

Ambient Voice Technology in Same Day Emergency Care: Enhancing Documentation Efficiency and Patient Flow

M Karavassilis, S Youn, D Chernov, E Tatla, I Ahmed, S Youn & D Devendra

Abstract

Background: Efficient documentation is essential in Same Day Emergency Care (SDEC) settings to maintain smooth patient flow. Manual typing, although reliable, is time-consuming and can negatively impact clinical efficiency.

Objectives: This Service Improvement Pilot study evaluates the impact of Heidi Health's Ambient Voice Technology on documentation efficiency, clinician workload, and patient satisfaction during clinical consultations.

Methods: An observational analysis was conducted on 100 case notes in an SDEC setting. Documentation times using Heidi Health's Ambient Voice Technology were recorded, while manual documentation times were estimated based on word counts and typical typing speeds. Clinician feedback was gathered on usability and administrative burden, and patient feedback focused on the consultation experience.

Results: Ambient Voice Technology reduced documentation time by 85.8%, saving an average of 5.27 minutes (equivalent to 5 minutes 16 seconds) per case compared to manual typing ($p < 0.001$). Clinicians reported high usability scores (mean = 9.1/10), reduced administrative burden, and improved consultation flow. Additionally, 90% of patients reported an enhanced consultation experience.

Conclusions: Ambient Voice Technology significantly improves documentation efficiency, reduces clinician workload, and enhances patient satisfaction in SDEC settings. Future research should explore its application across a variety of clinical environments.

Keywords

Artificial Intelligence, Machine Learning, Data, Acute Medicine, Prediction, Clinical Documentation

Introduction

Efficient clinical documentation is essential for ensuring patient safety, timely communication between healthcare professionals, and patient flow. Manual documentation consumes a significant amount of clinical time that could otherwise be directed toward patient care^{1,2}. This burden is particularly evident in high-demand settings such as Same Day Emergency Care (SDEC), where efficiency and patient flow are critical.

Ambient Voice Technology (AVT), offers a solution by automating clinical note transcription using advanced voice recognition. This Service Improvement Pilot study evaluates AVT's impact on documentation speed, clinician workload, and patient satisfaction and is based on a local Pilot of AVT in a District General Hospital.

Methods

Study Design

This is a quantitative, observational service improvement study comparing documentation efficiency between manual typing and Heidi Health's Ambient Voice Technology (AVT) in Same Day

Emergency Care. The Cerner Millennium Electronic Health Record (EHR) system was implemented on December 27th, 2021. During the pilot participating clinicians had over 3 years of experience with this EHR system and were considered proficient users. Additional data on clinician and patient perceptions were collected through structured surveys.

Participants

Twenty clinicians who had used AVT across various specialties participated in a questionnaire designed to explore current documentation practices, administrative burdens, and their experiences with AVT. The questionnaire was distributed as part of an organisation-wide pilot. To further examine AVT use in a specific clinical setting, 100 clinical case notes from the Same Day Emergency Care (SDEC) unit were analysed. Additionally, feedback was obtained from 20 patients who experienced AVT-assisted consultations in SDEC.

Data Collection

- **Documentation Time:** Documentation speed times were recorded for AVT's use. This time was measured in seconds using a stopwatch and included

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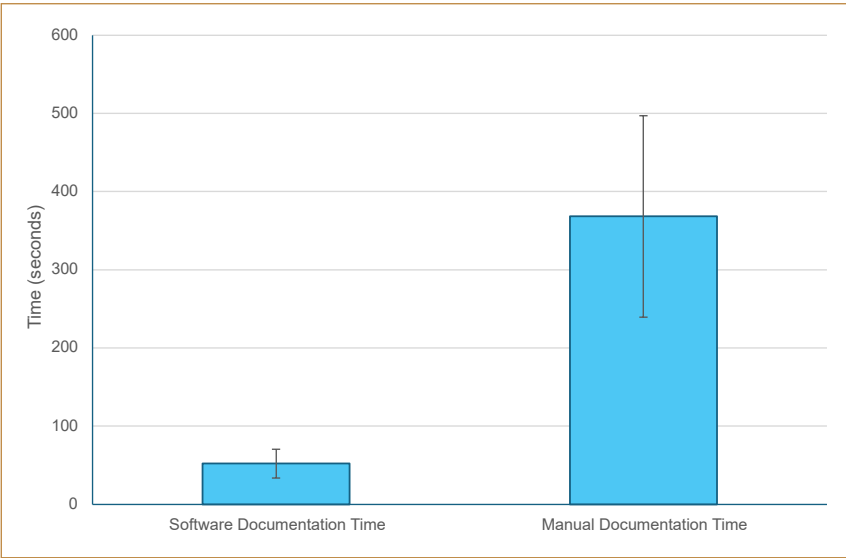


Figure 1. Comparison of documentation time between AVT (software assisted documentation) and Manual documentation.

