Revisiones Sistemáticas

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# Emerging Trends in Pre-Anesthetic Assessment: A Systematic Review of Novel Approaches and Technologies

## Tendencias emergentes en la evaluación preanestésica: una revisión sistemática de nuevos enfoques y tecnologías

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Andrés Sebastián Viteri Hinojosa[1]

## Abstract

In order to understand the current evolution, this systematic review examines the advances in preanesthetic assessment. Although the paper demonstrates the potential to revolutionize patient care, it also recognizes its limitations. These include publication bias and search limitations. At the same time, the general exposure to advances in preoperative care, including but not limited to technology and patient-centered approaches, may be valuable to the research. The nature of survey research is complicated because studies vary in quality and are prone to bias. Nevertheless, studies should be conducted on a regular basis, and techniques for assessing preanesthetic should be improved. Furthermore, this improvement should take into account patient outcomes and their subsequent need for surgical safety. Although achievements in assessment systems have limitations, prospective developments aim to fill gaps, including deficiencies in current approaches. This fact is beneficial for both patients and healthcare providers, and underscores the importance of innovation and EBP practices for preanesthetic assessment and overall quality of perioperative care.

**Keywords:** pre-anesthetic assessment, emerging trends, patient centered care, Technological advancements, Perioperative optimization.

## Resumen

Para comprender la evolución actual, esta revisión sistemática examina los avances en la evaluación preanestésica. Aunque el artículo demuestra el potencial para revolucionar la atención al paciente, también reconoce sus limitaciones, como el sesgo de publicación y las limitaciones de búsqueda. Al mismo tiempo, la exposición general a los avances en la atención preoperatoria, que incluyen, entre otros, la tecnología y los enfoques centrados en el paciente, puede ser valiosa para la investigación. La naturaleza de la investigación por encuesta es complicada porque los estudios varían en calidad y son propensos a sesgos. Sin embargo, los estudios deben realizarse de forma regular y las técnicas para evaluar la atención preanestésica deben mejorarse. Además, esta mejora debe tener en cuenta los resultados de los pacientes y su posterior necesidad de seguridad quirúrgica. Aunque los logros en los sistemas de evaluación tienen limitaciones, los desarrollos prospectivos apuntan a llenar los vacíos, incluidas las deficiencias en los enfoques actuales. Este hecho es beneficioso tanto para los pacientes como para los proveedores de atención médica, y subraya la importancia de la innovación y las prácticas de EBP para la evaluación preanestésica y la calidad general de la atención perioperatoria.

**Palabras clave:** evaluación preanestésica, tendencias emergentes, atención centrada en el paciente, avances tecnológicos, optimización perioperatoria.

1. Universidad de las Américas, Ecuador, Quito, Ecuador. https://orcid.org/0000-0001-8424-4253



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***Correspondencia autor:** andres.viteri4321@gmail.com

## Introduction

The preoperative assessment is an essential part of patient care, as it helps to optimize perioperative management and enhance surgical results. Anesthesia is crucial in this procedure, requiring a comprehensive assessment to minimize possible dangers and customize anesthetic approaches based on the specific needs of each patient[1].

Conventional methods of preoperative examination have evolved through time and usage of new approaches and technologies to make the procedures more effective, accurate and patient-friendly. Traditional preoperative assessment has included the more detailed collection of patient medical history, physical exam, and laboratory tests aimed at identifying the patient's medical status and asses their eligibility for the assigned surgery. While these methods are important, new medical technologies have created opportunities for developing new tools and manners of conducting patient examinations using the old ones[2]. Indeed, the potentials of developing new approaches stem from the limitations of traditional methods. These largely include time-consuming practices, a large variance in practitioner expertise and potential gaps in data gathering which all lead to somewhat suboptimal decision-making and higher perioperative risks. In this regard, innovative solutions that simplify the procedures while ensuring more exhaustive review should be considered[3].

