

**Supplemental Table A: Standardized Differences, Before and After Propensity Adjustment, of Patient Characteristics before and after Introduction of Pre-procedural Risk Stratification**

| Variable                                  | Before Propensity Adjustment | After Propensity Adjustment |
|---|------------------------------|-----------------------------|
| Age                                       | 6.4582                       | 1.29411                     |
| Female Gender                             | 4.0245                       | 0.21122                     |
| African American Race                     | 5.3979                       | 1.80483                     |
| Asian Race                                | 5.9742                       | 1.44808                     |
| American Indian Race                      | 1.7353                       | 3.97328                     |
| Native Hawaiian Race                      | 3.2039                       | 2.33608                     |
| Hispanic Ethnicity                        | 1.1272                       | 1.31588                     |
| Hypertension                              | 1.3091                       | 0.91128                     |
| Dyslipidemia                              | 7.3529                       | 1.39768                     |
| Family History of Coronary Artery Disease | 3.4584                       | 1.54131                     |
| Prior Myocardial Infarction               | 7.4549                       | 0.66733                     |
| Prior Heart Failure                       | 4.8938                       | 1.81104                     |
| Heart Failure within past 2 weeks         | 3.1151                       | 0.78834                     |
| Prior Valve Surgery                       | 2.3088                       | 4.30912                     |
| Prior PCI                                 | 1.9812                       | 1.48142                     |
| Prior CABG                                | 4.7856                       | 1.99125                     |
| Height                                    | 1.7979                       | 0.32223                     |
| Weight                                    | 2.1939                       | 1.35687                     |
| Current Dialysis                          | 0.0497                       | 0.45047                     |
| Prior Cerebrovascular Disease             | 4.1357                       | 0.94469                     |
| Prior PAD                                 | 9.4330                       | 0.05784                     |
| Chronic Lung Disease                      | 5.5473                       | 0.55400                     |
| Diabetes                                  | 1.5838                       | 0.74659                     |
| Admission from Emergency Room             | 15.6671                      | 2.99343                     |
| Transfer from Another Hospital            | 28.6971                      | 6.76053                     |
| No Insurance                              | 9.0444                       | 0.90805                     |

| <b>Variable</b>                                      | <b>Before<br/>Propensity<br/>Adjustment</b> | <b>After<br/>Propensity<br/>Adjustment</b> |
|--|---|--|
| Outpatient Converted to Inpatient Admission          | 12.6127                                     | 1.89299                                    |
| Inpatient Admission                                  | 19.2155                                     | 3.61617                                    |
| Cardiomyopathy/Left Ventricular Systolic Dysfunction | 5.3731                                      | 0.50226                                    |
| Cardiogenic Shock prior to PCI                       | 3.3159                                      | 2.54073                                    |
| Cardiac Arrest prior to PCI                          | 1.1786                                      | 0.58991                                    |
| Pre-procedural Stress Test Performed                 | 15.7296                                     | 1.28039                                    |
| Symptoms Unlikely to be Ischemic                     | 7.6312                                      | 4.30579                                    |
| Stable Angina  | 1.7150                                      | 3.20338                                    |
| Unstable Angina                                      | 13.7135                                     | 0.76585                                    |
| Non-ST Elevation MI                                  | 11.4291                                     | 4.95007                                    |
| Canadian Cardiovascular Society Class = I            | 16.1967                                     | 1.58124                                    |
| Canadian Cardiovascular Society Class = II           | 8.6447                                      | 0.16964                                    |
| Canadian Cardiovascular Society Class = III          | 3.4534                                      | 1.87419                                    |
| Canadian Cardiovascular Society Class = IV           | 2.7176                                      | 3.06949                                    |
| Diagnostic coronary Angiography                      | 14.3341                                     | 5.67367                                    |
| Other Procedure Performed in Conjunction with PCI    | 9.2267                                      | 2.93512                                    |
| PCI in Setting of STEMI in Stable Patient            | 14.8796                                     | 4.59098                                    |
| PCI for NSTEMI/Unstable Angina                       | 3.2138                                      | 0.97905                                    |
| Elective/other PCI                                   | 7.9240                                      | 3.21576                                    |
| Pre-procedural hemoglobin                            | 3.5691                                      | 0.69007                                    |
| Logarithm of Glomerular Filtration Rate              | 2.1713                                      | 1.87479                                    |
| Logarithm of Risk for Restenosis with BMS            | 1.1668                                      | 1.90761                                    |
| Logarithm of Predicted Bleeding Risk                 | 5.0187                                      | 1.16717                                    |

