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Quality assurance audit in adult cardiac anaesthesia

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Abstract

Objective: To assess different anaesthesia-related quality indicators during adult cardiac surgery.

Method: The prospective clinical audit was conducted at the Aga Khan University Hospital, Karachi, from October 2016 to March 2017, and comprised all adult patients scheduled for cardiac surgery. Different anaesthesia-related quality indicators were observed during the pre-induction phase, before the cardiopulmonary bypass, during the procedure, and post-surgery till the transfer from the operating room to the cardiac intensive care unit. Data was analysed using SPSS 19.

Results: Of the 264 patients, 217(82.2%) had complete record; 160(73.7%) males and 57(26.3%) females. The overall mean age was 56.56±12.46 years. In the pre-induction phase, difficult intravenous and invasive line access was seen in 42(19.3%) patients. Inappropriate information in the preoperative form was found in 6(2.8%) patients, and preoperative drugs for anxiolysis were used in 145(66.8%) patients. Haemodynamic issues were significant during the surgery in 15(6.9%) patients. In the post-surgery period, abnormal activated clotting time was found in 17(7.8%) patients, while monitoring problems were faced in 7(3.2%) cases during transfer to cardiac intensive care unit.

Conclusion: It will help to develop quality improvement policies to enhance patient safety, satisfaction and better outcome.

Keywords: Adult cardiac anaesthesia, Cardiac surgery, Quality assurance, Audit. (JPMA 71: 704; 2021)

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Introduction

Quality assurance is an essential component of any clinical service which ensures that the patients receive the highest standard of care, and to improve the services by identifying deficient areas. These audits help to improve patient safety, satisfaction and quality of care during perioperative period. It also ensures that the quality of care is consistent with accepted international standards.[1] Quality assurance is defined as "an organised process that assesses and evaluates health services to improve practice or quality of care".[2] For any improvement and good quality of anaesthesia in modern clinical practice, it is necessary to measure all indicators related to patient safety, effectiveness and the whole anaesthesia procedure.[3]

Cardiac surgery and anaesthesia represent a team effort, and success depends on the skills, behaviours and knowledge of the whole team of health professionals, supporting staff and community caregivers.[4] Cardiac surgery is characterised by standardised, but complex and technically demanding procedures.[5] Majority of errors in cardiac surgeries occur outside the operating room (OR).[6]

Cardiac surgery involves several steps during which numerous errors and issues arise that require continuous monitoring, assessment and remedial measures. After auditing paediatric cardiac anaesthesia[7] earlier, several issues were noticed in anaesthesia-related management of adult cardiac surgery patients. The current study was planned as an audit of anaesthesia-related quality indicators during adult cardiac surgery.

Patients and Methods

The prospective clinical audit was conducted at the Aga Khan University Hospital (AKUH), Karachi, from October 2016 to March 2017. After approval from the institutional ethics review committee, all patients scheduled for cardiac surgery were prospectively observed for any event in pre-induction, pre-cardiopulmonary bypass (CPB), during the surgery, post-CPB period till transfer from OR to the cardiac intensive care unit (CICU). All the relevant indicators were documented in a predesigned proforma by resident/consultant responsible for immediate care of patient at the time. In order to maintain confidentiality, all patient forms were given separate codes.

Data was analysed using SPSS 19. Frequencies and percentages were computed for categorical variables, while mean and standard deviation were estimated for numeric variables.

Results

Of the 264 patients, 217(82.2%) had complete record; 160(73.7%) males and 57(26.3%) females. The overall

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Table-1: Demographic and the procedure preformed.

Variables	Estimation
Age (Years)	56.56±12.46
Height (cm)	162.92±8.39
Weight (kg)	72.15±13.81
BMI (kg/m^2)	27.06±4.64
Gender	
Male	160(73.7%)
Female	57(26.3%)
Type of Surgery	
Elective	205(94.5%)
Emergency	12(5.5%)
Procedures:	
CABG	168(77.4%)
Redo	02(0.9%)
Aortic valve replacement	13(6%)
Mitral valve replacement	14(6.5%)
Others CPB procedures	08(3.7%)
CABG + AVR	03(1.4%)
CABG + MVR	03(1.4%)
Redo + MVR	01(0.5%)
Redo CABG	02(0.9%)
Redo AVR	01(0.5%)
Others	02(0.9%)

BMI: Body mass index; CABG: Coronary artery bypass graft; CPB: Cardio-pulmonary bypass; AVR: Aortic valve replacement; MVR: Mitral valve replacement.

Table-2: Pre-induction indicators (n=217).

