QUALITY INDICATOR: INTRAOPERATIVE AND POSTOPERATIVE MORTALITY RATE

Indicador de qualidade: taxa de mortalidade intraoperatória e pós-operatória

Indicador de calidad: tasa de mortalidad intraoperatoria y postoperatoria

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ABSTRACT: Objective: To identify and characterize the quality indicator of intraoperative and postoperative mortality rate. **Method:** This is a retrospective, quantitative, descriptive, cross-sectional study with variable correlation, based on 18,337 medical records and conducted from January to December 2017. The methods used were descriptive and inferential statistics, with analysis of probability issues of a population according to sample data. **Results:** In the study period, 18,337 patients underwent surgery, with a mortality rate of 1.75% in the intraoperative period and 1.76% in the first seven postoperative days. Among them, 191 (58.95%) were men, and 32.71% were classified as American Society of Anesthesiologists class III; 80.24% of urgent surgeries, considered clean, had a mean duration of up to 120 minutes. **Conclusion:** The mortality rate found in the facility is in accordance with the values described by the Commitment to Hospital Quality. The following variables showed a significant correlation: operative time (up to 120 minutes) and urgent surgery; and surgical contamination (clean) and death period (up to seven days).
Keywords: Death. Intraoperative period. Postoperative period. Hospitals, teaching.

RESUMO: Objetivo: Identificar e caracterizar o indicador de qualidade de taxa de mortalidade intraoperatória e pós-operatória. **Método:** Estudo retrospectivo, quantitativo, com delineamento descritivo, transversal e correlação entre variáveis, realizado de janeiro a dezembro de 2017 em 18.337 prontuários. Foram utilizados métodos de estatística descritiva e inferencial, analisando-se questões de probabilidade de uma população com base nos dados da amostra. **Resultados:** No período estudado, houve 18.337 pacientes com taxa de mortalidade intraoperatória de 1,75%, e a referente aos sete primeiros dias de pós-operatório foi de 1,76%. Destes, 191 (58,95%) eram do sexo masculino, 32,71% dos pacientes foram classificados como American Society of Anesthesiologists III, e 80,24% das cirurgias de caráter de urgência, classificadas como limpas, tiveram tempo médio de duração de até 120 minutos. **Conclusão:** A taxa de mortalidade encontrada na instituição está em conformidade com os valores descritos pelo Compromisso com a Qualidade Hospitalar. Houve correlação significativa entre as variáveis: tempo de cirurgia (até 120 minutos) e caráter de urgência; e classificação da cirurgia (limpa) e período de morte (até sete dias).
Palavras-chave: Morte. Período intraoperatório. Período pós-operatório. Hospitais de ensino.

RESUMEN: Objetivo: Identificar el indicador de calidad de las tasas de mortalidad intraoperatoria y posoperatoria. **Método:** Estudio retrospectivo, cuantitativo, con diseño descriptivo, transversal y correlación entre variables, realizado de enero a diciembre de 2017 en 18.337 registros. Se utilizaron métodos de estadística descriptiva e inferencial, analizando la probabilidad de una población a partir de los datos muestrales. **Resultados:** Durante el período de estudio, hubo 18.337 pacientes, con una tasa de mortalidad intraoperatoria del 1,75%, y la de los primeros siete días postoperatorios del 1,76%. De estos, 191 (58,95%) eran hombres, 32,71% de los pacientes fueron clasificados como American Society of Anesthesiologists III, 80,24% de las cirugías urgentes, clasificadas como limpias, tuvieron una duración media de hasta 120 minutos. **Conclusión:** La tasa de mortalidad encontrada en la Institución está de acuerdo con los valores descritos por el Compromiso con la Calidad Hospitalaria. Hubo una correlación significativa entre las variables: tiempo de cirugía (hasta 120 minutos) y urgencia; clasificación de cirugía (limpia) y período de muerte (hasta 7 días).
Palabras clave: Muerte. Periodo intraoperatorio. Periodo posoperatorio. Hospitales de enseñanza.

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INTRODUCTION

Hospital mortality rate has been used as a quality indicator, seeking to identify the care provided in some procedures in which death is not a rare event[1]. Operative death is defined as the death of a patient during or up to seven days after the anesthesia-surgical procedure[2].

Patient safety has become a global concern since 2000, when the United States Institute of Medicine published the report *To err is human: building a safer health system*, showing that approximately 98 thousand people die annually due to medical errors[3]. In the surgical context, safe care is a challenge. Estimates indicate that 234 million surgeries are performed worldwide per year, with a death incidence ranging from 2 to 7 million. However, half of these deaths could be avoided[4].

