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REVOLUTIONIZING PRE-ANAESTHETIC FITNESS ASSESSMENT WITH ARTIFICIAL INTELLIGENCE POWERED LANGUAGE TRANSLATOR AND PROCESSOR APP

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Abstract

Background: Artificial intelligence (AI) continues to expand its role in healthcare, including anesthesia. Pre-anesthetic evaluations are crucial for assessing patient risk, but language barriers and limited digital accessibility can impede accurate data collection. This study investigated the impact of an AI-powered language translator and processor app on the efficiency, accuracy, and patient satisfaction during pre-anesthetic assessments.

Methods: A prospective cohort study was conducted at Saveetha Medical College and Hospital with 60 patients who primarily spoke languages other than the provider's. Participants underwent standard and app-assisted pre-anesthetic evaluations. Key metrics included evaluation time, completeness of history, allergy/comorbidity identification, and patient satisfaction. Statistical analyses involved ANOVA, chi-square tests, and Pearson's correlation.

Results: App-assisted evaluations significantly reduced average time from 27.05 ± 2.21 to 15.98 ± 1.86 minutes ($p < 0.001$), saving 10.85 minutes per session. Missed history items dropped from 85 to 24, reflecting a 68.6% improvement in accuracy. Allergies were documented in 76.67% and comorbidities in 70% of cases. Patient satisfaction was high (3.67 ± 0.79), with a strong positive correlation to app usage ($R = 0.64$, $p < 0.001$).

Conclusion: The AI-powered translator app enhanced the quality and efficiency of pre-anesthetic assessments, especially for linguistically diverse populations. Its implementation supports improved patient safety, engagement, and workflow efficiency. Further research should evaluate its scalability, integration with hospital systems, and broader clinical applications.

Keywords: Artificial Intelligence, Pre-anesthetic Evaluation, Language Translation App, Patient Safety, Digital Health, Workflow Efficiency

INTRODUCTION

In recent years, the use of artificial intelligence (AI) in healthcare has seen notable growth [1]. As the medical field continues to evolve at a fast pace, AI has emerged as a promising tool, especially in the area of anesthesia [2]. However, this advancement is not without its challenges. The use of patient data in AI systems raises important privacy and security concerns [3]. Additionally, there is a risk that clinicians may rely too heavily on these systems, potentially weakening their own decision-making skills. The financial burden of implementing AI—including the cost of training, infrastructure, and technology—also poses significant barriers [4].

Despite these issues, the role of AI and machine learning (ML) in healthcare, and specifically in anesthesia, continues to grow [5]. The availability of large volumes of data—from electronic health records, monitoring systems, and wearable devices—provides a strong foundation for AI integration [6]. Applications range from airway management and ultrasound-guided diagnostics to smart drug delivery systems and early warning monitoring. These tools can help identify risks, predict complications, and improve patient care across various settings [7].

AI has the potential to streamline anesthetic procedures, making them faster, more accurate, and more cost-effective. By analyzing large datasets, AI can support safer and more efficient care. For this reason, it's essential that healthcare professionals gain familiarity with these technologies to ensure quality patient outcomes in an increasingly digital medical environment [4].

A key responsibility of anesthesiologists is conducting thorough preoperative evaluations. These assessments are crucial in identifying patients at risk and improving their readiness for surgery [8]. Preventing complications before surgery not only enhances the quality of care but also reduces the risk of adverse outcomes. One study by Kendale et al. [9] examined hypotension in over 13,000 patients, analyzing various factors to build predictive models. Research in this area continues to grow, yet clinical decisions still primarily rely on the anesthesiologist's judgment rather than AI tools [7].

Pre-anesthesia evaluations, often performed through face-to-face interviews, help build trust and allow doctors to assess potential risks [10]. These interactions are vital for identifying health concerns and planning appropriate interventions [11]. However, new research supports the use of digital self-assessment tools. Patients can complete health questionnaires electronically, improving efficiency and accuracy while enhancing patient satisfaction [12]. In multicultural healthcare settings, language differences can hinder effective communication during these evaluations. To address this, AI-powered language translation apps are being introduced. These tools help overcome communication barriers, improve data accuracy, and support better decision-making during pre-anesthetic assessments. They allow clinicians to access and interpret patient information quickly and accurately, leading to more personalized care. This study aims to explore how such AI tools can be integrated into the pre-anesthesia evaluation process to improve overall outcomes.

