



Blue Cross Blue Shield of Michigan Cardiovascular Consortium (BMC2) – Bibliography

<http://www.bmc2.org/>

1: J Am Coll Cardiol. 2008 Feb 5;51(5):529-35.

The relative safety and efficacy of abciximab and eptifibatide in patients undergoing primary percutaneous coronary intervention: insights from a large regional registry of contemporary percutaneous coronary intervention.

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OBJECTIVES: This study sought to assess whether the use of eptifibatide instead of abciximab is associated with a difference in outcomes of patients undergoing primary percutaneous coronary intervention (PCI) for ST-segment elevation myocardial infarction (STEMI). **BACKGROUND:** Pooled data from randomized controlled trials suggest that the use of abciximab may be associated with a survival advantage in patients undergoing primary PCI for acute STEMI. However, a large proportion of patients in the community are treated with eptifibatide, an agent that shares some but not all pharmacological properties with abciximab. **METHODS:** We evaluated the outcomes of 3,541 patients who underwent primary PCI for STEMI from October 2002 to July 2006 in a large regional consortium and who were treated with abciximab (n = 729) or with eptifibatide (n = 2,812). **RESULTS:** There was no difference in the incidence of in-hospital death (4.1% with abciximab vs. 3.5% with eptifibatide, p = 0.39), recurrent myocardial infarction (0.8% vs. 1.2%, p = 0.42), or stroke/transient ischemic attack (0.7% vs. 0.6%, p = 0.80). There was no difference in the need for blood transfusion (12.4% vs. 11.7%, p = 0.61), whereas there was a greater incidence of gastrointestinal bleeding with abciximab (4.8% vs. 2.8%, p = 0.01). In parsimonious risk-adjusted models, no significant difference between abciximab and eptifibatide was observed with respect to any of the outcomes measures. **CONCLUSIONS:** Currently, eptifibatide is used as the adjunct antiplatelet agent in the majority of patients undergoing primary PCI. There is no apparent difference in early outcomes of patients treated with eptifibatide compared with patients treated with abciximab.

PMID: 18237680 [PubMed - indexed for MEDLINE]

2: Clin Cardiol. 2007 Oct;30(10 Suppl 2):II49-56.

Blood transfusion and in-hospital outcomes in anemic patients with myocardial infarction undergoing percutaneous coronary intervention.

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Studies have shown poor prognostic implications of anemia in patients with myocardial infarction (MI) and in patients undergoing percutaneous coronary intervention (PCI). The impact of blood transfusion in these populations remains controversial. The objective of this study was to examine the effect of transfusion on in-hospital mortality in anemic patients undergoing PCI for MI. Data from 67,051 PCIs (June 1, 1997 to January 31, 2004) were prospectively collected in a multicenter registry (Blue Cross Blue Shield of Michigan Cardiovascular Consortium). Of these, 4,623 patients who were classified as anemic according to the World Health Organization criteria underwent PCI within 7 days of presentation with acute MI. A propensity score for being transfused was estimated for each patient, and propensity matching and a prediction model for in-hospital death were developed. The average age was 67.8 years, 57.7% of patients were men, and 22.3% of patients received a transfusion during hospitalization. Transfused patients, compared to nontransfused patients, were more likely to be older, female, have lower preprocedure hemoglobin levels, more comorbidities, and a higher unadjusted in-hospital mortality rate (14.52% vs. 3.01%, $p < 0.0001$). After adjustment for comorbidities and propensity for transfusion, blood transfusion was associated with a higher risk of in-hospital mortality (adjusted odds ratio = 2.02, 95% confidence interval 1.47-2.79, $p < 0.0001$). In anemic patients undergoing PCI for MI, transfusion was associated with an increased crude and adjusted rate of in-hospital mortality. A randomized controlled trial is needed to determine the value of transfusion and the ideal transfusion criteria.

PMID: 18228652 [PubMed - indexed for MEDLINE]

3: J Interv Cardiol. 2007 Jun;20(3):197-203.

