

The Health Care Improvement Foundation
2018 Delaware Valley Patient Safety and Quality Award
Entry Form

1. Hospital Name

Pennsylvania Hospital

2. Title Of Initiative

Early Recovery for Isolated Coronary Artery Bypass Graft (CABG) Surgery (ERACS):
Initiating an "On Table Extubation" (OTE) program and reducing postoperative length of stay (postop LOS).

3. Abstract (Please limit this description to 250 words.)

Background: The Society of Thoracic Surgeon's (STS) national database reports 2.9% of CABG patients undergo OTE despite anecdotal experience that CABG patients fear postoperative mechanical ventilation. Although our institution's CABG OTE rate equaled 48% in 7/1/14 - 6/12/15, 50% of patients required postop BiPAP (inadequate or profound analgesia). Beginning 6/12/15-12/31/17, we developed multimodal perioperative analgesic protocols to increase patient safety by the following: 1. Increase OTE, 2. Decrease postop BiPAP use, and 3. Reduce patient postop LOS.

Main Results: From 6/12/15 to 12/31/17, 179 patients underwent CABG. OTE occurred in 121 patients (OTE rate = 67%). The OTE rate increased (2015 = 60% (27/45), * 2016= 68% (49/72), and *2017 = 76% (47/62) $p < 0.0001$, 2017 and 2016 vs 2014). Postop BiPAP use decreased (*2017=9%). Postop LOS decreased 3.6 days for OTE patients compared to non-OTE patients (*OTE LOS = 5.6 ± 2.8 days vs non-OTE LOS = 9.2 ± 8.3 days, $p = 0.0001$). A multimodal analgesic regimen evolved: 1. Preoperative intrathecal narcotic (IT narc) administration increased (2015 = 26%, *2016 = 58%, and *2017 = 76% $p < 0.05$) 2. Preoperative Gabapentin administration increased (2016= 46%, and *2017= 88% $p < 0.05$) 3. Post-cardiopulmonary bypass IV acetaminophen use remained constant (2015 = 63%, 2016= 78%, and 2017= 76%).

Conclusion: Our CABG OTE rate in 2017 proves that OTE is a sustainable practice, and an effective method to decrease postop LOS. Our institution's multimodal pain protocol facilitates OTE and reduces postop BiPAP, thereby improving the quality of patient care.

4. What were the goals of your initiative?

1. Increase the OTE rate for isolated CABG patients to greater than 50% of cases
2. Reduce the use of postoperative Bi level positive airway pressure (BiPAP)
3. Reduce postoperative length of stay for isolated CABG patients
4. Establish a standardized multiple modal analgesic regimen for isolated CABG patients

5. What were the baseline data and the results of your initiative?

Baseline Data and Results with Statistical Significance:

1.OTE rate: The baseline OTE extubation rate prior to implementing a peri-operative multimodal analgesic regimen was 48% of isolated CABG patients (OTE 2014 n=27, Total CABG 2014 n=57). From 6/12/15 to 12/31/15, 45 patients underwent isolated CABG with 27 patients undergoing OTE (OTE rate = 60%). From 1/1/16 to 12/31/16, 72 patients underwent isolated CABG with OTE occurring in 49 patients (68%). Finally, from 1/1/17 to 12/31/17 62 patients underwent isolated CABG with OTE occurring in 47 patients (76%). There was a statistically significant increase in OTE for 2016 and 2017 compared to OTE in 2014 (Chi-squared test for 2016 vs 2014, $p=0.02$, 95% CI 3.77 to 34.8; 2017 vs 2014- $p=0.001$ 95% CI 11.41 to 42.38, please see Figure-1).

2.Postoperative BiPAP rate: In 2014 (baseline), 50% of OTE patients required postop BiPAP (14 of 27 OTE patients). In 2015, 4 of 27 OTE patients required BiPAP (14%). In 2016, 4 of 49 OTE patients required postop BiPAP (6%). Finally in 2017, 4 of 44 OTE patients required postop BiPAP (9%). Chi-squared test demonstrated a statistically significant decrease in postoperative BiPAP for OTE patients from 6/12/15-12/31/17 compared to baseline in 2014 (Chi-squared test 2014 vs 2015, $p=0.005$, 95% CI 11.13-55.6; 2014 vs 2016 $p<0.0001$, 95% CI 23.54 to 62.01, 2014 compared to 2017 $p<0.0001$, 95% CI 19.64 to 59.47, please see Figure-2)

3.Postop LOS: OTE patient's postop LOS decreased by 3 days compared to patients that did not undergo OTE (OTE Avg LOS= 5.6 days \pm 2.7 versus non-OTE Avg LOS= 9.2 days \pm 8.3, $p=0.001$, student's t-test, please see Figure-3).

