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CLINICAL RESEARCH

The inductor role of cardiac consultation in the pre-anesthetic evaluation of asymptomatic patients submitted to non-cardiac minor and intermediate-risk surgery: a cross-sectional study

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KEYWORDS
Preoperative assessment;
Coronary disease;
Overdiagnosis;
Inappropriate prescribing

Abstract
Introduction: Asymptomatic patients with moderate functional capacity do not require Coronary Artery Disease (CAD) workup in the preoperative period of non-cardiac surgeries, especially when scheduled for minor and intermediate-risk surgeries. The workup is inappropriate because it promotes over diagnosing and pointless treatments. Moreover, those patients usually undergo cardiology assessment, in addition to pre-anesthetic evaluation.
Objective: Investigate the role of cardiology consultation as mediator in inappropriate assessment of CAD for preoperative of non-cardiac surgeries.
Method: Retrospective study performed in a private anesthesia service using medical charts of asymptomatic patients with a history of controlled systemic disease and moderate functional capacity, submitted to pre-anesthetic consultation for minor and intermediate risk surgeries. Cardiology consultations were identified by the presence of a consultation report by a cardiologist. CAD workup was defined as undergoing cardiac stress tests.
Results: We included 390 medical charts of patients with mean age of 48.6 ± 15.4 years, 67% women and 69% intermediate risk surgeries. CAD workup was infrequent and performed in 3.9% of patients. Besides, pre-anesthetic evaluation, 93 (24%) patients had a cardiology consultation. Among those patients, 15.1% were submitted to CAD workup, compared to 0.34% of patients without cardiology assessment ($p < 0.001$; RR = 4.4; 95% CI: 3.5–5.6).

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Conclusions: Inappropriate testing for CAD investigation is infrequent for asymptomatic individuals submitted to minor and intermediate risk surgeries. However, cardiology consultation increases substantially the likelihood of a patient undergoing CAD workup, suggesting that, unlike the anesthesiologist, the cardiologist is a major mediator of this kind of management.
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Introduction

The chief purpose of preoperative assessment is to analyze the clinical status of patients before surgery to reduce perioperative morbidity and mortality associated with anesthesia-surgery and should preferably be carried out by the anesthesiologist.[1,2] The assessment is substantiated by different reasons, as roughly 20% of surgery patients have clinical complications in the postoperative period.[3]

In this scenario, consultations with a specialist during the pre-anesthetic evaluation should be requested by the anesthesiologist according to patient past medical history and type of surgery proposed.[1,2] Thus, the medical team may consider essential performing preoperative coronary tests, such as exercise testing, stress echocardiography, stress myocardial perfusion imaging, computerized tomography coronary angiogram, or coronary angiography, to establish a baseline assessment and detect subsequent changes.[1,4]

Conversely, the effectiveness of these anatomical and/or functional cardiac stress tests is not well known, especially for low risk patients submitted to minor and intermediate risk surgeries.[5,6] Additionally, between 60% and 70% of lab tests requested before elective non-cardiac surgeries are unnecessary, considering patient medical history and physical examination.[7] Thus, surgical patients generally undergo extensive preoperative evaluations with no solid evidence that diagnostic benefits outweigh costs and possible damage.[4,8]

Hence, several studies[5,6,8,9] and health guidelines[10,11] widely criticize the common practice of performing extensive and non-selective preoperative tests for asymptomatic patients with a controlled systemic condition and at least moderate functional capacity, and referring them to a medical consultation with a specialist before undergoing minor and intermediate risk non-cardiac surgeries. Additionally, more than 95% of patients submitted to elective minor and intermediate risk surgeries do not require coronary tests or complementary tests before undergoing the procedure in the scenario above.[4,8,11]

Research from Austria[12] has shown that limiting preoperative diagnosis to the recommendations of the most current anesthesiology guidelines leads to 10 to 35 million euros of annual savings in that country. Furthermore, a recent systematic review[13] analyzed the efficacy of non-cardiac preoperative tests for elective non-cardiac surgery and revealed no evidence from high-quality studies that supports performing routine preoperative tests in healthy adults or in asymptomatic patients undergoing non-cardiac surgery.