In order to raise professional awareness and political responsibility to ensure health care safety, the World Alliance for Patient Safety launched the campaign Safe Surgery Saves Lives, aimed at reducing the morbidity and mortality rate resulting from surgical procedures. This is the fourth global goal of the World Health Organization, focused on increasing the quality of health services. The campaign comprises four items: surgical site infection prevention, safe anesthesia, safe surgical teams, and measurement of surgical services[5].

With the intent of guiding the service toward health care quality and safety, some organizations, such as the Joint Commission on Accreditation of Healthcare Organizations, have presented programs to provide health care to the patient and decrease the number of incidents in prevention environments[6].

The Ministry of Health, through the Brazilian Health Regulatory Agency, has launched six operational protocols that address the relationships between drug therapy, risk of falls, hand hygiene, prevention of pressure ulcers, patient identification, and safety during surgical procedures[7]. Considering that patient safety means reducing the risk of unnecessary damage associated with health care to a minimum acceptable level[8], recognizing the incidents that occur in the surgical center (SC) is crucial.

Quality of care – not only in the SC – is mainly connected to non-compliance control. The operative death of a patient within the first 24 hours after the anesthesia-surgical procedure is considered a severe non-compliance[9]. Thus, we can note that this quality indicator only involves the absolute number of intraoperative deaths. Hence the importance of this study, as it discusses the operative mortality rate as an indicator of the care provided in the perioperative period.

OBJECTIVE

To identify and characterize the quality indicator of intraoperative and postoperative mortality rate.

METHOD

This is a retrospective, quantitative, descriptive, cross-sectional study with variable correlation. The research was conducted in a teaching hospital with extra capacity (708 beds) located in São José do Rio Preto, São Paulo State, Southeastern Brazil. The facility provides care to 2 million inhabitants, patients of the public and private health systems, from 102 municipalities in the Rio Preto Regional Health Division. The SC has 25 operating rooms, receiving, on average, 18,337 patients submitted to surgeries per year, of whom 10,642 (58.03%) are covered by the public health system and 7,695 (41.96%) by private health insurance providers.

Data were collected in the SC between July and August 2018, and included patients submitted to elective, urgent, and emergency surgeries who died in the intraoperative period and up to seven days after the anesthesia-surgical procedure from January to December 2017. The exclusion criteria were patients younger than 14 years, those who underwent surgery in the minor procedure room and the internal children hospital, which is part of the facility and organ procurement complex, individuals submitted to ophthalmic and obstetric surgeries, and with American Society of Anesthesiologists (ASA) class VI.

The information was gathered using the hospital database, with data provided by the billing and SC department managers. This collection involved reviewing the (online) medical records of 18,337 patients operated on between January 1 and December 31, 2017 — 324 records corresponded to patients who died in the intraoperative period or up to seven days after the procedure. Patients who died were characterized as to: gender, age, medical specialty, type of surgery (elective and urgent), surgical contamination (clean, contaminated, clean-contaminated, and dirty-infected), operative time (surgical complexity), and ASA physical status.

We calculated the operative mortality rate using the Commitment to Hospital Quality (*Compromisso com a Qualidade Hospitalar* – CQH) formula — the ratio between the number of operative deaths divided by the number of surgeries performed multiplied by 100[2].

The methods used were descriptive and inferential statistics, with analysis of probability issues of a population according to sample data. In certain situations, given the necessity and to improve the understanding, we employed the following methods: mean, median, Kolmogorov-Smirnov test, Poisson regression, Mann-Whitney test, Spearman's correlation, significance level, and standard error. The correlations verified were: type of surgery and gender; type of surgery and medical specialty; type of surgery and age; type of surgery and surgical contamination; type of surgery and ASA; type of surgery and operative time (in minutes); death after surgery (days) and surgical contamination; ASA and surgical contamination; ASA and age; and ASA and gender.

The variables underwent inferential statistical analysis, whose method was based on the result of the normality test of the variable. The methods chosen to analyze the result variation between the groups investigated intended, in short, to verify their relationships, standardizing one of the variables as dependent and the other as independent, in order to conduct a predictive analysis between them. Results with $p<0.05$ characterized significance among the groups studied. All tests considered a 5% alpha error and a 95% reliability.

Data were collected by the first researcher, after approval by the Research Ethics Committee of the facility studied, under opinion No. 2,775.232.

