment data entry.

The clinical shadowing sessions were followed by a 30-minute semistructured interview conducted by the same researchers to triangulate observations with reflections on the encounters. Standard topics covered during the interview included participants' expectations of their ambient scribes, perceived effects on patient communication and behavior, note review workflows, changes to EMR documentation, trust, and long-term adoption. Personalized questions were anchored in specific observational moments by asking participants to explain particular edits to scribe output or clarify whether observed verbalizations reflected their usual practice; this allowed observed behaviors to be interpreted through participants' own reasoning rather than inferred by the research team.

Option 2: Walk-Through and Interview

Participants who were unable or unwilling to accommodate shadowing participated in a 90-minute semistructured interview with 2 researchers. The interview began with a walk-through of participants' typical scribe use, during which they screen-shared the scribe interface using a test patient record when possible. Participants were asked to narrate what happens before, during, and after a typical patient encounter, reflecting on key decisions that are made and trends they have experienced over time.

After the walk-through, the remainder of the interview touched on many of the same themes covered in the other enrollment option. Because these participants were not observed directly, the guide additionally probed behaviors that would otherwise have been visible during shadowing: pausing the scribe, handling encounters with multiple patients or presenting issues, and forgetting to activate the scribe.

Data Analysis

Written observation notes were collated with interview transcripts to form our qualitative dataset. Data from the 2 enrollment options were combined and treated with equal weighting because of their modest sample sizes and complementary nature. Reported findings are predominantly drawn from interview data; observational data from both clinical shadowing and think-aloud walk-throughs informed the semistructured interview questions and provided direct support for interview-derived themes.

We synthesized the data using an inductive thematic analysis approach following the structure described by Braun and Clarke [24], with codebook development and reliability assessment procedures drawn from applied thematic analysis [25]. We selected this variant because our dataset combined observation notes and interview transcripts collected under 2 different protocols, and an explicit codebook allowed consistent analytic treatment across both sources. Two researchers first familiarized themselves with the full dataset through repeated reading, then independently applied a chronological open coding process [26] to the data to generate their own preliminary codebooks. The researchers then held iterative discussions to refine and consolidate codes, ensuring that the remaining codes were central to our research questions. To assess saturation, we retrospectively mapped the order in which sessions contributed new codes to the codebook. Because the final 5 sessions yielded no novel codes, additional data collection was deemed unlikely to materially change our findings.

The final codebook can be found in Multimedia Appendix 4. Theme selection was guided by relevance to our 3 research questions rather than by frequency alone. Notably, 2 of the highest-frequency codes—transcription errors and manual edits—are not foregrounded as standalone findings because they function as underlying conditions that shape the communicative and behavioral adaptations we report rather than as communication phenomena in their own right. Examples that remained in the final codebook included, but were not limited to, "confidential disclosure," "implicit communication," and "cognitive load." One researcher applied this final codebook to the entire dataset, while a second researcher independently coded a randomized 50% subset of the participants' data to assess interrater consistency (Cohen κ=0.829).

Researcher Positionality

Although the participants and researchers involved in this research came from various cultural backgrounds, this research was conducted in Toronto, Canada, and may therefore exhibit perspectives of WEIRD (Western, educated, industrialized, rich, and democratic) societies [27]. The researchers who gathered and analyzed the data are academically trained in computer science with a specific focus on human-computer interaction and qualitative methods. All team members have extensive experience at the intersection of health care and technology, with the lead investigators bringing over a decade of research expertise in this domain. In fact, a subset of our team conducted research examining ambient scribes before the advent of LLMs, revealing that transcription and summarization flaws created additional documentation burdens for physicians [16]. Potential interpretive bias from our previous experiences was minimized by documenting precoding assumptions and adhering strictly to inductive thematic analysis grounded in participant responses.

Ethical Considerations

Approval for this study was obtained from the University of Toronto's Research Ethics Board (#46504). All participants provided written informed consent before participating in the study, authorizing the collection of demographic information and interview transcripts at a minimum. Those who agreed to be shadowed in the clinic also provided written informed consent

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for that process, which included in-person observation and note-taking. No members of the research team had a prior relationship with any of the participants, and all participants received CAD $100 for their time regardless of which enrollment option they selected.

The researchers who conducted the shadowing received approval from each clinic to proceed, which required varying levels of paperwork and training. Furthermore, shadowed physicians obtained verbal consent from each patient before allowing the researchers to observe their appointments. If a given patient did not consent to shadowing or the physician decided not to use their scribe at all for the appointment, the researchers left the room and waited to be invited back in by the physician for the next encounter with a consenting patient and ambient scribe use.

Participants' demographic information was linked to a randomized alphanumeric identifier to protect their identities. The identities of speakers in the interview transcripts were similarly anonymized. Automatic summaries generated by scribes were not included in any analyses to protect patient confidentiality. However, physicians occasionally mentioned patient names or excerpts generated by their scribes, so any identifiable information from these utterances was redacted from the transcripts. The raw transcripts were deleted after this process, leaving only the postprocessed transcripts that were restricted to authorized researchers.