Based on the above, the present study intended to investigate the role of cardiology consultation as mediator to inappropriate assessment of obstructive Coronary Artery Disease (CAD) or its stratification during the preoperative period of non-cardiac surgery for asymptomatic patients with at least moderate functional capacity and with controlled systemic conditions, a scenario in which such coronary artery tests are unnecessary according to the latest guidelines.[10–12] We examined the consultations with specialists and preoperative tests in a private hospital in northeastern Brazil considering the issues related to patient safety, through permanent education and excellent care, prevention and reduction of risks and injuries without increasing costs.

Methods

Retrospective cross-sectional study carried out in a private hospital in a major city of the Brazilian northeastern region between May 2015 and May 2016. We evaluated medical charts of patients scheduled for minor and intermediate risk surgeries. The study was approved by resolution 1,703,064 of the Ethics Committee in Human Research of the Escola Bahiana de Medicina e Saúde Pública (EBMSP), with submission certificate for ethical appreciation (CAAE) nº 57161016.8.0000.5544. Due to the retrospective design of the study, the Ethics Committee waived requirement for informed consent.

The free PEPI-for-Windows (WINPEPI) software was used to estimate the minimum number of medical charts required to guarantee sample representativeness for making inferences to the target population.[14] The number of medical charts was estimated at 323, according to the descriptive epidemiology option, followed by sample size estimation, using an approximate prevalence of 30% and an acceptable error of 5% for a 95% Confidence Interval.

We included medical charts of patients who consecutively underwent pre-anesthetic consultations between May 2015 and May 2016 and met the following criteria: candidates for minor and intermediate risk surgery, asymptomatic, with functional capacity equal to or greater than four Metabolic Equivalents (MET) and without history of decompensated systemic diseases (Fig. 1).

Minor-risk elective surgeries, with perioperative mortality < 1%, included superficial and endoscopic procedures, and cataract, breast, or outpatient surgeries, while intermediate risk with perioperative mortality between 1% and 5%, comprised intraperitoneal, intrathoracic, carotid endarterectomy, head and neck, orthopedic, and prostate surgeries.[15]

In the anesthesiology service analyzed, the medical chart describes data pertaining to functional capacity in a parameterized method according to the Duke Activity Status Index (DASI), a 12-item questionnaire that assesses routine daily

