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Original article

Usefulness of preoperative studies in patients evaluated for elective surgery

Effectiveness of Preoperative Studies in Patients Undergoing Elective Surgery

Effectiveness of two pre-operative studies in patients undergoing elective surgery

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SUMMARY

Preoperative examinations are a widespread practice in medicine; however, their use is often not based on the best available evidence. With the aim of evaluating the Usefulness of preoperative studies in elective surgery in patients according to physical



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condition of American Society of Anesthesiologists Type I and IIA prospective, single-cohort, analytical study was conducted. The research included patients undergoing low-to moderate-risk elective surgeries, between the January 1st in 2022 and June 2023, at the Carlos Manuel de Céspedes Provincial General Hospital in Bayamo. The universe consisted of the 375 patients presented for elective surgery treated during the study period; the statistical program Epi Info 7© was used to calculate the sample size, yielding 184 patients. The results showed that the abnormalities were more frequent in female patients, aged between 51 and 60 years, and in type II patients, indicating a moderate surgical risk. In general, the mean values obtained in the laboratory tests remained within normal ranges. However, postoperative complications were observed in 14 patients. An association was found between surgical risk and altered hematocrit values with the occurrence of complications; it was concluded that Laboratory, electrocardiographic, and chest radiological examinations, with the exception of blood glucose, were not useful in predicting perioperative complications in patients according to the American Society of Anesthesiology physical status type I and II undergoing elective surgery.

Keywords: Additional tests; Physical condition; Elective surgery.

ABSTRACT

Preoperative tests are a widely used practice in medical care; However, in most cases, their use is not based on the best available evidence. In order to evaluate the usefulness of preoperative studies in elective surgery in patients classified as American Society of Anesthesiologists (ASA) physical status I and II, an analytical, prospective, single-cohort study was conducted. The research included patients scheduled for low- to moderate-risk elective surgeries between January 1, 2022, and June 2023, at the Provincial General Hospital Carlos Manuel de Céspedes in Bayamo. The study population consisted of 375 patients scheduled for elective surgery during the study period; sample size was calculated using the statistical program Epi Info 7©, which yielded 184 patients. The



results showed that abnormalities were more frequent in female patients, those aged 51 to 60 years, and ASA II patients, indicating a moderate surgical risk. Overall, the mean values obtained in laboratory tests remained within normal ranges. However, postoperative complications were observed in 14 patients. An association was found between surgical risk and altered hematocrit values with the occurrence of complications. It was concluded that laboratory, electrocardiographic, and chest radiological tests, except for blood glucose, were not useful in predicting perioperative complications in ASA physical status I and II patients undergoing elective surgery.

Keywords: Complementary tests; physical status; Elective surgery.

SUMMARY

The pre-operative exams are a practice widely spread in medical practice; However, most of the time, its use is not based on the best evidence available. With the objective of evaluating the usefulness of two pre-operative studies in elective surgeries in patients with second physical status of the American Society of Anesthesiology (ASA) types I and II, an analytical, prospective, single-section study was carried out. The research included patients undergoing elective surgeries at low to moderate risk between January 1, 2022 and June 2023, at Hospital Provincial Geral Carlos Manuel de Céspedes, in Bayamo. The universe was constituted by 375 patients undergoing elective surgery during the study period; To calculate the size of the sample, the statistical program Epi Info 7© was used, which resulted in 184 patients. The results will show that the alterations are more frequent in female patients, between 51 and 60 years old, and in ASA II patients, indicating moderate surgical risk. In general, the average of the values obtained from laboratory tests remains within two normal intervals. Meanwhile, postoperative complications were observed in 14 patients. It confirms the association between the surgical risk and the altered hematocrit values with the appearance of complications. It is concluded that laboratory, electrocardiographic and chest radiological examinations,



with excess glycemia, are not useful in predicting perioperative complications in ASA I and II patients undergoing elective surgery.

Key words:Complementary exams; Physical state; Elective surgery.

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Introduction

No medical procedure requires greater cooperation than surgery and perioperative (PO) patient care. Integrated work is increasingly common: the surgeon, supported by the medical history, examination, and appropriate complementary tests, formulates the diagnosis and indicates the surgical intervention for the patient's recovery; the anesthesiologist begins the patient's physical and psychological preparation, performs the preoperative evaluation, plans the PO pain management, and discusses and clarifies important aspects with the patient; and when necessary, other specialists (cardiologist, pulmonologist, radiologist, endocrinologist, among others) also participate to ensure that the PO management plan is the most appropriate. (1)

The American College of Physicians (ACP) recommends that laboratory tests should be ordered selectively and restrictively, always with clinical justification. The discovery of abnormal test results in clinically healthy patients does not influence treatment and generally does not affect the perioperative management plan.