Results

Overview

In total, 17 physicians completed the study protocol, comprising 5 (P1, P2, P3, P4, and P16) who consented to clinical shadowing and 12 who completed a walk-through instead. A summary of the prestudy survey responses is provided in Table 1. Although product comparison was beyond the study's scope, the diversity of tools offered additional insight into the communication modes enabled by ambient scribes.

Our thematic analysis revealed that ambient scribes impacted more than just the direct interactions between physicians and patients. As illustrated in Figure 1, introducing ambient scribes as a third party into the traditionally dyadic conversation prompted physicians to produce dual-purpose speech that benefitted both their patients and their ambient scribes simultaneously. Furthermore, physicians did not strictly interact with their ambient scribes during encounters; they spent nontrivial time curating the automatically generated outputs when preparing notes for their EMR systems. These 3 communication pathways—physician-to-patient, physician-to-patient-and-scribe, and physician-to-note—came with their own affordances and constraints, as enumerated in Table 2 and explained below.

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Table 1. Demographics of the family care physicians who participated in our study.

Characteristics/Descriptions	Values
Gender, n (%)	
Male	6 (35)
Female	11 (65)
Experience practicing medicine (years), mean (SD)	11.3 (10.4)
Ambient scribe tools used, n[a]	
Tali AI (platform: web application; EMR[b] integration: available with select platforms; note generation: postencounter; unique features: none observed)	6
Heidi AI (platform: web application and browser extensions; EMR integration: none; note generation: postencounter; unique features: standardized and custom note templates; translation to English)	6
Scribeberry (platform: web application; EMR integration: none; note generation: postencounter; unique features: chat interface for generating patient summaries and specialist referrals)	4
Fluent Health (Be Fluent LLP) (platform: web and mobile application; EMR integration: none; note generation: postencounter; unique features: none)	4
AutoScribe (Mutuo Health Solutions) (platform: web application; EMR integration: none; note generation: live; unique features: none)	4
QuickChart (Alioth LLC) (platform: web application; EMR integration: none; note generation: postencounter; unique features: none)	2
Ambient scribe experience, n (%)	
Tested multiple, using multiple	3 (18)
Tested multiple, using single	6 (35)
Tested single, using single	7 (41)
Tested single, using none	1 (6)
Perceived satisfaction with current ambient scribe, n (%)	
Extremely dissatisfied	1 (6)
Somewhat dissatisfied	1 (6)
Neither dissatisfied nor satisfied	1 (6)
Somewhat satisfied	10 (59)
Extremely satisfied	4 (24)
Duration of ambient scribe use at point of study, n (%)	
Less than 6 months	12 (71)
Greater than 6 months	5 (29)
Self-reported frequency of ambient scribe use, n (%)	
No longer using	1 (6)
Rarely	1 (6)
Occasionally	2 (12)
About half of all encounters	2 (12)
Most encounters	9 (53)
Every encounter	2 (12)

[a]Key attributes observed during the study are reported. Products may have had additional features beyond those observed.

[b]EMR: electronic medical record.

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Figure 1. The flow of information between stakeholders during patient encounters before and after the introduction of ambient scribes.

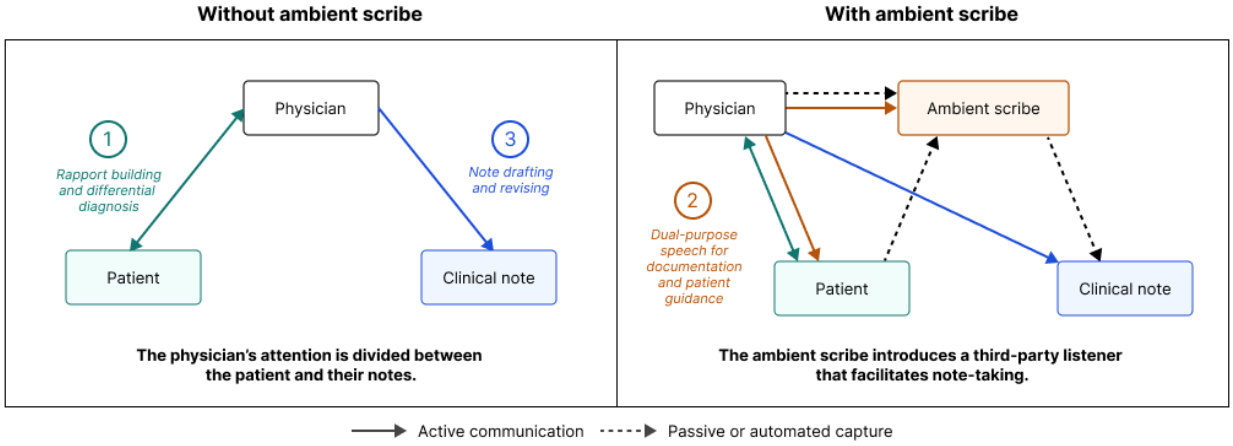


Table 2. The affordances and constraints generated by ambient scribes along 3 communication pathways. The fractions next to each item indicate the number of participants who described each theme, but in keeping with thematic analysis conventions [24], they do not determine the analytical weight we assigned to each theme.