Temporal trends, safety, and efficacy of bivalirudin in elective percutaneous coronary intervention: insights from the Blue Cross Blue Shield of Michigan Cardiovascular Consortium.

Gurm HS, Smith DE, Chetcuti SJ, Share D, Khanal S, Riba A, Carter AJ, Lalonde T, Kline-Rogers E, O'Donnell M, O'Neill W, Safian R, Moscucci M; Blue Cross Blue Shield of Michigan Cardiovascular Consortium (BMC2). University of Michigan, Ann Arbor, MI 48103-0311, USA.

OBJECTIVE: To evaluate the safety and efficacy of bivalirudin based therapy among patients undergoing percutaneous coronary intervention (PCI) for stable coronary artery disease in a large multicenter registry. **BACKGROUND:** The REPLACE I trial demonstrated the non-inferiority of a strategy of bivalirudin compared with heparin and glycoprotein (GP) IIb/IIIa inhibition in patients undergoing PCI. There is a paucity of outcome data with bivalirudin use in the setting of real-world PCI practice. **METHODS:** We evaluated the outcome of 11,719 patients who underwent elective PCI for stable coronary artery disease (CAD) from 2002 to 2004 in a large regional consortium, and who were treated with bivalirudin ($n = 2051$) or with heparin and GP IIb/IIIa inhibitors ($n = 9,668$). The primary endpoints were transfusion and in-hospital major adverse cardiovascular events (MACE) defined as the composite of death, MI, stroke, and any coronary artery bypass grafting (CABG) or target lesion revascularization. **RESULTS:** Compared with patients who received heparin plus GP IIb/IIIa inhibitors, patients who received bivalirudin had a similar incidence of post-procedural MI, stroke, in-hospital death, MACE (2.88 vs. 2.48, $P = 0.30$), or transfusion (2.83% vs. 2.41%, $P = 0.27$). Patients at greater risk of bleeding were more likely to be treated with bivalirudin. After adjusting for the propensity to receive bivalirudin and for baseline comorbidities, there was no difference in the odds of MACE or the need for transfusion between the two groups. **CONCLUSION:** Compared with heparin plus GP IIb/IIIa inhibition, use of bivalirudin in patients undergoing PCI for stable CAD is associated with similar ischemic and bleeding complications. Given the ease of administration and lower cost, bivalirudin provides an attractive treatment option in this patient population.

PMID: 17524111 [PubMed - indexed for MEDLINE]

4: Crit Care Nurse. 2006 Dec;26(6):38-45; quiz 46.

Decreasing vascular complications after percutaneous coronary interventions: partnering to improve outcomes.

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PMID: 17123950 [PubMed - indexed for MEDLINE]

5: Circulation. 2006 Feb 14;113(6):814-22. Epub 2006 Feb 6.

Comment in:

Circulation. 2006 Feb 14;113(6):767-70.

Association of a continuous quality improvement initiative with practice and outcome variations of contemporary percutaneous coronary interventions.

Moscucci M, Rogers EK, Montoye C, Smith DE, Share D, O'Donnell M, Maxwell-Eward A, Meengs WL, De Franco AC, Patel K, McNamara R, McGinnity JG, Jani SM, Khanal S, Eagle KA. Division of Cardiology, Blue Cross Blue Shield of Michigan Cardiovascular Consortium Coordinating Center, University of Michigan, Ann Arbor, Michigan, USA.