**Supplemental Table B: Site Implementation and Data Capture**

| Site      | Pre-PRISM<br>Observation (mo.) | PRISM<br>Go-Live Date | Break-in Period<br>(mo.) | Post-PRISM<br>Observation (mo.) |
|-----------|--------------------------------|-----------------------|--------------------------|---------------------------------|
| A         | 12                             | 3/24/10               | 1.0                      | 12.0                            |
| B         | 12                             | 7/20/10               | 3.7                      | 12.0                            |
| C         | 12                             | 10/20/10              | 3.1                      | 9.3                             |
| D         | 12                             | 11/10/10              | 3.2                      | 10.4                            |
| E         | 12                             | 12/9/10               | 2.1                      | 10.6                            |
| F         | 12                             | 1/26/11               | 1.4                      | 7.7                             |
| G         | 12                             | 1/27/11               | 1.3                      | 9.8                             |
| H         | 12                             | 2/24/11               | 1.8                      | 8.4                             |
| I         | 12                             | 5/5/11                | 1.3                      | 4.6                             |
| All sites | 12                             |                       | 2.1 ± 1.0                | 9.4 ± 2.3                       |

**Supplemental Table C: Changes in the Use of Alternative Anti-coagulants at the time of PCI Before and After Prospective Risk-stratification**

|   | Study Hospitals |                |                     |         |                                  | Control Hospitals   | PRISM Effect Corrected for Controls |         |
|---|-----------------|----------------|---------------------|---------|----------------------------------|---------------------|-------------------------------------|---------|
|   | Pre-PRISM Use   | Post-PRISM Use | Odds Ratio (95% CI) | P-value | PRISM x Risk Interaction P-value | Odds Ratio (95% CI) | Odds Ratio (95% CI)                 | P-value |
| <i>Unfractionated heparin use</i>       |                 |                |                     |         |                                  |                     |                                     |         |
| Overall                                 | 69.9%           | 69.8%          | 0.99 (0.82, 1.21)   | 0.95    | 0.05                             | 0.98 (0.93, 1.03)   | 1.02 (0.83, 1.25)                   | 0.87    |
| By bleeding risk                        |                 |                |                     |         |                                  |                     |                                     |         |
| Low                                     | 67.4%           | 70.5%          | 1.15 (0.89, 1.49)   | 0.27    |                                  | 0.99 (0.93, 1.06)   | 1.16 (0.89, 1.51)                   | 0.27    |
| Mod/high                                | 70.8%           | 69.1%          | 0.92 (0.74, 1.14)   | 0.44    |                                  | 0.98 (0.93, 1.04)   | 0.94 (0.75, 1.17)                   | 0.56    |
| <i>Low molecular weight heparin use</i> |                 |                |                     |         |                                  |                     |                                     |         |
| Overall                                 | 4.7%            | 3.0%           | 0.62 (0.52, 0.75)   | <0.001  | 0.78                             | 0.88 (0.85, 0.91)   | 0.71 (0.59, 0.86)                   | <0.001  |
| By bleeding risk                        |                 |                |                     |         |                                  |                     |                                     |         |
| Low                                     | 3.8%            | 2.5%           | 0.64 (0.44, 0.95)   | 0.026   |                                  | 0.95 (0.89, 1.01)   | 0.68 (0.46, 1.00)                   | 0.05    |
| Mod/high                                | 5.4%            | 3.5%           | 0.64 (0.52, 0.79)   | <0.001  |                                  | 0.86 (0.83, 0.90)   | 0.74 (0.60, 0.92)                   | 0.006   |
| <i>Gp IIb/IIIa inhibitor use</i>        |                 |                |                     |         |                                  |                     |                                     |         |
| Overall                                 | 17.1%           | 12.0%          | 0.66 (0.55, 0.79)   | <0.001  | 0.21                             | 0.73 (0.70, 0.76)   | 0.91 (0.75, 1.10)                   | 0.31    |
| By bleeding risk                        |                 |                |                     |         |                                  |                     |                                     |         |
| Low                                     | 15.8%           | 12.8%          | 0.79 (0.61, 1.02)   | 0.07    |                                  | 0.74 (0.70, 0.78)   | 1.07 (0.82, 1.39)                   | 0.64    |
| Mod/high                                | 18.3%           | 11.8%          | 0.60 (0.48, 0.73)   | <0.001  |                                  | 0.73 (0.69, 0.77)   | 0.82 (0.66, 1.01)                   | 0.06    |
| <i>Thienopyridine use</i>               |                 |                |                     |         |                                  |                     |                                     |         |
| Overall                                 | 91.7%           | 93.0%          | 1.20 (0.97, 1.50)   | 0.10    | 0.75                             | 1.16 (1.10, 1.22)   | 1.04 (0.83, 1.30)                   | 0.76    |
| By bleeding risk                        |                 |                |                     |         |                                  |                     |                                     |         |
| Low                                     | 91.9%           | 93.6%          | 1.28 (0.98, 1.67)   | 0.07    |                                  | 1.19 (1.13, 1.26)   | 1.07 (0.82, 1.41)                   | 0.60    |
| Mod/high                                | 91.5%           | 92.6%          | 1.16 (0.91, 1.47)   | 0.24    |                                  | 1.17 (1.11, 1.24)   | 0.99 (0.77, 1.26)                   | 0.91    |
| <i>Clopidogrel use</i>                  |                 |                |                     |         |                                  |                     |                                     |         |
| Overall                                 | 87.8%           | 85.5%          | 0.82 (0.69, 0.98)   | 0.03    | 0.09                             | 0.70 (0.66, 0.72)   | 1.20 (0.99, 1.43)                   | 0.07    |
| By bleeding risk                        |                 |                |                     |         |                                  |                     |                                     |         |
| Low                                     | 86.7%           | 82.8%          | 0.74 (0.58, 0.94)   | 0.01    |                                  | 0.60 (0.57, 0.63)   | 1.22 (0.95, 1.57)                   | 0.11    |
| Mod/high                                | 88.5%           | 87.4%          | 0.90 (0.73, 1.11)   | 0.33    |                                  | 0.75 (0.71, 0.78)   | 1.21 (0.98, 1.50)                   | 0.08    |
| <i>Prasugrel use</i>                    |                 |                |                     |         |                                  |                     |                                     |         |
| Overall                                 | 2.7%            | 5.9%           | 2.24 (1.73, 2.91)   | <0.001  | 0.66                             | 2.54 (2.41, 2.69)   | 0.88 (0.67, 1.15)                   | 0.36    |
| By bleeding risk                        |                 |                |                     |         |                                  |                     |                                     |         |
| Low                                     | 4.2%            | 9.2%           | 2.28 (1.74, <0.001  | <0.001  |                                  | 2.50 (2.37,         | 0.92 (0.69,                         | 0.53    |

