LVHN Enhanced Respiratory Monitoring Pathway: Outcomes and Impact

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Background

- Opioids are the most common class of medications prescribed in the hospital, and the second most common associated with serious adverse events.[1]
- There is substantial clinical concern for the morbidity and mortality associated with respiratory compromise secondary to opioid administration, particularly in unmonitored patients or those with concurrent risk factors.
- The Joint Commission's Sentinel Event database from 2004-2011 reports improper monitoring to be a leading cause of opioid related adverse events.[2]
- The Anesthesia Patient Safety Foundation (APSF) recommended that hospitalized patients who are receiving opioids for post-operative pain control should be monitored with continuous pulse oximetry as well as continuous capnography if supplemental oxygen is needed to maintain adequate oxygen saturation.[3]

Problem Statement

To reduce avoidable harm from opioid induced ventilatory impairment, Lehigh Valley Health Network (LVHN) designed an Enhanced Respiratory Monitoring (ERM) Pathway to improve the detection of respiratory compromise using continuous capnography in hospitalized patients receiving opioids.

Methods

- Before and after evaluation of the impact of the ERM Pathway on respiratory related adverse events rates for patients receiving opioids.
- ERM project team defined cohorts of patients and identified which would receive monitoring with continuous capnography.

Sub-Cohort 1: Post-operative patients with obesity or sleep apnea
Will have capnography ordered
Sub-Cohort 2: Post-operative patients without obesity or sleep apnea
Will have capnography ordered for patients who receive oxygen supplementation
Sub-Cohort 3: Non post-operative patients with sleep apnea or obesity
Will have capnography ordered
Sub-Cohort 4: Non post-operative patients without sleep apnea or obesity.
Will not receive capnography

- Clinical data tracked in the ERM analytics portal
- Adverse events, ICU transfers and Code Blues, recorded as adverse event rate per 1000 patient visits
- Goal was set to decrease the baseline rate from 22.3 (based on clinical outcomes from fiscal years 2017 and 2018) to 17.8 (a 20% reduction of baseline value)
- Program went live January 29, 2019

Results

- Post Intervention data is from the time period March 2019-December 2019.
- The data was sorted to include both Muhlenberg and Cedar Crest, across sub-cohorts 1-3, specifically for patients meeting the requirements for needing capnography.
- Sub-cohort 4 did not qualify for capnography, and patients in sub-cohort 2 who did not require supplemental oxygen did not qualify for capnography and thus were also sorted out
- From March to December 2019 there were a total of 4876 patient encounters that were in sub-cohorts 1-3 requiring capnography.
- The distribution of patient encounters, and respective adverse events per sub-cohort are detailed in Table 1.
- There were a total of 108 adverse events, 102 of which were ICU transfers and 6 code blues
- The average adverse event rate, post-intervention was 23.3, and therefore not reaching the intended target.
- As seen in Table 2, sub-cohort 1 had an adverse event rate increase from 18.4 pre-intervention to 20.1 post. Sub-cohort 2 had an increase in post intervention adverse event rates, from 13 to 19.6. However, sub-cohort 3 had a decrease in adverse event rates post intervention, decreasing from 28.5 to 24.8.

Table 1: Adverse Events, Post-Intervention March-December 2019

	Total Patient Encounters	ICU Transfers	Code Blues
Sub-Cohort 1: Post-operative patients with obesity or sleep apnea	1147	21	2
Sub-Cohort 2: Post-operative patients without obesity or sleep apnea, qualifying for capnography	1431	27	1
Sub-Cohort 3: Non post-operative patients with sleep apnea or obesity	2298	54	3
Total	4876	102	6

Table 2: Adverse Event rate per 1000 patient encounters

	Pre-Intervention Baseline, total adverse event rate	Post-Intervention (March 2019-December 2019) total adverse event rate	Post-Intervention, ICU Transfer adverse event rate	Post-Intervention, Code Blue adverse event rate
Sub-Cohort 1: Post-operative patients with obesity or sleep apnea	18.4	20.1	18.3	1.7
Sub-Cohort 2: Post-operative patients without obesity or sleep apnea, qualifying for capnography	13	19.6	18.9	0.7
Sub-Cohort 3: Non post-operative patients with sleep apnea or obesity	28.5	24.8	23.5	1.3
Total	22.3	23.3	22	1.3

Conclusions

- The overall adverse event rates per 1000 patient encounters increased from the baseline rate, 22.3 to 23.3, thus not reaching the target goal.
- Reasons for this increase may include:
  - improved patient monitoring has allowed for identification of respiratory compromise in previously undetected cases
  - capnography allowing for a possible earlier detection in respiratory compromise, earlier initiation of ICU transfer, therefore now occurring in the time frame used to log adverse events.
- To address limitations, future steps may include better filtering the data collected in the analytics portal. For example, chart review to ensure that the adverse events are secondary to opioid use or ensuring that the measured adverse events have validated vitals from capnography.
- Relation to SELECT competencies:
  - The project explored health systems/quality improvement by demonstrating an understanding of how LVHN was able to develop the ERM pathway and analyze the intervention.

Implications

- Although the metrics in the analytics portal suggest that the intervention did not achieve the desired goal, there is agreement from core team members that the implementation of the pathway has been an improvement in patient safety.
- Since implementation of the pathway, there has been no case of avoidable respiratory compromise due to opioid administration.
- Future implications of the project include expanding the pathway to other LVHN sites as well as additional patient populations such as maternal care and medically complex patients receiving sedation.

REFERENCES

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