



## CLINICAL RESEARCH

# Referral to immediate postoperative care in an intensive care unit from the perspective of anesthesiologists, surgeons, and intensive care physicians: a cross-sectional questionnaire

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### Abstract

**Introduction and objective:** Due to the high cost and insufficient offer, the request for Intensive Care (ICU) beds for postoperative recovery needs adequate criteria. Therefore, we studied the characteristics of patients referred to postoperative care at an ICU from the perspective of anesthesiologists, surgeons, and intensive care physicians.

**Methods:** A questionnaire on referrals to postoperative intensive care was applied to physicians at congresses in Brazil. Anesthesiologists, surgeons, and intensive care physicians who agreed to fill out the questionnaire were included. The questionnaire consisted of hypothetical clinical scenarios and cases for participants to choose which would be the priority for referral to the ICU.

**Results:** 360 physicians participated in the study, with median time of 10 (5–18) years after graduation. Of the interviewees, 36.4% were anesthesiologists, 30.0% surgeons, and 33.6% intensive care physicians. We found that anesthesiologists were more conservative, and surgeons less

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conservative in ICU referrals. As to patients with risk of bleeding, 75.0% of the surgeons would refer them to the ICU, in contrast with 52.1% of the intensive care physicians, and 43.5% of the anesthesiologists ( $p < 0.001$ ). As to elderly persons with limited reserve, 62.0% of the surgeons would refer them to the ICU, in contrast with 47.1% of the intensive care physicians, and 22.1% of the anesthesiologists ( $p < 0.001$ ). As to patients with risk of respiratory complications, 64.5% of the surgeons would recommend the ICU, versus 43.0% of the intensive care physicians, and 32.1% of the anesthesiologists ( $p < 0.001$ ). Intensive care physicians classified priorities better in indicating ICU, and the main risk indicator was the ASA physical status in all specialties ( $p < 0.001$ ). There was no agreement among the specialties and surgeries on prioritizing postoperative intensive care.

**Conclusion:** Anesthesiologists, surgeons, and intensive care physicians presented different perspectives on postoperative referral to the ICU.

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## Introduction

The criteria for referring postoperative patients to intensive care are unclear and, for this reason, physicians commonly have different opinions.<sup>1,2</sup> Based on ethical and scientific principles, front-line physicians making such critical decisions should be able to go through this process according to the best evidence.<sup>3</sup> To make this decision, they take into consideration, in addition to diagnosis and clinical status of the patient, bed availability and the actual benefit for the patient of the proposed therapy and prognosis.<sup>4</sup> In general, patients who are in the terminal phases of their diseases and dying patients without a chance of recovery are not appropriate for admission to an ICU, except as potential organ donors.<sup>5</sup>

Deciding about the need for intensive care are among the responsibilities of physicians of different specialties: internal medicine, anesthesiologists, and surgeons. However, there are interpersonal discrepancies with regard to the interpretation of clinical cases, severity, effectiveness, and potential resolution with intensive care.<sup>6-8</sup> This discrepancy makes different professionals have different visions of the criteria for referral to intensive care.

In this manner, in assessing referral to intensive care for surgical patients, it is appropriate to define which criteria are considered the most important, in addition to the possibility of finding discrepancies in interferences on the correct management of these patients in the postoperative period.

The objective of the present study was to assess, through a questionnaire answered by physicians, how postoperative referrals of surgical patients to the ICU would be from the standpoint of anesthesia, surgery, and intensive care practitioners. To do that, different standpoints were compared to find trends in referrals to the ICU, according to the participants' profiles.

## Methods

After approval by the ethics committee of Hospital de Câncer de Barretos, a questionnaire (Annex 1: Supplementary Materials) on physicians' decision about postoperative referral of surgical patients to an ICU was applied at major

medical congresses in Brazil (World Intensive Care Congress, ACERTO, São Paulo State's Congress of Anesthesiology).

Surgeons, anesthesiologists, and intensive care physicians who agreed to fill out the questionnaire handed out at medical congresses and who did it adequately and completely were included in the study. However, non-medical healthcare practitioners and physicians who graduated less than 2 years before were excluded. Participation was voluntary and consent for participation was implied by filling out the questionnaire. The survey was anonymous, although participants had the choice of leaving comments or requesting information at a station inside the congresses. The medical specialties were compared as to their decisions. The intention was to apply the questionnaire at medical congresses that were not specialized on a single surgical area, and for this reason, it included a broad range of surgeries, so that we could obtain better performance in the answers of participants.

