**Introduction**

- Pectus excavatum is a congenital chest wall deformity in which several ribs and the sternum grow abnormally, producing a concave appearance or depression in the anterior chest wall.

- The Nuss procedure is a minimally invasive procedure that provides immediate correction of the chest wall deformity by placing a stainless steel or titanium bar under the sternum. The surgical procedure creates a considerable amount of pain during recovery.

- Problem: Management following the Nuss procedure for pectus excavatum was variable and recovery quality was suboptimal.

- Goal: Develop a medication and management specific protocol for patients undergoing Nuss Procedure (Figure 1 and 2).

**Objectives**

- Learner will be able to identify the goal of the Nuss protocol
- Learner will be able to recognize pre, intra and post op interventions
- Learner will be able to discuss outcomes

**The Team**

- General Surgery
- Anesthesiology
- Pain Service
- Nursing
- Physical Therapy
- Child Life

**Management**

**Pre-op**

- Introduce teaching about pectus excavatum general goals and expectations following surgery to specific general surgery clinic patients.
- Gabapentin: less than 64 kg: gabapentin 15 mg/kg; 65-90 kg: gabapentin 30 mg/kg; >90 kg: gabapentin 45 mg/kg
- Hydromorphone: 0.15 mcg/kg bolus over 5 minutes
- Ondansetron: 0.1 mg/kg (max 59 kg) gabapentin 600 mg

**Intra-op**

- Move bowels (surgeon dependent)
- Acetaminophen 200 mg

**Post-op**

- Pain Service and Anesthesiology teams have direct access to vital signs and recent vital signs
- Gabapentin PO TID q6hr x 3 doses based on pain
- Acetaminophen IV
- Diazepam PO q6hr
- Discontinue: Ketorolac IV q 6hr after 8th dose
- Continue: Oral Analgesia

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**Outcomes**

- Pulled data on LOS, pain (POD 0-3), and PCA duration from 4/13/11 through 8/28/15:
  - Historical Cohort 4/13/11 through 4/14/15 (n=130)
  - Heterogenous management: epidural, wound catheter, IV PCA
  - Protocol Cohort 5/15/13 through 8/28/15 (n=30)
  - Less heterogeneity: No regional, IV PCA, multimodal analgesics

**Compliance**

- Gabapentin administration following protocol initiation POD 0 – 26/30, POD 1 – 28/30

**Conclusions**

- Median LOS decreased from 5 to 3.5 days
- Average LOS decreased from 5.1 to 4.1 days
- Average pain scores improved:
  - POD #0 5.3 to 4.6
  - POD #1 4.2 to 3.8
  - POD #2 3.8 to 3.3
  - POD #3 3.9 to 3.3

**Discharge Criteria**

- Sufficient oral intake
- Adequate pain control on oral analgesia without IV rescue
- CXR with appropriate position of Nuss hardware
- Pass physical therapy
- Move bowels (surgeon dependent)

**Figure 3 and 4**

- Run charts for individual LOS and pain scores with protocol patients highlighted in yellow

**Population Milestone Achievement**

- One patient readmitted (primarily due to confusion and anxiety about pain management at home)