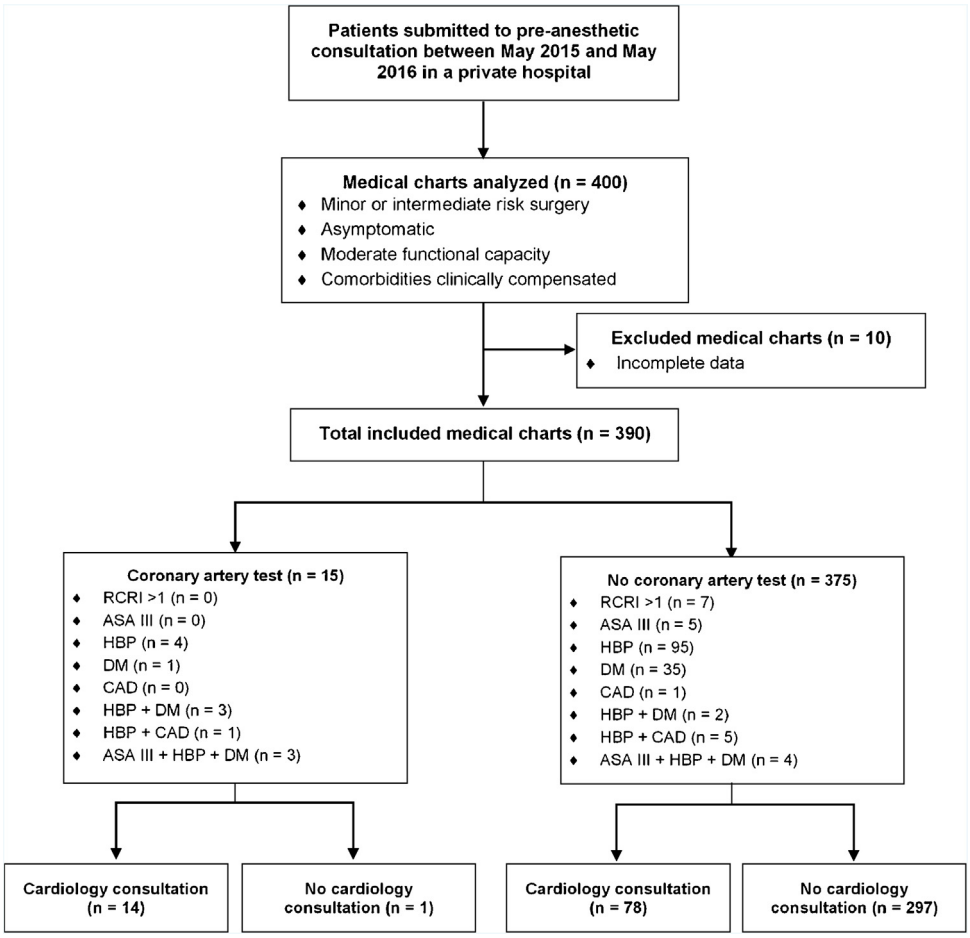

Figure 1 STROBE diagram of the population included in the study.

activities.[16] From a practical point of view, the minimum estimate of 4 MET was obtained from positive responses in the first four items of the questionnaire, namely: taking care of yourself; walking inside the house; walking a block on level ground; climbing up one flight of stairs.

We excluded medical charts missing representative data of study variables, such as: pre-anesthetic evaluation, report of consultation or report of requested complementary test. The main predictor study variable was cardiology consultation, and the outcome was having performed anatomical and/or functional tests to detect CAD.

Cardiology consultation was identified as the presence of a consultation report by a cardiologist[17] referred by an anesthesiologist of the service, requesting diagnostic assistance or consultation before anesthesiology consultation, and registered on the medical chart. CAD workup was defined as execution of any of the following tests as of the pre-anesthetic consultation: exercise test, stress echocardiogram, stress myocardial perfusion imaging, computerized tomography coronary angiogram, or coronary angiography.

We also analyzed clinical and anthropometric data, ASA physical status classification,[18] presence of clinically controlled comorbidities, surgical risk, and site of surgery. Finally, we also calculated the Revised Cardiac Risk Index (RCRI).[15] The index uses the type of surgery and clinical aspects of the patient for assessing the cardiovascular surgical risk, dividing patients into classes from 0 (no risk variable, with perioperative cardiac risk below 0.5%) to 3 (three or more risk variables, which represent risk above 10% for perioperative cardiovascular complications).

Data attained were entered into SPSS software (SPSS Inc., Chicago, IL, USA, Release 16.0.2, 2008), with automatic amplitude and consistency checking. The statistical analysis was descriptive, with categorical variables described in absolute and relative frequencies, and continuous variables, as mean $\pm$ Standard Deviation (SD), after checking for normal distribution of variables using the Kolmogorov-Smirnoff test.

Prevalence of cardiology consultation and inappropriate workup for CAD, by performing anatomical and/or functional cardiac stress tests was described as a percentage, and its imprecision quantified by a Confidence Interval at the 95% level (95% CI). For univariate analysis, individuals who had or did not have a cardiology consultation were compared for continuous variables by Student's *t*-test and for categorical variables by Fisher's exact test. Variables showing $p \leq 0.20$ in the univariate analysis were further analyzed with multivariate logistic regression using stepwise selection. Odds Ratio (OR), Relative Risk (RR), and respective 95% CI were calculated. All statistical analyses are two-tailed, with a significance level defined by $p \leq 0.05$.

Table 1 Characteristics of asymptomatic patients scheduled at a private hospital for minor and intermediate risk surgeries, and at least moderate functional capacity and risk comorbidity for cardiac disease clinically monitored and controlled. Salvador, BA, Brazil (n = 390).