Digital health technologies have brought a revolution to the field of preoperative assessment. Firstly, telemedicine platforms allow preoperative examination and consultation with patients remotely without the need to travel to the doctor's office. This makes PPE not only possible but also convenient for people from rural areas and those who can hardly walk. Health applications, in its turn, help patients examine themselves without a visit and understand their symptoms. This way, people do not feel abandoned even during the preparation stage, but they actively participate in every stage of the treatment process. Artificial Intelligence and Machine Learning.AI and machine learning systems could greatly elevate the preoperative examination. Firstly, AI algorithms could take a large scope of patient information, including electronic health records, imaging investigation, and even genetic information to risk stratify patients, predict their individual complications and adjust the anesthesia technique to its specific features. Furthermore, artificial intelligence consists of data processing systems, decision-making, and recommendation systems serving as an assistant for the clinicians, helping interpret complex data and make decisions based on level 1 evidence provided. Thus, diagnostic and therapeutic relevance and confidence would be significantly boosted[1,4].

### Wearable Devices

These devices include not only POC testing devices but also wearable biosensors for immediate monitoring of various physiological parameters. These devices can facilitate the early detection of perioperative problems and timely intervention. It means that medical personnel receive vital information about the patient's hemodynamic status, fluid balance, and metabolic function and react more proactively to the current problems during the perioperative period. In addition, wearable biosensors with a wide range of sensors can assess the physical condition of a patient to be operated on before the surgery. Specifically, they may continuously measure physical activity, signs of sleep disturbance, and vital signs. This can help to enhance the assessment of risk factors and therapy planning during the perioperative period[5].

The integration of genetic and molecular profiling into preoperative evaluation can promote the development of personalized medicine strategies in anesthesia. Genetic testing can identify various inheritable traits, characteristics, and predispositions

affecting the way the drugs are metabolized, the patient's sensitivity to anesthesia, and the risk of developing complications during surgery. Therefore, the availability of this information can help doctors to develop more personalized perioperative approaches. Also, health care providers should focus on patients' information needs and preferences and engage the patient in decision-making[6,7]. Nowadays, it is important to focus on patient-centered care and patient participation. Modern advances in preoperative assessment underline the importance of an engaged patient as an active participant in the care process. Tools for shared decision-making, such as decision aids and individualized calculators, empower patients to make informed decisions about their treatment or medication preferences in anesthesia. In addition, increased patient-health care provider communication helps foster trust, satisfaction, and, consequently, better clinical outcomes[8].

## Methods

### Data Search Strategy

A systematic and thorough search approach was utilized to locate pertinent research on Emerging trends in pre anaesthetic assessment. We conducted a thorough search of the following electronic databases: Google Scholar, ColumbiaDoctors, PubMed/MEDLINE. In order to successfully combine search terms, the search strategy comprised a combination of keywords and medical topic headings (MeSH) linked to pre anesthesia, preoperative management, artificial intelligence, Pre-Anesthesia Clinic, and pre-anaesthetic assessment. The search results were restricted and filtered by language, study design, and publication type. Only peer-reviewed articles and research published in the English language were searched. The reference lists of appropriate papers and systematic reviews manually searched to find other research that satisfied the inclusion criteria.

**Table 1.** Keywords and MeSH phrases utilized in the systematic review.

| Category | Keywords/MeSH Phrases |
|---|---|
| pre-anesthesia | "preoperative" OR " PAC " OR " PAE " |
| Management | " treatment " OR " administration " |
| ML | "Machine learning " |
| AI | "Artificial intelligence " |

### Inclusion Criteria:

Studies that met the following criteria were included:

- Studies evaluating preoperative administration
- Studies that offer in-depth information regarding pre anesthesia
- Studies that provide a brief detail on pre anesthesia assessment

### Exclusion Criteria:

Studies mentioned below were excluded:

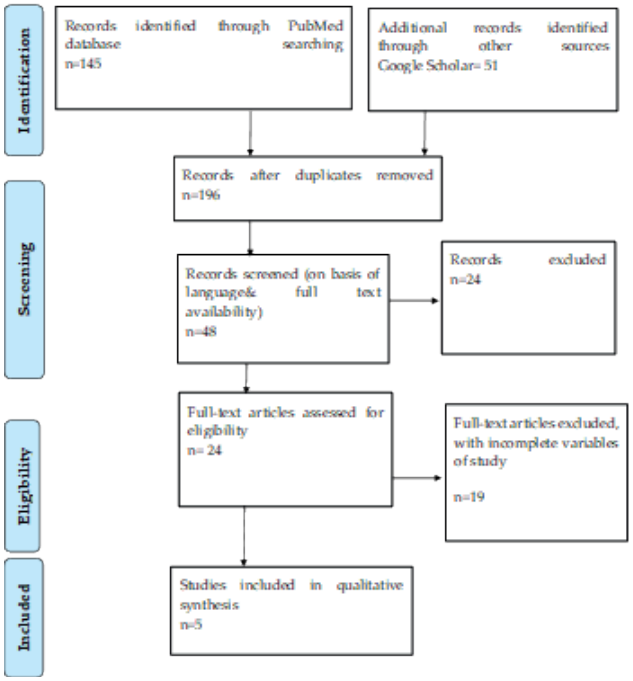
- Studies that did not specifically address pre anesthesia assessment
- Studies that did not fully report their findings
- Animal research; in vitro testing
- Studies that are not publicly available in English.

### Data Extraction

The research was conducted through a systematic data extraction and synthesis method. A comprehensive study of pre anesthesia assessment was made by assessment of specific articles that met predetermined benchmarks, extraction of relevant data from full-text publications, and commentary on notable findings. The technique relied on storytelling to report important facts, themes, and trends identified in many studies. A thorough analysis of the literature made possible by the methodical approach produced important results on the

pre anesthesia assessment. The rigorous selection and analysis of papers was made easier by the careful data management system, which ensured the validity and dependability of the review findings. Figure 1 describes the data extraction process used in this systematic review in accordance with PRISMA guidelines[9].

**Figure 1.** Flow chart for PRISMA.




## Results

Five pertinent studies in all that matched the inclusion requirements for this systematic review were found using the systematic search approach. Table 2 provides a summary of the features and major conclusions of these investigations.

A survey was conducted using the willingness to pay approach to determine the relative importance of five quality aspects: the location of the pre-an aesthesia visit, waiting time, patient-physician connection, usage of multimedia, and ambience. Participation in the trial for a duration of 12 months was completely voluntary. Out of the total of 1,058 questionnaires, 1,014 met the criteria for analysis. For nearly two thirds of the patients (624 out of 1,014), the pre-anesthesia visit conducted by the anesthetist responsible for administering anesthesia was considered the most crucial feature. On average, more than one third of the available funds were allocated to this particular item. The waiting time was ranked as the second most significant component, with almost one third of the patients considering it the most crucial aspect. On average, around one quarter of the total budget was allocated to addressing this issue. The least significant factors taken into account were the pre-anesthesia visit's location, use of multimedia, and ambience. The order of these choices was independent of the age and gender of the subjects. Nevertheless, there was a discernible pattern of variations based on age and gender in terms of the expenditure on these five goods. As individuals grow older, the relationship between patients and physicians, as well as the location of the pre-anesthesia visit, gain greater significance. These findings indicate that including a pre-anesthesia assessment clinic into patient care for anesthesia is not well-received by patients. This is because most patients consider it highly important to become acquainted with the anesthetist who would administer anesthesia. If a pre-anaesthetic evaluation clinic is necessary, alternative methods should be established to instill confidence and make up for the absence of a close patient-physician interaction. Promoting a unified corporate identity for the entire anesthesia department can be advantageous in this regard. Moreover, prioritizing minimizing the waiting time should be of utmost importance, given that this item was ranked as the second most significant element[11].

