



Active Chest Tube Clearance Added to an Enhanced Recovery After Cardiac Surgery (ERAS) Program Improves Outcomes and Reduces Resource Utilization

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Introduction

We initiated a cardiac ERAS program in early 2019, protocolized it in and applied it to all patients in 2020, and added the use of active chest tube clearance (ATC) in 2022. Prospective data collection of ATC patients was compared to historical controls to determine the impact of the device on outcomes.



active chest tube clearance

Methods and Materials

The study comprised 1,334 patients with 650 in the control group (Group 1) and 684 in the ATC Intervention group (Group 2). Group 1 (Historical Control) consisted of 650 patients from January 1st to October 31st 2020 and January 1st to October 31st 2021. From October 31st to December 31st 2021, we introduced ATC use per protocol. Group 2 (ATC) consisted of 684 patients treated consecutively from January 1st to August 31st 2022 with ATC. The preoperative characteristics and operative procedures between groups were similar.

ERAS protocol (summary)

ATC interventions to reduce chest tube clogging performed per protocol:

- 15 minutes (x 2 hours)
- 30 minutes (x2 hours)
- Every 1-2 hours while in ICU

Actuation every 4 hours if ATC unit still present upon transfer of the patient to the step-down unit.

Chest tubes placed in the OR just before closing the chest.

Table 1. Post Operative Transfusions

Variable (mean n, %)	Control (n = 650)	Intervention (n = 684)	% Change	p value
Any transfusion	178 (34%)	158 (28%)	-17%	0.049
·At least one postop RBC unit	146 (23%)	139 (20%)	-10%	0.35
·At least one postop FFP unit	26 (4%)	12 (2%)	-55%	0.02
·At least one postop Cryo unit	31 (5%)	17 (3%)	-48%	0.03
·At least one postop PLT unit	39 (6%)	26 (4%)	-37%	0.07
Chest tube drainage (CTD)				
·12 hours (mL)				
·Chest tube drainage	300 [200-430]	300 [200-406]	0.0%	0.54
·Bulb drainage	295 [195-425]	240 [148-370]	-19%	0.04
·Total chest drainage	340 [240-490]	330 [240-450]	-3%	0.17
·24 hours (mL)				
·Chest tube drainage	565 [380-775]	550 [390-766]	-3%	0.69
·Bulb drainage	490 [300-638]	359 [278-591]	-27%	0.07
·Total chest drainage	620 [445-850]	600 [440-816]	-3%	0.22
·Total (mL)				
·Chest tube drainage	1203 [650-1940]	990 [580-1563]	-18%	<0.001
·Bulb drainage	1313 [684-2085]	894 [476-1558]	-32%	0.01
·Chest drainage	1430 [801-2288]	1098 [678-1693]	-23%	<0.001
Chest tube dwell (hrs)	90 [69-116]	69 [48-90]	-23%	<0.001
Bulb drain dwell (hrs)	118 [82-163]	91 [51-122]	-22%	<0.001

Abbreviations/Definitions: Red Blood Cells (RBC), Fresh Frozen Plasma (FFP), Cryoprecipitate (Cryo), Platelet (PLT)

Results

- Group 2 experienced a 41% reduction in the composite of RBS (8.2% *G1* vs 4.8% *G2*)
- Group 2 POAF was decreased by 17% (33.8% *G1* vs 28.1% *G2*)
- Group 2 had a 30% decrease in median ICU hours (51.6hrs *G1* vs 36.3hrs *G2*)
- Group 2 had 8 patients (1.17%) readmitted to the ICU after initial discharge to the step down unit vs. 21 patients (3.2%) in group 1.

Table 2. Post Operative Hospital Outcomes

Variable (mean n, %)	Control (n = 650)	Intervention (n = 684)	% Change	p value
Retained blood syndrome	53 (8%)	33 (5%)	-41%	0.01
•Reop for bleeding/tamponade/wash out	15 (2%)	11 (2%)	-30%	0.43
•Postop pleural effusion with drainage	29 (5%)	16 (2%)	-49%	0.03
•Replacement of chest tube	26 (4%)	16 (2%)	-43%	0.09
Postop Pneumothorax with intervention	13 (2%)	8 (1%)	-40%	0.27
Post Operative Atrial Fibrillation (POAF)	178 (34%)	158 (28%)	-17%	0.049
Highest Postoperative Creatinine	1.26 ± 0.75	1.31 ± 0.92	4%	0.24
Dialysis required	11 (2%)	11 (2%)	-6%	1.00
Total ICU stay (hrs)	52 [30-77]	36 [21-69]	-30%	<0.001
ICU Readmission	21 (3%)	8 (1%)	-64%	0.01
Total post-op length of stay (days)	6 [5-8]	5 [4-7]	-17%	<0.001

Conclusions

The addition of the ATC intervention to an established ERAS program in a high-volume private practice setting decreases complications, improves outcomes and decreases resource utilization.

Contact

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