RESULTS

In the study period (between January and December 2017), 18,337 patients underwent anesthesia-surgical procedures, ranging from 1,389 (7.57%) in April to 1,740 (9.48%) in August. The operative mortality rate was 1.76% per year, ranging from 1.15 to 2.25%, and the median was 1.75%, as shown in Table 1.

The sample characterization (Table 2) indicated a predominance of male patients (58.95%) and urgent surgeries (59.23%). The most representative age group was 61 to 80 years (45.37%) – in this case, urgent surgeries were the most prevalent (46.15%) –, and patients aged up to 20 years had the lowest incidence (0.93%).

As to the profile built based on medical specialties, we found higher numbers in general surgery (50%), with predominance of urgent procedures (54.23%), and lower incidence in endoscopy (0.62%), particularly elective surgeries (3.13%).

Concerning surgical contamination, clean procedures showed prevalence in the sample, totaling 46.91%. Among them, urgent surgeries were the most frequent (43.08%). Clean-contaminated surgeries accounted for 27.47% of the procedures performed, and, out of them, urgent surgeries were also the most expressive (28.85%).

About the ASA classification, Table 3 reveals that 32.71% of patients who died up to seven days after the procedure were considered ASA III and underwent elective surgeries, followed by ASA IV patients submitted to urgent surgeries with 24.38%. These variables showed a significant relationship, with $p=0.036$.

A total of 43.83% of patients died in procedures performed in up to 120 minutes. In procedures with this duration, urgent surgeries were the most representative (49.23%). Next, the duration of 121 to 240 minutes presented 37.35% of deaths, among which urgent surgeries were also the most prevalent (37.31%). We found a significant correlation between these variables, with $p=0.000$.

Regarding surgical contamination and death period, the deaths ranged from 15 on the seventh day to 77 on the first day, as described in Table 4. Clean surgeries presented the highest percentage of deaths (152 patients / 46.9%). When analyzing the day of death associated with surgical contamination, contaminated surgeries with death on the first day were more expressive (28 patients). The analysis of correlation of these variables showed a significant association, with $p=0.040$.

Table 1. Surgeries performed, operative deaths, and operative mortality rate from January to December 2017.

Month	Surgeries performed	Operative death	Operative mortality rate
	n	n	%
January	1,614	26	1.61
February	1,441	30	2.08
March	1,544	26	1.68
April	1,389	25	1.80
May	1,593	36	2.25
June	1,517	18	1.18
July	1,702	29	1.70
August	1,740	20	1.15
September	1,548	31	2.00
October	1,422	25	1.75
November	1,422	28	1.96
December	1,405	30	2.13
Total	18,337	324	1.76

Table 2. Characterization of patients in the intraoperative period and seven days after the procedure, according to the type of surgery.

Gender	Elective		Urgent		Total	
	n	%	n	%	n	%
Male	37	57.81	154	59.23	191	58.95
Female	27	42.19	102	39.23	129	39.81
No information	0	0	4	1.54	4	1.23
Total	64	100	260	100	324	100
Age (years)						
≤20	1	1.56	2	0.77	3	0.93
21 to 40	3	4.69	26	10	29	8.95
41 to 60	24	37.50	70	26.92	94	29.01
61 to 80	27	42.19	120	46.15	147	45.37
>80	9	14.06	42	16.15	51	15.74
Total	64	100	260	100	324	100
Specialty						
General surgery	21	32.81	141	54.23	162	50
Neurosurgery	13	20.31	53	20.38	66	20.37
Vascular surgery	4	6.25	19	7.31	23	7.10
Orthopedics/traumatology	8	12.50	12	4.62	20	6.17
Cardiovascular surgery	10	15.63	7	2.69	17	5.25
Urology	2	3.13	10	3.85	12	3.70
Thoracic surgery	3	4.69	7	2.69	10	3.09
Colorectal	0	0.00	7	2.69	7	2.16
Head and neck	1	1.56	4	1.54	5	1.54
Endoscopy	2	3.13	0	0	2	0.62
Total	64	100	260	100	324	100
Contamination						
Clean	40	62.50	112	43.08	152	46.91
Clean-contaminated	14	21.88	75	28.85	89	27.47
Contaminated	8	12.50	57	21.92	65	20.06
Dirty-infected	1	1.56	15	5.77	16	4.94
No information	1	1.56	1	0.38	2	0.62
Total	64	100	260	100	324	100

Table 3. Distribution of the American Society of Anesthesiologists (ASA) classification and operative time according to the type of surgery.