Aim:

The aim of this study is to investigate the integration of an AI-powered language translator app into the pre-anaesthetic fitness assessment process.

MATERIALS AND METHODS

Study Design: This prospective cohort study was conducted at Saveetha Medical College and Hospital to evaluate the impact of an AI-powered language translator application during pre-anesthetic fitness assessments.

Study Population: The study included patients requiring pre-anesthetic evaluations who primarily spoke languages different from those spoken by the healthcare providers. The aim was to assess how effectively the translator app facilitated communication between patients and clinicians.

Inclusion and Exclusion Criteria: Patients were included if they primarily spoke a language different from the healthcare team and were capable of using a digital phone with internet access. Patients who were deaf and mute, thereby unable to communicate verbally or through text, or those without access to digital devices or the internet, were excluded from the study.

Sample Size and Sampling Technique: A total of 60 patients were enrolled using a convenience sampling method. Participants who met the inclusion criteria during the study period were invited to take part.

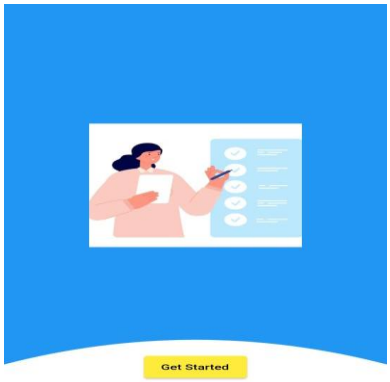
Study Procedure: Eligible patients scheduled for pre-anesthetic evaluation were recruited after obtaining informed consent in their preferred language. Each participant underwent the standard pre-anesthetic assessment. In addition, they used the AI-powered language translator app to aid communication during the evaluation process. The app was employed to translate medical history-related questions, improving the accuracy and efficiency of data collection related to allergies, comorbid conditions, and current medications. The time taken for each evaluation was recorded. Healthcare providers used structured feedback forms to assess the ease of communication, accuracy of information exchange, and workflow efficiency during the assessments. Following surgery, patient records were reviewed for postoperative complications such as hypotension or vomiting. Patient satisfaction with the AI-assisted assessment process was measured using a standardized questionnaire.

Statistical Analysis: The data collected were subjected to statistical analysis. ANOVA was used to compare time efficiency, Pearson's correlation was applied to examine relationships in patient satisfaction scores, and the chi-square test assessed accuracy rates between standard and AI-assisted evaluations. These analyses aimed to identify the feasibility, benefits, and limitations of using AI-powered language translation in pre-anesthetic assessments and to inform future clinical applications.

Ethical Considerations: All participants provided informed consent in their preferred language. Patient confidentiality was strictly maintained, and participation was entirely voluntary. The study posed no foreseeable risk to the participants.

Expected Benefits: The anticipated outcomes of the study included enhanced communication during pre-anesthetic evaluations, improved documentation accuracy, greater satisfaction among patients and providers, and potential insights into integrating AI solutions into broader preoperative workflows.

AI Based Pre-anesthetic evaluation Translator application




Welcome
Doctor
Consultant
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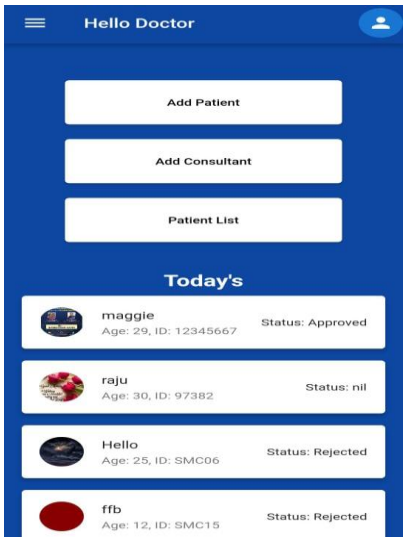
Patient


Hello Doctor
Add Patient
Add Consultant
Patient List
Today's
maggie
Age: 29, ID: 12345667
Status: Approved
raju
Age: 30, ID: 97382
Status: nil
Hello
Age: 25, ID: SMC06
Status: Rejected
ffb
Age: 12, ID: SMC15
Status: Rejected


