Perioperative anesthesia related mortality: a retrospective cohort study with 11,562 anesthetics procedures

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Introduction: Studying the postoperative in-hospital mortality rate is crucial to understand the perioperative care process failures and implement strategies that improve patient outcomes. Many of these can be avoidable and, most of the time, they result from the fragmentation of the perioperative care.

Objectives: To evaluate the incidence, preoperative risks factors, and classify the cause of perioperative deaths up to 30 days of procedures requiring anesthesia.

Methods: After obtaining approval from Medical Ethics Committee, we analyzed data from all consecutive surgeries from January 1st, 2012 to December 31st, 2013 performed at the Hospital de Clínicas de Porto Alegre, a reference university quaternary Institution in Southern Brazil. The data was obtained through the review of electronic and paper records (anesthesia files). The researches collected information related to the preoperative comorbidity, surgery and anesthesia, besides postoperative complications and detailed death occurrence. After the data collection, three of the anesthesiologists, authors of the study (LS, AB, FG, PG, EF), forewent consensual meetings to discuss and classify the deaths and their probable causes. To do so, ANZCA classification served as a **background source**, which defined eight death categories: three attributable to anesthesia, three where the anesthesiology participation in the result was probable, and two where it can not be determined as the grounds of the result. The deaths were also classified into early (until 48 hours) or late (>48 hours) and then had their related risk factors analyzed.

Death category according to the ANZCA classification	Death <48h n=75	Death >48h n=246	Total n (%)	p
Death attributable to anesthesia				
I) Where it is reasonably certain that death was caused by the anaesthesia or other factors under the control of the anaesthetist	-	-	-	-
II) Where there is some doubt whether death was entirely attributable to the anaesthesia or other factors under the control of the anaesthetist.	0	2	2 (0,31%)	0,55
III) Where it is reasonably certain that death was caused by both surgical and anaesthesia factors.	7	5	12 (3,75%)	0,00
Death Not attributable to anesthesia				
IV) Death where the administration of the anaesthesia is not contributory and surgical or other factors are implicated.	23	58	81 (25,3%)	0,23
V) Inevitable death, which would have occurred irrespective of anaesthesia or surgical procedures.	41	122	164 (50,7%)	0,48
VI) Incidental death which could not reasonably be expected to have been foreseen by those looking after the patient, was not related to the indication for surgery and was not due to factors under the control of the anaesthetist or surgeon.	1	51	52 (16,3%)	0,00
VII) Those that cannot be assessed despite considerable data but where the information is conflicting or key data are missing.	2	6	8 (2,5%)	0,92
VIII) Cases that cannot be assessed because of inadequate data.	1	1	2 (0,6%)	0,37

Deaths with anesthetic implication

Death Causes
1. Pulmonary Aspiration
2. Induction Cardiac arrest /Pulmonary Emboli

Death Causes < 48h
1. Pulmonary Aspiration
2. Cardiac arrest after extubation/hypoxemia
3. Hemorrhagic shock
4. Myocardial Infarction
5. Myocardial Infarction
6. Septic Shock
7. Ileus and septic shock

Death Causes >48h
1. Hemorrhagic shock
2. Aspiration and sepsis.
3. Hemorrhagic shock
4. Hemorrhagic shock
5. Hemorrhagic shock

Causa mortis associated to death < 48 hours or > 48 horas.
Bars followed by * present significant differences

Results

	Death <48hours N=75		Death >48hours N=246		p
Age	N=75	%	N=246	%	
1-1 Years	7	9,3	16	6,5	0,42
2-15 Years	1	1,3	8	3,3	0,37
16-35 Years	2	2,7	14	5,7	0,27
36-50 Years	3	4,0	24	9,8	0,11
51-64 Years	16	21,3	69	28,2	0,23
65-79 Years	35	46,7	84	34,3	0,06
>=80 Years	11	14,7	30	12,2	0,62
ASA					
I	0	0	2	0,8	0,42
II	5	6,7	35	14,3	0,09
III	21	28	121	49,4	<0,01
IV	37	49,3	76	31	<0,01
V	12	16	11	4,5	<0,01
Size					
Minor	3	4	33	13,5	0,02
Intermediary	17	22	77	31,4	0,13
Major	55	73,3	135	55,1	0,01
Nature					
Urgent	50	66,7	124	50,6	0,02
Elective	25	33,3	121	49	

Procedures most frequently related to deaths in 11562 patients.

Procedure	Total performed	Deaths	Mortality per procedure	% of the total deaths (n = 320)
Exploratory laparotomy	461	71	15,4%	22,2%
Colorectal resection	348	19	5,5%	6%
Amputation	169	18	10,7%	5,7%
Aortic Aneurysmectomy	34	15	44,1%	4,7%
Minor neurosurgeries	65	15	23,1%	4,7%
Ostomies	118	15	12,7%	4,7%
Coronary artery bypass graft (CABG)	204	14	6,9%	4,4%

Hierarchical logistic regression of risk factors for death up to 48 hours versus after 48 hours in 11562 procedures					
RISK FACTORS	B	SEM	P	Odds Ratio	95% IC
Surgery duration	-0,003	0,001	0,051	0,99	0,99-1,00
Surgery degree				1,00	
Minor				1,00	
Intermediary	1,87	1,08	0,11	0,18	0,02-1,52
Major	0,10	0,36	0,075	0,15	0,01-1,20
Perioperative risk situations					
Perioperative transfusion	0,93	0,36	0,01	2,55	1,24-5,25
Vasoactive drug	1,24	0,33	<0,01	3,47	1,79-6,72

The partial correlation is expressed by the R statistics, ranging from -1 to +1.
† Model 1: Age § Model 2: Age + ASA + size || Model 3: model 2 + perioperative risk situations: functional capacity < 4 METs, hemodynamic instability, sepsis, perioperative transfusion, use of vasoactive drug. Model 4: model 3 plus types of anesthesia.

Conclusion

- The present study has found a preoperative mortality incidence of 0,64% within 48 hours after procedure and 2,11% in patients hospitalized up to 30 days.
- The majority (50,7%) was considered to be inevitable, that is, it would happen independently of the anesthetic/surgical act, being so related to advanced conditions of illnesses. The second most common identified cause was related to complications from the surgical procedure (25%). The death incidence with probable contribution of anesthesia or factors under the control of the anesthetists was of 0,86:10.000. It wasn't identified any case triggered undoubtedly by the anesthetist.
- Further, the death cases in which the anesthetic contribution was recognized were significantly premature (<48h) in relation to other explored death causes. Hemodynamic instability was significant in this group of patients.
- The exploratory laparotomy was the surgery with greater partaking in the deaths. Lines of assistance that seek the reduction of the mortality in urgent laparotomies through pre, trans and postoperative standardized actions should be implemented.

Reference

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