	Physician-to-patient	Physician-to-patient-and-scribe	Physician-to-note
Affordances	• Active listening and engagement support (10/17) • Attentiveness to patients' nonverbal cues (2/17)	• Enhancement of patient comprehension (10/17) • Flexibility in conversational structure (11/17)	• Cognitive load reduction from workflow optimization (12/17) • Conversational control and note manipulation (17/17)
Constraints	• Communicative demand of scribe introduction and patient consent (15/17) • Conditional patient disclosure (7/17)	• Omission of implicit information (14/17) • Unintended documentation artifacts (10/17)	• Transcription error burden and cognitive overhead (17/17) • Diminished recall (5/17)

Physician-to-Patient Communication

Affordance #1: Active Listening and Engagement Support

With a perceived reduction in the need to stare at their screens, physicians in our study appreciated being more present during their encounters. They reported having more capacity to face their patients, maintain eye contact, and use affirmative gestures such as head-nodding to convey attentiveness and empathy. This shift was considered particularly significant for patients with mental health concerns, for whom the quality of relational engagement was seen as integral to care: "My mental health patients feel they're more heard. They feel like I'm paying more attention to them. When I'm typing, they sometimes feel like I'm not listening, or that it's disruptive to what they're saying" (P15). These benefits were also salient during lengthy or unstructured encounters, where the demands of manual documentation had previously compelled physicians to closely manage conversational flow. By offloading note-taking responsibilities, participants recounted that AI scribes afforded patients greater freedom to express their concerns without exacerbating any pressures to curtail encounters.

Beyond attentiveness, physicians in our study reported an increased capacity to empathize with complex or emotionally demanding patients: "Those heart-sink patients who have a million things to complain about...It used to be like, 'Oh my God, how am I going to get through all these things?' Now, I can just listen to them, and I can empathize a lot better with them" (P15). This shift in presence extended to broader social dimensions of the encounter. P05 noted that transcription demands had previously competed with social engagement, but their ambient scribe fostered greater capacity for informal conversation and rapport-building: "I probably have more time for the schmooze [now]. I can't schmooze and type at the same time, but I can schmooze and [have the conversation transcribed] at the same time." Sustained eye contact further proved valuable in moments of direct or intimate communication, such as when counseling patients on necessary lifestyle changes such as curbing alcohol consumption or adhering to medication schedules.

Affordance #2: Attentiveness to Patients' Nonverbal Cues

Directing more attention to their patients facilitated more than just an improvement in the patient experience. Participants reported being able to observe body language, facial expressions, and physical signs they might otherwise have overlooked. They valued this capability in scenarios where subtle shifts in affect or demeanor carried meaningful clinical significance: "If you're looking at the patient, there are a lot of things, like body language and facial expressions, that you wouldn't always notice. Sometimes they can be helpful, especially for mental health. I think a lot of [patients'] moods can change very

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quickly, and if you're really paying attention, you can really get a little bit more nuance in the situation" (P07). Beyond mood and affect, participants recalled that visual attention enabled the passive observation of physical indicators without requiring direct questioning, such as whether a patient appeared to be breathing rapidly and showing signs of respiratory distress, or guarding a particular area of the body. As described by P07, "There are certain signs like that you don't need to ask the question; you can just see them. When you have a little bit less distraction, it's easier to do your job."

Constraint #1: Communicative Demand of Scribe Introduction and Patient Consent

Before their encounters with first-time patients, physicians in our study were either mandated or felt an ethical obligation to disclose the presence of their ambient scribes to obtain patient consent. P17 estimated that they typically required 2 to 5 minutes to explain the purpose of their ambient scribe to new patients at their rural walk-in clinic. Since they could typically allocate only 10 to 15 minutes per encounter, this overhead threatened the efficiency of their workflow and the time they could spend talking with their patients, resulting in occasionally rushed encounters. P09 echoed this sentiment, recalling cases of prolonged follow-up questioning after patients nominally agreed to being recorded.

The consent process also occasionally set an awkward or uncomfortable tone during some encounters. When speaking with patients who had sensitive concerns related to mental or sexual health, P17 recalled being asked questions about data storage and access that they did not feel confident answering comprehensively. Some participants received training materials from their clinics on the specific features and data management practices of their endorsed ambient scribe products, but most others had explored one or more products with varying knowledge of their inner workings.

