

## FAST TRACK CARDIAC SURGERY

Iqbal Hussain<sup>1</sup>, Raffat Tanveer<sup>2</sup>, Mudasir Iqbal Dar<sup>3</sup>

<sup>1-3</sup> Department of Cardiac Surgery, Civil Hospital, Karachi, Pakistan

**Address for Correspondence:**

**Dr. Iqbal Hussain,**

A 803 Grey Skyline B 13 Gulistan E Johar, Karachi, Pakistan

E-Mail: samiqurt@yahoo.com

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**Contribution**

All the authors contributed significantly to the research that resulted in the submitted manuscript.

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### ABSTRACT

**Objective:** The aim of this study was to determine the applicability of fast track protocol for cardiac surgery in our unit .

**Methodology:** This cross sectional study was conducted at Civil Hospital DUMHS, Karachi from 1 February to 30 August 2014. Study population was followed for 120 hours after surgery. Our primary endpoint was to achieve patient discharge within 72 hours. While secondary endpoint was to observe limitations of fast track protocol and readmission rate in patients discharge within 72 hours.

**Results:** A total of 85 patients underwent different open and close heart surgeries. Fast track protocol was successfully observed in 37(44%) patients while remaining patients follows for 120 h. A significant association of failed fast track approached was observed in patients with DM 16(73%)(RR 1.18 ,OR 1.86) and smoking 9(74%)(RR 1.23,OR 2.14) and poor left ventricular function(RR 1.16,OR 1.66) with readmission rate of 6(17%), for following reasons delayed tamponade (1), SSI (4), respiratory insufficiency (1).

**Conclusion:** With the limited resources successful discharge in 44% patients, we believe our fast-track management, is applicable for safe postoperative management of patients undergoing cardiac surgery. Major contributing factors for failure of fast track protocol were identified by this study. These factors need to be targeted accordingly by modifications in our postoperative management .

**Key words:** Fast Track, Cardiac Surgery, Coronary Artery Bypass Graft

## INTRODUCTION

Open heart surgery is conducted under the state of controlled shock. It is associated with alteration of different enzymatic cascade those under basal state are tightly regulated. There is generalizes systemic inflammatory response syndrome (SIRS) with derangement of coagulation cascade secondary to use of heparin and cardiopulmonary bypass circuit. This all result in altered physiology and variable level of multiorgan dysfunction including myocardial ischemia, uncontrollable hypertension, arrhythmias and the risk of postoperative hemorrhage.<sup>1-3</sup> Thus patients are kept under intensive care to minimize these complications and traditionally were followed with time based protocol for extubation known as stress free anesthesia. The increased requirements for intensive care unit (ICU) beds owing to advanced age, with their associated co-morbidities result in exhausting burden on health care system. As well often result in deferring the list. For many years, however, sporadic case reports were published suggesting successful application of fast track cardiac surgery.<sup>4,5</sup> However major emphasis was placed on early extubation within 6 hour or ultrafast track extubation within 3 hours or in operation room, with believe that fast track extubation result over all reduce cost and stay.<sup>6,7</sup> However reduction of length of stay in ICU could be barely demonstrated as patients even extubated within operating room had to remain in ICU till next morning and had variable length of stay in high dependency unit and general ward despite of thoracic epidural analgesia.<sup>8-10</sup>

“Fast track cardiac surgery” is not just a fast track extubation but multidisciplinary approach to address perioperative course to minimize duration of stay in hospital and early return to home while keeping the patient safety in first place.<sup>11</sup> We consider the term “fast track ”includes the reducing the preoperative stay as well as postoperative course by fast track extubation early mobilization and discharge if possible even from the ICU omitting ward course.<sup>12</sup> Thus fast-track cardiac care is a complex intervention involving several components of care during cardiac anesthesia and in the postoperative period, all with the ultimate aim of early extubation after surgery, to reduce the length of stay in the intensive care unit and in the hospital. Safe and effective fast-track cardiac care may reduce hospital costs and more efficient management of operating list.<sup>13</sup>

This study was conducted to assess feasibility of fast track protocol with the aim of discharge within 72 h after cardiac surgery and exploring possible limitation.

## METHODOLOGY

This prospective quality assurance audit was conducted in a single centre of Civil hospital DUMHS, Karachi, Sind

Pakistan from 1st February 2014 to 30th August 2014. All consecutive patients who met the inclusion criteria entered in the fast track protocol. Clinical data, including demographics, risk factors and complications, were prospectively collected in our computerized Performa.

Inclusion criteria for the fast track protocol was patients scheduled for elective cardiac surgery irrespective of age, gender and diagnosis. Exclusion criteria for the fast track protocol were emergency operations, complex congenital heart defects and Redo sternotomy.

For preoperative evaluation, patients were called for surgery 72 hour prior the planed surgery. Investigation were carried out. Counseling and motivation to encourage for joining fast track protocol audit. Spirometry and physiotherapy were performed.