BACKGROUND: The objective of this study was to evaluate the association of a continuous quality improvement program with practice and outcome variations of percutaneous coronary intervention (PCI). METHODS AND RESULTS: Data on consecutive PCI were collected in a consortium of 5 hospitals; 3731 PCIs reflected care provided at baseline (January 1, 1998, to December 31, 1998), and 5901 PCIs reflected care provided after implementation of a continuous quality improvement intervention (January 1, 2002, to December 31, 2002). The intervention included feedback on outcomes, working group meetings, site visits, selection of quality indicators, and use of bedside tools for quality improvement and risk assessment. Postintervention data were compared with baseline and with 10,287 PCIs from 7 hospitals added to the consortium in 2002. Quality indicators included use of preprocedural aspirin or clopidogrel, use of glycoprotein IIb/IIIa receptor blockers and postprocedural heparin, and amount of contrast media per case. Outcomes selected included emergency CABG, contrast nephropathy, myocardial infarction, stroke, transfusion, and in-hospital death. Compared with baseline and the control group, the intervention group at follow-up had higher use of preprocedural aspirin and glycoprotein IIb/IIIa blockers, lower use of postprocedural heparin, and a lower amount of contrast media per case ($P < 0.05$). These changes were associated with lower rates of transfusions, vascular complications, contrast nephropathy, stroke, transient ischemic attack, and combined end points (all $P < 0.05$). CONCLUSIONS: Our nonrandomized, observational data suggest that implementation of a regional continuous quality improvement program appears to be associated with enhanced adherence to quality indicators and improved outcomes of PCI. A randomized clinical trial is needed to determine whether this is a "causal" or a "casual" relationship.

PMID: 16461821 [PubMed - indexed for MEDLINE]

6: Am Heart J. 2005 Sep;150(3):455-8.

Incidence, risk factors, and prognosis of in-hospital heart failure after percutaneous coronary intervention: insight from the Blue Cross Blue Shield of Michigan Cardiovascular Consortium (BMC2).

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BACKGROUND: Prior history of heart failure (HF) has been shown to be a predictor of poor outcomes after percutaneous coronary intervention (PCI). Clinical predictors of the development of in-hospital HF and its prognostic significance after PCI have yet to be defined. In this study, we sought to identify the incidence, risk factors, and prognosis of in-hospital HF after PCI. **METHODS:** Using a contemporary registry of consecutive PCIs, the incidence of HF after PCI was identified. Multivariate logistic regression analysis was used to determine predictors of the development of HF after PCI as well as the impact of HF on in-hospital mortality. **RESULTS:** The incidence of HF after PCI in the overall patient population was 1.4%. Independent predictors of HF were female sex, age \geq 60 years, exceeding a maximum weight- and creatinine-adjusted contrast dose, diabetes, prior HF, prior gastrointestinal bleeding, prior chronic obstructive pulmonary disease, history of atrial fibrillation, American College of Cardiology type B2 or C vessel, emergency PCI, ejection fraction $<$ 50%, myocardial infarction with or without cardiogenic shock, and repeat angiography. After adjustment for comorbidities, the development of HF was independently associated with an increased risk of in-hospital death (adjusted OR 2.48, 95% CI 1.77-3.48). **CONCLUSIONS:** The development of HF is a relatively uncommon occurrence after PCI and is associated with a poor prognosis. The identification of risk factors for HF could foster the development of interventions aimed toward its prevention in high-risk patients.

PMID: 16169323 [PubMed - indexed for MEDLINE]

7: Circulation. 2004 Jul 20;110(3):271-7. Epub 2004 Jun 28.

Comment in:

Circulation. 2005 Apr 26;111(16):e263-4; author reply e263-4.

Prognostic implication of anemia on in-hospital outcomes after percutaneous coronary intervention.

McKechnie RS, Smith D, Montoye C, Kline-Rogers E, O'Donnell MJ, DeFranco AC, Meengs WL, McNamara R, McGinnity JG, Patel K, Share D, Riba A, Khanal S, Moscucci M; Blue Cross Blue Shield of Michigan Cardiovascular Consortium (BMC2). Blue Cross Blue Shield of Michigan Cardiovascular Consortium (BMC2), USA.