A preliminary investigation conducted among anesthesiologists unveiled a significant divergence in individual practices, including the omission of pre-anaesthetic airway evaluation during the COVID-19 epidemic due to apprehensions over contracting the infection. The potential for infection

during the pre-anaesthetic airway evaluation has not been investigated. The main aim of the survey was to assess the procedures followed by anesthesiologists when conducting airway examinations during the current pandemic period. The secondary aims of the study were to examine the impact of institutional factors and individual practices on the modification of risk and the occurrence of COVID-19 infection among anesthesiologists. A survey was done using a pre-validated questionnaire consisting of 35 questions. An email containing a questionnaire was sent to 4676 members of the Indian Society of Anesthesiologists (ISA) using Google Forms. Out of the 4676 members who were reached out to via email, 470 emails were unable to be sent. Out of the remaining 4206 individuals who received the questionnaire, 456 of them provided completed responses, resulting in a response rate of 10.8%. The software EZR was used to calculate the percentage, mean, and standard deviation. During the pandemic, there has been a 31.7% drop in the performance of pre-anaesthetic airway examination. As a result, 5.2% of participants have experienced unexpected difficulty with the airway. Out of the participants, 8% tested positive for infection. The failure of anesthesiologists to do preoperative airway assessments during the COVID-19 epidemic has resulted in an increase in unexpected difficult airway situations, which poses a threat to patient safety. Compliance with prescribed protocols guarantees protection against the risk of contracting COVID-19[12].

Prior to an elective surgical treatment, patients must have a pre-anaesthetic assessment (PAE) in order to check their medical readiness. Telehealth, which involves using video conferencing technology to provide healthcare and medical information, has become a desirable choice for the PAE. Telehealth can enhance the provision of secure patient care while minimizing inconvenience and expenses. A comprehensive literature study was performed utilizing PubMed, The Cochrane Library, online medical databases, ancestral research, and Google Scholar. Conducting a literature search yielded 115 potential sources, out of which 1 a randomized controlled trial was, 2 were retrospective studies, 3 were surveys, and 1 was a case report that met the inclusion criteria. The overall evidence indicates that the use of telehealth technology for PAE is equally dependable compared to in-person techniques and offers specific benefits in remote and rural areas where healthcare accessibility can be challenging. Research has also verified that the use of telehealth for PAE (pre-anaesthetic assessment) results in high levels of patient satisfaction and has the potential to save time and money compared to in-person evaluations[13].

Providing sufficient preoperative information can reduce patient anxiety. Providing adequate information during a personal interview is time-consuming, which makes it a significant cost consideration. A study was conducted to examine the impact of providing video material to patients prior to the pre-anaesthetic interview on their anxiety levels and the duration of the interview. A total of 302 individuals undergoing various forms of anesthesia were randomly assigned. A total of 151 patients viewed a brief movie including general information regarding the expected anesthesia procedure. Subsequently, all patients underwent a typical pre-anaesthetic interview. Anxiety and satisfaction of patients regarding pre-anesthesia care were evaluated post-interview using a visual analogue scale. The duration of the interview was recorded. The student t-test was used to determine if there were significant differences between the groups. A significance level of $P < 0.05$ was used. There were no discernible distinctions in terms of gender, age, ASA physical status, previous anesthesia experience, and the intended anesthesia technique between the two groups. There was no discernible disparity in anxiety levels and satisfaction about pre-anesthesia care. There was no difference in

the time of the pre-anaesthetic interview between the groups. The provision of preoperative multimedia information did not result in a reduction in anxiety or an increase in patient satisfaction among individuals undergoing anesthesia. The film providing general information did not expedite the pre-anaesthetic interview[13].

**Table 2.** Characteristics of Studies Included in the Systematic Review.

| Study | Study Design | Intervention | Key Findings |
|---|---|---|---|
| Aust et al., 2011 [10] | Cross sectional study | pre-anaesthetic | Alternative strategies should be used to build confidence and compensate for the lack of patient-physician interaction in pre-anaesthetic evaluation clinics. |
| Manjit et al., 2022 [11] | Cross sectional study | pre-anaesthetic | Anesthesiologists' inability to perform preoperative airway assessments during the COVID-19 pandemic has increased unexpected challenging airway circumstances, endangering patient safety. |
| Schoen & Prater (2019) [12] | Systematic review | pre-anaesthetic | Telehealth pre-anesthetic assessment (PAE) has been shown to improve patient satisfaction and save time and money. |
| Metterlein et al., 2021 [13] | Randomized study | pre-anaesthetic | Providing sufficient preoperative information can reduce patient anxiety |
| Kristoffersen et al., 2022 [14] | Systematic review | pre-anaesthetic | The Pre-Anesthesia Clinic (PAC) reduced hospital stays and surgery cancellations for patients who received assessment. |