All preoperative medications were continued until the preoperative morning as per protocol. Premedication consisted of oral Midazolam at the night. Anesthesia consisted of Propofol, Rocuronium/Pancuronium, Sevoflurane and intraoperative Nalbuphin. Postoperatively, patients were sedated with Nalbuphine and paralyzed until ready for tracheal extubation and received Tramadol or Paracetamol infusion for analgesia.

Operatively, Tepid non-pulsatile flow was used during cardiopulmonary bypass (CPB). Warm antegrade blood cardioplegia with warm intermittent antegrade as well as retrograde blood cardioplegia was used to induce and maintain cardioplegic arrest as per requirement. The patient was weaned from the CPB only when the esophageal temperature of 37.0°C were achieved and OR team satisfy for weaning. Inotropic support started if required. We used single ionotrope adrenaline in our patient series.

Post operatively, all patients were shifted to the ICU from the operating room. The ICU was staffed by an ICU attending physician along with cardiac surgery residents and trained nursing staff. In ICU patients were maintained on CMV or SIMV mode with Nalbuphin and Acuron as per requirement. The weaning from volume-controlled ventilation to pressure-support ventilation and subsequent extubation was performed under the direction of ICU nurses and on call resident as per standard physiologic criteria for extubation. Fast track extubation as well as earlier cessation of ionotrope support was desired in all patients. Patients were kept pain free, nabalized 4 hourly, spirometry and physiotherapy started along with bed mobilization. Earlier feed encourageged. Chest drain was removed as soon as it became <0.5ml/kg/h. Once drains were removed patients were mobilized from bed to chair.

Patients were transferred to the ordinary ward on the next day of the operation when the following conditions were fulfilled:

(I) Stable hemodynamic parameters without pharmacological or mechanical cardiac supports. Systolic blood pressure of >90 mmHg .

(ii) Awake and alert patients. Patients answer questions and follow orders.

(iii) A stable sinus rhythm / atrial fibrillation with rate <120b/m on the electrocardiogram without signs of ischemia.

(iv) Normal respiratory function with O2 saturation of >90% with maximum 5-l supplementary oxygen through a nasal catheter, and arterial pCO2 level of <50 mmHg on arterial blood gas analysis.

(v) Chest tube removed

(vi) Urine output of >0.5 ml/ kg/ h

(vii) Patient mobilized from bed to chair

Patients were discharge once patient was full filling following requirements:

Mobilize from bed to toilet, taking orally, stool passed, adequate spirometry, desire INR achieved, clear chest X ray, willing to discharge and healthy wound.

Data was collected prospectively in computerizes Performa. Data are expressed as means  $\pm$  standard deviations and ranges for continuous variables and as numbers (percentages) for categorical variables.

## RESULTS

A total of 85 patients were followed with fast track protocol. Out of them 52 were male (61%) and 33(39%) were female. Mean patient age was  $41.7 \pm 18.7$ (1 - 68). Preoperative data is shown in Table 1. These patients undergone both on pump as well as off pump surgery to correct both acquired and simple congenital heart defects. Intraoperative data is shown in Table 2. All the patients were shifted to ICU on mechanical ventilation with ionotrope if required except two patients operated for Patent Ductus Arterious closure. ICU course is shown in Table 3. Fast track protocol was successfully observed in 37(43%) patients while remaining patients follows for 120h. Patients discharged within 96 hours 120 hours and beyond were 20(23%), 11(13%) and 18(21%), respectively. Result of fast track protocol as per type of surgery is shown in Table 4. A significant association of failed fast track approached was observed in patients with DM 16(73%) out of 22 diabetic patients (RR 1.18 ,OR 1.86) and smoking 9(74%) out of 12 nonsmoker(RR 1.23, OR 2.14). While poor left ventricular function is also predictor of failed fast track protocol with 6 (63%) out of 9 patients with low EF (RR 1.16, OR 1.66). Major reason for failure to fast track protocol is delay in require INR achievement in 18(37%) out of 49 patients while other patients requiring increase stay secondary to delayed mobilization (5),

**Table 1: Demographic and Preoperative Data**

Variables	N (%)
Patient No	85
M:F	52(61%):33(39%)
Age (years), mean with SDEV	41.7 $\pm$ 18.7(1 TO 68)
BMI <18.5 kg m <sup>-2</sup>	18(21%)
BMI 18.5 to 30 kg m <sup>-2</sup>	53(62%)
BMI >30 kg m <sup>-2</sup>	14(17%)
SMOKER	12(14%)
DM	22(26%)
CRF	2(2%)
HYPERTENSION	18
OLD MI (q wave)	16(33%)
PAD	6 (7%) (4 stroke, 2 carotid bruits)
EF% <50%	9 (10%)
ESD >40	22(26%)
PAP >50	19(22%)

respiratory insufficiency (2), perioperative MI(2), remote residency (4), low output syndrome (3), reluctant to discharge (3), stroke (2), constipation (1), leg wound complication (2), cognitive dysfunction (1), heart block (2), mediastinal bleed (4) Patients successfully discharge within 72 hours were followed for readmission, 6(17%) require readmission for following reasons delayed tamponade (1), SSI (4), respiratory insufficiency (1).

