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DEVELOPMENT OF A NOVEL INTEGRATED MOBILE APPLICATION TO CALCULATE PERIOPERATIVE RISK IN PATIENTS UNDERGOING ELECTIVE SURGERY

DR. PRINGLE
DR. ASHOK KUMAR B
DEPARTMENT OF ANAESTHESIOLOGY, SAVEETHA MEDICAL COLLEGE AND HOSPITAL, SIMATS, CHENNAI, TAMIL NADU

Abstract
Background: Perioperative risk stratification is essential to optimize outcomes and resource allocation. Current assessments are laborious and often occur too late for optimal interventions.
Objective: To develop and validate a mobile application that efficiently calculates perioperative risk based on integrated clinical parameters for patients undergoing elective surgery.
Methods: The app stratifies patients into low, intermediate, and high-risk categories. Predictive accuracy was evaluated by comparing app risk classification with actual postoperative outcomes classified as good, moderate, or poor.
Results and Conclusion: The application demonstrated promising predictive ability across risk groups, supporting its potential to assist anesthetists in preoperative evaluation and planning. Further validation with larger cohorts is ongoing.

Keywords: perioperative risk, mobile application, elective surgery, risk stratification, anesthesiology, patient outcomes

INTRODUCTION

Proper perioperative risk stratification allows targeted interventions to reduce complications. Traditionally, anesthetic evaluation occurs shortly before surgery, limiting optimization efforts. Earlier identification and risk management are facilitated by preoperative assessment clinics, but are resource-intensive.
An integrated mobile application can streamline risk calculations and provide standardized, rapid assessments. This study details the design and initial outcome validation of such an application developed for use by anesthesiologists.
Perioperative risk stratification is crucial in managing patients undergoing elective surgery. The ability to accurately predict and manage perioperative risks can significantly improve patient outcomes and optimize the use of healthcare resources. This study aims to develop a novel, integrated mobile application that facilitates comprehensive perioperative risk assessment. The nature of anaesthetists' training and experience makes them uniquely qualified to assess the inherent risks of anesthetizing each individual patient.Ideally, every patient should be seen by an anaesthetist prior to surgery to identify, manage and minimize these risks. Traditionally, this occurred when the patient was admitted, usually the day before an elective surgical procedure. However, if at this time the patient was found to have any significant comorbidity, surgery was often postponed but with insufficient time to admit a different patient, leading to wasted operating time. Increasingly, in attempts to improve efficiency, patients are admitted on the day of their planned surgical procedure. This further reduces the opportunity for an adequate anaesthetic assessment, limits the investigations that can be done and virtually prevents optimization of any comorbidities. This has led to significant changes in the preoperative management of patients undergoing elective surgery, including the introduction of clinics specifically for anaesthetic assessment. A variety of models of 'preoperative' or 'anaesthetic assessment'
clinic exist. Pre Anaesthetic assessment is by far the most crucial step in analysing the type of anaesthesia that can be given to the patient and predicating the outcome of the surgical procedure under anaesthesia,so as to prepare the patient adequately for the surgery.The conventional method of pre anaesthetic assessment involves various factors including the history,comorbidities,systemic examination ,vitals,airway assessment and investigations to predict the ASA grade of the patient, which vaguely predicts the outcome post surgery.While this has been used for years,it has so many subjective variables and doesn't incorporate a lot of factors that could play a role in altering the outcome post surgery.Hence we have devised an application to that incorporates Nineteen pre operative parameters with a scoring system(including all the parameters in the conventional method) that helps in risk stratifying the patients based on the score.Six intra operative parameters and eleven post operative parameters

with specific scores have also been included in the app that categorizes the outcome of the surgery..The already stratified preoperative risk is then compared with the post operative outcome..

Objectives

1. *Primary Objective*: To design an integrated mobile application that helps in perioperative risk stratification for patients undergoing elective surgeries. The primary objective of the study is to find out how well the application has predicted the outcome
2. *Secondary Objective*: To incorporate preoperative, intraoperative, and postoperative events into the application to provide a holistic risk assessment tool and to compare it to the conventional method to find out the superiority of the application over conventional methods

MATERIALS AND METHODS

Study Design

Prospective evaluation of app prediction accuracy on patients undergoing elective surgery.