The questionnaire consisted of six main segments with multiple choice and direct questions, and the first two were meant to identify the participants and characteristics of the organizations where they work, taking into account the type of hospital (private, public, university), and their capabilities (total number of beds, ICU beds, monthly surgeries, patients sent to the ICU).

The third segment of the questionnaire had the intention of presenting situations of surgical patients for participants to decide if they would, hypothetically, refer the patient to the intensive care unit or not. Seven cases were reported, all referring to postoperative intensive care for several reasons (potential blood loss, limited reserve, acute respiratory failure, major surgery, sepsis, and hemodynamic instability), except for one of the cases, which did not meet criteria for recommendations of postoperative intensive care. For each of those hypothetical situations, participants were asked if they would recommend admission to an ICU for each patient's postoperative care. There was no mention of priorities or shortage of beds (Annex 1: Supplementary Materials).

In the following segment, surgical cases were presented, and participants classified each situation according to a table of priorities: 1) Critically ill and unstable patient who needs intensive care that cannot be provided outside an

ICU; 2) Patient who needs intensive monitoring and may need immediate intervention; 3) Critically ill patient with reduced likelihood of survival; and 4) Patients generally inappropriate for admission in an ICU. This priority classification has already been reported before.<sup>1,4</sup>

All scenarios reported in the questionnaire are based on criteria that define high surgical risk patients, as described in the literature.<sup>9</sup>

The fifth segment presented the profile of a patient with physical status II according to the American Society of Anesthesiologists (ASA), with eight types of surgery which he/she could have, and participants were asked to classify surgeries according to the priority for referral to postoperative ICU admission.

Last, participants were asked to choose the criteria used at their hospital to identify surgical risk (ASA, SAPS3, Shoemaker, POSSUM, or other).

## Statistical analysis

According to clinical experience and using the minimal clinically significant difference among the groups for the calculation, a sample of at least 400 participants would be necessary to produce a 30% chance (answer differentiation percentage between specialties) of an alternative hypothesis and a 2% chance (answer differentiation percentage between specialties) of a null hypothesis, accepting a type I error of 0.05 (unilateral) and 0.95 power.

Data were analyzed and results are expressed as average  $\pm$  standard deviation, median (interquartile interval), or percentage. For the statistical analysis, continuous variables were evaluated by ANOVA and Kruskal Wallis. Categorical variables were evaluated by the contingency Chi-Square test.

Agreement analysis was done by applying Kappa statistics (K), which considered:  $K = 1$  when there is perfect agreement;  $K = 0$  when agreement is no better than chance; negative K when agreement is worse than chance. The  $p$ -values presented were two-tail tests and those below 0.05 were considered statistically significant.

The Statistical Package for the Social Sciences software (SPSS-IBM Corp., Armonk, NY, USA) 25.0 was used for the statistical analyses.

## Results

The survey was made available at three congresses attended by more than 5,000 physicians from all over Brazil; 420 agreed to answer the questionnaire and 360 physicians of the specialties of surgery, intensive care and anesthesiology filled out the survey appropriately, of which 77.6% were from the Southeast region, 11% from the Northeast, 6% from the South, 3.3% from the Center-West, and 2.1% from the North. The median time after graduation of physicians was 10 (5–18) years. Of those, 36.4% were anesthesiologists, 30.0% surgeons, and 33.6% intensive care physicians. Of all participants, 40.0% worked mainly in public hospitals, 41.4% in private hospitals, and 18.6% in university hospitals (defined as a hospital that has a link to a medical school, without specification on funding) (Table 1).

Of the surgeons, 92.6% were from the Southeast region, while no surgeon from the Midwest or North regions participated in the survey. Among intensive care physicians and anesthesiologists, in contrast, there was a predominance of the Southeast region, but proportions were better balanced for the other regions (Table 1).

On the profile of hospitals, similar percentages of specialists said they worked in public and private hospitals. Interestingly, 28.3% of the anesthesiologists declared that their main workload was in university hospitals, whereas that was the case of only 11.1% of the surgeons, and 14.9% of intensive care physicians. In spite of these differences, the answers on the number of ICU beds, type of ICU, estimated number of surgical patients referred to the ICU, and work logistics were similar and compatible among all groups (Table 1).

