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# From Clinical Speech To Ai-Ready Healthcare: Improving Digital Health Management In Uzbekistan Through Speech Recognition

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**Abstract:** Digital transformation in healthcare requires efficient clinical documentation, reliable electronic records, and effective use of medical personnel's time. However, manual data entry can increase physicians' administrative workload and reduce the time available for patient care. Our study examines the potential of automatic speech recognition (ASR) to improve clinical documentation and support digital healthcare management in Uzbekistan. The article presents a descriptive analysis of findings from a two-site, mixed-methods, quasi-experimental study involving 120 physicians in Bukhara, Uzbekistan. Documentation time, record length, spelling errors, and physician attitudes were examined using aggregate results. ASR reduced the reported time required to enter 100 words from 8.8 to 5.2 minutes and the time needed to complete an electronic medical record from 23.0 to 17.8 minutes. Average record length increased from 273 to 356 words, while spelling errors decreased from 16.7 to 14.0 per record. Most participants (87.5%) expressed positive attitudes toward ASR. Speech recognition may improve documentation efficiency and contribute to more structured digital healthcare workflows. Nevertheless, implementation requires clinical verification, language adaptation, interoperability, and appropriate data governance.

**Keywords:** automatic speech recognition, digital healthcare, electronic medical records, healthcare management, Uzbekistan.

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## 1. Introduction

Healthcare digitalization is an important component of improving service quality, institutional efficiency, and evidence-based management. Electronic medical records (EMRs) can support continuity of care and provide information for planning and monitoring healthcare services. Their benefits, however, depend on the accuracy, completeness, and usability of the data entered by healthcare professionals.[1]

Clinical documentation remains a time-consuming task. International research has shown that electronic record systems can create substantial administrative demands for physicians[2]. In settings where digital infrastructure is developing, these demands may complicate the adoption of new technologies.

Automatic speech recognition (ASR) offers an alternative method of entering clinical information. Instead of typing every observation, physicians can dictate notes that are converted into text. This approach may reduce documentation time, although its effectiveness depends on recognition accuracy, medical terminology, language support, and integration with existing information systems.[3]

In Uzbekistan, the modernization of healthcare management creates opportunities to introduce such technologies. Nevertheless, international solutions cannot simply be transferred without considering local languages, clinical practices, technical infrastructure, and institutional capacity.[4]

The objective of this article is to evaluate the documented performance of speech-based clinical data entry and identify practical conditions for its implementation in Uzbekistan's healthcare system.

## 2. Materials and Methods

This article draws on empirical findings reported in the author's dissertation, *Improving Healthcare Management Tools in Uzbekistan Based on Foreign Experience* [5].

The underlying research employed a mixed-methods, quasi-experimental approach involving 120 physicians from two healthcare institutions in Bukhara, Uzbekistan, to compare conventional typing with automatic speech recognition (ASR) in clinical documentation and assess physicians' attitudes toward the technology. Four quantitative indicators were examined: the time required to enter 100 words, the time needed to complete an electronic medical record, the average number of words per completed record, and the average number of spelling errors per record. [6]

The analysis also considered participants' documentation preferences and existing practices. Percentage changes were calculated using the formula: Percentage change = [(ASR value − typing value) / typing value] × 100.The analysis is descriptive. It uses the aggregate results reported in the dissertation rather than individual participant-level data. Consequently, no new statistical significance tests, confidence intervals, or causal estimates are presented.[7]

The research findings are interpreted in relation to international evidence on electronic documentation, digital health governance, and healthcare interoperability.

## 3. Results

The Table 1. And Figure 1. comparison indicated improvements in several documentation-related indicators when speech recognition was used.[8]

**Table 1. Comparison of Conventional Typing and Speech Recognition**

| Indicator | Typing | Speech recognition | Change |
|---|---|---|---|
| Time to enter 100 words | 8.8 min | 5.2 min | −40.9% |
| Time to complete an EMR | 23.0 min | 17.8 min | −22.6% |
| Average record length | 273 words | 356 words | +30.4% |
| Spelling errors per record | 16.7 | 14.0 | −16.2% |

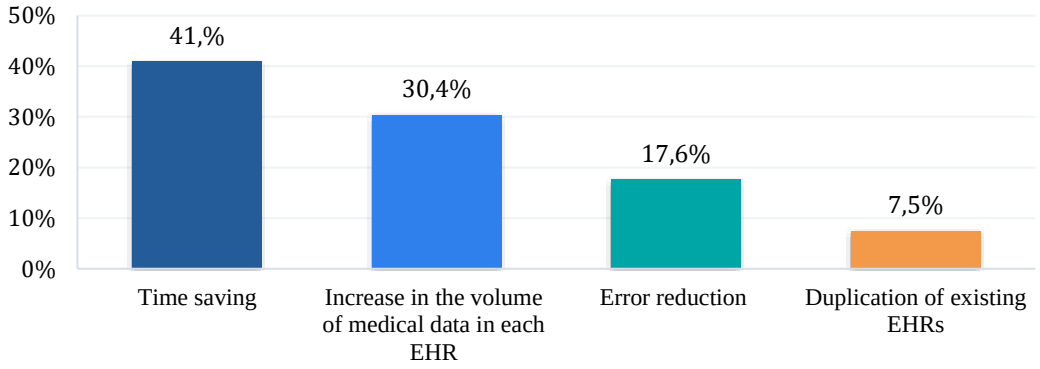


**Figure 1. Main practical effects of ASR technology[9]**

The largest proportional difference concerned the time required to enter 100 words, which was approximately **41% lower** with ASR. The time required to complete an electronic medical record was approximately **23% lower**.