Information	Elective		Urgent		Total	
ASA	n	%	n	%	n	%
ASA I	2	3.13	6	2.31	8	2.47
ASA II	21	32.81	43	16.54	64	19.75
ASA III	22	34.37	84	32.30	106	32.71
ASA IV	14	21.87	65	25	79	24.38
ASA V	3	4.68	12	4.61	15	4.62
No information	2	3.13	50	19.23	51	15.74
Total	64	100	260	100	324	100
Operative time (minutes)						
≤120	14	21.88	128	49.23	142	43.83
121 to 240	24	37.50	97	37.31	121	37.35
241 to 360	16	25	24	9.23	40	12.35
361 to 480	7	10.94	10	3.85	17	5.25
>480	3	4.69	1	0.38	4	1.23
Total	64	100	260	100	324	100

Table 4. Distribution of operative deaths according to the day of death and surgical contamination.

Days	Contaminated		Dirty-infected		Clean		Clean-contaminated		No information		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
0	11	16.92	2	12.50	39	25.66	13	14.61	0	0	65	20.06
1	28	43.08	4	25.00	25	16.45	18	20.22	2	100	77	23.77
2	6	9.23	5	31.25	20	13.16	21	23.60	0	0	52	16.05
3	7	10.77	1	6.25	20	13.16	12	13.48	0	0	40	12.35
4	5	7.69	1	6.25	13	8.55	12	13.48	0	0	31	9.57
5	1	1.54	2	12.50	12	7.89	4	4.49	0	0	19	5.86
6	2	3.08	1	6.25	16	10.53	6	6.74	0	0	25	7.72
7	5	7.69	0	0	7	4.61	3	3.37	0	0	15	4.63
Total	65	100	16	100	152	100	89	100	2	100	324	100

DISCUSSION

The present study identified an indicator of operative mortality rate with a median of 1.75%. In the 2017 CQH Program, including records of 49 general hospitals, the same indicator had a median of 0.12%, ranging from 0.05 to 4.96%[2].

A study conducted in the hospital complex Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (HCFMUSP), from 2007 to 2011, showed an operative mortality rate ranging from 1 to 2.3%[10]. A case-control study carried out in a public hospital in Santa Catarina presented a rate of 9.8%[11].

In a systematic literature review, the authors revealed that operative mortality rates are higher in Brazil and other developing countries compared to developed countries[12].

A prospective cohort study of 187 patients conducted in Porto Alegre found that 48% of patients who died were men[13]. These data are in line with the present research, which also detected a male predominance (58.95%). In contrast, 2 studies on deaths of patients submitted to orthopedic surgeries identified a predominance of women, with 76.9[14] and 72.3%[15], disagreeing with the results of the current study.

In 2010, a study performed in a database of French hospitals verified the derivation and validation of the Preoperative Score to Predict Postoperative Mortality, showing that the risk of hospital mortality was 3.46% after major orthopedic surgeries and 1.09% after vascular surgeries[16]. The above data differ from those of the current study, whose highest rates corresponded to general surgery (50%) and neurosurgery (20.37%). In this context, research conducted in a large public hospital of Rio Grande do Sul, in 2017, presented similar data to those of the present investigation, with the most frequent cause of death being neurosurgery (44.3%), followed by general surgery (33.3%)[17].

With respect to age group, operative death was predominant in older adults aged 61 to 80 years; however, we found no correlation between the variables age and death caused by surgeries. A study on operative deaths carried out in a public hospital in the inland of São Paulo showed that the prevalent age was 72 to 79 years[18]. In contrast, another research indicated that age was not an independent risk factor[19], corroborating the results presented in this study.

A systematic literature review evidenced that most perioperative deaths occur in patients classified as ASA III or over and in urgent surgeries.

Research on mortality rate performed in the HCFMUSP found that the high complexity of the population treated in this facility reached 57.09%; these patients also showed the same classification – ASA≥III[11]. The above data corroborate the results of the current study, which presented a significance level for these variables. A study conducted for three years (2008 to 2010) in a teaching hospital in Edmonton, Canada, revealed that most patients aged 80 years or older submitted to emergency general surgery had functional impairment, with prevalence of ASA III patients. In addition, over 60% of them showed good long-term survival[20].