Constraint #2: Conditional Patient Disclosure

Even when patients had consented to being recorded, physicians in our study suspected that the ambient scribe's ongoing presence caused some to reconsider what information they disclosed. P08 recounted a patient who initially consented to an ambient scribe but later requested that the scribe be turned off: "It's usually when they're in a really vulnerable, stressful situation, and then they're already vulnerable coming into the appointment. So they just don't want to think about this new extra thing that I'm introducing, which is fair." Reporting a similar situation, P05 said, "It was a very sensitive issue for [the patient], and he just didn't want it recorded, even though I told him that I would delete it.... I don't think he wanted somebody else to formulate an opinion or note on him. He just wanted me to do it." In these scenarios, participants perceived that their patients held concerns not about the data itself but in the presence of an external party constructing a record of the encounter.

We observed that some physicians adapted to these concerns by anticipating them—deciding not to introduce the scribe during encounters when they expected patients might find its presence stressful. As P08 described, "Sometimes with very sensitive appointments, and it's the first time I'm using a scribe, I usually just don't bring it up, because I don't want to add to their stress." These decisions did not follow a formal policy but reflected in-the-moment judgments that varied with each participant's familiarity with their patients or their read of how patients presented themselves.

Physician-to-Patient-and-Scribe Communication

Affordance #1: Enhancement of Patient Comprehension

Beyond facilitating documentation, participants reported that ambient scribes had an indirect but meaningful effect on patient comprehension during clinical encounters. We observed several instances when physicians narrated their actions and findings aloud to their ambient scribes, exposing patients to more information than they might otherwise have received. This was particularly evident during physical examinations, when participants had to verbalize procedures and findings so that the ambient scribes could capture the required details. P3 hypothesized that these interactions provided reassurances to patients: "I actually think that it's helpful to describe what you're doing to the patient.... You often would do it for, let's say, a pelvic exam, to make people feel comfortable.... Patients probably appreciate it as opposed to me wiggling their knee and leg around, saying 'huh', and nodding, because then they don't really know." To make this communication effective for patients, participants reported speaking more slowly and in greater detail than necessary for their notes. Discretion was also required during these interactions, as several participants reported being careful to reserve clinical terminology for their written notes. That said, a few ambient scribes were able to translate lay language into corresponding clinical terminology, which lessened the need to modulate vocabulary during encounters.

Toward the end of their encounters, some physicians in our study found it helpful to explicitly summarize their conversations as a structured overview for the scribe. They believed that these summaries also indirectly supported patients' understanding of their care by consolidating key takeaways from otherwise information-dense clinical conversations. For example, P17 shared that ambient scribe adoption encouraged them to verbalize the reasoning behind their clinical recommendations, leaving patients with clearer transparency about their care.

Affordance #2: Flexibility in Conversational Structure

Before scribe adoption, physicians in our study recounted managing multi-issue encounters by structuring their conversations around their note-taking, addressing issues sequentially to maintain organized documentation. With an ambient scribe capturing the full exchange, some participants reported allowing patients to move between topics more freely, trusting the scribe to organize the resulting note. P06 described this shift as follows: "Like the ones when patients are all over the place, like my mood and my headache and my body and my whatever. Normally, you would have to write out issue by issue, but with [the ambient scribe].... It separates them by issues already for me." P07 noted that this flexibility extended to unexpected conversational trajectories, allowing them to follow

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a patient's train of thought rather than redirecting it: "Sometimes when they go off script...you can actually focus on that. So it helps me also stay on track with what information I need to get from the patient." P14 described a similar benefit for older adult patients with extensive concerns, noting that the scribe's ability to track the conversation relieved her of a task she found difficult to manage alongside active listening.

Constraint #1: Omission of Implicit Information

Participants described clinical encounters as being rich with information that both parties understand without speaking. When documentation depended on a channel limited to spoken words, they lamented that such implicit knowledge was excluded from their notes. This was particularly apparent in long-term care relationships where participants and patients shared an accumulated clinical context that neither party needed to reiterate aloud. In the words of P10, "I had a patient last week where the background is that she has metastatic cancer. We talked about weight loss, nutrition, and blood pressure, but the underlying issue is that she has metastatic cancer...That wasn't anywhere in my note." Participants identified deictic references and gestures as other forms of implicit communication that were immediately meaningful during face-to-face interactions but carried no information for ambient scribes. P05 remarked on having to coach their patients to facilitate ambient scribe documentation: "Patients will say things like, 'Well, I have a lot of pain over here,' and I would have to tell the patient, 'You have to tell me where 'here' is because the microphone doesn't understand.'" Likewise, P03 described with humor, "They think I'm a little crazy, because they're like, 'Yeah, it hurts here,' and then I say, 'Oh, right there on your medial left knee.'"