Variables	n (%)
Sex	
Female	262 (67%)
Male	128 (33%)
Revised Cardiac Risk Index (RCRI)	
0 (perioperative risk < 0.5%)	238 (61%)
1 (perioperative risk < 1%)	145 (37%)
2 (perioperative risk 6.6%)	7 (1.8%)
≥ 3 (perioperative risk 11%)	0 (-)
Physical status	
Healthy (ASA I)	166 (43%)
Mild or controlled systemic condition (ASA II)	212 (54%)
Moderate or controlled systemic condition (ASA III)	12 (3.1%)
Severe systemic condition (ASA IV)	0 (-)
Risk of surgery	
Minor	122 (31%)
Intermediate	268 (69%)
Cardiology consultation	93 (24%)
Hypertension	117 (30%)
Obesity	106 (28%)
Diabetes mellitus	48 (12%)
Controlled coronary artery disease	7 (1.8%)

Table 2 Clinical and anthropometric features of asymptomatic patients scheduled for minor and intermediate risk surgery, showing at least moderate functional capacity and risk associated with cardiac conditions under follow-up and clinical control. Salvador, BA, Brazil (n = 390).

Variable	Mean ± SD
Age, years	48.6 ± 15.4
Total body mass, kg	76.1 ± 14.5
Body mass index, $kg.m^{-2}$	27.7 ± 4.6
Systolic blood pressure, mmHg	123.1 ± 14.8
Diastolic blood pressure, mmHg	79.0 ± 10.2
Axillary temperature, °C	36.3 ± 2.2
Heart rate at rest, bpm	74.6 ± 9.8
Hemoglobin, $g.dL^{-1}$	13.5 ± 4.8
Hematocrit, %	40.2 ± 4.5
Platelet count, n	252,444.9 ± 69,734.6
Prothrombin activity, s	96.1 ± 13.5
International Normalized Ratio (INR)	1.00 ± 0.10
Activated partial thromboplastin time, s	32.8 ± 4.4
Urea, $mg.dL^{-1}$	31.3 ± 11.9
Creatinine, $mg.dL^{-1}$	0.8 ± 0.6

SD, Standard Deviation.

Results

Characteristics of sample

Of the total 400 medical charts screened, 10 (2.5%) were excluded because the pre-anesthetic evaluation form was missing. Thus, we analyzed 390 medical charts of asymptomatic patients, without decompensated systemic diseases, candidates for minor and intermediate risk non-cardiac surgery, and submitted to pre-anesthetic evaluation. Sixty-seven percent were women and 69% of the patients were submitted to intermediate risk surgery (Table 1).

The sample had mean ± standard deviation age values of 49 ± 15 years; Body Mass Index (BMI) was 28 ± 5 $kg.m^{-2}$; creatinine 0.8 ± 0.6 $mg.dL^{-1}$, and systolic and diastolic arterial pressures were 123 ± 15 mmHg and 79 ± 10 mmHg, respectively (Table 2).

Fifteen patients were submitted to obstructive CAD workup with anatomical and/or functional cardiac stress tests during pre-anesthetic evaluation, corresponding to a prevalence of 3.9% (95% CI 2.3–6.3%). Nine (60%) patients performed exercise stress testing, 4 (27%) coronary angiography, and 2 (13%) stress myocardial perfusion imaging.

Association between cardiology consultation and obstructive CAD workup

Ninety-three patients submitted to pre-anesthetic assessment were referred to consultation with a cardiologist during the preoperative period, presenting a prevalence of cardiology consultation of 23.9% (95% CI: 19.9–28.3%) in the sample studied.

Among the patients who had a cardiology consultation, 15.1% (95% CI: 9.1–23.8%) were submitted to tests for obstructive CAD, compared to 0.34% (95% CI: 0.01–2.1%) of patients without cardiology assessment ($p < 0.001$; RR = 4.4; 95% CI: 3.5–5.6).

A statistical association was observed between cardiology consultation and obstructive CAD workup by anatomical and/or functional cardiac stress tests ($p < 0.001$). Associations were also found between cardiologist consultation and patients diagnosed with systemic arterial hypertension ($p < 0.001$), patients presenting diabetes mellitus ($p = 0.001$), patients with physical status ASA III ($p = 0.002$), patients with a diagnosis of controlled CAD ($p = 0.01$) and male gender ($p = 0.045$). In addition, patients submitted to cardiology consultation during pre-anesthetic evaluation had higher mean age ($p < 0.001$), total body mass ($p < 0.001$), BMI ($p < 0.001$), and systolic ($p < 0.001$) and diastolic arterial pressures ($p < 0.01$) (Table 3).