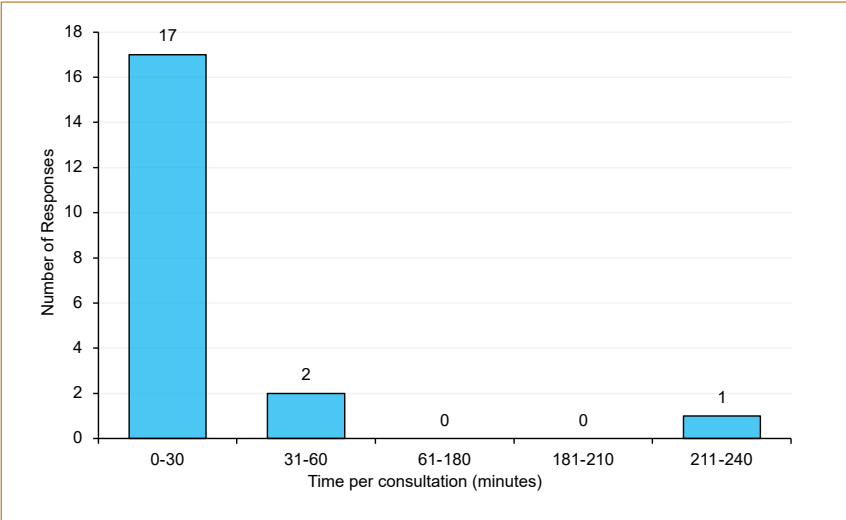


Figure 2. Estimated manual documentation time per consultation in minutes, reported by 20 clinicians prior to using AVT.

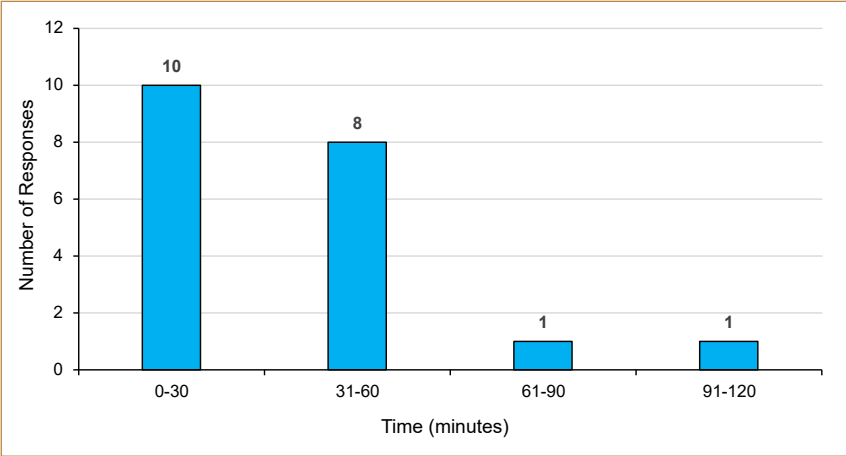


Figure 3. Number of responses for extra time spent by clinicians outside of normal working hours on clinical documentation in minutes.

time taken to review, edit and submit the clinical note on the EHR. Participants received training on the use of AVT prior to the data collection period. Manual documentation times were calculated based on final clinical document word count and individual clinician typing speeds assessed using an online typing speed assessment tool.

- **Clinician Survey:** Surveys assessed experiences with documentation tasks, note accuracy, satisfaction, and perceived impact on patient care. Clinician’s survey can be found in Appendix I. The results of the survey are attached in Appendix II.
- **Patient Survey:** Patients rated their consultation experiences, focusing on comfort, clinician attentiveness, and overall satisfaction. Patient survey can be found in Appendix III.

Statistical Analysis

Mean and standard deviation values for documentation times were calculated. An independent t-test compared time taken to document with AVT against manual typing. Survey responses were summarised descriptively, with frequencies and percentages reported for categorical data.

Results

Documentation Time

The average time required for software-assisted documentation was significantly lower (mean = 52.01 seconds, SD = 18.34) compared to manual documentation (mean = 368.32 seconds, SD = 128.70). A paired t-test confirmed a statistically significant difference between the two methods ($t(99) = -27.94, p < 0.001$) suggesting that software documentation is considerably faster (Figure 1).

Clinician Feedback

Time Burden: Most clinicians ($n = 17$) reported spending 0–30 minutes on manual documentation per consultation (Figure 2). This is a stark contrast to the average documentation time of 52 seconds with AVT. Ten clinicians noted spending an additional 0–30 minutes daily outside regular working hours on documentation (Figure 3).

Accuracy and Quality: Confidence in manually typed note accuracy was moderate, with a common score of 6 ($n = 7$) on a scale from 1 (not confident) to 10 (very confident) (Figure 4). Satisfaction with manually typed note quality was also moderate, with 7 being the most frequent score ($n = 7$) (Figure 5).

Administrative Load: Missing or unclear information in manually typed clinical records was reported by 13 respondents as a daily issue (Figure 6), primarily due to incomplete documentation ($n = 16$) (Figure 7). Most clinicians ($n = 10$) spent 31–60 minutes

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daily searching for missing information, highlighting significant administrative burden (Figure 8).

Burnout and Usability: Most clinicians (n = 19) felt AVT reduced burnout, with 18 reporting significant time savings on clinical documentation with AVT (Figure 9). Usability ratings were high; the majority scored the tool 10 (very easy to use), with others rating it 8 or 9 (Figure 10). AVT was also perceived to improve non-verbal communication and consultation flow (Figure 11).