BACKGROUND: Although prior studies have shown a relationship between anemia and in-hospital mortality after coronary artery bypass grafting and acute myocardial infarction (MI), the prognostic implication of anemia in patients undergoing percutaneous coronary intervention (PCI) is unknown. Therefore, we evaluated the relationship between anemia and outcomes of PCI. **METHODS AND RESULTS:** Clinical and outcome data on 48,851 consecutive PCIs were prospectively collected. Patients were classified as anemic using the World Health Organization definition ($<$ 12.0 g/dL in women and $<$ 13.0 g/dL in men). A total of 6471 men (21.7%) and 4659 women (30.4%) were anemic. Anemic men and women were older and had a higher percentage of comorbidities compared with their nonanemic cohorts ($P <$ 0.0001 for all comparisons). When compared with nonanemic patients, anemic patients had higher in-hospital mortality (3.0% versus

0.8% in men; 2.4% versus 1.5% in women; $P < 0.0001$) and postprocedural MI (2.0% versus 1.6% in men; 2.4% versus 1.6% in women; $P < 0.02$) and a higher combined major cardiovascular events end point, including death, MI, and cerebrovascular event (5.0% versus 2.6% in men; 5.1% versus 3.5% in women; $P < 0.0001$). After adjustment for comorbidities, anemia was associated with a higher risk of in-hospital mortality (odds ratio [OR], 2.29; 95% CI, 1.79 to 2.92; $P < 0.0001$) and MI (OR, 1.34; 95% CI, 1.05 to 1.72; $P = 0.02$) and major cardiovascular events (OR, 1.2; 95% CI, 1.05 to 1.34). Significant gender interactions were observed for death in men and for MI in women. CONCLUSIONS: Preprocedural anemia is associated with increased adverse in-hospital outcomes after PCI. Whether optimization of hemoglobin before PCI is of clinical benefit will need to be determined in a randomized clinical trial.

PMID: 15226214 [PubMed - indexed for MEDLINE]

8: Am J Cardiol. 2003 Oct 15;92(8):972-4.

Impact of extracardiac vascular disease on acute prognosis in patients who undergo percutaneous coronary interventions (data from the Blue Cross & Blue Shield of Michigan Cardiovascular Consortium [BMC2]).

Mukherjee D, Eagle KA, Smith DE, Kline-Rogers EM, Chetcuti S, Grossman PM, Nallamothu B, O'Donnell M, DeFranco A, Maxwell-Eward A, McGinnity J, Meengs WM, Patel K, Moscucci M; Blue Cross & Blue Shield of Michigan Cardiovascular Consortium (BMC2). University of Michigan Health System, Ann Arbor, Michigan, USA.

Extracardiac vascular disease is associated with an increased risk of in-hospital mortality and other complications after coronary interventions, independent from other co-morbidities and baseline characteristics. The underlying cause of this significant association is unclear, but it warrants further investigation in an attempt to improve outcome in this high-risk cohort.

PMID: 14556876 [PubMed - indexed for MEDLINE]

9: Am J Cardiol. 2003 Oct 15;92(8):967-9.

Frequency and prognosis of emergency coronary artery bypass grafting after percutaneous coronary intervention for acute myocardial infarction.

Moscucci M, O'Donnell M, Share D, Maxwell-Eward A, Kline-Rogers E, De Franco AC, Meengs WL, Clark VL, McGinnity JG, De Gregorio M, Patel K, Eagle KA. University of Michigan, Division of Cardiology, Blue Cross Blue Shield of Michigan Cardiovascular Consortium Coordinating Center, Ann Arbor, Michigan, USA.

We evaluated the frequency and prognosis of emergency coronary artery bypass grafting (CABG) after percutaneous coronary intervention (PCI) for acute myocardial infarction in a large, multicenter registry of contemporary PCI. In this study, emergency CABG occurred in 2% of cases, and was associated with high in-hospital mortality (20%) and with a high incidence of stroke (8%), renal failure requiring dialysis (8.3%), and bleeding (63.3%).

PMID: 14556874 [PubMed - indexed for MEDLINE]

10: Am J Cardiol. 2002 Nov 15;90(10):1068-73.