4.Implementation of multimodal analgesic regimen: Preoperative IT narc administration occurred in 26% (2015), 58% (2016), and 76% (2017) of patients. Chi-squared test demonstrated an increase in IT narc administration for 2016 and 2017 versus 2015 IT (Chi-squared 2015 vs 2016 $p=0.008$, 95% , CI-13.61 to 47.03; 2015 vs 2017, $p<0.001$, 95% CI 31.34 to 63.82). Pre-operative oral Gabapentin administration increased in 2017 (88%) compared to 2016 (46%) (Chi-squared $p<0.001$, 95% CI 26.88 to 54.41). After cardiopulmonary bypass 63% (2015), 78% (2016), and 76% (2017) of patients received 1 gm of intravenous acetaminophen (Chi-squared 2015 vs 2016, $p=0.08$ 95% CI -1.5 to 31.7, 2015 vs 2017 $p=0.13$ 95% CI -3.9 to 29.9). Pre-operative IT narc administration reduced 24 hour postoperative fentanyl (24 hr fent) requirements compared to patient not receiving preoperative IT narc (24hr postop fen IT narc = 67 μg \pm 77.46 μg , 24hr postop fen No IT narc = 138.01 μg , \pm 218 μg , $p=0.004$ student t-test). The average 24 hr postop fent value for patients receiving preop GABA appears less than patients not receiving preop GABA. Student t-test fails to demonstrate statistical significance (24hr postop fen GABA= 85.15 μg , \pm 179 μg , 24 hr postop fent No GABA= 112.13 μg , \pm 133.67 $p=0.26$)

6. Describe the interventions that were instrumental in achieving the results for your initiative.

1. Setting patient expectation for OTE in preoperative surgical consultation: Previously the surgical team confined the preoperative surgical consultation/discussion strictly to the surgical procedure. Now the surgical team's (the surgeon, physician assistant, and perioperative nurse liaison) preoperative discussion includes the medications used to provide multimodal peri-operative analgesia (preop IT narc, preop GABA, and IV acetaminophen) and set the patient's expectations for OTE and early ambulation.
2. Intravenous Administration of 1 gm of Acetaminophen post cardiopulmonary bypass: Previously in 2014, we utilized preoperative oral acetaminophen along with a non-standardized general anesthetic to facilitate OTE, but patients either experienced inadequate analgesia or profound analgesia requiring BiPAP. Now (2017), post-cardiopulmonary bypass patients receive 1 gm of intravenous acetaminophen to facilitate OTE thereby reducing intraoperative narcotic administration and the use of postoperative BiPAP.
3. Preoperative Intrathecal narcotic administration: Previously, 26% of patients received pre-operative IT narc. Due to post-operative ICU nursing's observation that patients receiving preoperative IT narc administration demonstrated less of a need for post-operative narcotics, now 76% (2017) of patients receive preoperative IT narc. Preoperative IT narc administration reduces postoperative narcotic requirements and may accelerate patient ambulation.
4. Preoperative administration of oral Gabapentin: Previously, patients did not receive preoperative oral Gabapentin. After observing patients taking Gabapentin prior to CABG i.e. routine preoperative medication, demonstrated increased analgesia after OTE, we now administer preoperative Gabapentin to 88% of CABG patients.
5. Changing the culture of the ICU nursing staff to accept OTE as routine in the immediate postoperative period for CABG: In 2014, The ICU staff questioned the concept of OTE for CABG since 48% of patients required BiPAP. The above interventions have facilitated OTE in the operating room. Now, the ICU staff cares for comfortable postsurgical patients that are not over sedated. This accelerates the postoperative recovery i.e. nurses no longer focus on performing postoperative extubation and now concentrate on patient ambulation.

7. Describe the key steps required to successfully replicate this initiative throughout the region. (Please limit this description to 100 words.)

Continued endotracheal intubation into the immediate postoperative period (2-6hrs) is ingrained in cardiac surgical culture with only 2% of CABG patients undergoing OTE across the United States. Therefore to replicate our experience, programs must be receptive to change by realizing and understanding the patient benefits of OTE i.e. improved patient satisfaction, reduced postoperative length of stay, and improved patient comfort. By disseminating our experience and protocol through the Delaware

Valley Patient Safety and Quality foundation other programs will benefit from this clinical paradigm.