Patient Feedback

Patients reported overwhelmingly positive experiences with AVT. Most (n = 18) felt the software improved their overall consultation experience and comfort (Figure 12). Nineteen agreed it enhanced clinician attentiveness and consultation flow, while 17 believed clinicians were more attentive to their concerns. Eighteen patients expressed a preference for using the software in future consultations, indicating strong patient support.

Discussion

This service improvement pilot suggests that AVT can significantly reduce documentation time in SDEC, saving an average of 5.27 minutes per case (equivalent to 5 minutes 16 seconds). Such efficiency can enhance patient flow, particularly in high-demand clinics like SDEC, allowing clinicians to see more patients within the same time frame^{3,4,5}. Participating clinicians were experienced users of the existing EHR system, allowing the focus of this pilot to be primarily on the impact of the AVT itself rather than confounded by initial EHR learning curves. However, the pilot's focus on SDEC may limit generalisability to other clinical areas where patient flow dynamics differ. Furthermore, this pilot evaluated a specific AVT within the context of the Cerner Millennium EHR; findings may vary with different EHR systems or specific user expertise in alternative data entry methods. Future research should evaluate the tool's effectiveness across diverse specialties, settings and EHR systems.

While AVT showed promise in reducing documentation burden, several limitations of large language model (LLM)-based transcription systems merit discussion. One notable issue is the potential for transcription errors, especially in noisy environments common in SDEC. Mishearing critical information could introduce inaccuracies, necessitating careful review by clinicians⁶. Additionally, LLMs may generate fabricated or irrelevant content (often referred to as hallucinations), which poses risks to documentation quality and patient safety⁷. Addressing these limitations through enhanced algorithm training and noise-cancelling technology could improve the software's reliability⁸.

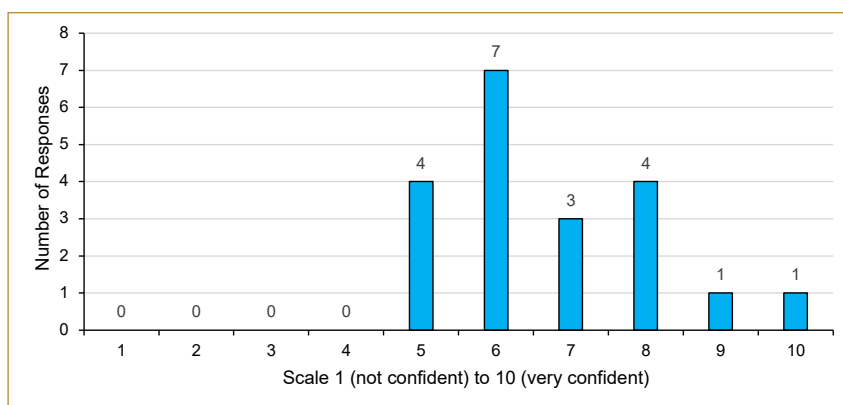


Figure 4. Showing number of responses for how confident clinicians felt that their notes reflected their consultation, on a scale 1 to 10.

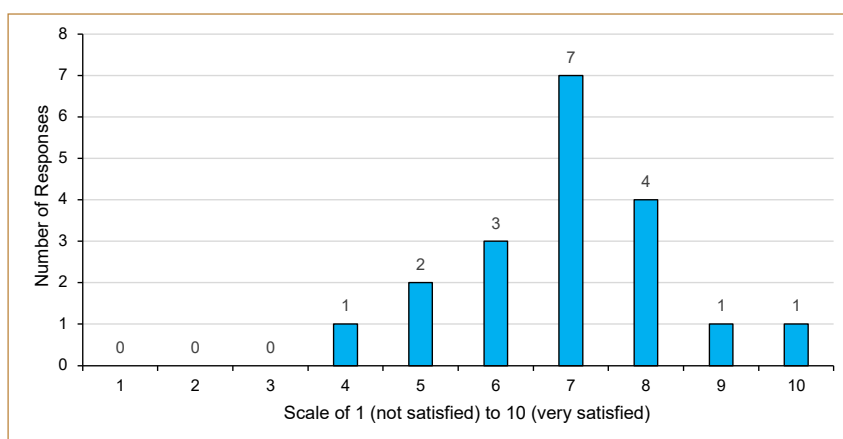


Figure 5. Showing number of responses for how satisfied clinicians were with the quality of their clinical notes, on a scale of 1 to 10.

