Development and Opening of a Cardiac Ambulatory Sedation and Recovery Unit: Processes, Opportunities and Lessons Learned

Jamie M. Schwartz, MD1,2, Nina Deutsch, MD2, Gerard R. Martin, MD3, Jeanne R. Ricks BSN RN3, Richard J. Levy MD2

Divisions of 1Critical Care Medicine, 2Anesthesiology and Pain Medicine, and 3Cardiology, Children’s National Medical Center, The George Washington University School of Medicine and Health Sciences

Introduction

- The population of patients with congenital and acquired heart disease have a growing need for diagnostic and therapeutic procedures
- Anesthesia for this population has greater risk of cardiac arrest and death compared to patients without heart disease
- Specialized cardiovascular anesthesia teams and intensive care units have been created to manage these fragile patients
- The post-anesthesia and ambulatory procedure period may be the missing link in the continuum of specialized cardiac care
- We sought to address this discrepancy by developing a brief procedure, post-anesthesia care and short stay recovery area for patients with heart disease, the Cardiac Procedure Recovery Unit (CPRU)

CPRU Characteristics

- 4 bed unit with single rooms
- 7 nurses, 3 support staff
- Medical direction from CV Anes/CCM physician
- 24 hour/5 day staffing model
- Anesthesia machine, equipment and medications to convert 1 room to procedure room
- Physical proximity to CICU and emergency support

Methods: Design, Recruitment and Implementation

- Needs assessed from catheterization and electrophysiology case loads
- Nurses recruited with experience in pediatric cardiology, critical care, or post-anesthesia care
- Nurse training:
  - Post anesthesia care and complications
  - Basic airway management
  - ECG and arrhythmia interpretation
  - Advanced physical assessment
  - Pediatric congenital heart disease
- In-situ simulation of critical events performed prior to unit opening; latent threats identified and remedied
  - Volume, case mix, and complications assessed 8 months after opening

Results

- In-situ simulation identified 3 major latent threats that were addressed prior to opening (Table 1)
- In the first 8 months, 441 patients were managed for recovery or procedure + recovery associated with multiple procedure types (Figure 1)
- Steady case mix increase for procedures performed in the CPRU
- Average volume 45 patient s per month (Figure 2)
- 18/441 patients (4.1%) had complications (Table 2)
  - 6/441 (1.3%) had unplanned transfers to CICU
  - No cardiac arrests or deaths have occurred to date

Table 1: Latent Threats Detected and Addressed during Pre-Opening In-situ Simulation

<table>
<thead>
<tr>
<th>Latent Threat</th>
<th>Action Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two pieces of critical equipment missing from room set up</td>
<td>equipment stocked</td>
</tr>
<tr>
<td>Staff had poor understanding of CPRU defibrillator operation; CPRU defibrillators were different than rest of hospital</td>
<td>staff in-service performed</td>
</tr>
<tr>
<td>Staff experienced task saturation when notifying physicians during emergency situation</td>
<td>notification automated into ‘code’ buttons</td>
</tr>
</tbody>
</table>

Table 2: Patient Complications during Recovery or Procedure + Recovery

<table>
<thead>
<tr>
<th>Complication</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematoma or bleeding at catheterization site</td>
<td>n=5</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>n=4</td>
</tr>
<tr>
<td>Hypertension</td>
<td>n=4</td>
</tr>
<tr>
<td>Apnea and need for bag-mask ventilation</td>
<td>n=1</td>
</tr>
<tr>
<td>Hypercyanotic spell due to Tetralogy of Fallot</td>
<td>n=1</td>
</tr>
<tr>
<td>Seizure</td>
<td>n=1</td>
</tr>
<tr>
<td>Syncope</td>
<td>n=1</td>
</tr>
<tr>
<td>Hives</td>
<td>n=1</td>
</tr>
</tbody>
</table>

Conclusions:

Hi fidelity simulation identified latent threats in a new environment prior to opening for patient care
Development of a specialized cardiac procedure and recovery unit is associated with:
- increased utilization and scope of practice
- low complication rate
Further study is needed to determine if peri-procedure care specific for children with heart disease impacts outcomes