**Topic:** Quality Improvement Initiative

**Title:** Real World Experience with Metric #37: Retrospective analysis of Post PCI bleeding rates in a statewide healthcare system.

**Authors:** Andrea Price RCIS MS, Christina Comito RN BSN, Roxanne Kovacs RN MSN, & Elisabeth von der Lohe MD., FACC, FSCAI

**Affiliations:** IU Health & Indiana University School of Medicine; Indianapolis, Indiana

Metric #37, Risk Adjusted Bleeding, defines bleeding as: Any of the following occurring within 72 h after PCI or before hospital discharge (whichever occurs first): site-reported arterial access site bleeding, which may be either external or a hematoma >10 cm for femoral access, >5 cm for brachial access, or >2 cm for radial access; retroperitoneal, gastrointestinal, or genitourinary bleeding; intracranial hemorrhage; cardiac tamponade; post-procedure hemoglobin decrease of 3 g/dl in patients with a pre-procedure hemoglobin level <=16 g/dl; or post-procedure nonbypass surgery-related blood transfusion for patients with a pre-procedure hemoglobin level >=8 g/dl.

**Summary Statement:**
Initial observed performance outcomes at IU Health’s largest institution, Methodist Hospital, were greater than desired for our post PCI risk adjusted bleeding events. As our quality improvement team began to look at our individual patients that were classified as a bleeding event in Metric #37, we found unexpected local trends in our 2011 data. Frail elderly women were not the majority of our observed post PCI bleeding events; this population accounted for approximately 12% of our post PCI bleeding event. Males under the age of 70 were over 50% of our post PCI bleeding events. We also observed that over 22% of our post procedural bleeding events reported radial/ulnar access sites; this was also an unexpected observation. Our greatest opportunities for improvement were with blood transfusions and hemoglobin decreases greater than 3 gm. This discovery was unexpected and didn’t align with published research / national trends. In an effort to improve safety we undertook a retrospective review to understand why our bleeding rates were higher than expected.

**Abstract:**
Indiana University Health is a 17 facility system in which 9 sites report CathPCI Registry® procedures to the National Cardiovascular Data Registry (NCDR®). When reviewing the system results for Metric 37, our institutional bleeding rates exceeded the CathPCI Registry 90th Percentile of 1.61% at all 9 sites and the CathPCI Registry 50th Percentile of 3.67% at 7 of the 9 locations. The team analyzed 3,701 patients within our health system who had PCI procedures in 2012. Variables were analyzed to best replicate those in the NCDR CathPCI registry, Metric 37. Among the multiple variables analyzed, major surgery during the same episode of care as the PCI (t(78) = 3.73, p=0.000) was statistically significant. Of the bleeding, 53% occurred in males. Four anticoagulation therapies were independently analyzed and only two were found to be statistically significant – Bivalirudin and IIBIlla.

Approximately one half of the bleeding events by definition were attributed to patients who received RBC transfusion. Of that subset, 58.7% (37/63) were anemic at the time of transfusion without evidence of any overt bleeding. In the statewide analysis, 67% (63/94) of the RBC transfusions were not associated with a hemoglobin drop or other defined bleeding event. Of those 63 patients, 28 patients or 44% of the patients were reported as having a ‘major surgery’ during the same episode of care as the PCI.

Further analysis revealed that 86.6% of the observed bleeding events were attributed to transfusion and/or an observed hemoglobin decrease of ≥ 3 gm, not attributed to a specific anatomic location according to the patient’s record. Our institutional guidelines recommend a hemoglobin trigger of an Hgb < 8 g/l for RBC transfusion. The statewide data analysis showed that 44% of the RBC transfusions were completed with the pre-transfusion greater than 8 gm.

**Conclusions:**
Our quality improvement team found physician and leadership education was the best approach to change our post PCI bleeding rates. Historically, vascular injury was how most physicians and clinicians classified post PCI bleeding. The total
observed bleeding events, as defined by Metric #37, was an educational opportunity that had to occur before performance could be improved.

Prior to our project, it was thought that transitioning access site utilization to radial would decrease the post PCI bleeding rates. Our Lean Six Sigma project revealed that approximately 10% of the bleeding rates were access site related. Our greatest areas to improve were in the areas of RBC transfusions and hemoglobin decreases. Combined these areas accounted for 86% of the observed bleeding events. We developed physician specific slides to demonstrate the difference between PCI vascular injuries and post PCI bleeding events. This visual demonstrated the difference of the PCI ‘cause and effect’ vascular injury metric to the ‘observed events’ for Metric #37.

The second area that we undertook to improve our post PCI bleeding rates was RBC transfusion. We compared our reported hemoglobin at transfusion to those our organizational RBC transfusion guidelines and found a large opportunity for improvement. 41/93 RBC transfusion post PCI occurred when reported hemoglobin values were above 8 grams. Our 2012 physician specific scorecards included individual performance for adherence to the RBC transfusion guidelines. After the distribution of the physician specific scorecards, we observed an overall decrease in RBC transfusion at Methodist. Our entire PCI population observed a 36% decrease in post PCI transfusion (2012=73, 2013= 47). There was a 75% decrease in patient transfused when their hemoglobin values were greater than 8 grams (2012=28, 2013=7).

The raw number of post PCI bleeding events continues to decrease at Methodist Hospital. Preliminary performance illustrates a 50% decrease in events from CY2012 compared to CY2013 (2012= 96, 2013= 48 prelim). In addition, we continue to observe improvement in our Risk Adjusted Bleeding performance: CY2011= 6.51%, CY 2012= 5.84%, Q3 2013= 3.37% (Q3 2013 performance includes metric adjudication).

Significant process improvements and transparencies have changed the way post PCI care is provided. Future opportunities to continue our performance improvement have been identified for Metric #37. Our quality improvement team is currently developing an anticoagulation algorithm and investigating causes for the unexplained hemoglobin decreases post PCI.