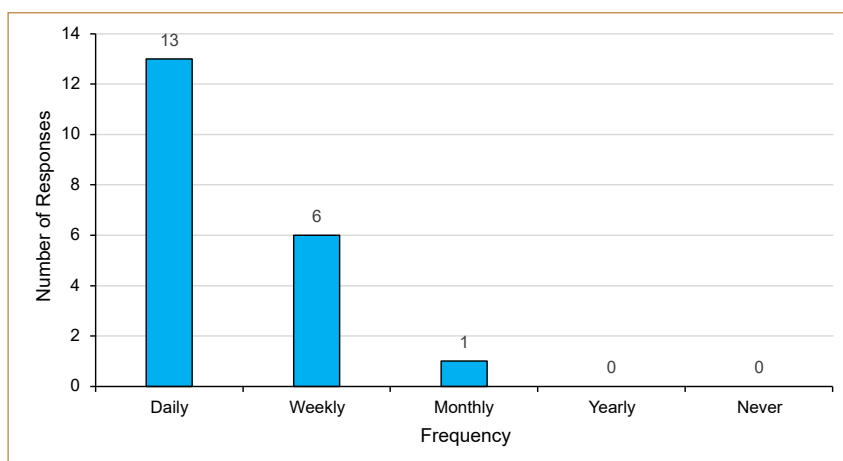


Figure 6. Showing number of responses for how often clinicians encountered missing or unclear information in their clinical records.

Clinicians should also maintain situational awareness, as interruptions from colleagues during transcription may lead to errors in the patient's record or compromise confidentiality⁹.

Clinicians' moderate confidence in manually entered note accuracy highlights the need for

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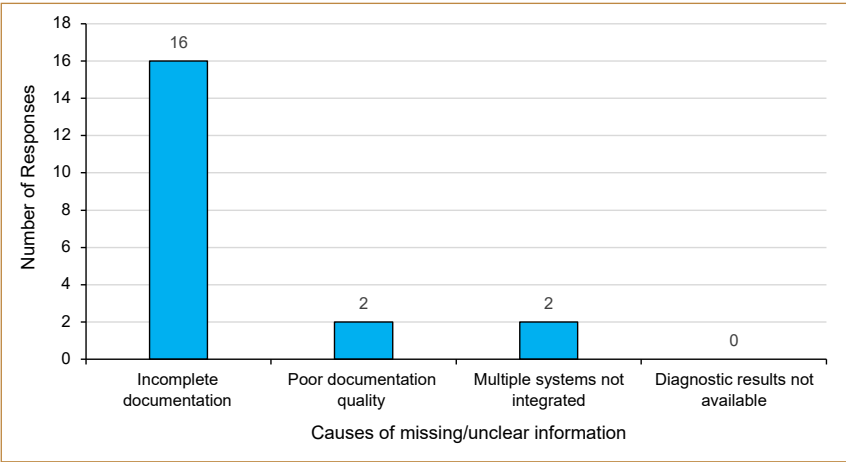


Figure 7. showing the number of responses from clinicians for the primary causes of the missing or unclear information in their clinical records.

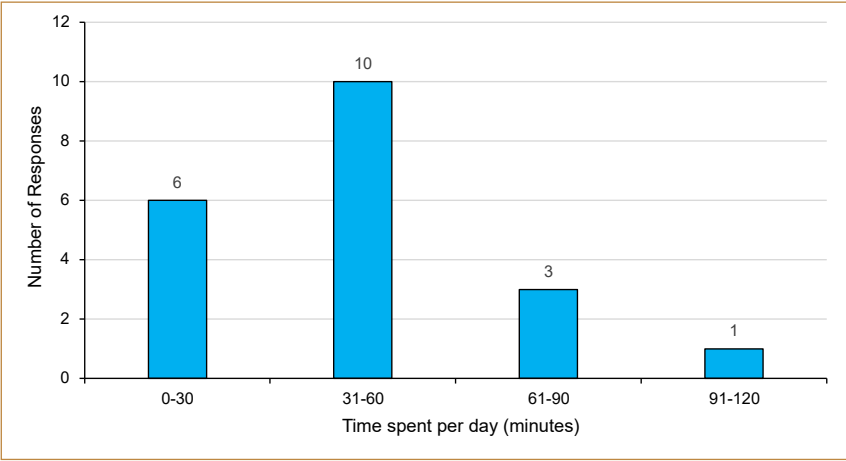


Figure 8. Showing the number of responses for the additional amount of time spent by clinicians searching for missing information from their documentation in minutes.

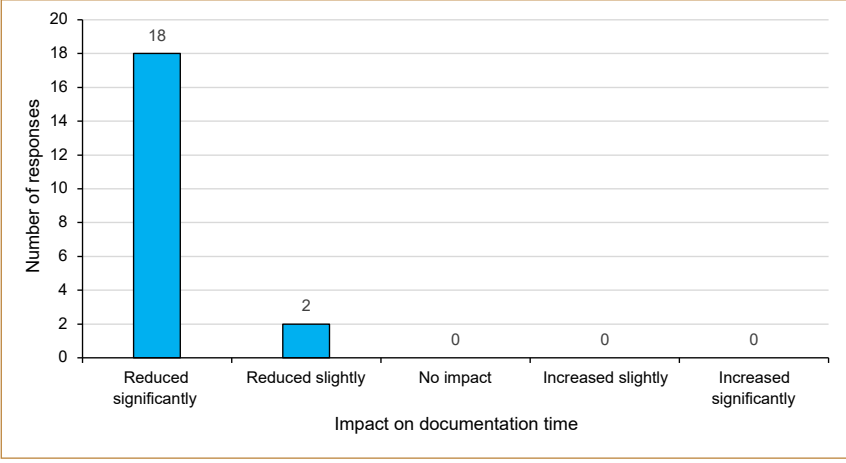


Figure 9. Number of responses for how significantly clinicians felt the transcription tool reduced the time they spent on documentation.

continuous validation of transcription outputs. Despite these concerns, AVT’s usability and positive impact on burnout were significant advantages¹⁰. While usability for the AVT was reported as high (Figure 10), an initial learning curve for the voice recognition software by users is typical, and efficiency may improve with extended use.