Predictors of cardiology consultation

Regarding predictor variables, multivariate analysis resulted in higher OR for having had a cardiology consultation in the preoperative period when the patient was physical status ASA III (OR = 5.0; 95% CI: 1.3–19.6), BMI ≥ 30 $kg.m^{-2}$ (OR = 2.9; 95% CI: 1.7–4.9) or age ≥ 60 years (OR = 2.6; 95% CI: 1.5–4.4). Moreover, patients with controlled CAD, physical status ASA III, BMI ≥ 30 $kg.m^{-2}$, systolic blood pressure ≥ 140 mmHg, systemic arterial hypertension, diabetes mellitus or age ≥ 60 years presented a likelihood at least twice

Table 3 Association between cardiology consultation and clinical characteristics of asymptomatic patients scheduled for minor and intermediate risk surgery with at least moderate functional capacity and risk comorbidities for cardiac disease under clinical monitoring and control. Salvador, BA, Brazil (n = 390).

Variables	Cardiology consultation		*p*[a]
	Yes (n = 93)	No (n = 297)	
Age, years	56.0 ± 15.1	46.3 ± 14.8	< 0.001
Total body mass, kg	81.1 ± 15.0	74.6 ± 14.1	< 0.001
IMC, $kg.m^{-2}$	29.5 ± 5.3	27.1 ± 4.3	< 0.001
Systolic blood pressure, mmHg	128.6 ± 15.2	121.4 ± 14.3	< 0.001
Diastolic blood pressure, mmHg	81.5 ± 9.9	78.3 ± 10.1	0.008
Male, n (%)	39 (42%)	89 (30%)	0.032
Intermediate risk surgery, n (%)	63 (68%)	205 (69%)	0.816
RCRI > 1, n (%)	3 (3.2%)	4 (1.3%)	0.365
Moderate systemic disease (ASA III), n (%)	8 (8.6%)	4 (1.3%)	0.002
Obstructive CAD investigation, n (%)	14 (15%)	1 (0.34%)	< 0.001
Hypertension, n (%)	44 (47%)	73 (25%)	< 0.001
Diabetes mellitus, n (%)	21 (23%)	27 (9.1%)	0.001
Controlled CAD, n (%)	5 (5,4%)	2 (0,67%)	0,010

BMI, Body Mass Index; RCRI, Revised Cardiac Risk Index; CAD, Coronary Artery Disease.
[a] Values obtained after Fisher's exact test or Student *t*-test.

Table 4 Analysis of predictors for cardiology consultation in asymptomatic patients scheduled for minor and intermediate risk surgery at a private hospital, showing at least moderate functional capacity and risk comorbidities for cardiac conditions under follow-up and clinical control. Salvador, BA, Brazil (n = 390).

Variables	Relative risk (95% CI)	*p*
Controlled coronary artery disease	3.11 (1.88–5.14)	0.010
Moderate systemic disease (ASA III)	2.97 (1.91–4.61)	0.002
BMI ≥ 30 $kg.m^{-2}$	2.24 (1.58–3.18)	< 0.001
Systolic BP ≥ 140 mmHg	2.19 (1.54–3.11)	< 0.001
Systemic Hypertension	2.10 (1.48–2.96)	< 0.001
Diabetes mellitus	2.08 (1.42–3.04)	0.001
Age ≥ 60 years	2.07 (1.47–2.92)	< 0.001
Diastolic BP ≥ 90 mmHg	1.75 (1.21–2.50)	0.005
Male sex	1.48 (1.04–2.11)	0.042

BMI, Body Mass Index; BP, Blood Pressure; 95% CI, 95% Confidence Interval.

times higher of being submitted to a cardiology consultation during pre-anesthetic evaluation (Table 4).

Anatomical and/or functional tests to detect obstructive CAD, in turn, were requested unnecessarily, especially for hypertensive (OR = 6.5; 95% CI: 1.7–25.0) or diabetic (OR = 4.7; 95% CI: 1.5–14.8) patients.