## Discussion

A systematic evaluation was done to analyze the efficacy of pre-anesthesia assessment clinics (PACs) in enhancing the quality and safety of perioperative patient care. The inclusion criteria for this study were scientific original research that included randomized or non-randomized prospective controlled studies, and the studies had to be published in English or Scandinavian language. In addition, studies that documented the results of a Patient Advisory Committee (PAC) consultation with the patient in attendance were incorporated. A team of three authors conducted a screening of titles, abstracts, and complete texts. The assessment of bias was conducted using the Joanna Briggs Institute critical evaluation checklist for quasi-experimental studies. Data extraction was conducted by a single author and verified by four additional writers. The results were synthesized narratively due to the diversity of the research represented.

Seven controlled studies examining the efficacy of PACs were incorporated. Three studies found a notable decrease in the duration of hospitalization, while two studies found a notable decrease in the number of surgeries being cancelled for medical reasons when patients were seen in the Pre-Anesthesia Clinic (PAC). Furthermore, the research included in the analysis yielded inconclusive findings regarding anxiety in patients. The majority of research exhibited a significant risk of bias. This comprehensive study revealed that patients who underwent assessment in the Pre-Anesthesia Clinic (PAC) saw a decrease in the duration of their hospital stay and a decrease in the number of surgeries that were cancelled[14].

### Limitations

Even though an analysis of change in pre-aesthetic assessment trend is a valuable perspective, the potential biases and limitations of this review should also be noted. First, the biases, such as publication bias, and limitations of the search methodology, have the potential to question the validity of

the findings. Second, potential limitations could be the works' quality variety, complexity of generalization, and dichotomous nature of interventions. As for survey research, it is also open to response bias, and the results may be affected or confounded by other variables. Third, the review is characterized by the exclusiveness of focusing only on the trends in technology and patient-centeredness. Other variables could also be considered, such as health inequalities or determinants of care access and cultural issues relevant to the choice of pre-anesthetic assessment methods. Summarizing all of the above, despite several limitations, the analysis of the trend provides valuable information on the changing environment of pre-anesthetic assessment. It has shown a need for further research and development in the insufficiently known areas and quality improvement or preoperative care. Health providers can impact the patient's perioperative outcomes by recognizing and trying to mitigate these limitations when issuing the assessment.

## Conclusion

The above systematic review looks into the possibility of the change in the pre-anesthetic assessment process from the extent and basis of emerging trends but with the limitations of being informed by the preoperative realities. From the statement, preoperative or pre anesthetic therapy seems to be dynamic, as shown by the effect of technology and the shift to patients-centered approaches. Although data reliability may be influenced by biases like publication bias and search restrictions, the review entails valuable information on the emerging and promising area of preoperative or pre-anesthetic therapy. The emphasis on technology indicates a change in the direction of health provisioning starting towards offering health services efficiently and personalized. In a bid towards patient participation, telemedicine and mobile health systems allow patients to be dynamically involved in preoperative therapy. The search and use of data are still a challenge to address in the end. However, there are difficulties associated with the quality and realization of study findings. Surveys specifically are prone to results to bias or confounding factors. However, this study indicates that more future research should be conducted and developed to improve and optimize the current standards and limitations. Future trends may completely eliminate the use of existing trends and limitations, addressing new and future limits. These changes are intended to improve the patient's outcomes and streamline the anesthetists' work. Data science and more use of artificial intelligence expect a more integrated approach in prediction and advisories for the anesthetist. This will help make more personalized and specific anesthetic data management and risk evaluation. Generally, the emerging field of preoperative is committed to making health delivery convenient to patients and optimize patient-producing factors. Healthcare professionals are well placed to enhance the above challenges and trends by embracing changes and adapting evidence-based practice. This ensures changing needs and expectations across patients and health systems.

### Conflict of interest

The authors declare no conflict of personal, financial, intellectual, economic or corporate interest with the Hospital Metropolitan and the members of MetroCiencia magazine.

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