Comparison with Other Documentation Technologies

Ambient voice technology differs fundamentally from conventional speech-to-text dictation tools like Nuance Dragon Medical One (DMO). Whilst DMO requires post-consultation dictation with manual editing and EHR navigation, AVT passively listens during consultations and generates complete draft notes immediately afterwards, without active clinician dictation.

This real-time approach eliminates reliance on retrospective recall, reducing documentation errors common when multiple patients are seen consecutively. Clinicians can maintain natural patient communication without considering note formatting during consultations. Our study participants reported improved patient rapport and consultation flow with this hands-free, screen-free approach.

The immediate availability of draft notes reduces end-of-day workload and minimises delayed documentation. Whilst our study didn’t directly compare AVT with DMO, the fundamental workflow differences. Real-time ambient transcription versus structured post-consultation dictation shows distinct clinical applications. Future research should investigate comparative effectiveness, particularly in high-volume emergency and ambulatory care settings.

In our service improvement study AVT alleviated the emotional toll associated with excessive documentation tasks, a finding consistent with studies linking clerical burden to clinician burnout¹⁰.

Patient feedback underscored AVT’s potential to enhance the consultation experience. Improved clinician attentiveness and consultation flow likely contributed to high satisfaction levels¹¹. The ability to streamline documentation without compromising interaction quality represents a key benefit.

LLM-based transcription also raises ethical questions regarding data privacy and security. As healthcare systems increasingly rely on AI-driven tools, ensuring secure data handling becomes imperative. Misuse of sensitive data or breaches could erode trust in this technology^{12, 13}.

Patient Consent, Confidentiality, and Governance Considerations

Implementing AVT in clinical settings requires careful attention to patient consent and data confidentiality.

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Our pilot obtained verbal consent from all patients before using AVT during consultations. Whilst NHS England guidance recommends explicit consent for such technology, this requirement may present barriers to large-scale implementation in high-throughput settings.

Importantly, Heidi Health's AVT system transcribes in real-time without recording or storing audio data. Unlike conventional transcription systems, the software immediately discards the audio stream post-transcription, with no persistent recording mechanism. This distinction has significant implications for consent and information governance.

Heidi functions as a data processor; deploying organisations act as data controllers, bearing responsibility for data protection, Data Protection Impact Assessment (DPIA) completion, and Data Security and Protection Toolkit (DSPT) compliance. NHS England now mandates Medicines and Healthcare products Regulatory Agency (MHRA) registration for all AVT systems, ensuring standards for clinical safety, data integrity, and software reliability are met.

While the pilot primarily focused on efficiency gains, the potential impact on patient outcomes warrants further exploration. Reducing administrative tasks may allow clinicians to dedicate more time to direct patient care, potentially improving clinical outcomes¹⁴. However, these benefits must be weighed against the risk of errors introduced by transcription inaccuracies.

In summary, AVT demonstrated significant time-saving benefits and positive user feedback, making it a valuable tool for SDEC settings. Future iterations should address its limitations to ensure broader applicability and sustained impact across healthcare contexts.

Conclusion

AVT, an ambient listening software, reduced documentation time by 85.8% compared to manual methods, offering substantial time savings and improved clinician efficiency. The tool's impact on documentation efficiency in SDEC highlights its potential to enhance capacity in rapid flow clinics. While patient and clinician feedback was positive, challenges such as transcription errors and setting-specific applicability require further investigation. Expanding research to diverse clinical environments will provide a more comprehensive understanding of its long-term value in healthcare delivery.

Conflict of interest

No competing interests

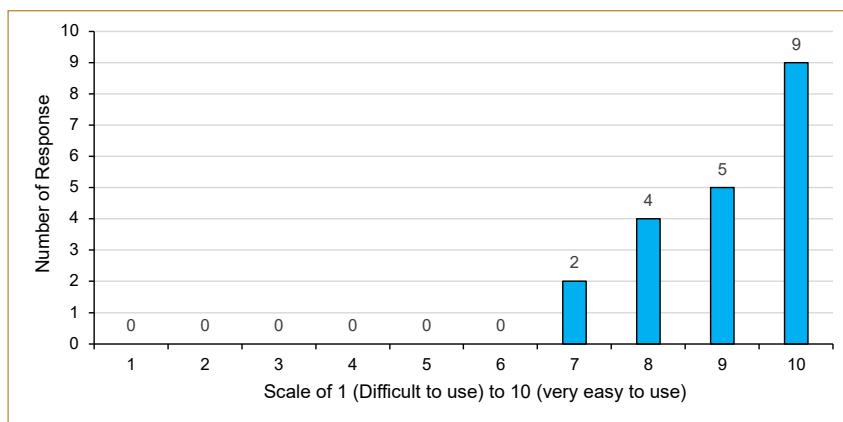


Figure 10. Number of responses for the usability of the transcription tool reported by clinicians, on a scale of 1 to 10.

