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The Use of a Fast-Track Protocol for Perioperative Management of Cardiac Surgery Patients

Abstract

Background: Cardiac Surgery dept. is a new unit of Joint Corps Armed Forces since March 2013. In order to support the project of organization and opening of a direct admission CS-ICU supported by minimum but well trained staff nurses we developed a fast-track concept.

Methods: After an 8 months observation period, cooperation with the other parts of the dept. and the local medical ethics committee approval, we put in application the use of Leipzig fast-track protocol. It is about well-prepared but not selected patients. It regards their perioperative period until they discharge hospital. The database contains these 3 perioperative periods as multifactorial indicators.

Results: Readmission is associated with patient outcomes. ASA, NYHA, perfusion XCL time and temperature at admission are predictors[1] of early extubation, short duration of ICU care, hospitalization and readmission. It also proves a high quality level of CS-ICU organization, based on the use of protocols as ORCHESTRA study[2] suggest, ready to respond challenges.

Conclusion: In well preoperative prepared patients, we found that the Leipzig fast-track protocol.[3] is safe for cardiac surgery patients and an efficient method to combat the problem of decreasing numbers of ICU beds, working nurses and to save costs as a result of shortened length of stay.[4]

Keywords: Fast-track; Cardiac Surgery; Weaning, Extubation

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Introduction

The main aim of most studies was to achieve a rapid uncomplicated recovery with minimal load on ICU. The safety and convenience of early extubation and reduced mechanical ventilation is well documented that the safety and convenience of early extubation and a reduction of mechanical ventilation. Early extubation or fast track treatment of cardiac surgery patients results in a decrease in ICU and hospital stays and subsequently a possible reduction of hospitalization costs. In addition, ultra fast track therapy with extubation in the operation room failed to reduce length of stay in ICU or in hospital even with the use of thoracic epidural analgesia.[5,6]

Fast track management is not early extubation but the shortening of prolonged ventilatory support. Such a protocol has specific inclusion and exclusion criteria well described by M. Haanschotten et al..[7] This procedure is followed by standard anesthetic and operative techniques.[7] After admission, the CS-ICU a weaning protocol was performed when parameters were stable and then patient was extubated. Database describes pre- and intraoperative parameters as well as the postoperative outcome.

Organization of a Department based on the use of protocols is also well described lately. Modern cardiac surgery perioperative management is faced with the challenge of finding the balance between patient safety and economic restriction without comprising the quality of patient care.[3]

Methods

Patients

This study was performed in a single center from November 2014 until September 2015. The local medical committee approved the study. There were no exclusion criteria other than emergency operations. All well preoperatively prepared patients were included in this study but not selected. Clinical data, demographics, risk factors and complications were prospectively collected in our database.

Procedures

Immediately after patients admission to the intensive care unit the fast track protocol began. First priority was normalization of body temperature and stabilization of their hemodynamic and respiratory parameters. If these conditions remained stable and blood loss via the chest tubes was less than 50ml/h we extubated the patient using a weaning protocol. A recruited maneuver was carried out prior to weaning. Patients were transferred to the ward the other morning, following discharge and rehabilitation protocol, received telemetric surveillance of heart rhythm, blood pressure and saturation as well as.

Statistical analysis

Data are displayed as median and interquartile range for all non-normally distributed continuous variables and mean and SD for normally distributed values. Qualitative variables were expressed as absolute and relative frequencies. Mann-Whitney test was used for the

comparison of continuous variables between two groups. Spearman correlations coefficients were used to explore the association of two continuous variables. Correlation coefficient between 0.1 and 0.3 were considered low, between 0.31 and 0.5 moderate and those over 0.5 were considered high. All reported p values are two-tailed. Statistical significance was set at $p<0.05$ and analyses were conducted using SPSS statistical software (version 19.0).

Table 1 Sample characteristics

	N (%)
Age, mean (SD)	68.0 (10.8)
Sex	
Males	80 (80.0)
Females	20 (20.0)
NYHA	
1	19 (19.0)
2	60 (60.0)
3	21 (21.0)
ASA	
1	6 (6.0)
2	63 (63.0)
3	22 (22.0)
4	9 (9.0)
Readmission	
No	94 (94.0)
Yes	6 (6.0)

Results

Sample consisted of 100 patients (80% males) with mean age 68.0 years old (SD=10.8 years). Sample characteristics are presented in Table 1. Most patients were classified at NYHA stage 2 and at stage ASA 2, with the percentages being 60.0% and 63.0% respectively. Only 6.0% of the patients were readmitting in ICU.

Patients' preoperative and postoperative data are presented at Table 2. Median occlusion time was 295.0 min (IQR: 240.0–330.0 min) and median perfusion time was 111.0 min (IQR: 83.0–39.5 min). In addition, median XCL time was 64.0 min (IQR: 44.0–92.5 min) and median temperature was 36.7 degrees (IQR: 36.5–36.9 degrees). Moreover, median temperature at admission in the unit was 35.8 degrees (IQR: 35.4–36.2 degrees). Median EXT time was 180.0 min (IQR: 150.0–237.5 min) and median duration of ICU care was 21.0 hours (IQR: 19.3–22.0 hours). Median duration of hospitalization was 9.0 days (IQR: 8.0–14.0 days).