Participants also raised pertinent negatives as yet another form of unspoken information vital to clinical note-taking. Without an ambient scribe, physicians in our study reported being free to type out their observations and nascent hypotheses in private; with an ambient scribe, they wrestled with the consequences of verbalizing these thoughts aloud. P01 recounted the awkwardness of narrating pertinent negatives during a physical examination: "[I would say] 'This isn't happening. I don't see this. I don't see that.' It's not relevant to the patient, but it's relevant to the note." Participants also commented that they avoided discussing speculative or concerning observations to prevent unnecessary alarm, instead choosing to document their thoughts privately after the encounter: "I told her I felt a lump and it needed further investigation. And then I went back later and documented, 'Large, non-mobile, fixed-to-chest mass is concerning.' I would never say that to her" (P10).

Constraint #2: Unintended Documentation Artifacts

We occasionally observed clinical encounters involving multiple speakers: patients accompanied by family members, parents speaking on behalf of children, or patients raising health concerns about relatives. While most scribes use diarization to distinguish between speakers, we often saw that participants had to clarify attribution in their notes after encounters. Even when diarization was successful, participants noted that people could talk about medical issues associated with other individuals. P03 recounted such a situation involving a man accompanied by his wife: "He said, 'Oh, my wife wants to talk to you. Her leg also hurts.' People do that all the time. They sneak in a two-for-one.... That gets thrown into the note too, because it can't figure out that it's for the other person." We also observed unaccompanied patients make casual remarks about family members that have been elevated to the status of clinical findings. For instance, P01 met with a patient who mentioned heartburn in passing, only to find that heartburn was listed as the primary diagnosis in their scribe's assessment.

Physician-to-Note Communication

Affordance #1: Cognitive Load Reduction From Workflow Optimization

Physicians in our study reported that using an ambient scribe alleviated much of their cognitive load during clinical encounters. Without a scribe, participants felt burdened as they balanced note-taking with the multitude of other clinical tasks: searching for patients' EMR charts, ordering medications, and scheduling follow-up visits. Instead of feeling constrained by a sequential workflow for all these tasks, ambient scribes allowed them to attend to these tasks dynamically as encounters unfolded. Participants recounted being able to retrieve prior medical history while patients described a previous concern, place orders or referrals without pausing the conversation, and cross-reference medications midencounter. As P12 described, "You don't even realize how much cognitive load you carry, doing the 2 tasks at once, or the 6 tasks at once, or whatever it is. When you only have one cognitive task to do at a time, it's such a relief."

Several participants also found ambient scribes useful for generating additional documentation beyond their notes, including referrals and patient education guides. P12 shared, "Whenever I diagnose someone with depression or anxiety, I would include social suggestions like, 'You should exercise. You should have sunshine. You should journal. Get off social media.' All the non-medical things that you should do, and I go through it with them verbally. And afterwards, [the scribe] would generate a nice point-form summary that I'd share with my patient and put in my note." This affordance was contrasted with typing similar documentation from scratch after the encounter, which took more time, bled into the next appointment, or risked omitting important information. With an ambient scribe, these notes were being generated, reviewed, and shared with patients while encounters were still fresh.

Affordance #2: Conversational Control and Note Manipulation

Participants reported that ambient scribes unlocked a new mode for interacting with their notes, repurposing them as dictation tools for postencounter manipulation. During clinical shadowing, several participants provided verbal and short written instructions to adjust the scribe-generated notes. These interactions ranged from brief commands directed at their scribes to extended verbal accounts of entire consultations. Oftentimes, these revisions were limited to quick fixes that participants believed the scribe could easily understand: "If [the ambient scribe] gets the gender wrong, I'll say, 'Please fix gender', but the rest I'll usually do in the EMR" (P13). Additionally, participants used this affordance to add information they did

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not feel comfortable saying aloud during patient encounters, such as P03's written amendment: "Once they walk out of the room, I hit the 'Generate Note' button, and I'll write at the bottom, 'Please add in line: Patient has very significant health anxiety.'" Postencounter dictation was also necessary for encounters conducted in a language other than English due to a lack of support from their chosen scribe system. Unlike traditional dictation relying on word-for-word note recitation, these interactions allowed physicians in our study to speak naturally as their scribes handled synthesis and organization.

Constraint #1: Transcription Error Burden and Cognitive Overhead

During clinical shadowing and think-aloud walk-throughs alike, some participants used ambient scribes that produced live transcripts. Although these individuals often appreciated seeing visual evidence that the tool was working, they also considered the transcripts to be a source of distraction. Beyond the peripheral distraction of moving text on the screen, we observed that transcription errors occasionally prompted some participants to pause their patient conversations to make corrections. The impact of the distraction ultimately depended on the relevance of the transcription mistakes to the final notes.