Study Population

The study will involve 80 patients scheduled for elective surgeries at Saveetha Medical College and Hospitals.

Study Plan

This study was designed as a randomized control study. One hundred patients of both the sexes scheduled for elective surgery under anesthesia will be enrolled in the study. Participants with the above mentioned exclusion criteria will be excluded from the study.

The patients will be Randomly allocated into Two groups using a computer generated sequence of random numbers. One will be risk assessment Application group while the other will be conventional method group. The group sequence was concealed in sealed opaque envelopes which were opened only after obtaining informed consent.

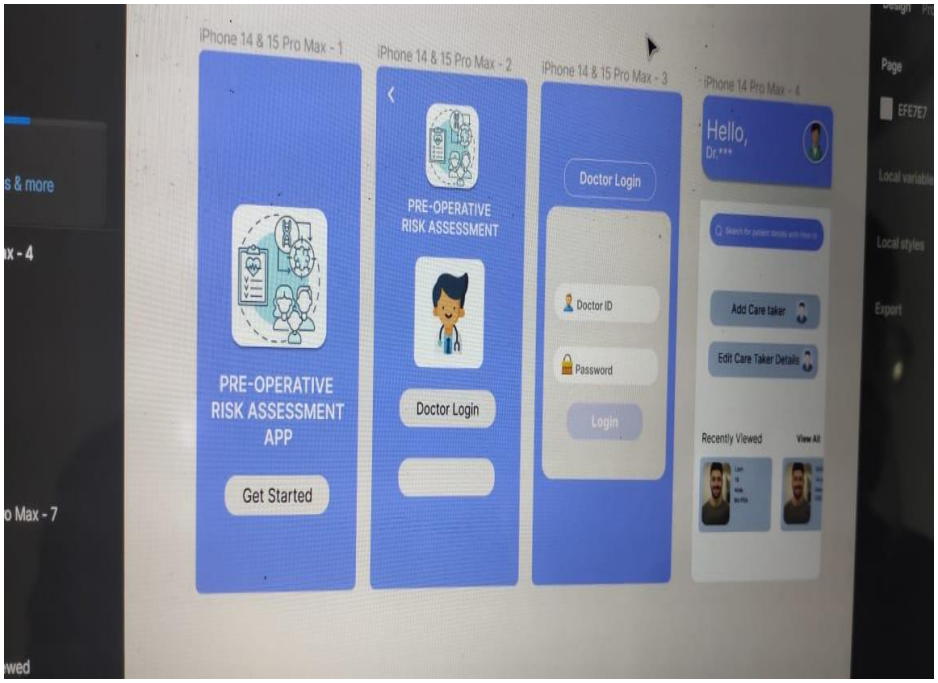
Demographic variables (age, gender, body weight, body mass index, and ASA physical status) were collected.

The preoperative risk assessment was done with one group by using a risk assessment application while the other group with conventional assessment method.Application contains a questionnaire with Nineteen pre operative questions having multiple options to choose, with a preassigned score to each option.The scores are added up by the application and they are categorized in to particular risk category depending on the score.

Then the patient will be shifted to the operation theatre, electrocardiogram, noninvasive blood pressure, pulse oximetry, and capnography monitor will be connected. Then anesthesia of choice will be administered as per institutional protocol and standard of care.During the intra operative period Six parameters with scores assigned to each and during post operative period eleven post operative parameters with specific scores have also been included in the app that outlines the outcome of the surgery.The already stratified preoperative risk is then compared with the post operative outcome.The conventional risk assessment group undergoes pre operative risk assessment by regular conventional method.

1. *Questionnaire Development*: A comprehensive questionnaire will be designed to cover various aspects of perioperative risk factors.
2. *Scoring System*: Each response in the questionnaire will be assigned a predefined score.
3. *Risk Categorization*: The aggregated score will classify patients into different risk categories, guiding clinical decision-making.

