

Implementation of Goal Directed Therapy Utilizing Hypotension Prediction Index in Postoperative ERAS Cardiac Surgery Patients

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INTRODUCTION

Goal Directed Therapy (GDT) utilizes monitoring techniques beyond traditional measures to optimize and individualize the administration of fluids, vasopressors, and inotropes in the perioperative setting. Individualizing patient interventions assures optimal perfusion by titrating therapy to specific endpoints, promptly detecting hemodynamic instability and differentiating the cause. It has been shown to improve patient outcomes including reducing acute kidney injury (AKI), surgical site infection (SSI), intensive care unit (ICU) and postoperative length of stay (LOS). GDT is a Class I recommendation from the Enhanced Recovery after Surgery (ERAS) Cardiac Society Guidelines for Perioperative Care in Cardiac Surgery. Although GDT has been utilized in the postoperative cardiac surgery patient, variability exists in algorithms and triggers. In November of 2022 a GDT algorithm was implemented utilizing hypotension prediction index (HPI) in our cardiac surgery program (Fig 1) for a subset of adult postoperative coronary artery bypass graft (CABG) ERAS patients.

METHODS

The GDT algorithm was utilized on ERAS isolated CABG patients with EF \geq 45% (n=112) and compared to a historical matched non-GDT ERAS control (n=129). The patients in the control group had PA catheters and were given 1 liter boluses of lactated ringers (LR) utilizing triggers of central venous pressure (CVP) <8, cardiac index (CI) <2.0 or mean arterial pressure (MAP) <65. Vasopressors and inotropes were utilized after volume resuscitation to maintain a MAP >65 and CI >2.0. The implementation group received 250 mL LR boluses as part of a nurse driven algorithm utilizing the minimally invasive acumen IQ sensor for hypotension prediction index (HPI) >85, MAP <65 or CI <2.0. Vasopressor and Inotrope utilization were then determined by the algorithm. (Figure 1) There were no differences in demographics or risk between groups.

RESULTS

Statistical significance was found in the reduction of albumin administration by 433 mL (p<0.001), with an increase in crystalloids administration averaging 658 mL (p 0.007). There was a trend toward reduced mean ICU LOS 8.96 hrs (p 0.33), total post op LOS 0.31 days (p 0.61), ICU bouncebacks 1.9% (p 0.49) and hospital readmissions 12.3% (p <0.001). We also saw a trend toward reduced discharge AKI 2.2% (p 0.23) and atrial fibrillation 7.3% (p 0.24) (Table 2). No significant difference was found in early extubation or pulmonary complications.

CONCLUSION

We found GDT to be a safe and less invasive way to monitor selected patients post-cardiac surgery. GDT patients demonstrated a trend toward reduced postoperative LOS, ICU LOS, ICU readmissions, atrial fibrillation, and AKI compared to matched historical controls. More studies are needed to confirm the potential benefit of GDT in adult cardiac surgery.

Table 2

	Control n=129	GDT n=112	Difference	p value
Average POD 2 AKI %	10.1	8.9	-1.1	0.76
Average POD 7 AKI %	6.2	6.3	0.1	0.99
Average D/C AKI %	3.1	0.9	-2.2	0.23
Average Albumin (ml)	550.00	116.96	-433.04	<0.001
Average IVF (ml)	4060.47	4718.75	658.28	0.007
Average Vasopressor (hrs)	45.56	48.45	2.90	0.88
Average Afib (%)	40.3	33.0	-7.3	0.24
Average ICU LOS (hrs)	44.95	36.00	-8.96	0.33
Average post op LOS (days)	5.59	5.28	-0.31	0.61
Average Readmission (%)	13.2	0.9	-12.3	<0.001
Average ICU bounce back (%)	5.4	3.6	-1.9	0.49