Pre induction Indicator	Estimation
Difficult intravenous access	17(7.8%)
Difficult central venous access	10(4.6%)
Difficult arterial access	10(4.6%)
IV & Invasive lines took >45 minutes	05(2.3%)
Carotid puncture	07(3.2%)
Pneumothorax Left or Right side	0
Arrhythmias	19(8.8%)
A-Fib/APC	10
Bradyarrhythmia	4
PVC	5
Inadequate pre-operative evaluation	06(2.8%)
Drug reaction	04(1.8%)
Sulfa Drug	1
Morphine	1
Rashes	1
Vancomycin	1
Misc. equipment malfunction	01(0.5%)
Premedication given on the floor	145(66.8%)
Pre Med drug dose	145(66.8%)
Patient sedated score	145(66.8%)
2 Units blood available before incision	200(92.2%)
Antibiotic given 45 minutes before incision	185(85.3%)
Any other	01(0.5%)

A-Fib: Atrial fibrillation; APC: Atrial premature complex; PVC: Premature ventricular contractions.

Ramsey score

Ramsey score	Frequency	Valid percent
1	15	10.3
2	100	69
3	22	15.2
4	5	3.4
5	2	1.4
6	1	0.7
Total	145	100

Table-3: Pre-CPB indicators (n=217).

Variables	Estimation
Pre-CPB Indicators	
Difficult intubation	
Unanticipated	14 (6.5%)
Anticipated	13 (06%)
Difficult mask ventilation	16 (7.4%)
Dental injury	02 (0.9%)
Perioral injury	01 (0.5%)
Haemodynamic instability:	32 (14.7%)
Hypotension	20
Hypertension	6
Bradycardia	3
Other	3
Ischaemia	03(1.4%)
Any other	03(1.4%)
CBP Indicator	
K > 5.6	11(5%)
Hypertension	07(3.2%)
Hypotension	08(3.7%)
Difficulty In CPB	04(1.8%)
Any Other	04(1.8%)

CPB: Cardio-pulmonary bypass; K: Potassium.

mean age was 56.56±12.46 years. There were 205(94.5%) elective surgeries and 12(5.5%) were emergency operations (Table-1)

In the pre-induction phase, difficult intravenous (IV) and invasive line access was seen in 42(19.3%) patients, while inadvertent carotid puncture occurred in 7(3.2%) during central venous access (Table-2).

Inappropriate information in the preoperative form was found in 6(2.8%) patients, and preoperative drugs for anxiolysis were used in 145(66.8%) patients. Haemodynamic issues were significant during the surgery in 15(6.9%) patients (Table-3). In the post-surgery period, abnormal activated clotting time (ACT) was found in 17(7.8%) patients (Table-4), while monitoring problems were faced in 7(3.2%) cases during transfer to CICU (Table-5).

Table-4: Post-CPB indicators (n=217).

Variables	Estimation
Unanticipated IABP	00(0%)
Unplanned Inotropes	07(3.2%)
Protamine Reaction	01(0.5%)
Hemodynamic Instability	10(4.6%)
Visual Coagulopathy	08(3.7%)
Act > 130 Or Heparin – Titration	17(7.8%)
Arrhythymias	13(6%)
V. Tach	1
A. Fib	5
PVC	2
Tachyarrhythmia	2
SVT	2
Sinus Brady	1
Death	00(0%)
Any Other	03(1.4%)

CPB: Cardio-pulmonary bypass; IABP: Intra-aortic balloon pump; V.Tach: Ventricular tachycardia; A-Fib: Atrial fibrillation; PVC: Premature ventricular contractions; SVT: Supraventricular tachycardia.

Table-5: CPB Indicators during transfer to CICU (n=217).

Variables	Estimation
IV Infiltration	01(0.5%)
Re intubation	00(0%)
Severe Hypertension	03(1.4%)
Severe Hypotension	05(2.3%)
Tachycardia / Bradycardia	03(1.4%)
Haematoma Neck	0
Pulled Out Cvp/A-Line/ Pa Catheter	0
Pulled Out Foley Catheter	0
Flushed Ionotropes /Vasodilators	02(0.9%)
Monitoring Problems	07(3.2%)
A-Line	2
CVP	1
SaO2	4
Other Finding	
Oxygen Cylinder off	1

CPB: Cardio-pulmonary bypass; CICU: Cardiac intensive care unit; IV: Intravenous; A-Line: Arterial line; CVP: Central venous pressure; Pa: Pulmonary artery; SaO2: Oxygen saturation.

Discussion

Cardiac anaesthesia is become a challenge for anaesthesiologists because it involves patients who are acutely ill with multi-organ involvements and their condition is associated with relatively high rates of mortality and morbidity. In one study in the United States, the rate of preventable adverse events in coronary artery bypass graft (CABG) and cardiac valve surgery were higher than the study's average rate for all surgeries.[4] Unfortunately, in Pakistan, there is no regular audit on quality assurance in cardiac anaesthesia and the current study is probably the first to look at these events in adult cardiac surgery patients. At the same institution, paediatric cardiac anaesthesia audit was done[7] prior to the current study.