Patient Details
Name
maggie
Patient ID
12345667
Age
29
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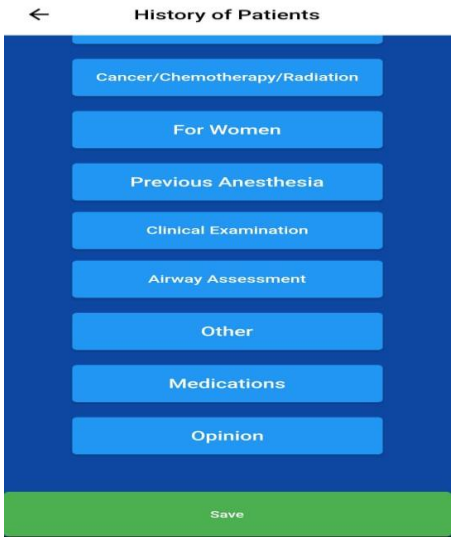
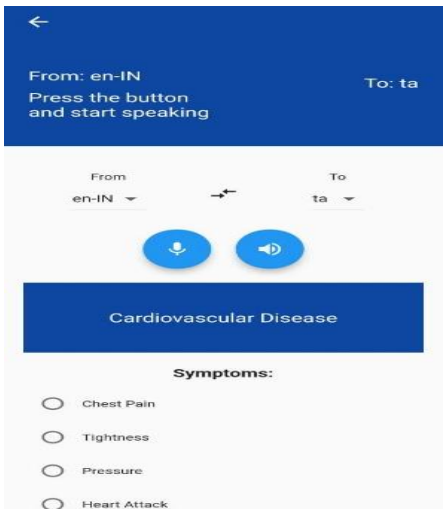




RESULTS

This cohort study was conducted at Saveetha Medical College and Hospital with 60 participants, aiming to revolutionize pre-anesthetic fitness assessment using an AI-powered language translator and processor app. The study evaluated improvements in communication, accuracy, workflow efficiency, patient safety, and satisfaction. The majority of participants (26.67%) were aged 26–35 years, followed by 36–45 years (23.33%). Gender distribution was nearly equal (51.67% male, 48.33% female). The most common language was Tamil (33.33%), followed by Telugu (21.67%) and Kannada (20%). Most participants were graduates (43.33%), and laborers constituted the largest occupational group (20%). Half resided in urban areas, and half in rural regions (Table 1).

Table 1: Demographic and Clinical Characteristics of Participants

Characteristic	Frequency	Percentage
Age (years)		
18–25	11	18.33%
26–35	16	26.67%
36–45	14	23.33%
46–55	10	16.67%
56–65	9	15%
Gender		
Male	31	51.67%
Female	29	48.33%
Language		
Tamil	20	33.33%
Telugu	13	21.67%
Kannada	12	20%
Hindi	9	15%
Malayalam	5	8.33%
Marathi	1	1.67%
Education Level		
Illiterate	13	21.67%
Primary	9	15%
Secondary	10	16.67%
High School	2	3.33%
Graduate	26	43.33%
Occupation		
Laborer	12	20%
Clerk/Teacher	10 each	16.67% each
Engineer/Farmer	9 each	15% each
Housewife	4	6.67%
Student	5	8.33%
Nurse	1	1.67%
Area of Living		
Urban	30	50%
Rural	30	50%

All participants (100%) owned smartphones and had internet access. However, 56.67% used them rarely, while 95% were familiar with mobile apps (Table 2).

Table 2: Device and App Usage Patterns

Parameter	Frequency	Percentage/Mean ± SD
Smartphone ownership	60	100%
Internet access	60	100%
Frequency of use		
Rarely	34	56.67%
Occasionally	8	13.33%
Sometimes	9	15%
Frequently	9	15%
Familiarity with apps	57	95%

The app-based evaluation significantly reduced assessment time (15.98 ± 1.86 min vs. 27.05 ± 2.21 min manually; *p* < 0.001), saving 10.85 ± 1.96 min per evaluation. The app also improved history accuracy, reducing missed items from 85 (manual) to 24 (Table 3).