8. Explain how the initiative demonstrates innovation (Please limit this description to 100 words.)

Our group developed and implemented a multimodal analgesic pain regimen to accomplish OTE and decrease postoperative BiPAP use. Most cardiac programs do not incorporate preoperative IT narc administration, preoperative GABA administration, and intraoperative intravenous acetaminophen administration into clinical practice either due to time constraints or not realizing the benefits of these interventions. The STS database reports a national postoperative extubation rate of 58% for isolated CABG patients in < 6 hrs after ICU arrival. Due to OTE our program demonstrates < 6 hour extubation rate > 90% of patients.

9. How does this initiative demonstrate collaboration with other providers within the continuum of care? (Please limit this description to 100 words.)

In 2014, the ICU staff (nursing, cardiologists, and intensive care physicians) expressed concern over the benefits of OTE due to the 50% post-operative BiPAP rate as well as the challenges of controlling postoperative pain. Therefore in 2015, we met with all the above departments to present our goal and ask for their cooperation. We developed a data collection sheet to determine the effect of the above interventions and presented the data to all yearly. Now (2017), the ICU staff expects isolated CABG patients to arrive in the ICU extubated without pulmonary artery pressure monitoring thereby streamlining the postoperative recovery.

10. Explain ways in which senior leadership exhibited commitment to the initiative (Please limit this description to 100 words.)

Our institution is a member of a larger health care system. Although our program performs a modest number of cardiac surgical procedures, all surgical statistics are reviewed on a system wide level. Over time, the senior cardiac leadership not only observed our less than 6 hour extubation rate, but also our OTE rate which was greatly increased compared to the national average of 2.9%. As a result of our initiative, Senior Cardiac leadership convened a multisystem/specialty committee to develop protocols to implement a system wide OTE program to reduce postoperative length of stay and standardize peri-operative multimodal analgesic regimes.

11. Appendices (i.e., tables and graphs)

Appendices (Graphs and tables)

Figure 1:

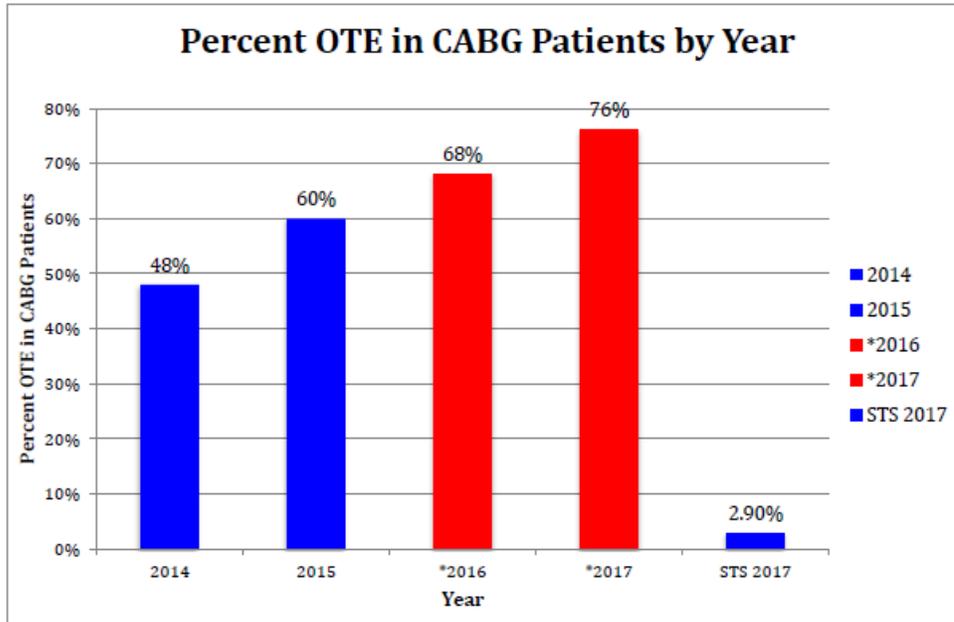


Figure 1: The x-axis represents year. The y-axis represents % of OTE in CABG patients. 2014 represents baseline- 1st year of performing OTE. For 2014 OTE =48%, n=57; For 2015 OTE=60%, n=45, p= 0.25, increase in % but not statistically significant; *2016=68%, n=72, p=0.02 statistically significant; * 2017= 76%, n=62, p=0.01. This figure depicts not only an increase over time in OTE but also a sustainable improvement in OTE over time. STS 2017- represents the national OTE as reported by the Society of Thoracic Surgeons (STS) national database (this entry displays the comparison of the OTE national average vs. our institution).