As to the questionnaire on referral to the ICU, seven descriptions of fictitious patients and their surgical plans were provided. In this part, 75% of the surgeons would refer to the ICU patients whose surgeries would bring an inherent risk of intense hemorrhage, in contrast with a smaller proportion of intensive care physicians and anesthesiologists. Surgeons were also more likely to recommend ICU for elderly patients with limited physiological reserve, patients with risk of respiratory complications, and for major surgeries. Sepsis patients undergoing urgent surgeries would be referred to the ICU by most of the intensive care physicians. Patients without clear referral criteria for ICU admission – controlled comorbidities, surgeries in between minor or major – would also be referred by most of the intensive care physicians. Finally, surgeons would be less likely to refer patients with hemodynamic instability and acute anemia to the ICU (Table 2).

In the second part, six examples of clinical cases were provided, and participants were asked to rank them by priority. Intensive care physicians, followed by anesthesiologists classified cases more adequately than surgeons (Table 2).

The main surgical risk indicator was ASA physical status for all specialties, followed by SAPS 3, which is more frequently used by intensive care physicians (Table 2).

On the priority classification for referral to the ICU by type of surgery, the three specialties did not agree on any of the cases (Fig. 1).

The agreement indicated by Kappa was poor, with intensive care physicians more likely to recommend ICU for esophagectomy and pelvic exenteration, while anesthesiologists for colectomies and, lastly, surgeons were more likely to recommend post-operative ICU for intestinal biliary bypass, total gastrectomy, and perforated acute abdomen (Fig. 1).

## Discussion

In the comparison among surgeons, anesthesiologists and intensive care physicians with similar demographic characteristics, this study found that surgeons were less strict in the process of screening patients for postoperative ICU, and the opposite happened with anesthesiologists. Moreover, the perception of priority to indicate post-operative ICU seemed to be more adequate among intensive care physicians; and

**Table 1** Characteristics of participants and workplace.

Variables	All (n = 360)	Surgeons (n = 108)	Intensive Care physicians (n = 121)	Anesthesiologists (n = 131)	p-value
Time since graduation (years)	10 (5.0–18.0)	11 (7.0–20.0)	10 (6.0–18.0)	10 (4.0–24.5)	0.74
Characteristics of workplace					
Region of Brazil					
Southeast	78.6%	92.6%	74.4%	71.0%	0.75
South	5.8%	2.8%	7.4%	6.9%	0.18
Northeast	10.6%	4.6%	10.7%	15.3%	0.01
central	3.8%	0.0%	5.0%	3.8%	0.76
North	1.9%	0.0%	2.5%	3.1%	0.70
Type of hospital					
Public	40.0%	49.1%	35.5%	36.6%	0.59
Private	41.4%	39.8%	49.6%	35.1%	0.19
University	18.6%	11.1%	14.9%	28.3%	< 0.001
Type of ICU					
Mixed	85.3%	81.5%	90.9%	83.2%	0.09
Surgical	14.7%	18.5%	9.1%	16.8%	
Hospital beds	200 (120–00)	150 (105–300)	150 (100–300)	200 (140–500)	0.001
ICU beds	20 (17.5–40)	20 (20–30)	20 (13–40)	20 (15–40)	0.60
Hospital operation logistics					
Surgeries performed in the past month	400 (150–700)	400 (50.0–600.0)	200 (80.0–500.0)	500 (375–1000)	< 0.001
Surgical patients sent to the ICU in the past month	40 (20–80)	37.5 (10–80)	36 (20–80)	50 (25–80)	0.13
ICU operation logistics					
Nurse to patient ratio					
< 1/10	37.0%	28.0%	43.5%	36.4%	0.31
1/10	25.3%	28.0%	23.5%	25.3%	
> 1/10	37.7%	44.0%	33.0%	38.4%	
Physician to patient ratio					
< 1/10	28.6%	20.7%	35.9%	26.7%	0.09
1/10	37.8%	40.2%	38.5%	35.2%	
> 1/10	33.6%	39.0%	25.6%	38.1%	

ICU, Intensive Care Unit.

the three specialties did not agree on the type of surgery and referral to the ICU for the post-operative period.