Post-operative assessment is one of the most important aspects for improving the quality of care for surgical patients and the doctor-patient relationship, for reducing anxiety, morbidity and mortality from surgery, for facilitating recovery and, ultimately, for enabling the patient to return to their normal activities as quickly as possible. (2)



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A thorough medical history and a detailed physical examination are usually sufficient to reduce the number of routine preoperative tests by up to 60%. (3) If only necessary preoperative tests were ordered, costs per patient would decrease, laboratory services would be less congested, and preoperative times would be reduced. (4,5)

Firde & Yetneberk, (6) agree in pointing out that pre-surgical examinations requested indiscriminately and not justified by the suspicion of disease produce a large number of abnormal results that in some cases require repeating the tests or requesting other more aggressive ones, which can cause a risk to the patient, in addition to increasing the degree of confusion and anxiety of the same.

Kaplan, (7) in a retrospective analysis conducted in the United States of America, found that of the results in 785 routine initial screening tests in patients who would undergo elective surgery, 60% were not necessary.

However, authors agree that with respect to the patient's physical condition according to the American Society of Anesthesiologists (ASA), the categories ASA I (Healthy and asymptomatic patient, without any alteration other than the localized process that requires the intervention) and ASA II (Patient with mild-to-moderate systemic disease, which does not produce disability or functional limitation), when dealing with these patients, preoperative assessment through laboratory tests is of little value and rarely modifies the perioperative course. (8-10)

It is very common to see healthy patients in the pre-surgical anesthesiology clinic who have undergone numerous laboratory and imaging tests before any surgical procedure. These tests are often unnecessary given the patient's asymptomatic condition, with no signs or clinical history that would justify ordering them. (11)

In recent years, there has been a generalization in the routine request for preoperative tests in all patients of the Carlos Manuel de Céspedes provincial general hospital in Bayamo without achieving the two main objectives in these patients: the eventual modification of the anesthetic technique and the prediction of postoperative complications.

Therefore, based on the need to rationalize the prescription of complementary examinations; and taking into consideration the above, it was decided to carry out this research with the objective of evaluating the usefulness of preoperative studies in elective surgery in patients with a low or medium risk physical condition.

Methods

A prospective, single-cohort, analytical study was conducted on ASA I and ASA II patients evaluated for low- to moderate-risk elective surgery between January 1, 2022, and June 2023 at the Carlos Manuel de Céspedes Provincial General Hospital in Bayamo. The study population consisted of the 375 patients who underwent elective surgery during the study period.

To calculate the sample size, a preliminary study was first conducted with 50 random interconsultations, from which a prevalence of 5% with abnormal results was obtained; with this value and using the statistical program Epi Info 7©; the sample size was finally calculated taking into account the following parameters: expected frequency of 5% of at least one abnormal test, a design effect of 1, the confidence interval of 95%, which resulted in 184 patients who met the inclusion criteria: Patients of both sexes, aged between 20 and 60 years, ASA I and ASA II, who underwent low-to-moderate risk elective surgery and who wished to participate in the study, by signing the informed consent.

Patients who underwent emergency surgery, high-risk surgeries, and patients with ASA physical status III and IV were excluded, as were patients who did not undergo the complementary examinations included in the study and who did not wish to cooperate with the research. The Chi-square or Mann-Whitney test was used, with a p-value of 0.05 and the likelihood ratio was calculated.

The variables obtained were demographic and clinical characteristics of the study sample: age, sex, personal pathological history, ASA I and ASA II classification, type of surgery assessed according to NICE risk guide (low and moderate risk), surgical specialty,



laboratory tests (hemoglobin, hematocrit, total leukocyte count, platelets, blood glucose and serum creatinine), radiological studies of chest x-ray and electrocardiogram. All patients, once assessed by the researcher based in the anesthesiology service, had their data collection notebook prepared, in which the main variables of interest were received, with prior consent from the patient., freely expressed by each one before their inclusion.

The analysis of qualitative variables was carried out using tables with frequency values and percentages (absolute and relative values), for quantitative variables (age, diameter) the mean and standard deviation were obtained.

The normality of continuous variables was assessed using the Kolmogorov-Smirnov test. Demographic findings and clinical and surgical characteristics of the various patients were analyzed using the Chi-square (X²) test (for categorical variables) or the Mann-Whitney test (for non-parametric continuous variables) with a p-value of 0.05.

To assess the clinical benefit of preoperative studies independently of prevalence, the most useful tool is the likelihood ratio (LR), defined as the ratio between the likelihood of observing an outcome in patients with the disease in question versus the likelihood of that outcome in patients without the disease. The ranges of likelihood ratio values and their impact on clinical utility were used.