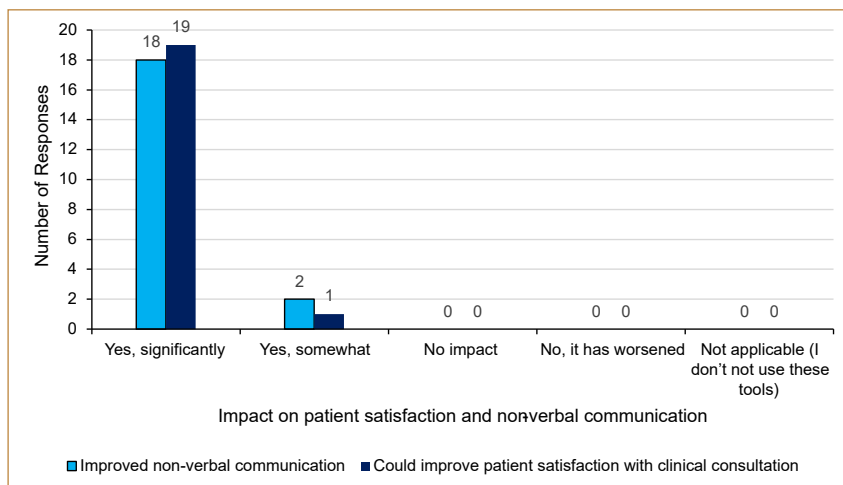


Figure 11. Number of responses for how significantly the clinicians felt the AI improved non-verbal communication with the patient as well as patient satisfaction with clinical consultation.

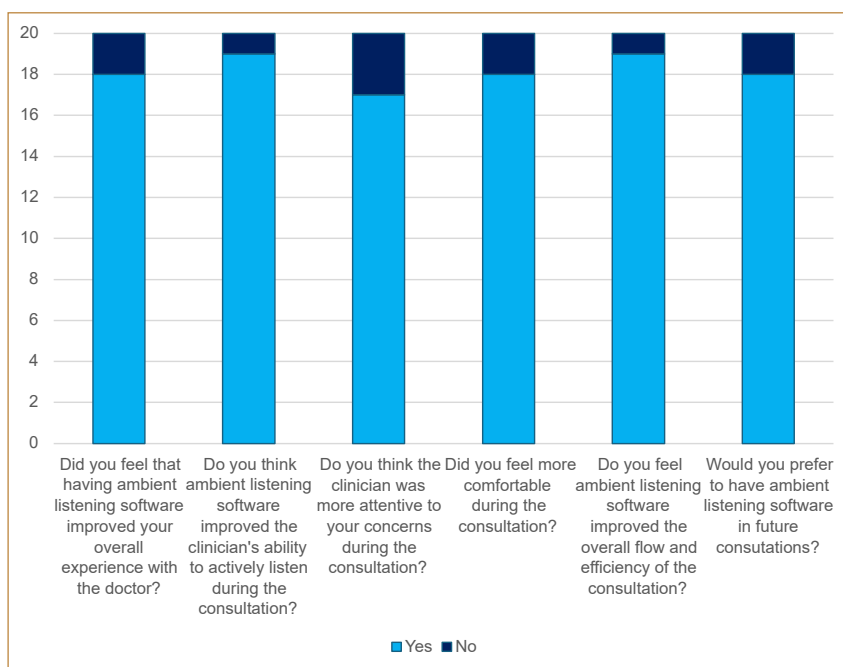


Figure 12. Patient feedback on communication aspects of their consultation with AVT.

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Appendix I: Clinician Questionnaire

Introduction

We are conducting an audit to evaluate the burden of clinical documentation and the role of transcription tools in streamlining workflows. Your feedback will help us understand the time spent on documentation, its challenges, and its impact on your workload and wellbeing. The survey is anonymous and will take approximately 5-7 minutes to complete.

Section 1: Demographics

1. What is your role?

- Consultant
- Non-consultant Doctor
- Nurse
- Allied Health Professional
- Other (please specify)

2. What is your primary field of work?

- Surgery
- Acute Medicine (e.g., A&E, AAU, EAU)
- Hospital Medicine
- Other (please specify)

3. On average, how many hours do you work per week?

- <20 hours
- 20-37.5 hours
- 37.5-50 hours
- 50 hours

Section 2: Time Spent on Clinical Documentation

4. How much time do you spend per consultation on clinical documentation?

(Specify in minutes per consult)

5. How much time do you spend on clinical documentation per week?

(Specify in hours per week)

6. How much time do you spend outside of normal working hours on clinical documentation?

(Specify in minutes per day)

7. Do you feel that clinical documentation consumes too much of your working time?

(Scale of 1 = Not at all to 10 = Extremely)

Section 3: Documentation Quality

8. How satisfied are you with the quality of your clinical notes?

(Scale of 1 = Not satisfied to 10 = Very satisfied)

9. How confident are you that your notes fully reflect your consultations?

(Scale of 1 = Not confident to 10 = Very confident)

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10. If you had more time, how likely is it that your notes would be more complete and accurate?