Table 2 Preoperative and postoperative data

	Median (IQR)
Preoperative	
Occlusion time (min)	295.0 (240.0 – 330.0)
Perfusion time (min)	111.0 (83.0 – 139.5)
XCL time (min)	64.0 (44.0 – 92.5)
Temperature cc	36.7 (36.5 – 36.9)
Postoperative	
Temperature at admission	35.8 (35.4 – 36.2)
EXT time (min)	180.0 (150.0 – 237.5)
ICU care (h)	21.0 (19.3 – 22.0)
Hospitalization (days)	9.0 (8.0 – 14.0)

Preoperative and postoperative data associated with patients' readmission are presented at Table 3. Patients who were readmitted in ICU had significantly higher perfusion and XCL time. In addition, the duration of hospitalization was significantly greater in patients who were readmitted in ICU. Correlation coefficients between preoperative and postoperative data are presented in Table 4. Preoperative occlusion and perfusion time are negatively correlated with length of stay in ICU care. Thus, patients with higher occlusion and perfusion time stayed less hours in ICU. In addition, higher perfusion time and preoperative temperature are associated with higher temperature at admission in the unit.

Table 3 Preoperative and postoperative data associated with patients' readmission

	Readmission		
	No Median (IQR)	Yes Median (IQR)	P*
Preoperative			
Occlusion time (min)	285.0 (240.0 – 330.0)	315.0 (300.0 – 360.0)	0.061
Perfusion time (min)	105.5 (82.0 – 137.0)	147.0 (143.0 – 173.0)	0.013
XCL time (min)	62.5 (43.0 – 89.0)	105.5 (72.0 – 126.0)	0.02
Temperature cc	36.7 (36.5 – 36.9)	36.9 (36.5 – 370.0)	0.302
Postoperative			
Temperature at admission	35.8 (35.4 – 36.2)	35.8 (35.4 – 36.0)	0.61
EXT time (min)	180.0 (150.0 – 235.0)	210.0 (170.0 – 3000.0)	0.161
ICU care (h)	21.0 (19.0 – 22.0)	21.8 (21.5 – 22.5)	0.203
Hospitalization (days)	9.0 (7.0 – 13.0)	17.0 (14.0 – 28.0)	0.002

Table 4 Spearman correlation coefficients between preoperative and postoperative data

Postoperative		Preoperative			
		Occlusion time (min)	Perfusion time (min)	XCL time (min)	Temperature cc
Temperature at admission	r	0.04	0.23	0.19	0.4
	P	0.662	0.02	0.056	<0.001
EXT time (min)	r	0.12	0.02	-0.04	-0.08
	P	0.243	0.845	0.723	0.403
ICU care (h)	r	-0.35	-0.25	-0.13	-0.11
	P	<0.001	0.011	0.205	0.274
Hospitalization (days)	r	0.11	0.14	-0.04	0.08
	P	0.268	0.158	0.706	0.425

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Discussion

The term fast track includes the shortening of prolonged ventilator support or even the immediate postoperative extubation. In this study, the term fast track is understood to mean extubation of the patient on the day of surgery. The median extubation time was 180 min for a patient who admitted the CS-ICU with a median temperature of 35.8 degrees. The goal of the prospective study is observation and description of the pre- and intraoperative parameters as well as the postoperative outcome. In other words, we will try to find out the risk variables for readmission.

We know in patients undergoing cardiac surgery that ASA>3, NYHA>3 and operation time>267 min are independent predictors of fast-track protocol failure.[1] Especially advanced age and left ventricular dysfunction (EF<35%) found to be significant preoperative predictors of failure. In our study, we noticed that 5/6 of patients readmitted the ICU were ≥ 68 y.o. (mean: 68). Observed the cardiac factors of EUROscore we noticed that 3/6 of patients readmitted the ICU had moderate LV dysfunction (EF: 30-50 %) although 1/100 with EF< 30% did not. Finally, 2/6 of them had pulmonary hypertension (mean 6/100).

All of them (6/6) were NYHA≤3 but ASA: 4 only 2/6 (mean 9/100). Readmission to ICU is generally considered a negative quality criterion. In our study we correlated readmission with higher perfusion (> 110 min) and XCL (>64 min) time. Readmission increases total length of hospital stay (> 9 days) while median duration of ICU care was 21 hours. To address the question of fast-track protocol failure and readmission to SC-ICU we noticed that miss of fluid balance and following electrolyte disturbances play a main role as volume overload or heart rhythm disturbances.

Serum lactate seems to be the main marker for the successful use of the fast-track protocol. We have to remind that is elevated in situations like cardiogenic or hypovolemic shock, post cardiac arrest, tissue ischemia and excessive work of breathing.[8] Lactate < 2 mmol/L is the target.

Conclusion

In a conclusion we can say that fast-track is the perioperative management of patients undergoing cardiac surgery based on protocols including rehabilitation.[9] as well. Predictor factors are well preoperative prepared patients, operative techniques and patient admission to the ICU in order to be extubated as soon as they have body temperature normalization, fluid and electrolyte balance stabilization.

Such a protocol is an efficient method to combat of decreasing numbers of ICU beds and working nurses and to save costs because of shortened length-of stay in expensive postoperative units without comprising the quality of patient care. Results compared with the Catherina Hospital study[8] were similar and prove rather the need of a direct-admission PACU.

Ethical Standards Statement

This work is original and, has been approved by the appropriate ethics committee and has therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. Specific national laws have been, observed too.

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