The 'anaesthetic record' forms is an essential part of a patient's medical record, which is truly a clinical, scientific, legal and administrative document relating to patient care, thereby justifying the diagnosis, the implemented treatment and the end-result. In short, an anaesthetic record captures a patient's 'comprehensive' anaesthetic experience in a succinct format.[8] Numerous professional bodies, including the Australian and New Zealand College Of Anaesthetists (ANZCA), the American Society Of Anaesthesiologists (ASA) and the Canadian Anaesthesiologists' Society (Cas), have outlined the necessity for adequate, accurate and legible anaesthetic records.[9] Apart from medico-legal implications, lack of proper documentation can be detrimental to the quality of care provided to patients, thereby compromising the basic underlying principles of 'clinical governance'. The current study's compliance of documentation rate was 82.19% which needs improvement. An 'anaesthetic record' should be accurate, legible, elaborate and have a signature verifying the 'authenticity and truthfulness' of the document.

In the pre-induction phase, the study mostly found usual problems related to cardiac surgeries apart from the preoperative anxiolysis routine. As a teaching hospital, the first attempt is mostly made by the junior anaesthesia resident, therefore difficult IV and invasive vascular access was found that led to delays. Difficult IV and invasive lines were included among adverse events because these incidents have potential for hypothermia and reasons for delay. Patients undergoing cardiac surgeries are more vulnerable to arrhythmia. Preoperative arrhythmia is clinically important because it can be associated with significant haemodynamic instability. The current study found atrial fibrillation (A-Fib) in most patients, which is mostly related to the patient's disease. Various factors associated with anaesthesia influence the occurrence of arrhythmia. The major problem found in the pre-induction phase was premedication used for sedation or anxiolysis, which was suboptimal. Cardiac surgical patients receiving oral midazolam at AKUH often have an inadequate level of sedation or a Ramsay Score when called in the OR.

The standard of care expected from midazolam premedication prior to surgery is "anxiolysis with minimal sedation or a Ramsay Score of 3, and a full Glasgow Comma Score (GCS)". The standard time from the drug to OR door is 30-45 minutes. The median sedation score was suboptimal at Ramsay 2 compared to the standard Ramsay 3. Control of anxiety in cardiac surgical patients is necessary to avoid haemodynamic changes, but due to the erratic nature of premedication prescription and

process of hospital admission, this control could not be achieved.[10] Another problem found in the current study was the timing of antibiotics. The standard was 45 minutes prior to incision, which was achieved only in 85.5% patients. In pre-CPB indicators, the current study found significant haemodynamic instability in 14.7% patients who required immediate treatment. Hypotension was found in most patients, while significant ischaemia was noted in 1.4%. The reported incidence of ischaemia during the pre-CPB period ranged 7-56%.

Cardiac surgical patients usually do not tolerate traditional induction agents and their doses, even drugs typically not associated with hypotension, cause hypotension in cardiac surgical patients as a result of anaesthetics-induced reduction in sympathetic tone. Reasons for cardiac and circulatory depression include combination of certain induction agents, initiation of positive pressure ventilation as well as using angiotensin-converting enzyme (ACE) inhibitor, angiotensin receptor blockers (ARBs) and diuretics. There are a few simple rules which may assist in the management of cardiac patients before CPB, like 'keep them where they live' and 'the enemy of good is better'.[11]

On CPB, haemodynamic issues (8.7%) were mainly encountered as well as issues related to some electrolytes, mainly potassium. Another problem was vasoplegic syndrome leading to systemic vasodilation and hypotension that was resistant to conventional therapy. Difficult weaning from CPB was noticed in a few patients in whom unplanned inotropic support or intra-aortic balloon pump (IABP) was used. In the new era methylene blue, a competitive inhibitor of nitric oxide, is used as a rescue drug for vassoplegia during CPB.[12,13]

In the post-CPB period, protamine reaction was noted, but the reaction rate was very low, indicating that it might have been under-reported. A systematic review of prospective and retrospective studies reporting serious anaphylactic reactions caused by protamine administration revealed an incidence of adverse reactions varying from 0.06% to 10.6%.[14] Haemolysis occurs in all extra-corporeal circuits due to shear stress, wall impact forces, contact with non-endothelial surfaces, and positive and negative pressures that can lead to coagulation disturbances. In the current study such issues were found in 7.8% patients requiring extra protamine or other treatment. Haemodynamic instability was found in 10.6% patients, and 6% of them were related to different arrythmias that required early treatment.

Problems encountered during transfer to CICU in the current study, we believe, were very under-reported.

In terms of limitations, the current study had a small sample size and several adverse incidences appeared to be under-reported. Re-auditing is essential in order to complete the audit loop after implementing the suggested changes.

Conclusion

The concept of implementing incident reporting as a high-quality assurance tool in developing countries needs to be followed locally as well. It is cheap, feasible, and helps in identifying areas that need improvement.

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