- Very likely
- Somewhat likely
- Neither likely nor unlikely
- Somewhat unlikely
- Very unlikely

Section 4: Impact of Transcription Tools

11. Do you use one of the following transcription tools for clinical documentation?

(Select all that apply)

- Dragon Medical One
- Heidi
- Tortus
- DAX CoPilot
- Dictate.it
- Other (please specify)
- No (If no, skip to Section 6)

12. What specific tasks do you use this transcription tool for?

(Select all that apply)

- Clinical notes
- Discharge summaries
- Referral letters
- Other (please specify)

13. How often do you use this transcription tool?

- Daily
- Weekly
- Monthly
- Yearly
- Never

14. How has this transcription tool impacted the time you spend on documentation?

- Reduced significantly
- Reduced slightly
- No impact
- Increased slightly
- Increased significantly

15. How would you rate the usability of this transcription tool?

(Scale of 1 = Difficult to use to 10 = Very easy to use)

16. Which features of the tool do you find most helpful?

(Open-ended)

17. What challenges have you faced while using this tool?

(Open-ended)

Section 5: Impact on Communication and Patient Experience

18. Do you feel that ambient AI software/tools (e.g., Heidi) have improved your non-verbal communication during consultations?

- Yes, significantly
- Yes, somewhat
- No impact
- No, it has worsened
- Not applicable (I do not use these tools)

19. Do you believe these tools could improve patient satisfaction with clinical consultations by allowing more focused and engaging interactions?

- Yes, significantly
- Yes, somewhat
- No impact
- No, they may worsen satisfaction
- Not sure

Section 6: Clinical Documentation Challenges

20. How often do you encounter missing or unclear information in clinical records?

- Daily
- Weekly
- Monthly
- Yearly
- Never

21. What are the primary causes of missing or unclear information?

(Select all that apply)

- Incomplete documentation
- Poor documentation quality
- Multiple systems not integrated
- Diagnostic results not available
- Other (please specify)

22. How much additional time do you spend searching for missing information?

(Specify in minutes per day)

Section 7: Burnout and Job Satisfaction

23. How often do you feel emotionally drained by your work?

- Daily
- Weekly
- Monthly
- Yearly
- Never

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24. How often do you feel frustrated by your documentation workload?

- Daily
- Weekly
- Monthly
- Yearly
- Never

25. Do you feel your documentation workload impacts your ability to care for patients effectively?
(Scale of 1 = Not at all to 10 = Very significantly)

26. Do you feel transcription tools (if used) have contributed to reducing burnout?

- Yes
- No
- Neutral

27. Overall, how would you rate your job satisfaction?
(Scale of 1 = Very dissatisfied to 10 = Very satisfied)

Section 8: Suggestions and Future Improvements

28. What additional features or support would improve your experience with clinical documentation tools?
(Open-ended)

29. What are your expectations for the ideal clinical documentation process?
(Open-ended)

Appendix II: Clinician Questionnaire Additional Responses

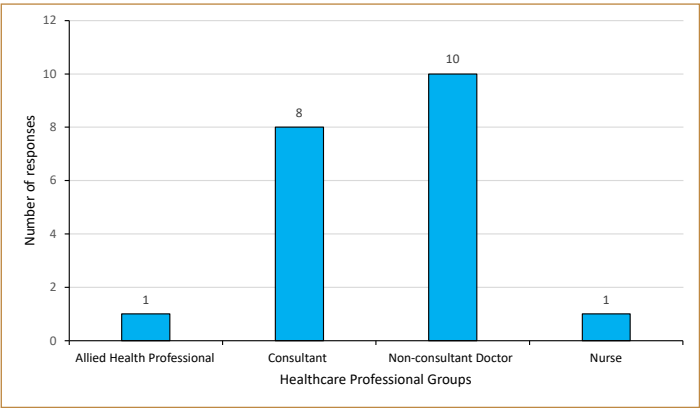


Figure A1. Showing different number of healthcare professionals; allied health professional, consultant, non-consultant doctor, nurse, that contributed in the clinician questionnaire.

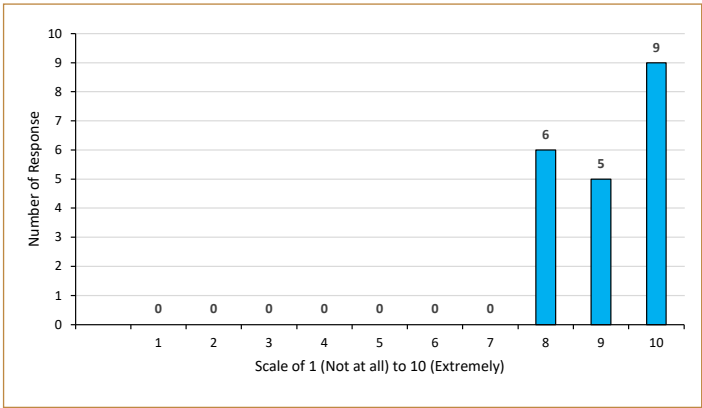


Figure A2. Showing whether clinicians felt clinical documentation consumed too much of their working time, on a scale of 1 to 10.