Recent research reported that an elective surgery with duration exceeding 130 minutes is an independent risk factor for complications, as well as length of stay[21]. Thus, these data corroborate the findings of the current study, statistically

correlating the type of surgical procedure and operative time. We stress the importance of preceptors following the residents, an item highlighted in the literature by the *New South Wales Health Emergency Surgery Guidelines* as one of the main goals when redesigning the services, since it leads to a decrease in operative time, weakening a variable that affects the operative mortality rate[21].

A study performed in eight hospitals in several countries (Canada, India, Jordan, Philippines, New Zealand, Tanzania, England, and the United States) identified the need for monitoring all patients in all stages they undergo while in the SC. The research showed that the values of all indices analyzed decreased, including mortality rate – from 1.5 to 0.8% –, representing a 55% reduction in postoperative mortality rate[22].

The present study identified a higher mortality rate in clean surgeries up to 24 hours after the procedure, with statistical association. However, a prospective study that compared clinical results before and after the implementation of the ACERTO Project[23], which consists of a set of routines to accelerate the recovery of patients submitted to abdominal surgeries, revealed a mortality prevalence in surgeries classified as clean-contaminated, but with no statistical significance. These results disagree with those obtained in the present study.

This study has limitations, such as the scarcity of current national and international research related to the topic investigated and the presentation of data associated with mortality and the incidence of reoperations. Improving outcomes depends essentially on some factors, such as: recognizing the patient regarding their ASA classification, which considers the physical status of the individual; seeking to reduce the operative time, which will allow the patient to be less exposed/susceptible to complications; and following routines and protocols that provide the best care to surgical patients, regardless of their potential for contamination. This study showed high mortality rate in surgeries considered clean, differing from national and international research.

Providing safe care to patients in all surgical stages is a challenge for all health care facilities that aim at reducing the morbidity and mortality caused by anesthesia-surgical procedures[4].

CONCLUSION

Analysis of the information of 18,337 patients allowed us to calculate the operative mortality rate, which amounted to 1.75% in the facility studied, an incidence in agreement with the values described by the CQH. Regarding the patient profile, the findings showed a predominance of men, age group of 61 to 80 years, ASA III class, urgent surgeries, general surgery medical specialty, clean surgeries, and mean operative time of up to 120 minutes.

The topic addressed in this study is highly relevant given the scarcity of literature about it. This research allowed us to map the rate and characterization of operative mortality. These data may contribute to the situational diagnosis and the elaboration of strategies aimed at reducing this rate in the target population, improving the quality of care provided by the nursing staff and perioperative team as a whole.

REFERENCES

1. Noronha JC, Martins M, Travassos C, Campos MR, Maia P, Panezzuti R. Mortalidade hospitalar após cirurgia de revascularização do miocárdio. Cad Saúde Pública. 2004;20(Supl. 2):S322-30. http://doi.org/10.1590/S0102-311X2004000800025

2. Duarte IG, Nagai MH, Mota NVVP, Bittar OJNV, Nishikuni YY. Compromisso com a qualidade hospitalar. 3º Caderno de Indicadores CQH. São Paulo: Van Moorsel; 2009.

3. Kohn LT, Corrigan JM, Donaldson MS. To err is human: building a safer health system. Washington, D.C.: National Academy Press; 2000.

4. Bezerra WR, Bezerra ALQ, Paranaguá TTB, Bernardes MJC, Teixeira C. Ocorrência de incidentes em um centro cirúrgico: estudo documental. Rev Eletr Enf. 2015;17(4). https://doi.org/10.5216/ree.v17i4.33339

5. Organização Pan-Americana da Saúde. Cirurgias seguras salvam vidas. Segundo desafio global para a segurança do paciente. Rio de Janeiro: Organização Pan-Americana da Saúde; Ministério da Saúde; Agência Nacional de Vigilância Sanitária. Brasília; 2009 [accessed on May 11, 2018]. Available at: http://bvsms.saude.gov.br/bvs/publicacoes/seguranca_paciente_cirurgias_seguras_salvam_vidas.pdf

6. Joint Commission International. The Joint Commission announces 2014 national patient safety goal. Joint Commission Perspec. 2013;33(7):1-20.

7. Agência Nacional de Vigilância Sanitária (ANVISA). Segurança do paciente. [Internet]. Brasília: Ministério da Saúde; 2014 [accessed on May 11, 2018]. Available at: http://www20.anvisa.gov.br/segurancadopaciente/index.php/publicacoes/category/div ersos

8. World Health Organization (WHO). World alliance for patient safety. Taxonomy. The conceptual framework for the international classification for patient safety [Internet]. Genebra: World Health Organization; 2009 [accessed on May 11, 2018]. Available at: http://www.who.int/patientsafety/taxonomy/icps_full_report.pdf

9. Grazziano ES, Viana DL, Harada MJCS, Luz M. Enfermagem perioperatória e cirurgia segura. São Paulo: Yendis; 2016. 344 p.