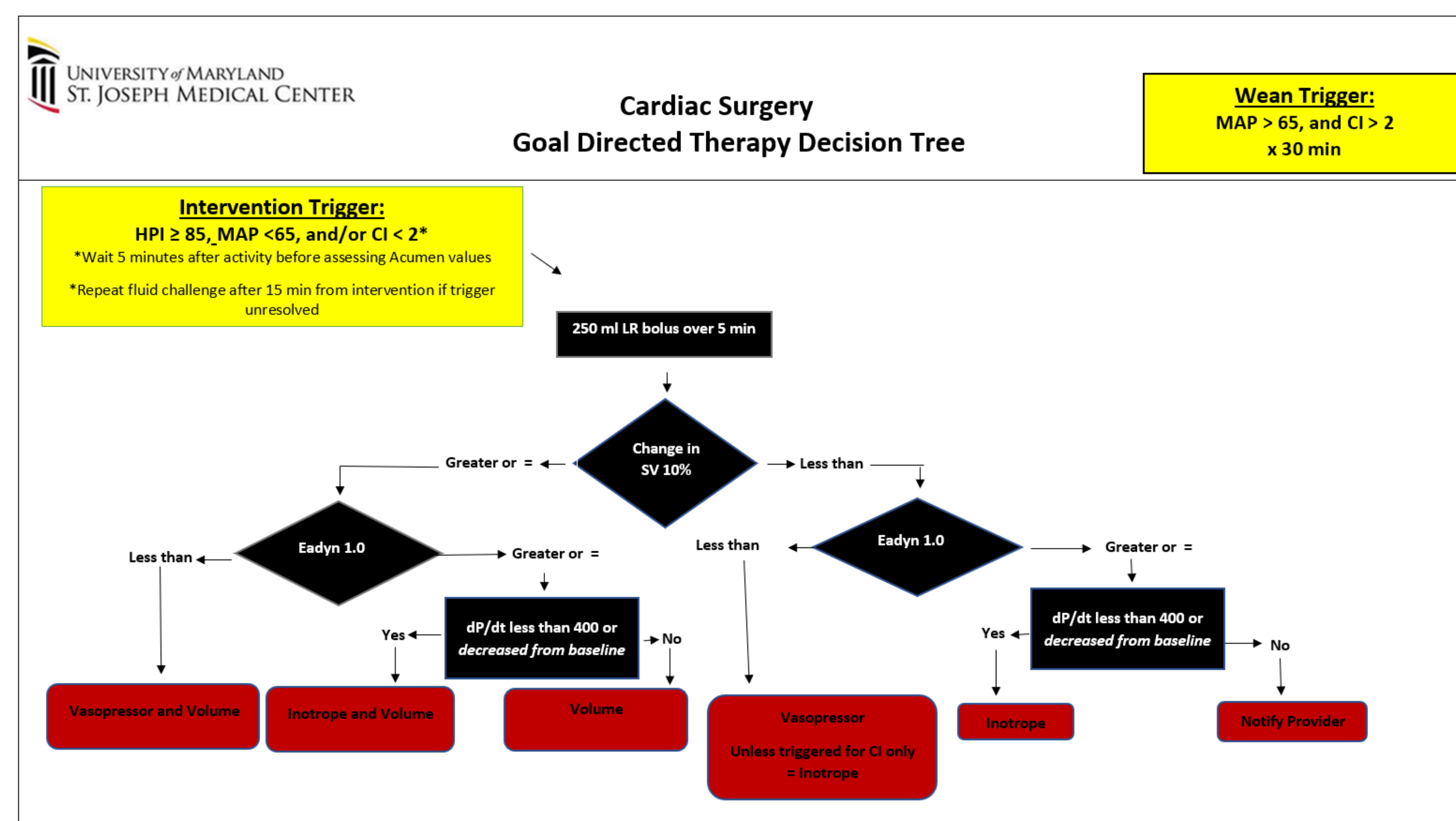


Figure 1 - Cardiac Surgery Goal Directed Therapy Decision Tree