Speech-recognition-assisted records were also longer on average. This may indicate that dictation enables physicians to record more information within their normal workflow. However, greater word count alone does not establish greater clinical accuracy or completeness.[10]

The average number of spelling errors was lower in ASR-generated documentation. Nevertheless, spelling-error counts do not capture all possible recognition mistakes, including incorrect medical terminology or clinically important substitutions.

Physician attitudes were generally favorable. Of the 120 participants, **105 physicians (87.5%)** expressed a positive attitude toward speech recognition. At the same time, **42 physicians (35%)** indicated a preference for typing. These findings are not necessarily contradictory: participants may recognize the advantages of ASR while continuing to prefer familiar documentation methods for certain tasks.[11]

The dissertation also reported that approximately **95% of participants** acknowledged copying information from previous records in their existing documentation practices. This finding highlights a broader need to improve the efficiency and reliability of clinical record creation.

## 4. Discussion

The findings suggest that speech recognition can contribute to healthcare management in Uzbekistan through three related mechanisms: reducing documentation time, supporting more detailed clinical records, and facilitating the development of digital information systems.

First, lower documentation time may reduce administrative pressure on medical personnel. International studies have demonstrated that electronic documentation can occupy a considerable share of physicians' working time [12].

The observed reduction in documentation time therefore represents a potentially meaningful operational improvement. However, time savings should be confirmed through larger studies across different specialties and healthcare institutions.

Second, longer records may provide more information for continuity of care and clinical review. Nevertheless, implementation must prioritize **clinical correctness rather than text volume**. Every dictated record should be reviewed and approved by the responsible healthcare professional before becoming part of the official medical record.

Third, speech recognition may support the development of better digital health data. The Table 2. World Health Organization emphasizes that digital health systems require appropriate governance, data quality, and safeguards. Interoperability standards, including HL7 FHIR, can facilitate structured information exchange between systems [13].

**Table 2. Management directions for implementing ASR in healthcare**

| Direction | Existing problem | Proposed solution | Expected outcome |
|---|---|---|---|
| **Technical infrastructure** | Internet quality, devices and EHR integration remain limited | Step-by-step integration of ASR into EHR systems | Digital documentation becomes faster |
| **Medical terminology** | Uzbek medical vocabulary and terminology are complex | Develop specialty-specific ASR medical dictionaries | Transcription accuracy improves |
| **Doctor competence** | Digital literacy and ASR experience differ among doctors | Practical training and short certification courses | User acceptance increases |
| **Work process** | Paper and electronic records are used in parallel | Simplify document flow and introduce digital processes gradually | Administrative workload decreases |
| **Information security** | Sensitive personal medical data are processed | Define privacy, consent, storage and transmission protocols | Patient data protection is strengthened |
| **Quality control** | ASR may produce transcription errors | Final doctor verification and audit mechanism | Reliability of clinical records increases |

For Uzbekistan, successful implementation requires adaptation to local conditions. ASR systems must accommodate Uzbek and Russian language use, medical vocabulary, accents, and the practical conditions of healthcare facilities. Performance should be tested in actual clinical environments rather than assumed from results obtained in other countries.

Physician participation is equally important. The continued preference for typing among some participants indicates that ASR should initially be introduced as an **optional documentation method**, supported by training and technical assistance. A flexible approach is more likely to encourage adoption than immediate replacement of existing workflows.

The findings also have implications for future artificial intelligence applications. High-quality clinical records may support healthcare analytics, resource planning, and decision-support research. However, converting speech into text does not automatically produce standardized or AI-ready data.

A Table 3. practical implementation framework can be organized into seven stages:

**Table 3. Algorithm for improving healthcare management through ASR[14]**

| Stage | Action to be implemented | Management outcome |
|---|---|---|
| **Stage 1** | Analyse the EHR documentation process in a medical institution | Processes that consume the most time and create errors are identified |
| **Stage 2** | Select ASR technology and adapt it to clinical departments | A technical solution suitable for doctors' workflow is formed |
| **Stage 3** | Train doctors to use ASR in practice | User acceptance and trust in technology increase |
| **Stage 4** | Apply ASR-based EHR creation as a pilot project | Time, errors and data volume are measured |
| **Stage 5** | Introduce final doctor review and approval of ASR-generated notes | Medical data quality and legal reliability are ensured |
| **Stage 6** | Establish monitoring, audit and continuous improvement | The ASR system is continuously adapted to clinical workflow |
| **Stage 7** | Scale the experience to other departments and regions step by step | National digital healthcare infrastructure develops |

In this framework, speech is captured and transcribed, clinicians verify the resulting text, information is organized into appropriate record fields, and standardized data are exchanged across authorized systems. Analysis and governance then support responsible secondary use. Human oversight, privacy protection, and access controls must apply throughout the process.

Healthcare institutions considering ASR should begin with limited pilots and evaluate documentation time, clinically significant transcription errors, user satisfaction, and implementation costs. Expansion should depend on demonstrated performance rather than technological expectations alone.

The study has limitations. Its evidence comes from two institutions in one region, and the analysis relies on reported aggregate results. The available findings do not establish long-term cost-effectiveness, effects on patient outcomes, or statistically significant differences. Further multicenter research is required.[15]

## 5. Conclusion

Speech recognition represents a promising instrument for improving digital healthcare management in Uzbekistan. The reported findings indicate shorter documentation times, longer clinical records, fewer spelling errors, and generally positive physician attitudes. These results support the introduction of carefully monitored ASR pilot projects. However, implementation should be accompanied by local-language development, clinician verification, interoperability standards, staff training, and data protection measures. Speech recognition should therefore be understood not as a replacement for medical judgment but as a tool for improving documentation workflows and strengthening the information foundation of healthcare management.

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