Advanced AI-guided Hemodynamic Management within Cardiac ERAS Pathways: A Multi-institution Quality Improvement Review

Objectives: Implementation of Enhanced Recovery After Surgery (ERAS) pathways have demonstrated improved clinical outcomes in cardiac surgical settings. This quality improvement (QI) initiative reviewed the incremental impact of incorporating an advanced minimally invasive monitoring technology, with Goal Directed Hemodynamic Management (GDHM) tool. Incorporated into the tool was an AI module. Data were reviewed from three large volume existing cardiac surgery ERAS pathways. Intriguing early data from this initiative is presented.

Methods: This was a retrospective QI study that used data from 1334 patients at three U.S. institutions for patients undergoing cardiac surgery requiring CPB that utilized an ERAS pathway between April-August, 2021. The protocol involved the utilization of a guided hemodynamic management approach using arterial line based data (Acumen HPI, Edwards Lifesciences, Irvine, CA, USA). The protocol began on arrival to the cardiac intensive care setting. Excluded were emergency cases, off-pump, and redo surgery. Statistical (Chi Squared, Fisher's Exact test) comparisons were performed between the cohort (Aug – Dec 2019) prior to implementation. Early outcomes included predicted mortality/morbidity, ventilator time greater than 24 hrs., extubation by 6 hours postop and ICU LOS. Additional outcomes related to renal injury are still being analyzed.

Results: The GDHM cohort had no differences in mean age, gender distribution, race or predicted mortality/morbidity. A 41% reduction in ICU LoS was noted (68.1 +/- 3.3 hrs vs 39.8 +/- 2.7 hrs. (p<0.0001) and a reduction in the proportion of patients ventilated for > 6 hours or >24 hours (p<0.0001).

Conclusion: The addition of goal directed hemodynamic management to existing Cardiac ICU ERAS pathways for patients undergoing cardiac surgery demonstrates incremental improvement in patient outcomes. Specifically, implementation of guided GDHM resulted greater proportion of patients extubated by six hours, a smaller proportion intubated for greater than 24 hours and an overall shorter ICU length of stay. More precise fluid and volume management may have contributed to better extubation criteria. Additional data review may point to advantages in terms of renal injury and other morbidities. These findings may have important implications for quality improvement in centers utilizing ERAS protocols.

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