A Quality Improvement Project Decreases Incidence of Pulmonary Embolism Following Arthroplasty

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Introduction

Venous Thromboembolism (VTE), which includes deep vein thrombosis (DVT) and pulmonary embolism (PE), is an extremely dangerous medical condition that results in high rates of morbidity and mortality.

Although not directly addressed in the 2015 Global Burden of Disease study, VTE associated with hospitalization was the leading cause of morbidity in low- and middle- income countries and the second leading cause in high-income countries.

Pulmonary embolism, the most lethal VTE variant, has a 30-day fatality rate of 4% and a 1-year fatality rate of 13%. Pulmonary embolism is especially common in hospitalized patients undergoing orthopedic surgery with an incidence ranging between 0.3% and 2%.

While prophylactic anticoagulation has been responsible for decreasing the incidence of PE following joint replacement surgery, it does not completely eliminate the risk. Other interventions, such as early ambulation and mechanical intervention, also appear to be important in minimizing the risk.

VTE associated with

- Patient morbidity and mortality
- Length of stay
- Healthcare costs
- Patient experience
- Functional outcomes (Quality of Life)

Problem/Need

At our institution, we noted that there was a high rate of pulmonary embolism in patients undergoing elective joint replacement in 2014 despite patients receiving pharmacologic prophylaxis. The goal of the study was to develop a quality improvement intervention designed to reduce the incidence of pulmonary embolism in patients undergoing elective hip and knee replacement.

Methods

This study was approved by the Institutional Review Board at Johns Hopkins Aramco Healthcare. The prospective pre-post interventional study that was designed using six sigma methodology was conducted at Johns Hopkins Aramco Healthcare. This is a 350-bed private hospital that provides healthcare to Aramco employees and their families and is a joint venture between Saudi Aramco and Johns Hopkins Medicine.

Participants

866 patients who underwent an elective total knee or total or partial hip replacement at JHAH between January 1, 2014 and March 31, 2016 were eligible for inclusion in this study. There were six different orthopedic surgeons who performed these procedures. A total of four surgeons participated with the intervention, leaving 757 patients in the analysis.

Measures

Primary Outcome: Development of pulmonary embolism following surgery

Secondary Outcome :The length of stay in the hospital

Process and Barriers

Early 2015, an interdisciplinary quality improvement team was formed to develop an initiative to reduce the incidence of pulmonary embolism following elective joint replacement surgery.

- A process map was created that identified barriers at several steps in the process.
- Challenges that were encountered were further explored by constructing an Ishikawa fishbone diagram.
- A series of interventions were then decided based upon these findings.

Interventions

An evidence-based bundle of interventions was implemented that included:

1. Completion of a risk assessment tool was required when a patient was scheduled for surgery
2. Development of a new adapted order set specifically designed for post-op hip and knee replacement surgery patients

   Standardization of dose and duration of anticoagulant pharmacotherapy
   Starting patients on physical therapy twice daily on post-op day one and encouraging them to begin ambulating on post-op day zero if they could

5. Increase the wearing of TED (thromboembolism deterrent) stockings. All sizes of TED stockings were made available. Requirement that (Sequential compression device) SCDs be worn in the pre-op day surgery unit and the post-anesthesia care unit (PACU).

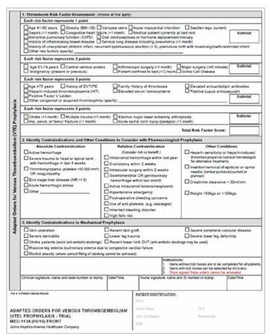
Analysis

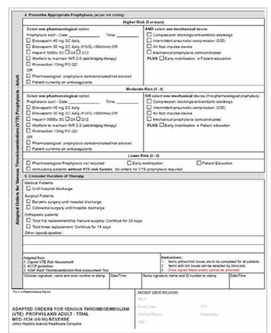
Statistical analysis was performed using STATA 12 (Stata Corp, College Station, Texas, USA). A p-value of ≤0.05 was considered statistically significant.

The chi-square test and analysis of variance were used to compare the baseline characteristics for patients in two groups: patients before the intervention and patients after the intervention.

The chi-square test was used to compare the incidence of pulmonary embolism before and after the intervention.

All predictor variables were included in the multivariate analysis.





Results

Primary Outcome

757 lower extremity joint replacement surgeries were included in the study.

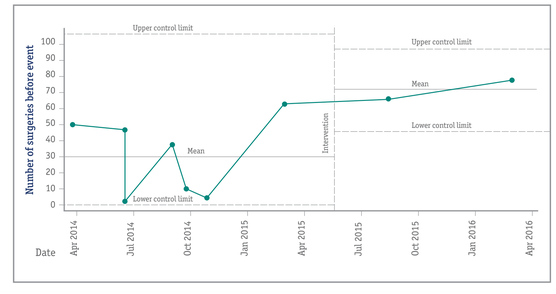
- 15 PEs diagnosed (2.0%)
- 13 PEs prior to intervention (2.8%)
- 2 PEs after intervention (0.7%)

Study found a statistically significant decrease in PE incidence (2.8% vs. 0.7%; p=0.044).

And there have been no PEs following the intervention

Secondary Outcome

Patients with PE had a longer length of stay (14.4 vs. 5.3;p=0.00)
No major bleeding events were reported in the patient population



Conclusions

The quality improvement project was successful in reducing the incidence of PE following arthroplasty. Due to the success of the risk assessment and adapted order forms that were used, these have been tailored and implemented for all adult services in JHAH. A process has been implemented to review form compliance. This study resulted in VTE compliance for CBAHI accreditation.

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