Regardless of whether there was a live transcript, participants frequently reflected on the cognitive burden they experienced when they identified additions and corrections they wanted to apply to their generated note, knowing they could only implement those changes later. P17 described having trouble finding time to offload this cognitive burden: "Now I have to remember which things I mentioned that it didn't include and which things to take out. Also, do I do that in between patients, or can I do that at the end of the day? Will I remember it until then?" Additional burden was created when the physicians could not determine whether errors in their generated notes were transcription errors or misunderstandings. Recounting their thoughts on such situations, P03 said, "Maybe I either didn't hear the patient say it, or [the ambient scribe] made it up. I guess it could be 50/50." Such uncertainties complicated participants' reviews of generated notes; rather than just fixing obvious errors, they often found themselves evaluating the validity of seemingly plausible notes.

Constraint #2: Diminished Recall

While participants reported having to rely on their recall to revise generated notes, several recognized that using ambient scribes actually diminished their recall of patient cases. They reported increased difficulty remembering discussion points in follow-up visits with patients, leading to the following reflection from P11: "Usually when I have a patient come in, and I saw them last month, I can go to the note I last wrote, and within 15 seconds or less, have a whole picture of what we talked about and what the focus is. When I was going back to notes written by my ambient scribe, I wasn't getting that now. Maybe it's not the way the note is presented, and it's actually the act of taking notes that solidifies things in my brain in a different way, and so I recall them better." This quote highlights 2 related points. First, actively writing during an encounter supported P11's memory consolidation, resulting in stronger recall during future visits. Second, the structure and format of the note shaped how easily P11 processed information when reviewing it later. In the words of P04, "When you're reading something that's generated by something else, it's hard to be in that frame of mind."

Beyond retrospective recall, physicians in our study also reported losing a form of real-time cognitive scaffolding that manual note-taking had previously provided during their encounters. As P11 described, distilling and synthesizing information via typing provided frequent checkpoints for determining encounter completeness: "I know every time a patient comes in with a fever and a runny nose, I know all the questions I need to ask. Sometimes, I look at my note, and I'll ask while I'm typing, 'Why does my note look so short? What bucket of questions did I forget to ask?'" Relying on an ambient scribe removed this affordance, increasing the likelihood that gaps in questioning went unnoticed until patients had already left.

Discussion

Principal Findings

Ambient scribes may offer significant potential to enhance the relational quality of clinical encounters by reducing physicians' administrative burden during encounters. We observed that these tools allow physicians to maintain consistent eye contact, and participants reported being able to attend more closely to nonverbal cues such as facial expressions or signs of physical distress. This increased presence may improve patient rapport and empathy, particularly in mental health settings where the quality of the therapeutic alliance is paramount [28]. Participants perceived that this workflow shift allowed them to manage other tasks, such as ordering referrals or medications in real time, since they no longer need to pause the conversation to type. Consequently, they experienced greater flexibility in structuring multi-issue encounters, as patients were able to pivot between diverse concerns without disrupting the automated documentation process.

Alongside these affordances, our findings reveal a set of constraints that introduce new complexities into clinical communication. Participants in our study noticed instances when patients were hesitant to disclose sensitive information in the presence of an ambient scribe. Because ambient scribes rely entirely on audio, participants also indicated that they often failed to capture unspoken information while introducing documentation artifacts such as misattributed remarks from family members or casual asides. These issues imposed increased cognitive overhead when auditing generated notes, especially when scribes added clinical reasoning the physicians did not perform themselves. Finally, a few physicians in our study reported that the loss of active note-taking may have diminished their long-term clinical recall and removed the real-time scaffolding that previously helped them ensure that all relevant questions were addressed during the visit.

These findings can be situated within the broader literature on triadic clinical consultations involving human scribes. Yan et al [20] documented that the presence of a human scribe requires physicians to simultaneously manage patient rapport and

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scribe-facing documentation demands, introducing a third party into what would otherwise be a dyadic encounter. Our study found that ambient scribes perpetuate this triadic structure and offer some of the same benefits as human scribes, but the shift from a human to an algorithmic third party meaningfully reconfigures its demands. Like human scribes, ambient scribes allow physicians to have more focused conversations with patients, undistracted by the labor of typing or note-taking. However, unlike a human scribe who can request clarification, leverage clinical training to interpret contextual cues, and form relationships with patients, ambient scribes listen passively and cannot recover deictic gestures or unspoken clinical context. Transforming what was once a relational challenge into a technical one, ambient scribes shift the dominant burden of triadic management away from real-time interpersonal negotiation and toward a solitary, postencounter process of cognitive recall and note verification.

Variability in Physician Adaptation and Practice

Our analysis of affordances and constraints reveals a spectrum of patterns physicians exhibit while adopting ambient scribes. At one end of the spectrum, physicians in our study refused to alter their natural communication style to maintain patient rapport, resulting in clinically imprecise notes and additional note curation burden. At the other end of the spectrum, physicians in our study intentionally integrated clinical terminology and documentation-oriented language directly into their patient-facing conversations, resulting in occasionally awkward patient interactions.