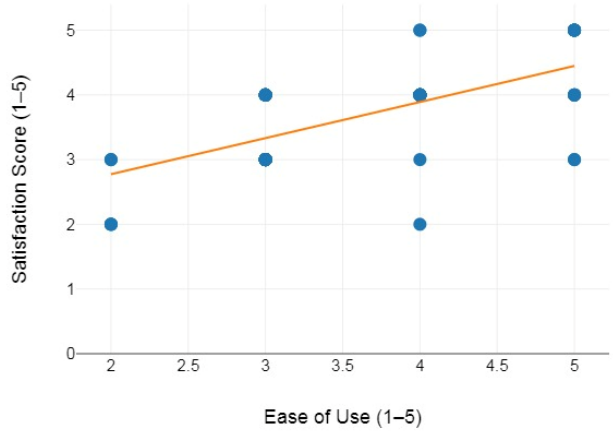
Table 3: Comparison of Manual vs. AI-Based Evaluation

Metric	Manual	AI-Based	Difference	p-value
Time taken (min)	27.05 ± 2.21	15.98 ± 1.86	11.07 ± 2.08	**<0.001***
Missed history items	85	24	61	—
Accuracy improvement (%)	—	68.6 ± 38.95	—	—

The app identified allergies in 76.67% of participants and documented comorbidities in 70%. Postoperative complications were mild (21.67% hypotension, 18.33% vomiting), with 48.33% reporting none. Usability scores

were favorable (ease of use: 3.6 ± 0.91; satisfaction: 3.67 ± 0.79). A strong positive correlation existed between app use and satisfaction ($R = 0.64$, *p* < 0.001).

Figure 1: App use vs. Patient Satisfaction



DISCUSSION

This prospective cohort study assessed how an AI-powered language translation and processing app affected pre-anesthetic fitness evaluations among patients speaking languages other than the healthcare provider's primary language. Conducted at Saveetha Medical College and Hospital with 60 participants, our findings shed light on the app's usability, accuracy, efficiency, and patient satisfaction.

The introduction of the AI-translator app brought marked improvements in multiple operational metrics. Pre-anesthetic evaluations declined in duration from 27.05 ± 2.21 minutes (manual method) to 15.98 ± 1.86 minutes using the app—an approximate 11-minute savings per patient ($p < 0.001$). The completeness of medical histories also improved considerably: missed items dropped from 85 to just 24, resulting in a 68.6% gain in accuracy. Moreover, the app successfully documented allergies in 76.67% of cases and comorbidities in 70% of patients. Overall satisfaction was high (mean score 3.67 ± 0.79), and app usage correlated strongly with patient satisfaction ($R = 0.64$, $p < 0.001$). These findings point to the app's potential to enhance pre-anesthetic care through speed, precision, and safety.

Participants were predominantly young to middle-aged adults: 26.67% were aged 26–35, followed by 23.33% in the 36–45 bracket. While younger patients generally face lower anesthetic risks, the app's flexibility across age groups suggests broader utility. Age remains a critical factor in anesthetic planning—especially in older adults, who may face reduced physiological reserves and more fragile cardiovascular or respiratory responses [13,14]. Our nearly equal gender distribution (51.67% male; 48.33% female) allowed for balanced insight into gendered experiences. Other research has noted that women often report higher preoperative anxiety and greater informational needs than men [15]. Thus, digital tools like our app must account for these differences to optimize patient engagement.

Educational levels varied—21.67% were illiterate, while 43.33% had completed a graduate degree—reflecting diverse literacy and digital proficiency. Digital health app usability tends to increase with higher education and literacy levels [16]. Lower socioeconomic status or occupation types may also influence app usability [17], underlining the need for intuitive design to serve all users equitably.

Participants spoke Tamil, Telugu, Kannada, Hindi, Malayalam, and Marathi—demonstrating a clear necessity for multilingual support. Language barriers in healthcare contribute to miscommunication, misdiagnoses, increased testing, and patient dissatisfaction; limited proficiency in the dominant language can even lead to adverse clinical events [18]. Translation services like interpreters or digital aids reduce these risks and improve care delivery and satisfaction [19].

AI-powered language tools—using NLP and machine learning—can provide real-time, culturally nuanced translation [20]. AI systems can help flag language-discordant patients who may otherwise be overlooked, prompting interpreter involvement as needed [21]. Our study supports the integration of such tools as a practical, scalable means to ensure equitable care across diverse linguistic populations.

