

Reducing Length of Stay (LOS) with Post-Operative Cardiac Clinical Care Guidelines

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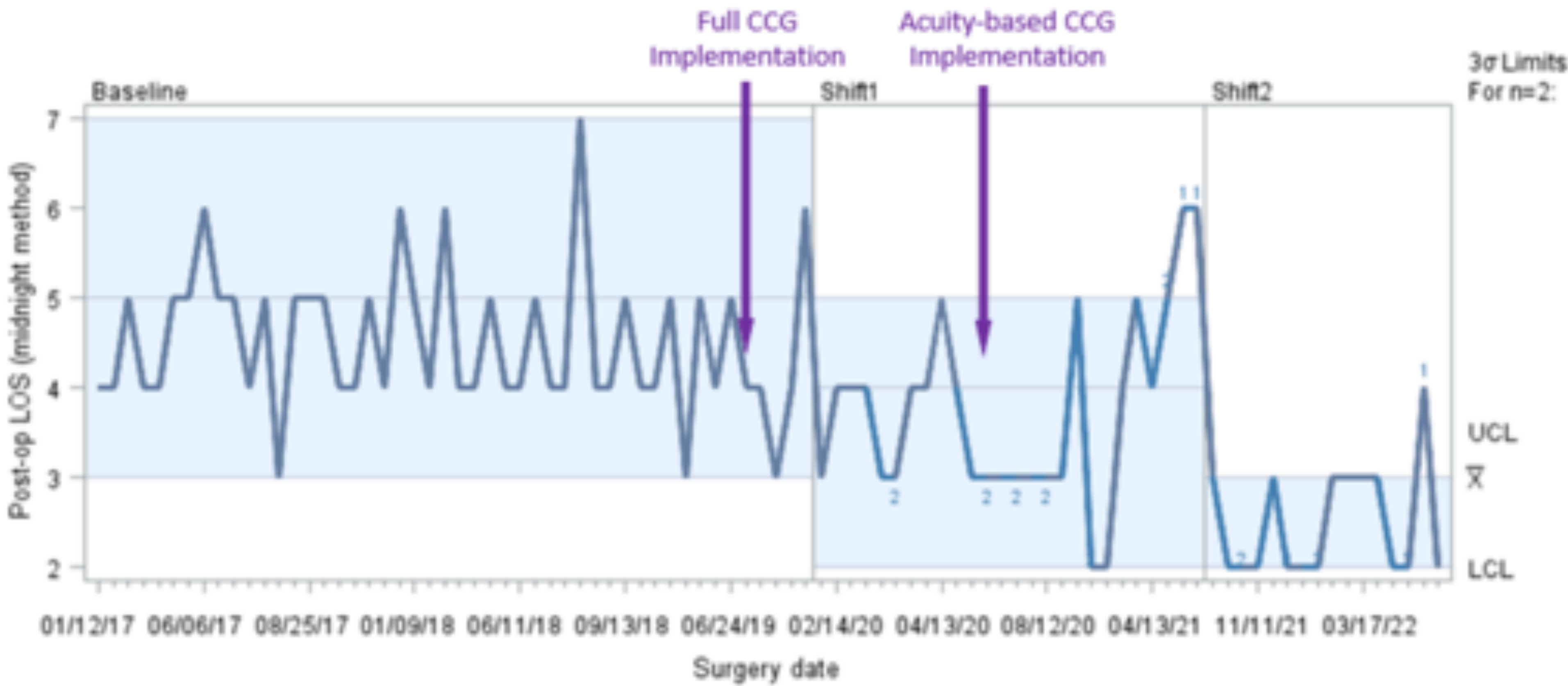
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Abstract

Clinical care guidelines (CCGs) were first implemented at the Ann & Robert H. Lurie Children’s Hospital of Chicago in October 2019. CCGs were intended to standardize post-operative management by removing unnecessary variations in clinical care that were believed to increase patient length of stay (LOS). Initially, these CCGs were surgery-specific; however, in November of 2020 they were modified to an aspirational post-operative LOS. Our straightforward ventricular septal defect (VSD) patients now use the 2-day LOS CCG. We report early results for VSD patients after CCG implementation.

Results

IR chart of Post-op LOS (midnight method), January 2017 - July 2022 by Observation



Introduction/Methods

Potential drivers of increased LOS were identified and interventions were implemented within the CCG to decrease their burden. Interventions within the CCG included:

- Eliminating continuous infusions of opioids and sedatives
 - Earlier chest tube removal
 - Early and aggressive use of diuretics
 - Earlier mobilization
- It was our aim to decrease average post-operative LOS by creating a standardized approach to post-operative care of straightforward VSD patients in the CCU.
 - We measured the number of midnights spent in the hospital, based on the time of post-operative admission to the CCU, with a minimum value of 1.
 - Our population was patients undergoing an isolated repair of VSD older than 3 months of age. Patient eligibility for the CCG was determined by the care team through a weekly case conference prior to surgery and assessed intra- and post-operatively.

- Implementation of a post-operative CCG reduced post-operative LOS for straightforward VSD patients
- Average LOS for straightforward VSD patients decreased from 5 to 3 days since CCG implementation
- 11 of 24 straightforward VSD patients were discharged on post-operative day 2 since December 2020 (never done prior to this initiative)
- Average time to chest tube removal decreased from 4 to 2 days

Conclusions

The formalization and continuous modification of the CCG resulted in post-operative LOS reduction in straightforward VSD patients. This post-operative LOS reduction is expected to expand to more patients across the CCU. Our work will continue to focus on adherence, improvement, and evolution of our various CCGs.