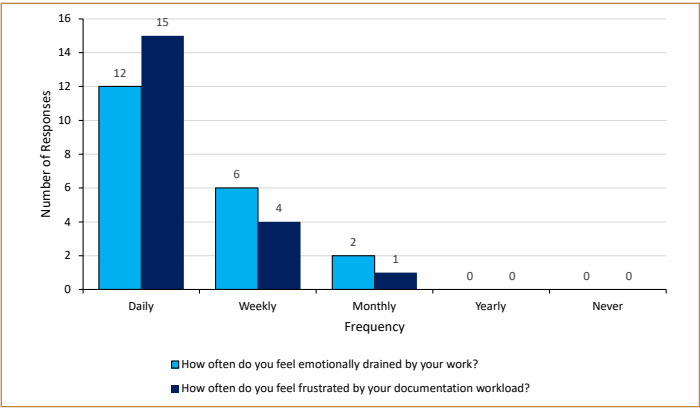


Figure A3. Showing the number of responses to how often clinicians felt emotional burn out due to work and frustration with documentation workload.

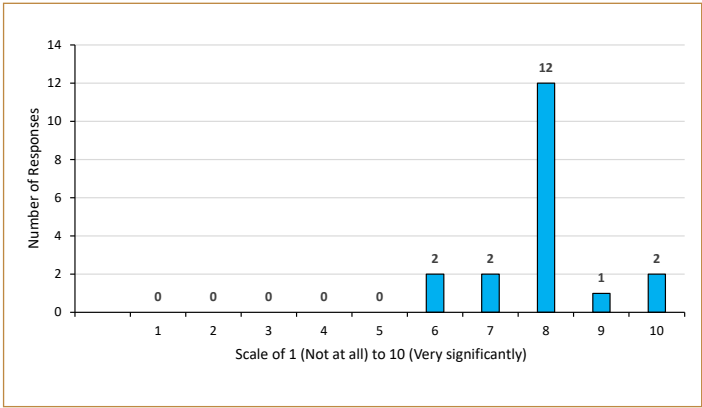


Figure A4. Showing number of responses from clinicians whether they felt the documentation workload impacted their ability to care for patients effectively, on a scale 1 to 10.

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Efficiency and Patient Flow

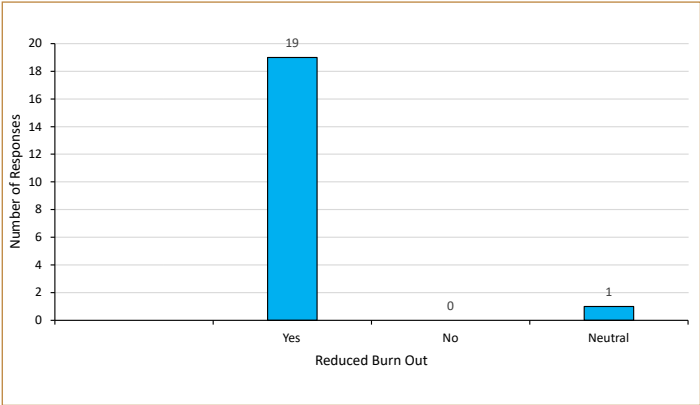


Figure A5. Showing number of responses when clinicians were asked if they felt the transcription tool has contributed to reducing burnout.

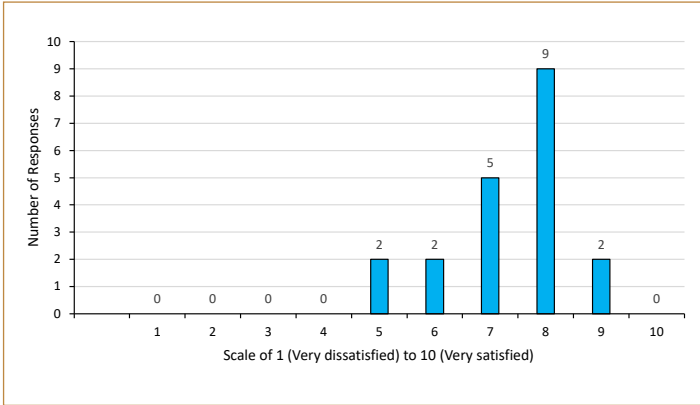


Figure A6. Showing number of responses for how satisfied clinicians were with their job, on a scale of 1 to 10.

Appendix III - Patient Feedback

Did you feel that having ambient listening software improved your overall experience with the doctor?

- ☐ Yes
- ☐ No

Did you feel more comfortable during the consultation?

- ☐ Yes
- ☐ No

Do you think ambient listening software improved the clinician’s ability to actively listen to you during the consultation?

- ☐ Yes
- ☐ No

Do you believe the presence of ambient listening software improved the overall flow and efficiency of the consultation?

- ☐ Yes
- ☐ No

Do you think the clinician was more attentive to your concerns during the consultation?

- ☐ Yes
- ☐ No

Would you prefer to have ambient listening software assist in future consultations?

- ☐ Yes
- ☐ No