10. São Paulo. Governo do Estado de São Paulo. Relatório de Gestão HCFMUSP. Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo. São Paulo: Governo do Estado de São Paulo; 2010.

11. Leandro GS, Parolim SC, Moro C, Carvalho DR. Mineração de dados na avaliação de óbitos após cirurgia de amputação. J Vasc Bras. 2018;17(1):10-8. http://doi.org/10.1590/1677-5449.008317

12. Braz LG, Braz DG, Cruz DS, Fernandes LA, Módolo NSP, Braz JRC. Mortality in anesthesia: a systematic review. Clinics. 2009;64(10):999-1006. https://doi.org/10.1590/S1807-59322009001000011

13. Stahlschmidt A, Novelo B, Freitas LA, Passos SC, Dussán-Sarria JA, Félix EA, et al. Preditores de mortalidade intra-hospitalar em pacientes submetidos a cirurgias não eletivas em um hospital universitário: uma coorte prospectiva. Braz J Anesthesiol. 2018;68(5):492-8. https://doi.org/10.1016/j.bjane.2018.04.009

14. Barbosa TA, Souza AMF, Leme FCO, Grassi LDV, Cintra FB, Lima RM, et al. Complicações perioperatórias e mortalidade em pacientes idosos submetidos a cirurgia para correção de fratura de fêmur: estudo prospectivo observacional. Braz J Anesthesiol. 2019;69(6):569-79. https://doi.org/10.1016/j.bjan.2019.09.004

15. Guerra MTE, Viana RD, Feil L, Feron ET, Maboni J, Vargas ASG. Mortalidade em um ano de pacientes idosos com fratura do quadril tratados cirurgicamente num hospital do Sul do Brasil. Rev Bras Ortop. 2017;52(1):17-23. https://doi.org/10.1016/j.rboe.2016.11.006

16. Manach LY, Collins G, Rodseth R, Bihan-Benjamin C, Biccard B, Riou B, et al. Preoperative Score to Predict Postoperative Mortality (POSPOM): derivation and validation. Anesthesiology. 2016;124(3):570-9. https://doi.org/10.1097/ALN.0000000000000972

17. Machado LVL, Jardim DP. Óbito do paciente intensivo na recuperação pós-anestésica: uma experiência descontextualizada. Rev SOBECC. 2018;23(3):130-5. https://doi.org/10.5327/Z1414-4425201800030004

18. Moreira PS, Alcântara LRS, Matilde JD, Rinaldi LC, Avila MAG. Cirurgias realizadas em idosos em um hospital público do interior de São Paulo. Rev SOBECC. 2019;24(2):69-75. https://doi.org/10.5327/Z1414-4425201900020004

19. Kawashima Y, Seo N, Morita K, Irita K, Iwao Y, Tsuzaki K, et al. Anaesthesia related mortality and morbidity in Japan (1999). J Anesth. 2002;16:319-31. https://doi.org/10.1007/s005400200049

20. Merani S, Payne J, Padwal RS, Hudson D, Widder SL, Khadaroo RG. Predictors of in-hospital mortality and complications in very elderly patients undergoing emergency surgery. World J Emerg Surg. 2014;9:43. https://doi.org/10.1186%2F1749-7922-9-43

21. Stahlschmidt A, Novelo B, Freitas LA, Passos SC, Dussán-Sarria JA, Félix EA, et al. Preditores de mortalidade intra-hospitalar em pacientes submetidos a cirurgias não eletivas em um hospital universitário: uma coorte prospectiva. Rev Bras Anestesiol. 2018;68(5):492-8. https://doi.org/10.1016/j.bjane.2018.04.009

22. Mendelssonh P. Cirurgia segura: armadilhas na prática cirúrgica. Brasília Med. 2012;49(1):59-65.

23. Bicudo-Salomão A, Meireles MB, Caporossi C, Crotti PLR, Aguilar-Nascimento JE. Impacto do projeto acerto na morbi-mortalidade pós-operatória em um hospital universitário. Rev Col Bras Cir. 2011;38(1):3-10. https://doi.org/10.1590/S0100-69912011000100002