Although most of the physicians in our study were predisposed to the former end of the spectrum as they prioritized patient interactions over documentation quality, their positioning was not static. Rather, they frequently shifted their communicative approach both within a single patient encounter and across different encounters depending on the immediate demands of the clinical context. This fluidity suggests that the presence of ambient scribes as third-party listeners necessitates a complex, real-time negotiation of communicative priorities where physicians must balance the interpersonal demands of their patients with the integrity of their EMR notes. Reducing the cognitive load associated with this process could be the key to improving ambient scribe effectiveness and acceptability.

Transferability of Our Findings

Several factors likely influenced the transferability of our findings across contexts. Because we recruited physicians from family medicine practices and walk-in clinics, our sample reflected a broad diversity of patient presentations. Discussions surrounding confidential disclosure and active listening were especially prominent when physicians described encounters involving mental health concerns, while the benefits of having a scribe follow circuitous conversations were salient when patients presented with disparate health concerns. In contrast, ambient scribes may offer less utility in specialized tertiary care due to their heavy reliance on structured reporting templates [15], while physicians in high-volume emergency settings may face unique practical constraints regarding when and where scribes can be activated [29]. Future research should continue to explore ambient scribe integration across these distinct clinical environments, especially with longitudinal study designs that track adoption patterns over time.

Product variability also introduced nuances in how participants experienced ambient scribes, as physicians used a wide array of tools with distinct feature sets and shortcomings. Although some findings were directly attributable to specific product characteristics, such as the added distraction created by ambient scribes that provided live transcripts with errors, others were difficult to isolate. Because our sample size precluded comparative claims across individual platforms, controlled, head-to-head evaluations with larger cohorts are needed to yield clearer feature-level insights. We hypothesize that findings related to speech processing performance (eg, transcription accuracy and speaker diarization) will become less relevant as underlying models improve, whereas findings tied to the fundamental limitations of audio-only capture (eg, interpreting deictic gestures and nonverbal cues) are more likely to persist.

Potential Design Implications

Although our analyses focused on patient-physician communication, the implications of our findings extend beyond the channels through which information is verbalized, processed, and documented. An encounter documented by an ambient scribe can have significant downstream effects on the care physicians provide over time, especially in primary care settings where care provision requires consistent follow-up and longitudinal management [30]. Physicians' ability to quickly and accurately recall what occurred in prior encounters is therefore important. If important information is omitted or extraneous information is not removed, physicians may act on incomplete or misleading notes the next time they review a patient's file. This is especially true if enough time has passed that the physician can no longer rely on their memory to recall what was said, since clinical notes have historically served as cognitive scaffolding for physicians' reasoning across encounters [31].

To minimize the likelihood of omitted information, future ambient scribes could emerge from the background and assume more active roles during encounters. For example, some participants suggested that new designs could use a combination of a patient's medical history and the trajectory of the conversation to suggest relevant topics for physicians to probe. Ambient scribes could also track progress to restore some of the organizational logic that physicians previously gained through manual note-taking. If a serious omission is detected, ambient scribes could even provide a real-time nudge to alert them to the gap before the patient leaves the room. However, using active intervention strategies may contradict standard training that emphasizes unobtrusive tool use. Careful consideration would be needed to realize these features without distracting physicians or undermining their expertise in the eyes of their patients.

To help physicians wrangle extraneous information, ambient scribes might not require definitive decisions on what information to include or exclude in their synthesized summaries. Instead, designers could consider a high-recall approach that preserves a wider breadth of data while automatically assigning importance and relevance ratings to

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each extracted fact. Rather than reviewing every transcribed detail individually, physicians could evaluate information in descending order of its assigned clinical weight. This could allow them to stop once they feel the note has reached a comprehensive threshold, significantly reducing the cognitive labor required during their note curation.

Ethics of Ambient Scribe Use

Physicians serve as the primary interface for obtaining patient consent for ambient scribe use, yet many reported struggling to address concerns about data storage, access, and the implications of breaches. As a result, the procedural consent patients give may not always equate to substantive informed consent [32]. Moreover, consent does not always end with the consent conversation: patients may request that scribes be deactivated midencounter or exhibit hesitation during sensitive disclosures, particularly around mental health or sexual health. This reluctance echoes a broader pattern observed in population surveys, in which the documentation of clinical encounters is associated with patients withholding information to protect their privacy [33]. Together, these patterns suggest that consent for ambient scribes may be better understood as an ongoing negotiation across the encounter than as a 1-time agreement. To alleviate this burden within the encounter, clinics could shift parts of the consent process to previsit electronic platforms, which have already been shown to enhance patient comprehension and engagement in clinical research [34]. Additionally, in-clinic autonomy can be reinforced through visible pause controls and explicit indicators of recording status.