Discussion

In the present study, nearly 24% of patients with controlled systemic conditions and at least moderate functional capacity, scheduled for minor and intermediate risk surgeries had a cardiology consultation during pre-anesthetic evaluation. The consultation process among specialties involves many variables, but, in general, the opinion of the cardiology specialist during the preoperative evaluation of non-cardiac surgeries aims to properly complement preoperative assessment.[17]

Performing a consultation requested by another specialist is an important aspect of the clinical practice of the cardiologist. Albeit the appropriate practice of requesting consultations seems to be an extension of the clinical sense acquired in medical practice routine, some of the strategies involved in the process are unique. In face of this, studies should be fostered and the importance of this kind of training should not be underestimated in medical education. In the meantime, the selection of preoperative tests, specific tests or imaging exams should be performed as a complementary measure to investigate clinical suspicion.[17,19] Indiscriminate and routine requesting is unnecessary and results, in addition to additional costs to the organization, in possible false-positive results, and in less or more severe consequences to patients.[19]

During the pre-anesthetic evaluation of asymptomatic patients with at least moderate functional capacity, scheduled for minor and intermediate risk non-cardiac surgeries, the prevalence of inappropriate investigation of obstruc-

tive CAD was found to be 4%. The result shows that almost the total (93.3%) of anatomical and/or functional cardiac stress tests performed during pre-anesthetic evaluation were requested by the cardiologist.

Although the results observed are in compliance with the literature, they show a higher trend toward performing inappropriate cardiac stress tests when the cardiologist takes part in the preoperative process.[8] The result may also be partially associated with higher availability of diagnostic resources at the hospital analyzed, which belongs to a private hospital network, that normally has higher economic capacity.[20–24]

Another possible approach intrinsic to the results found, which should be carefully analyzed, is the possibility that anesthesiologists or cardiologists request complementary tests for themselves (or their team) to perform the medical procedure to their financial benefit. During professional practice, requesting complementary tests to be performed by the same physician is not unethical when the procedure occurs to benefit a patient's health, and the professional should be duly compensated for the act practiced. On the other hand, one can infer that performing unnecessary coronary tests observed in the present study does not seem to be related to financial benefit to the physician and/or hospital, given only 14 of 93 patients referred to cardiology consultation were submitted to anatomical and/or functional cardiac stress tests.

The inappropriate investigation of coronary artery disease during the preoperative period can reveal a major concern with a potential risk of legal action resulting from the medical professional activity, in addition to the cultural aspect of medical activity, which is the investigative proactive approach of ruling out all diagnostic possibilities.[22–24] In this sense, when a candidate for non-cardiac minor and intermediate risk surgery has risk factors for cardiovascular conditions, the health professional may consider requesting complementary tests to minimize possible cardiac complications.[20,23,24] Still, requesting those tests should be analyzed carefully, given previous studies[21–23] have shown that performing such tests can indirectly, increase the risk of complications due to their execution.

However, it should be emphasized that the frequency of unnecessary coronary tests identified in the present study exceeds the 2.1% (95% CI: 2.1–2.2%) observed by Kerr et al.[25] for low-risk surgical patients analyzed from the Medicare database in 2009. It was equally higher than the 0.7% (95% CI: 0.6–0.8%) identified also by Kerr et al.[25] for low-risk surgical patients submitted to cataract surgery and shoulder or knee arthroscopy, analyzed through the Veterans Affairs Corporate Data Warehouse in the same timeframe. However, the prevalence herein estimated is in line with the 3.8% (95% CI: 3.6–3.9%) identified by Sheffield et al.[4] for 74,785 elective non-cardiac and non-vascular surgical patients from the Medicare database between 1996 and 2008.

It is worthwhile to consider that, in accordance with different guidelines and previously published studies,[26–29] asymptomatic patients do not need to undergo any anatomical and/or functional cardiac stress tests for obstructive CAD investigation during pre-anesthetic evaluation when they are scheduled for minor and intermediate risk surgeries, have functional capacity $\geq$ 4 MET, and their risk factors for cardiac disease are under clinical follow-up and control. Furthermore, coronary tests are not indicated in the perioperative period because of surgery, if there is no other indication.[19,29] Also, no additional cardiac tests are indicated for non-cardiac surgery patients showing RCRI index equal or lower than a predictor.[8,29] In most cases, the rationale for performing additional tests will not be based on aiming to decrease the risk at the time of surgery, but to decrease long-term risk. Although seven patients evaluated had an RCRI index > 1, none of them underwent anatomical and/or functional cardiac stress tests in the perioperative period.