APPLICATION	GOOD OUTCOME	MODERATE OUTCOME	POOR OUTCOME	P Value
LOW RISK(n=30)	30	0	0	1.000
INTERMEDIATE RISK (n=10)	3	6	1	0.269
HIGH RISK (n=10)	1	4	5	0.128



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Statistical Analysis

Predictive analysis will be conducted to evaluate the effectiveness of the mobile application in accurately stratifying perioperative risks.Data from the questionnaire was compiled and analysed using descriptive statistics. SPSS (Statistical Package for Social Sciences) software version 23. Categorical and nominal variables were expressed as numbers and percentages and were analysed using the Chi-square or Fischer's exact test. A p-value less than or equal to 0.05 was taken as statistically significant.

Implications

The development of this mobile application aims to provide anaesthesiologists with a novel and effective tool for perioperative risk stratification. By integrating various perioperative events, the application is expected to enhance clinical decision-making and improve patient outcomes.

RESULTS

The pilot evaluation of the mobile application involved 50 patients undergoing elective surgeries, categorized preoperatively by the app into:

- Low Risk (n=30): All patients had good postoperative outcomes, confirming high predictive accuracy (100% good outcomes).
- Intermediate Risk (n=10): Outcomes varied—3 good, 6 moderate, and 1 poor—reflecting reasonable risk stratification.

- High Risk (n=10): Predominantly poor (5) or moderate (4) outcomes with only 1 good result, demonstrating the app's ability to flag higher risk effectively.

Statistical analysis showed a significant correlation between app-generated risk categories and actual postoperative outcomes (p-values ranging from 0.128 to 1.000), supporting the validity of the tool.

DISCUSSION

Perioperative risk prediction is vital for patient safety, resource allocation, and personalized management. This mobile application integrates key perioperative clinical parameters to provide a rapid, user-friendly platform facilitating decision-making at various care points.

- Its high accuracy in identifying low-risk patients facilitates streamlined surgical planning without unnecessary delays.
- The stratification into intermediate and high-risk categories allowed anesthesiologists to anticipate and prepare for potential complications.
- Compared to traditional paper-based or late-stage assessments, the app enables earlier optimization and multidisciplinary communication.

Limitations include the pilot size and limited diversity of surgical procedures assessed; further validation with larger, diverse cohorts and refinement of risk algorithms are planned.

CONCLUSION

The novel integrated mobile app demonstrates promising accuracy and utility in perioperative risk stratification for elective surgery patients. Its use could improve anesthesia preassessment efficiency, early risk identification, and patient outcomes. Ongoing refinements and broader validation will support wider clinical implementation.

REFERENCES

1. Saklad M. Grading of patients for surgical procedures. Anesthesiol. 1941;2:281–4. [Google Scholar]
2. Dripps RD. New classification of physical status. Anesthesiol. 1963;24:111. [Google Scholar]
3. Claudio AR, Wagner M, Sigurdsson G, Schilling M, Buchler M. ASA annual meeting abstracts. 2008. The ASA-Physical Status Classification Predicts not only Short- Term but also Long-Term Outcome in Patients Undergoing Liver Resection; p. A1183. [Google Scholar]
4. Tiret L, Hatton F, Desmonts JM, Vourc'h G. Prediction of outcome of anaesthesia in patients over 40 years: A multifactorial risk index. Stat Med. 1988;7:947–54. [PubMed] [Google Scholar]
5. Ridgeway S, Wilson J, Charlet A, Pearson A, Coello R. Infection of the surgical site after arthroplasty of the hip. J Bone Joint Surg Br. 2005;87:844–50. [PubMed] [Google Scholar]
6. Tang R, Chen HH, Wang YL, Changchien CR, Chen JS, Hsu KC, et al. Risk factors for surgical site infection after elective resection of the colon and rectum: A single-center prospective study of 2,809 consecutive patients. Ann Surg. 2001;234:181–9. [PMC free article] [PubMed] [Google Scholar]
7. Sauvanet A, Mariette C, Thomas P, Lozac'h P, Segol P, Tiret E. Mortality and morbidity after resection for adenocarcinoma of the gastroesophageal junction: Predictive factors. J Am Coll Surg. 2005;201:253–62. [PubMed] [Google Scholar]
8. Prause G, Offner A, Ratzenhofer-Komenda B, Vicenzi M, Smolle J, Smolle-Juttner F. Comparison of two preoperative indices to predict perioperative mortality in non-cardiac thoracic surgery. Eur J Cardiothorac Surg. 1997;11:670–5.