Physicians in our study also chose to avoid introducing their ambient scribe altogether during some encounters, particularly in scenarios when they anticipated that patients might find a scribe's presence uncomfortable. This dynamic decision may introduce a discrepancy in documentation quality, as patients whose encounters include a scribe may receive more consistent or comprehensive records than those whose encounters do not. Future systems could highlight this potential variability by incorporating standard metadata indicating which ambient scribe was used, if any, during the encounter. This would allow physicians to contextualize the notes they receive or revisit.

Ethics of Ambient Scribe Data Capture and Retention

Historically, physicians have been responsible for ensuring that conversational asides, off-the-record exchanges, or omitted details were excluded from permanent EMR records. Ambient scribes fundamentally change this dynamic since they often generate more than just written notes; they produce full transcripts or audio recordings of encounters. Regardless of whether these underlying materials are ultimately retained, they exist as clinical artifacts that capture far more than a standard physician's note. The existence of these materials means that they could be requested during a complaint review, malpractice case, or legal inquiry, raising open questions about their status relative to the formal health record [35]. Future deployments would therefore benefit from clearer policies defining what constitutes the official clinical record, who has access to underlying transcripts and recordings, how long they are retained, and how these distinctions are communicated to both clinicians and patients.

Furthermore, ambient scribes not only capture information about patients but also other individuals mentioned incidentally in conversation (eg, family members and friends). Because these third parties have not consented to being recorded, we urge scribe software developers to consider how such information is handled in both the generated note and the underlying transcript. Ideally, such incidental references would be flagged for physician review before being incorporated into the clinical record.

Limitations

In addition to clinical practice settings and scribe feature sets, the transferability of our findings may be limited by our recruitment strategy, which specifically targeted physicians with ongoing or previous experience using ambient scribes. Table 1 conveys that our cohort had a self-selection bias toward individuals who were at least moderately satisfied with their scribe use, inherently filtering out physicians who have rejected ambient scribes from the outset. Although we cannot verify this claim from our data as presented, our analytic impression was that the reported constraints appeared across participants regardless of their scribe satisfaction. We believe what differed was the degree to which these constraints contributed to that satisfaction, thus suggesting that several of our findings may still be applicable to dissatisfied users or nonadopters.

Additionally, our sample did not include patients because our research questions centered around physicians' perceptions. Some of our data captured patient reactions directly observed during clinical shadowing or indirectly recounted by our physician participants. However, a follow-up study with patient participants would elicit richer insights into their comfort with ambient scribes, particularly regarding privacy concerns and how the presence of AI influences perceived rapport.

Conclusions

Although ambient scribes reduce manual documentation burden during patient encounters, they introduce a complex trade-off in which clinicians must manage the tension between patient engagement and the technical requirements of a third-party digital listener. This technology is not truly invisible; it requires physicians to consciously navigate when, how, and whether to adapt their communication to ensure accuracy and prevent extraneous documentation artifacts. Our findings suggest that ambient scribes do not simply remove documentation work but redistribute it, shifting demands toward communication management during the encounter and cognitive recall and note verification afterward. To better integrate into physicians' workflows, future systems should therefore move beyond simple transcription to support clinicians in managing these demands. Future evaluations should likewise look beyond documentation speed to assess the added cognitive and relational demands placed on physicians.

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Data Availability

The final analytical codebook for this study can be found in Multimedia Appendix 4. This file enumerates all of our thematic codes, each of which is accompanied by participant frequency counts and representative quotes. Anonymized transcripts can be provided upon reasonable request.

Generative AI Use

The authors declare that generative AI was used in the creation of this manuscript. Generative AI (Gemini, Claude) was used for proofreading, editing, or language polishing. The authors verified all outputs of the tool(s) used in the preparation of this manuscript and take full responsibility for the final content of the manuscript.

Authors' Contributions

KT and BL conceived the study design and research questions. NH, KJ, and BL conducted the observations and interviews. NH, KJ, and BL analyzed the data. NH, KJ, AM, and BL wrote the original draft of the manuscript. All authors reviewed this paper.

Conflicts of Interest

None declared.

Multimedia Appendix 1

The observation template that researchers used to take notes during clinical shadowing.
[PDF File (Adobe PDF File), 86 KB-Multimedia Appendix 1]

Multimedia Appendix 2

The semistructured interview script that researchers followed when speaking to participants who agreed to clinical shadowing.
[PDF File (Adobe PDF File), 58 KB-Multimedia Appendix 2]

Multimedia Appendix 3

The semistructured interview script that researchers followed when speaking to participants who agreed to a think-aloud walkthrough of their scribe usage.
[PDF File (Adobe PDF File), 83 KB-Multimedia Appendix 3]

Multimedia Appendix 4

The list of finalized thematic codes along with example quotes.
[PDF File (Adobe PDF File), 56 KB-Multimedia Appendix 4]

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Abbreviations

EMR: electronic medical record
LLM: large language model
WEIRD: Western, educated, industrialized, rich, and democratic

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