The criteria used in the selection of ICU beds may be classical if we consider patients with higher morbidity and mortality,<sup>10</sup> however, we saw conflicting answers among anesthesiologists, surgeons and intensive care physicians on the referrals and prioritization of surgical patients, for example, 43% of the surgeons recommended ICU admission for patients who did not present a clear need, and in contrast, only 50% would do the same for cases of hemodynamic instability – against 82.6% of the intensive care physicians and 80.9% of the anesthesiologists. Nevertheless, only 22.1% of the anesthesiologists considered elderly patients with limited physiological reserve eligible for post-operative ICU, against 47.1% of the intensive care physicians and 75% of the surgeons.

The appropriate use of intensive care resources is fundamental, given the scarcity of ICU beds in Brazil and in the world,<sup>11,12</sup> in addition to the fact that these centers specialized in providing care to critical patients require very high levels of investment.<sup>13,14</sup>

Because of that, some priority criteria for ICU admission have been designed,<sup>4,15</sup> but they are less applied in

clinical practice, especially for surgical patients. For medical patients, independent factors for ICU admission are old age, high prognostic scores and the presence of chronic diseases (especially cardiovascular).<sup>16</sup> However, there are still uncertainties for surgical patients.

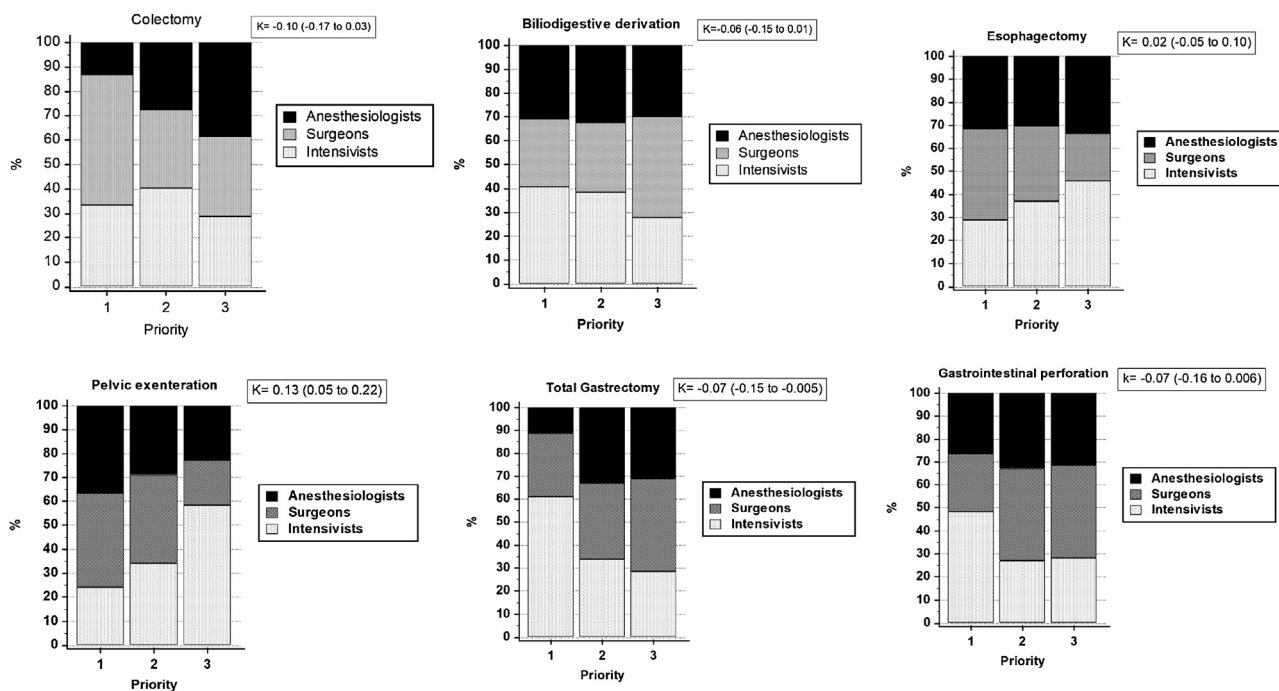
The rate of refusal of ICU beds is lower for surgical patients, but this fact does not lead to more requests for post-operative intensive care by surgical teams.<sup>17,18</sup> A large multicenter study, conducted in many ICUs in all regions of Brazil, found that only 3.5% (95% IC 3.3–3.8) of the patients undergoing major surgeries were sent to post-operative intensive care; however, the rate of surgical complications remains high.<sup>19</sup> Therefore, it seems evident that there is a lack of clear definitions on which surgical patients may benefit from intensive care. In our study, when surgeries were classified as to their priorities for ICU referral, intensive care physicians, followed by anesthesiologists classified cases more strictly than surgeons.