Results

Table 1 shows the Demographic and clinical characteristics of the patients in the study; those with ages between 51 and 60 years were frequent, with a mean of 47.22 years, a median of 49 years and a standard deviation of 14.75.

63.59% of the patients (n=117) were female; and in 134 patients (72.83%) the presence of some personal pathological history was found.

Table 1. Demographic and clinical characteristics of the study sample.



Variable	No	%
Age		
20-30 years	31	16.85
31-40 years	39	21.20
41-50 years	27	14.67
51-60 years	51	27.72
61-70 years	29	15.76
+ 71 years	7	3.80
Sex		
Female	117	63.59
Male	67	36.41
Personal medical history		
Present	134	72.83
Missing	50	27.17

Table 2 shows that they were frequent with American Society of Anesthesiology classification: ASA II (133 patients;72.28%); as well as patients who underwent moderate-risk surgery (122 patients;66.30%).

The surgical specialties that contributed the largest number of patients were: gynecology and obstetrics (75 patients;40.76%), followed by general surgery (64 patients;34.78%) and urology (19 patients;10.33%).

Table 2.Demographic and clinical characteristics of the study sample (continued).

Variable	No	%
ASA Classification		
ASA I	51	27.72
ASA II	133	72.28
Type of surgery		
Low risk	62	33.70
Moderate risk	122	66.30
Surgical specialty		
Gynecology and Obstetrics	75	40.76
General surgery	64	34.78
Urology	19	10.33

Otolaryngology	9	4.89
Orthopedics and Traumatology	5	2.72
Neurosurgery	4	2.17
Coloproctology	3	1.63
Angiology and vascular surgery	3	1.63
Plastic surgery	2	1.09

When analyzing the results of the laboratory tests of the sample under study (table 3), it was found that the mean of each of them was within the range of normal values, when the creatinine figures were altered, were not significantly associated ($p=0.4280$) with the appearance of perioperative complications; the rest of the abnormal complementary examinations were statistically significantly associated.

Table 3. Laboratory test results of the sample under study.

Laboratory test	Average	Median	Standard deviation
Hemoglobin levels (Hb) in g/L	121.31	120	9.24
Hematocrit (Hct) values in L/L	0.41	0.41	0.03
Leukocytes (total count) x 10 ⁹ /L	6.93	6.8	1.84
Platelet count x 10 ⁹ /L	262.34	262.5	45.22
Creatinine in μ mol/L	77.44	74	14.32
Blood glucose in mmol/L	4.78	4.6	0.94

Table 4 shows that complications occurred in 14 patients; the appearance of arterial hypotension and arterial hypertension (3 patients; 21.43%) was frequent in the patients.

Table 4. Distribution of patients according to the presence of complications.

Complications	No	%
Low blood pressure	3	21.43
High blood pressure	3	21.43
Bradycardia	2	14.29
Bradycardia - hypotension	2	14.29
Hypovolemia-hypotension	2	14.29

Tachycardia	2	14.29
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When analyzing the various complementary tests, it was found that blood glucose was the test that achieved the highest sensitivity (92.86), a result shown in Table 5.

Table 5.Sensitivity and specificity of complementary tests.

Variable	S	AND	IV	Vp +	Vp -
Electrocardiogram	78.57	97.06	95.65	68.75	98.21
Chest X-ray	71.43	98.24	96.20	76.92	97.66
Hemoglobin levels	64.29	86.47	84.78	28.13	96.71
Hematocrit figures	71.43	90.56	89.18	37.04	97.60
White blood cells (total count)	78.57	92.94	91.85	47.83	98.14
Platelet count	78.57	98.24	96.74	78.57	98.24
Creatinine	57.14	57.65	57.61	10.00	94.23
Blood glucose	92.86	90.00	90.22	43.33	99.35

Symbols: Sensitivity, S; Specificity, E; Validity Index, IV; Positive Predictive Value, pv+; Negative Predictive Value, pv-

Discussion

There is uncertainty about whether preoperative tests performed in the absence of a specific indication prevent complications and improve outcomes, or whether they cause unnecessary delays, additional costs, and harm due to false-positive results. There is sufficient evidence to determine whether these tests influence quality of life, patient satisfaction, or harm (2,11), as was observed in the present study.

Siddaiah and colleagues, (5) suggest that performing complementary examinations on a daily basis did not cause changes in anesthetic behavior and agree that a rigorous process of evaluating the diagnostic examination before introducing it into daily clinical practice could not only reduce the number of complications related to the erroneous estimation of the effectiveness of the examination, but also health costs by decreasing the number of unnecessary tests.