Enhanced workflow has been observed in various AI-assisted contexts. For example, Shanghai Children's Medical Center's XIAO YI system cut pre-consultation wait times from two hours to under five minutes by recommending diagnostic tests before doctor interaction [22]. Likewise, AI detection of large vessel occlusion in acute stroke reduced transfer times by 22.5 minutes [23]. In preoperative care, value-based models have decreased evaluation time from 373 to 290 minutes [24]. Our findings closely mirror these efficiency enhancements, demonstrating that AI tools can meaningfully reduce pre-anesthetic evaluation durations and streamline clinical processes. Incomplete medical histories hinder clinical decision-making and patient outcome prediction, especially within electronic health records [25]. AI tools offer automated data extraction and transcription, reducing omissions and

improving completeness. An AI symptom checker study demonstrated more accurate differential diagnoses, while other studies highlighted voice-to-text systems and decision-aid applications that reduce administrative burden and enhance documentation quality [26]. Yet, reliance on AI must come with vigilance—some tools still miss diagnoses, emphasizing the importance of ongoing performance monitoring and validation [27].

In our study, the app's ability to identify allergies and comorbidities in a majority of cases aligns well with existing literature. AI algorithms have been effective in correlating patient symptoms and exposure with allergy referrals. AI models have also parsed free-text EHR narratives to detect allergic reactions, and algorithmic clustering has surfaced frequent comorbidities like asthma and urticaria. Predictive models increasingly support precision medicine in managing patient comorbidities [28]. By capturing critical medical details early, AI tools may directly contribute to enhanced perioperative safety. While postoperative hypotension (21.67%), vomiting (18.33%), nausea (10%), and a single allergic reaction (1.67%) occurred in some patients, nearly half (48.33%) experienced no complications. These rates are within expected ranges given typical surgical care. Rigorous preoperative evaluations—facilitated by comprehensive history collection—help anticipate and mitigate complications, improving recovery trajectories and lowering morbidity [29]. AI-based predictive models for outcomes like postoperative nausea and vomiting hold promise for further personalization of anesthetic planning [30].

Patient satisfaction (mean 3.67 ± 0.79) and the strong positive correlation with app usage underscore the importance of user experience. However, translation clarity (3.37 ± 1.02) lagged slightly behind ease of use (3.6 ± 0.91), signaling room for improvement in linguistic accuracy and interface localization. Well-designed, accessible AI interfaces can significantly enhance health engagement by bridging communication gaps and offering intuitive control over digital tools [31]. Our data supports continued refinement of translation accuracy as a pathway to boost user trust and satisfaction.

This study demonstrated several strengths, including significant time savings during pre-anesthetic evaluations, improved accuracy in medical history collection, and high patient satisfaction with the AI-powered language translator app. The tool proved effective in identifying allergies and comorbidities, supported diverse linguistic and educational backgrounds, and showed promise for use in risk stratification and workflow optimization. However, the study's limitations include its single-center setting, a relatively small sample size, reliance on self-reported data, and a limited assessment of the app's role in clinical decision-making or economic feasibility. To address these gaps, the study recommends developing patient training programs to increase digital literacy, refining the app's translation accuracy, implementing robust postoperative monitoring, and integrating regular feedback mechanisms for continuous improvement. Future research should expand to multicenter trials with larger sample sizes, enhance the app's predictive and decision-support capabilities, integrate it with electronic health records, and evaluate its cost-effectiveness and long-term clinical impact. By pursuing these directions, AI-powered tools could be more widely adopted to support safer, more efficient, and equitable preoperative care across healthcare systems.

CONCLUSION

This study highlights the effectiveness of a language-enabled digital tool in transforming pre-anesthetic evaluations. The app notably shortened assessment time—from an average of 27.05 to 15.98 minutes—and significantly reduced omissions in patient history, decreasing missed items from 85 to just 24. These improvements contributed to a more streamlined and accurate evaluation process. The application also proved valuable in identifying key clinical information, capturing allergy histories in 76.67% of cases and comorbid conditions in 70%, reinforcing its contribution to safer patient care. Patient engagement was positively influenced, with users reporting a high satisfaction score (3.67 ± 0.79). A clear link was found between usage and satisfaction ($R = 0.64$, $p < 0.001$), suggesting that increased interaction with the tool enhances the overall experience. While the translation function scored moderately (3.37 ± 1.02), indicating areas for further development, the app effectively helped overcome communication challenges often seen in multilingual clinical settings. By supporting thorough preoperative history-taking, the tool assists in clinical risk assessment and may help in reducing postoperative issues. In summary, the use of a smart pre-anesthetic assessment tool shows strong potential to improve the efficiency, quality, and personalization of perioperative care. Ongoing research should prioritize refining the app's interface, expanding language support, and exploring its broader application across healthcare environments to fully realize its benefits.

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