The lack of consensus among the members of the surgical and perioperative care teams may lead to judgement errors and harm to patients.<sup>20</sup> Based on these assumptions, in this study, we found very poor agreement among physicians on the referral to intensive care after certain major surgeries,

**Table 2** Comparison between the three specialties on post-operative referrals to the ICU and surgical risk indicators.

Variables	All (n = 360)	Surgeon (n = 108)	Intensive Care physician (n = 121)	Anesthesiologist (n = 131)	p-value
Causes that would determine referral to the ICU according to specialty					
1- Risk of bleeding	55.8%	75.0%	52.1%	43.5%	< 0.001
2- Elderly with limited reserve	42.5%	62.0%	47.1%	22.1%	< 0.001
3- Risk of respiratory complication	45.4%	64.5%	43.0%	32.1%	< 0.001
4- Major surgery	63.8%	74.8%	74.4%	45.0%	< 0.001
5- Sepsis	72.1%	69.2%	81.8%	65.6%	0.012
6- Without recommendation for ICU	21.4%	16.8%	43.0%	5.3%	< 0.001
7- Hemodynamic instability	72.3%	50.0%	82.6%	80.9%	< 0.001
Number of correct answers according to priority classification					
P1	66.1%	48.1%	76.9%	71.0%	< 0.001
P2	66.7%	48.1%	76.9%	72.5%	< 0.001
P2	60.0%	51.9%	72.7%	55.0%	0.002
P2	66.4%	51.9%	80.2%	65.5%	< 0.001
P3	55.0%	63.9%	68.6%	35.1%	< 0.001
P4	52.2%	49.5%	62.0%	45.3%	0.025
Surgical risk criteria used for referral to the ICU					
SAPS 3	10.2%	1.9%	21.7%	6.3%	< 0.001
ASA physical status	82.2%	97.2%	67.5%	83.5%	0.14
POSSUM	0.8%	0.0%	0.8%	1.6%	0.56
Shoemaker	0.8%	0.9%	0.0%	1.6%	0.56
Other	3.7%	0.0%	6.7%	3.9%	0.40
None	2.3%	0.0%	3.3%	3.1%	1.00

ICU, Intensive Care Unit; P, Priority scale.



**Figure 1** Agreement between specialties and type of surgery to prioritize ICU admission. (The higher the priority, the greater the need of postoperative intensive care).

that is, none of the specialties was unanimous in considering ICU admission for the proposed surgeries. Interestingly, in spite of not being very sensitive in determining the worse surgical outcomes,<sup>2,21</sup> the main risk indicator chosen by all

specialties was ASA physical status, maybe because of the convenience of the score.

The heterogeneity of the answers obtained in this study denotes a vast difference in the way specialists of the area



think, something that should be tackled with educational actions and implementation of organizational protocols (systematization of processes), also bearing in mind the possibility of complications in case of emergencies that are outside this scope. This study sought to diagnose the current situation to serve as the basis for the design of more appropriate policies for a consensus among physicians on the identification of the patients who should be referred to post-operative intensive care.

However, the study has limitations including the geographical distribution of surgeons, who were predominantly from the southeast region. In order to avoid bias, there was no type of communication with participants to clarify or explain what was asked in each part of the questionnaire, which may have left doubts. They could also have questions about the clinical cases used, whether they were major or minor surgeries, but as everyone answered the same cases, the comparison remained valid. Moreover, the scenarios described did not include some surgical specialties, like vascular, neurosurgery, thoracic, and others. Lastly, the comparison among other groups, like private versus public, or among the regions of Brazil, was not done because they were outside the scope of the study; in addition, more detailed questions were not asked, because they could increase time to answer the questionnaire and thus reduce adherence to the survey.

## Conclusion

Anesthesiologists, surgeons, and intensive care physicians have different perspectives when it comes to referring surgical patients to post-operative intensive care. This should be taken into account in professional improvement actions to clarify the benefits and limitations of post-operative intensive care, aiming to improve the use of a finite and high-cost resources.

## Conflicts of interest

The authors declare no conflicts of interest.

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## Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.bjane.2021.03.025>.

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