Furthermore, according to criteria of Umesh and collaborators, (12) preoperative examinations should be used to guide the action plan of patients who are going to undergo surgery or other procedures that require anesthesia and to predict potential complications.

The personal medical history (hypertension, diabetes mellitus, bronchial asthma) is very common in the Cuban population, (13) and therefore in patients undergoing surgery. However, their presence meant that they had to be well-controlled in order to be included in the study (ASA II or lower patients).

According to Trabelsi and colleagues, (14) a correct preoperative clinical assessment should integrate the ASA risk scale with the selective prescription of laboratory tests, according to age, sex, disease, main and secondary diagnosis, depending on the type of planned procedure to be performed and the type of anesthesia to be used.

However, the authors of the present research agree with what is stated in the literature, (15-17) that in patients category ASA I and ASA II laboratory tests have little value and rarely alter the behavior in the perioperative period.

A study conducted in the United States (9) found that preoperative tests were of limited utility for ASA I and II patients undergoing a wide variety of outpatient procedures, recommending the elimination of unnecessary tests in these patients. Similar results were obtained in the present study, which also found no association between ASA category and the presence of complications during surgery.

Electrocardiography (ECG) is considered for patients of any age with diabetes, hypertension, chest pain, congestive heart failure, a history of smoking, peripheral vascular disease, disability, and morbid obesity. (4)

For his part, Reazaul, quoted by Halvorsen and collaborators (16) recommends performing a routine ECG in patients over 65 years of age due to the high incidence of silent heart attacks, with decompensation of cardiac, vascular and pulmonary diseases, according to the risk factors present and the surgery.

The benefit of routinely ordering an electrocardiogram is also questioned due to the limited benefits of doing so indiscriminately. It is important to note that there is no evidence demonstrating the benefit of routine electrocardiograms in asymptomatic patients. Thus, it is understandable why their use could be omitted in asymptomatic patients with good functional class, as it would not affect the postoperative outcome; (15) this is demonstrated by the results obtained in the present investigation, although it was associated with the occurrence of complications, the sensitivity was 78.57%.

Trabelsi, (14) in his research found that a significant percentage of preoperative tests are prescribed unnecessarily; in the case of chest x-rays, these often do not have a significant impact on treatment or perioperative outcomes, except if there is a history of symptomatic lung disease or clinical findings, similar to what was found in the present investigation.

In the present investigation, decreased hemoglobin values were associated with the appearance of complications; but with a very low sensitivity (64.29%).

Currently, there are no guidelines or recommendations that support the routine use of hematocrit/hemoglobin as a preoperative test. In the study of Labrador and colleagues, (17) 0.1% of patients undergoing low-risk surgeries presented alterations in hematocrit and hemoglobin levels, which led to changes in perioperative management. There is an almost general consensus that Hct/Hb testing is indicated when the patient presents with acute anemia, signs of intra- or postoperative hemorrhage or bleeding, and in chronic anemia with signs of exacerbation. (14,15)

Regarding the total leukocyte count, Flanagan and Fikry (18) recommend performing these laboratory tests in patients over 60 years of age and according to the severity of the surgery. In the present study, although an association was found between this complementary test and the occurrence of complications, the sensitivity did not exceed 80%.

When analyzing the platelet counts cited by Labrador and colleagues, (17) no sufficient scientific evidence was found to demonstrate that the routine use of these coagulation tests induces a decrease in morbidity and mortality and perioperative outcome, similar to what was found in the present investigation, when the sensitivity of the test did not exceed 80%.

Flanagan and Fikry (18) suggest that blood chemistry tests should be ordered based on the clinical history of diabetic patients, or those with endocrine disorders, hepatic or renal insufficiency. Similar results to the above were obtained in the present study; however, with the difference that blood glucose levels significantly predicted the occurrence of complications, achieving a sensitivity greater than 90%.

Conclusions

Laboratory, electrocardiographic, and chest radiological examinations, with the exception of blood glucose, were not useful in the evaluation of perioperative complications in ASA I and ASA II patients undergoing elective surgery.

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Conflict of interest

The authors declare no conflicts of interest.

Authorship contribution

José Miguel Acosta Guerrero: participated in the conceptualization, data curation, formal analysis, research, methodology, drafting of the original manuscript, and final drafting, revision, and editing of the manuscript.

Domingo Ángel Labrada Tapia: She participated in data curation, formal analysis, research, and manuscript writing.



Yurisnel Ortiz Sanchez: participated in the curation of the data, in the formal analysis, research, methodology, in the writing of the original draft and in the writing, review and final editing of the manuscript.

Jorge Ceiro Grimón and Gleidys Acosta Guerrero: participated in the curation of the data, in the formal analysis, research and in the writing of the manuscript.



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