|          |      |      |                               |        |                               |                               |      |
|----------|------|------|-------------------------------|--------|-------------------------------|-------------------------------|------|
| Mod/high | 2.1% | 4.3% | 3.00)<br>2.08 (1.58,<br>2.73) | <0.001 | 2.63)<br>2.36 (2.26,<br>2.47) | 1.21)<br>0.88 (0.66,<br>1.16) | 0.36 |
|----------|------|------|-------------------------------|--------|-------------------------------|-------------------------------|------|

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## Supplemental Figure A: Personalized Informed Consents with Incorporated Risks

**Saint Luke's Health System**  
Consent for Cardiovascular Procedures

Consent Form

Tuesday, June 01

Patient Name: Doe, Mary A.  
Date of Birth: 1/1/1951  
Medical Record Number: 777777777

**Consent for Coronary Angiography ("Heart Dye Study") and/or an Intervention Procedure ("Opening Blood Vessels in the Heart")**

We are asking you to sign this form because it is very important that you be part of the decision your care. It is important to understand the procedure, its risks, benefits and alternatives. You will talk with you about these. Be sure you get your questions answered before you sign this Form. Please initial and date here to show that you understand.

Patient's initials or authorized individual \_\_\_\_\_ Date \_\_\_\_\_

I hereby authorize Dr. \_\_\_\_\_ and any associates/assistants to perform following procedure(s): \_\_\_\_\_

\_\_\_\_\_

Catheter

**Figure 1**

If a vessel is blocked, your doctor may decide to treat the blockage with an angioplasty and/or stent. (If your doctor decides that surgery is needed instead of a procedure, a coronary artery graft (CABG) may be done at a later time.)

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Consent for Cardiovascular Procedures

**Angioplasty:** In this procedure an expandable balloon on a catheter is used to help open the artery and press the plaque blockage against the artery wall (Figure 2).

Figure 2

Figure 3

**Stent Implant:** A catheter is used to deliver a small metal mesh tube (stent) to a blocked artery (Figure 3). A stent, which helps keep the artery open, is often implanted after angioplasty.

The doctor has explained the benefits of the procedure(s) to me. I understand there is a risk that I will achieve these benefits. I understand that serious things may happen during the procedure. Because of that, a different procedure may be needed. Therefore, I authorize the doctor to perform any procedure(s) needed to best take care of me. I authorize the doctor to be given to me for my comfort, well-being, and safety. This would be done if the doctor decides that it is in my best interest to do so.

The doctor has explained to me that there are risks with this procedure. It is possible that the following things may happen. These might include, but are not limited to:

**Risk of In-Hospital Complication**

Range of outcomes for patients with similar clinical profiles

Percent (%) chance.

where **Death** is the risk of death within the next year after the procedure, and **Bleeding** is the risk of major bleeding.