Nephropathy requiring dialysis after percutaneous coronary intervention and the critical role of an adjusted contrast dose.

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This study was undertaken to determine the incidence, risk factors, and in-hospital outcome of nephropathy requiring dialysis (NRD) after percutaneous coronary intervention (PCI), and to evaluate the role of a weight- and creatinine-adjusted maximum radiographic contrast dose (MRCD) on NRD. Data were obtained from a registry of 16,592 PCIs. The data were divided into development and test sets. Univariate predictors were identified and a multivariate logistic regression model was developed. The MRCD was calculated for each patient as: $MRCD = 5 \text{ ml} \times \text{body weight (kilograms)} / \text{serum creatinine (milligrams per deciliter)}$. Predictive accuracy was assessed by receiver-operating characteristic curve analysis. In the development set, 41 patients (0.44%) developed NRD with a subsequent in-hospital mortality rate of 39.0%. NRD increased with worsening baseline renal dysfunction. Other risk factors included peripheral vascular disease, diabetes mellitus, congestive heart failure, and cardiogenic shock. There was a direct relation between the number of risk factors and NRD. After adjustment for baseline risk factors, MRCD was the strongest independent predictor of NRD (adjusted odds ratio 6.2, 95% confidence interval 3.0 to 12.8). NRD and in-hospital mortality were both significantly higher in patients who exceeded the MRCD compared with patients who did not ($p < 0.001$). In conclusion, NRD following PCI is a rare complication with a poor prognosis. Baseline clinical characteristics identify patients at greatest risk for NRD. Optimization of procedural variables such as timing of the intervention relative to the diagnostic catheterization, staging coronary procedures, or dosing within the MRCD may help reduce the risk of this complication in high-risk patients. A risk prediction tool for NRD with guidelines for prevention is presented.

PMID: 12423705 [PubMed - indexed for MEDLINE]

11: J Interv Cardiol. 2002 Oct;15(5):387-92.

Development of a multicenter interventional cardiology database: the Blue Cross Blue Shield of Michigan Cardiovascular Consortium (BMC2) experience.

Kline-Rogers E, Share D, Bondie D, Rogers B, Karavite D, Kanten S, Wren P, Bodurka C, Fisk C, McGinnity J, Wright S, Fox S, Eagle KA, Moscucci M; Blue Cross Blue Shield of Michigan Cardiovascular Consortium (BMC2). University of Michigan, Division of Cardiology, Blue Cross Blue Shield of Michigan Cardiovascular Consortium Coordinating Center, Ann Arbor, Michigan, USA.

The technical challenges in the development of a quality-controlled registry of percutaneous coronary interventions (PCIs) are currently unknown. This article describes the authors' experience in the development of a regional, quality-controlled PCI registry. In 1996, 16 centers in Michigan were invited to participate in a multicenter PCI registry. Nine centers agreed to a pilot data collection and, as of July 2001, eight centers are still actively collecting data. An Oracle database was developed by the coordinating center. A common data collection form and a standard set of definitions were agreed on during several meetings. Data validity was insured through review of each form by a trained nurse, by automatic database diagnostic routines, and by site visits that included a review of the catheterization laboratory logs and a review of

randomly selected charts. The average number of forms requiring query resolution was 33% in 1997 (range 7-76%), and it decreased to 5% in 1999 (range 1.4-10%). The most commonly queried variables were outcomes prior to discharge, lesion category, lesion complexity, date of birth, device used, gender, postprocedural percent stenosis, presence of left main disease, and MI date. Invalid dates, identification of the doctor, the presence of duplicate forms, and of duplicate outcomes were additional common queries generated by the internal diagnostic routines. In conclusion, the number of queries and diagnostic reports generated in the database suggests that the development of a quality-controlled PCI registry requires the institution of a careful diagnostic and data quality assessment system.

PMID: 12440182 [PubMed - indexed for MEDLINE]

12: J Interv Cardiol. 2002 Oct;15(5):381-6.