The low frequency of inappropriate obstructive CAD investigation by unnecessary coronary tests in the pre-anesthetic evaluations analyzed seems to demonstrate that the vast majority of anesthesiologists of the service in question incorporated into their practice the guidelines on preoperative stress tests according to the Choosing Wisely® recommendations.[22] Conversely, it highlights the need for the anesthesiology service to focus on future recommendations for comprehensive quality improvement of pre-anesthetic assessment, since unnecessary coronary tests can mean significant costs, both for patients and health insurance companies or even for the Brazilian Unified Health System (SUS). Costs of the 15 anatomical and/or functional cardiac stress tests performed in this study varied from R$3,648.92, using the fee tables of the Ambulatory and Hospital Information Systems (SIA and SIH/SUS) to R$9,500.00, according to the average market value for medical procedures in the city where the test was performed at the time of the study.

It is worth underlining that, in this study we analyzed the anesthesiology service of only one private hospital in northeastern Brazil, and if our findings are generalized to other services nationwide, they may substantially boost unnecessary costs. Sheffield et al.[4] reported that the excessive use of preoperative cardiac stress tests for patients undergoing elective non-cardiac surgery and covered by the US health insurance system represents significant expenditures for Medicare. This fact highlights the need for adequate medical expertise in preoperative evaluation to relieve costs to the health system and patients.

Using a reverse approach model, Peterson et al.[8] analyzed all preoperative cardiac stress tests performed by adult patients scheduled for non-cardiac surgery between 2012 and 2014 at Penn State Milton S. Hershey Medical Center, concluding that in 67% of cases, these tests were rarely appropriate. Adopting the same analysis model, the prevalence of unnecessary or rarely appropriate preoperative anatomical and/or functional cardiac stress tests in our sample would be 100%, which shows the trend to overestimate when this model is used. However, while in our study the number of preoperative cardiac stress and/or functional tests that are rarely appropriate totaled 15 in one year, in the US study 501 tests were performed in the 3-year period analyzed.

Given that a cross-sectional study was performed in a single center with data from medical charts, the limitations of the design should be reported. Although the study was able to describe trends and identify independent predictors for having a cardiology consultation during pre-anesthetic evaluation and to reveal the inductor role of cardiology consultation in performing unnecessary anatomical and/or

functional cardiac stress tests during the preoperative period of patients without clinical indication for them, the results can be limited by patient selection bias. Moreover, the set of data analyzed does not allow assessing delays or cancellation of surgeries, and has clinical information limited by the parameters adopted in the pre-anesthetic evaluation.

Conclusion

We observed that requesting inappropriate tests to investigate obstructive CAD is infrequent for the population of asymptomatic individuals submitted to minor and intermediate risk surgeries at the anesthesiology service investigated. Moreover, requesting cardiology consultation during pre-anesthetic evaluation substantially increases the likelihood of these patients being submitted to anatomical and/or functional cardiac stress tests. The results suggest that, unlike the anesthesiologist, the cardiologist is an important mediator in this scenario, showing the need for multi professional education to reduce these requests and the growth of costs to patients and health systems.

Authors' contributions

Antonio Carlos Cerqueira Oliveira: Conception and design of the study; Acquisition, analysis, and interpretation of data; Technical procedures; Manuscript writing; Final approval of the version to be submitted.

Paulo Adriano Schwingel: Analysis and interpretation of data; Drafting the article or revising it critically for important intellectual content; Final approval of the version to be submitted.

Lucas Archanjo dos Santos: Conception and design of the study; Acquisition, analysis, and interpretation of data; Final approval of the version to be submitted.

Luis Cláudio Lemos Correia: Conception and design of the study; Acquisition, analysis, and interpretation of data; Final approval of the version to be submitted.

Conflicts of interest

The authors declare no conflicts of interest.

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