## DISCUSSION

Cardiac surgery has casted about \$27 billion annually in United States and is a huge burden on health care system.<sup>14</sup> Most of this burden is due to extended postoperative stays in the intensive care unit (ICU) and the hospital. A desire to reduce hospital cost has prompted the development of different approaches to reduce overall hospital stay. Many investigators tried different approaches and methods to achieve fast-track pathway for postoperative management of cardiac surgery patients.<sup>15-17</sup> Their major emphasis was to minimize intensive care unit (ICU) stay. Most investigators focused on ventilation time, length of ICU stay and hospital stay and post operative Complications as the main end-points to evaluate the outcome of fast-track management.<sup>18</sup> Fast track extubation itself is not major factor in determining the success of the of the fast-track process. A desire to reduce hospital stay has prompted the Development of clinical practice guidelines by different groups.<sup>18-20</sup> There are reports from different groups using successful implication

**Table 2: Patients Operative Detail**

Variable	N (%)
Pump Time	101 ± 44.4min
Pump Time >120M	27(31%)
Blood Transfusion	63(73%)
CABG	44(51%)
CABG+MVR	4(6%)
IMA used	41
Isolated MVR	12(14%)
Isolated AVR	7(8%)
DVR	6(7%)
ASD	4(5%)
VSD	1(1%)
AR+VSD+ASD	1(1%)
Myxoma	2(2%)
Aortic Aneurysm	2(2%)
PDA	2(2%)

of Leipzig fast-track protocol omitting the ICU stay and planned extubation and monitoring in recovery room (PACU) and shifting the stable patient to intermediate care unit.<sup>21</sup> In our study, we confirmed the safety and efficiency of our fast-track pathway in patients undergoing cardiac surgery for acquired as well as congenital heart defects despite of limited resources. DM, smoking and low EF (i.e. EF <50%) were found to be predictors of failure to discharge within 72 hours. Our cohort of 86 patients represents 41.2% of the total number of patients operated in our department. We started fast track protocol to accommodate more patients to manage long waiting list and reduced resources. Fast track pathway in cardiac surgery if conducted in professional and organized manner protocol is an efficient method to combat

**Table 3: Patients ICU Course Detail**

Variable	N (%)
Extubation time mean ± SD	4.7 ± 3.6h
Fast track extubation: delayed extubation	79 (9%) : 6 (7%)
Inotrope duration mean ± SD	18.3 ± 15.4
Inotrope required: inotrope not required	70 (82%) : 15 (18%)
Mediastinal bleed	4
Perioperative MI	2
ICU stay	46.6 ± 25.7 h

**Table 4: Result of Fast Track Protocol as Per Type of Surgery**

Variable	N (%)
CABG (FTPA : FTPF)	18 (41) : 26 (59%)
CABG + MVR (FTPA : FTPF)	0 : 4 (100%)
MVR (FTPA : FTPF)	6 (50%) : 6 (50%)
AVR (FTPA : FTPF)	3 (43%) : 4 (57%)
DVR (FTPA : FTPF)	2 (33%) : 4 (67)
MYXOMA (FTPA : FTPF)	2 : 0
AAA (FTPA : FTPF)	0 : 2
VSD+ASD+AR (FTPA : FTPF)	0 : 1
VSD (FTPA : FTPF)	0 : 1
PDA (FTPA : FTPF)	2 : 0
ASD (FTPA : FTPF)	4 : 0

FTPA = Fast track Protocol Achieved, FTPF = Fast track Protocol Failed

the problem of decrease resources like ICU beds, trained human power and above all more efficient way to manage long waiting list that our patients often suffered. The benefits of early extubation are beyond the doubt as proved by many authors include improved cardiac function and patient comfort, reduction in respiratory complications, as well as ease in management.<sup>21</sup> Different independent risk factors like emergency operation, type of procedure, age, renal dysfunction, CVA, reoperation, female gender and left ventricular dysfunction as significant predictors of failed fast track pathway requiring prolong stay.<sup>22-27</sup>

There are sporadic reports of fast track pathway in complex congenital heart surgery from the developing world.<sup>28-30</sup> Despite of change in approach towards the complex congenital heart surgeries from initial palliation with delayed repair towards early primary repair resulting greater likelihood of a hemodynamic compromise in the early postoperative period, requiring pharmacological and mechanical support and more prolonged stay in intensive care. Small infants undergoing open-heart surgery may be suitable for early Extubation but these patients were often excluded from the fast-track program and kept in intensive care overnight for cardio-vascular monitoring and pharmacologic support as required.<sup>31</sup>

**Limitation**

This is a single centre study. Patient population is quiet diverse but of limited number that may not represent each category in statically significant number. However we had also included the patients who we believe it is difficult to achieve early discharge like patients with aortic aneurysm just to avoid our selection bias. Our fast track protocol is still

in progress. In future we may be able to present with more robust data.

## CONCLUSION

With the fast track discharge protocol for cardiac surgery in 37(43%), we can conclude the applicability of our protocol. All patients who are considered suitable for 'fast-track' should be followed for fast-track protocol whenever feasible. Smoking, DM and low EF are possible risk factors for delay discharge.

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