The Blue Cross Blue Shield of Michigan Cardiovascular Consortium (BMC2) collaborative quality improvement initiative in percutaneous coronary interventions.

Moscucci M, Share D, Kline-Rogers E, O'Donnell M, Maxwell-Eward A, Meengs WL, Clark VL, Kraft P, De Franco AC, Chambers JL, Patel K, McGinnity JG, Eagle KA; Blue Cross Blue Shield of Michigan Cardiovascular Consortium (BMC2). University of Michigan, Division of Cardiology, Blue Cross Blue Shield of Michigan Cardiovascular Consortium Coordinating Center, Ann Arbor, Michigan, USA.

The past decade has been characterized by increased scrutiny of outcomes of surgical and percutaneous coronary interventions (PCIs). This increased scrutiny has led to the development of regional, state, and national databases for outcome assessment and for public reporting. This report describes the initial development of a regional, collaborative, cardiovascular consortium and the progress made so far by this collaborative group. In 1997, a group of hospitals in the state Michigan agreed to create a regional collaborative consortium for the development of a quality improvement program in interventional cardiology. The project included the creation of a comprehensive database of PCIs to be used for risk assessment, feedback on absolute and risk-adjusted outcomes, and sharing of information. To date, information from nearly 20,000 PCIs have been collected. A risk prediction tool for death in the hospital and additional risk prediction tools for other outcomes have been developed from the data collected, and are currently used by the participating centers for risk assessment and for quality improvement. As the project enters into year 5, the participating centers are deeply engaged in the quality improvement phase, and expansion to a total of 17 hospitals with active PCI programs is in process. In conclusion, the Blue Cross Blue Shield of Michigan Cardiovascular Consortium is an example of a regional collaborative effort to assess and improve quality of care and outcomes that overcome the barriers of traditional market and academic competition.

PMID: 12440181 [PubMed - indexed for MEDLINE]

13: Circulation. 2001 Jul 17;104(3):263-8.

Simple bedside additive tool for prediction of in-hospital mortality after percutaneous coronary interventions.

Moscucci M, Kline-Rogers E, Share D, O'Donnell M, Maxwell-Eward A, Meengs WL, Kraft P, DeFranco AC, Chambers JL, Patel K, McGinnity JG, Eagle KA. Division of Cardiology, University of Michigan, Blue Cross Blue Shield of Michigan Cardiovascular Consortium Coordinating Center, Ann Arbor, USA.

BACKGROUND: Risk-adjustment models for percutaneous coronary intervention (PCI) mortality have been recently reported, but application in bedside prediction of prognosis for individual patients remains untested. **METHODS AND RESULTS:** Between July 1, 1997 and September 30, 1999, 10 796 consecutive procedures were performed in a consortium of 8 hospitals. Predictors of in-hospital mortality were identified by use of multivariate logistic regression analysis. The final model was validated by use of the bootstrap technique. Additional validation was performed on an independent data set of 5863 consecutive procedures performed between October 1, 1999, and August 30, 2000. An additive risk-prediction score was developed by rounding coefficients of the logistic regression model to the closest half-integer, and a visual bedside tool for the prediction of individual patient prognosis was developed. In this patient population, the in-hospital mortality rate was 1.6%. Multivariate regression analysis identified acute myocardial infarction, cardiogenic shock, history of cardiac arrest, renal insufficiency, low ejection fraction, peripheral vascular disease, lesion characteristics, female sex, and advanced age as independent predictors of death. The model had excellent discrimination (area under the receiver operating characteristic curve, 0.90) and was accurate for prediction of mortality among different subgroups. Near-perfect correlation existed between calculated scores and observed mortality, with higher scores associated with higher mortality. **CONCLUSIONS:** Accurate predictions of individual patient risk of mortality associated with PCI can be achieved with a simple bedside tool. These predictions could be used during discussions of prognosis before and after PCI.

PMID: 11457742 [PubMed - indexed for MEDLINE]