Figure 2:

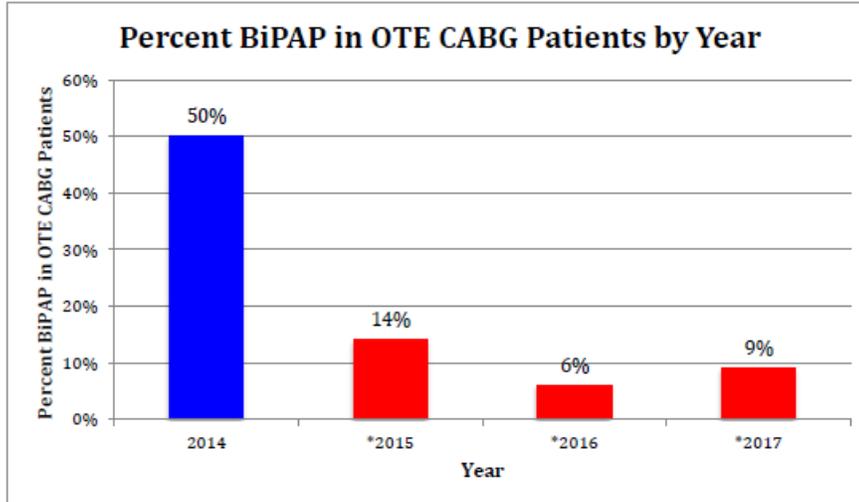


Figure 2- The x-axis represents year. The y-axis represents % of BiPAP in OTE CABG patients. 2014 represents our baseline postop BiPAP rate = 50%, n=27; 2015 represents our 1st year of intervention i.e. Intraoperative IV acetaminophen *BiPAP = 14%, n=27, p=0.0005; 2016 represents our 2nd year of intervention i.e. Preop IT narcotic and IV acetaminophen *BiPAP =6%, n=49, p<0.0001; 2017 represents our 3rd year of intervention i.e Preop oral GABA, preop IT narcotic, and IV acetaminophen *BiPAP =9%, n=44, p<.0001. The above graph depicts not only a decrease in use of postoperative BiPAP over time but also a sustainable decrease in BiPAP compared to 2014. In 2017 the decrease in postoperative BiPAP is also coupled with an increase in OTE to 76% of patients.

Figure 3:

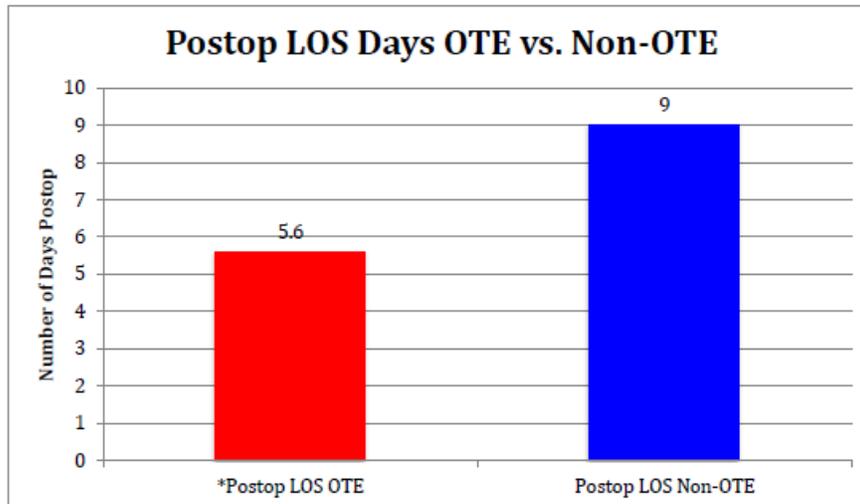


Figure 3: The x-axis represents the postop LOS for OTE and non-OTE patients. The y-axis represents number of days postop. Postop LOS decreased in the OTE patients when compared with patients that did not undergo OTE. Postop LOS OTE= 5.6, Postop LOS no OTE= 9.2 p= 0.0003.