<div>Types of Surgeries:<ul style="list-style-type: none">• VSD• Multiple VSD• Aortic stenosis subvalvar repair• Conduit reoperation• Pulmonary valve replacement• RVOT procedure• Pulmonary valvuloplasty• Conduit replacement, other• PA reconstruction (up to peripheral)• Tetralogy of Fallot</div> <div>Exclusion Criteria:<ul style="list-style-type: none">• Greater than or equal to 37 weeks gestational age at time of surgery• Greater than or equal to 1 month of age at time of surgery for ToF patients</div> <div>Exclusion Criteria:<ul style="list-style-type: none">• Pre-operative invasive positive pressure ventilation support• Pre-operative renal replacement therapy• Pre-operative or post-operative moderate dysfunction of either ventricle• Tracheostomy with positive pressure ventilation• Chronic kidney disease• Significant non cardiac diagnosis such as tracheostomy and severe neurologic impairment</div>	OR	<div>1. Ensure good pain control with peri-sternal Marcaine</div> <div>2. Extubate in OR when possible</div> <div>3. Order CV PCA pain order set</div> <div>4. IV acetaminophen, ondansetron (if over the age of three), ketorolac and furosemide in OR at surgeon discretion. Please include which of these medications were given in sign out to the CCU team</div>
	Admit	<div>1. Pain control regimen per the CCU Comfort Algorithm</div> <div>2. IV ondansetron upon arrival for children over 3 years of age (make sure they did not receive it in the OR)</div> <div>3. Document presence or absence of a rub in the admit note</div> <div>4. Total fluid goal of 50% maintenance, up to a maximum of 50ml/hr</div>
	3 Hours After Admission	<div>1. Allow PO, starting with clears, when awake enough with good perfusion</div> <div>2. Stop IV after first sips taken without vomiting</div> <div>3. Wean to room air if appropriate</div> <div>4. Encourage incentive spirometry as developmentally appropriate</div>
	6-12 Hours After Admission	<div>1. Furosemide 1 mg/kg/dose (max 20 mg) IV scheduled Q6-Q8 (first dose 6-8 hours post-operatively)</div> <div>2. Stop IV if still infusing<ul style="list-style-type: none">-If G tube or NG/ND fed exclusively at home, start Pedialyte or breast milk and if tolerated for a short time, stop maintenance fluids. Consider starting at 20-40ml/kg/day at minimum. Consider feeding tolerance history and regular home feeding schedule as determined by the team and family</div> <div>3. Consider discontinuing foley if patient can mobilize</div> <div>4. Wean to room air if not already accomplished</div> <div>5. Get child out of bed as developmentally appropriate</div> <div>6. Encourage incentive spirometry as developmentally appropriate</div> <div>7. Give ondansetron if not drinking</div> <div>8. Consider discontinuing any vasoactive medications</div> <div>9. Consider chlorothiazide IV Q12 hours (make sure to account for CVP and HR as you evaluate intravascular volume and diuresis as much as hemodynamically tolerable)</div>
	Post-Operative Day 1	<div>AM rounds:</div> <div>1. Stop vasoactive medications</div> <div>2. Get child out of bed as developmentally appropriate by 10 AM</div> <div>3. Discontinue lines and tubes:<ul style="list-style-type: none">-Discontinue arterial line-Discontinue CVL</div> <div>4. Switch ketorolac to scheduled ibuprofen TID with food or milk for patients older than six months</div> <div>5. Attempt to walk if this is developmentally appropriate</div> <div>6. Continue IV diuretics (furosemide Q6-Q8 and chlorothiazide Q12). Account for CVP and HR as you evaluate intravascular volume and diuresis as much as hemodynamically tolerable</div> <div>7. Consider ondansetron if not drinking</div> <div>8. Consider transfer to Stepdown</div> <div>12 PM:</div> <div>Discontinue chest tubes if less than 4 mL/kg drainage (or more at surgeons discretion) since midnight and not frankly bloody. FLP expected to touch base with CV Surgery team. Obtain a second regular portable CXR (PA/Lat not needed) after the chest tube is removed</div>
	Post-Operative Day 2	<div>1. Discontinue chest tube if still in if less than 4 mL/kg drainage since midnight if no significant drainage after child gets out of bed, reevaluate at 12 PM if not pulled in morning. Obtain a second regular portable CXR (PA/Lat not needed)</div> <div>2. Echo for discharge after chest tube and wire removal</div> <div>3. Obtain weight on day of discharge</div> <div>4. Obtain discharge ECG. Evaluate for pericarditis</div>
	Discharge Instructions	<div>Follow-up:</div> <div><ul style="list-style-type: none">• Approximately one week with CV clinic if no evidence or concerns for pericardial effusion on discharge echo• Cardiologist in 4 weeks• Primary Care Provider in 1 week</div> <div>Discharge medications:</div> <div><ul style="list-style-type: none">• For those at high risk of pericardial effusion (ASD repair, rub on exam after surgery, diffuse ST segment elevation on discharge or prior ECG's, or presence of trivial or trace pericardial effusion on discharge echocardiogram):<ul style="list-style-type: none">-Under 6 months: Five days of scheduled Ibuprofen with feeds and two weeks of furosemide BID-Over 6 months: 14 days of scheduled Ibuprofen with meals• Oxycodone as needed (for early discharges, at least a few doses should be prescribed)• Consider furosemide for 5 days PO BID if:<ul style="list-style-type: none">A.) Patient required oxygen within 12 hours prior to dischargeB.) Chest tube removed on day of discharge and drained more than 4 mL/kg/day over the 24 hours prior to removalC.) Patient greater than 10% fluid overloaded on day of discharge based on day of discharge weight divided by pre-operative weightD.) Pleural effusion evident on discharge chest radiograph or echocardiogram (no furosemide if trivial on CXR and not apparent on echocardiogram)E.) Pericardial effusion evident on discharge echocardiogram</div>