**Saint Luke's Health System**  
Consent for Cardiovascular Procedures

Sometimes after opening a blocked artery the artery closes again. This procedure may need to be done again. There are 2 types of stents that can be used to keep arteries open, bare metal stents or drug eluting stents. After either type of stent, patients must take a blood thinner, like Plavix. Patients with drug eluting stents may take this medicine for a longer time than patients with a bare metal stent. This extra medicine can be costly, depending on your insurance. The graphs show your chance for another procedure in the next year if you are treated with a bare metal or a drug eluting stent.

**Risk of Blood Vessel Closing within a Year**

Range of outcomes for patients with similar clinical profiles

Percent (%) chance of needing a repeat procedure within a year.

where **Bare Metal** is the risk of the vessel closing within the next year when a bare metal stent is used, and **Drug Eluting** is the risk of the vessel closing within the next year when a drug eluting stent is used.

**NOTE:** These graphs use data from many previously treated patients. It is important to know that your results may differ from these prior patients, even though they had similar medical conditions to you. It is impossible to predict for certain what will happen in your case. This information is not a guarantee of your results.

I understand that I may need a blood transfusion during the procedure. I know that there are risks with a transfusion. This might be fever, a kidney reaction, hepatitis, Acquired Immune Deficiency Syndrome (AIDS), or other infections.

Possible alternatives to the procedure have been explained to me. This includes not having this procedure at all. Other alternatives might include, but are not limited to:

\_\_\_\_\_

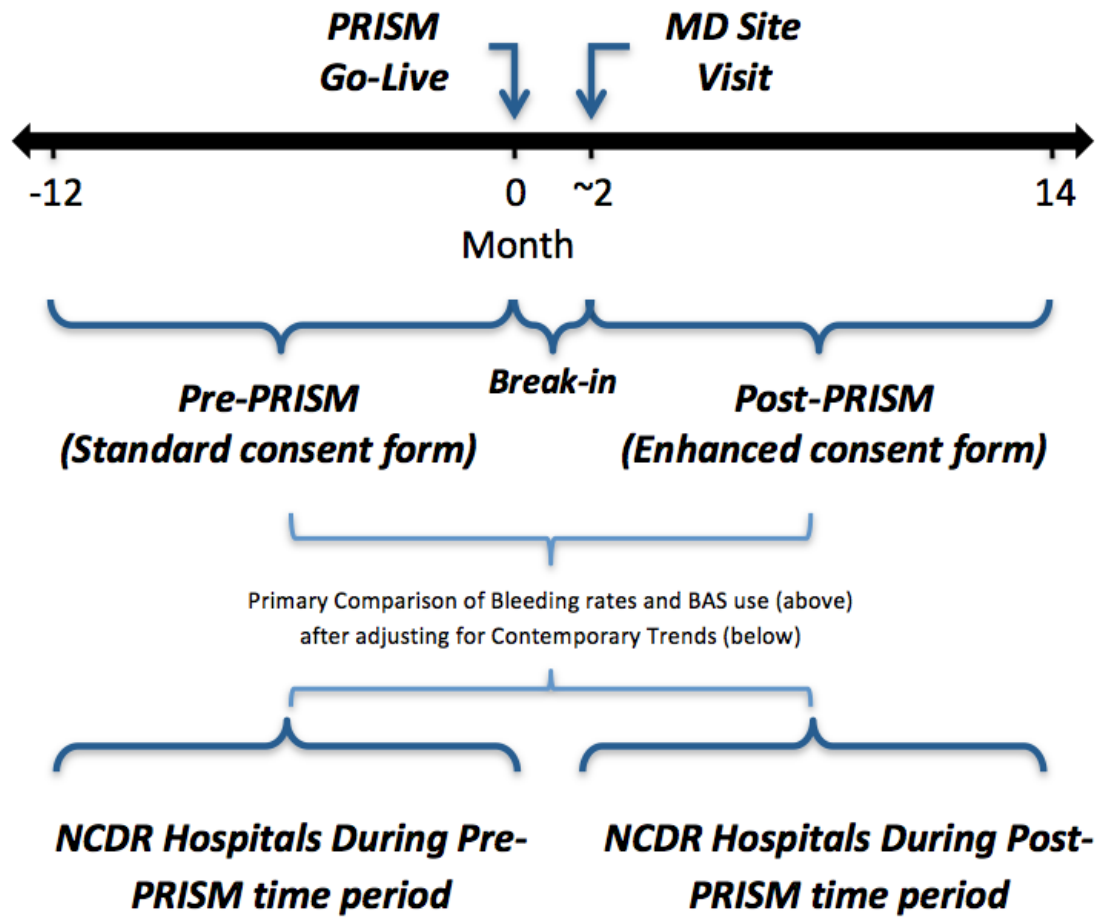
If I get a medical device, my Social Security number can be released to the maker of the device. This is because of the Federal Food and Cosmetic Act section 522(b).

Because this facility is an academic hospital, my medical record may be used for scientific purposes. I understand I may be contacted in the future about my recovery from this procedure.

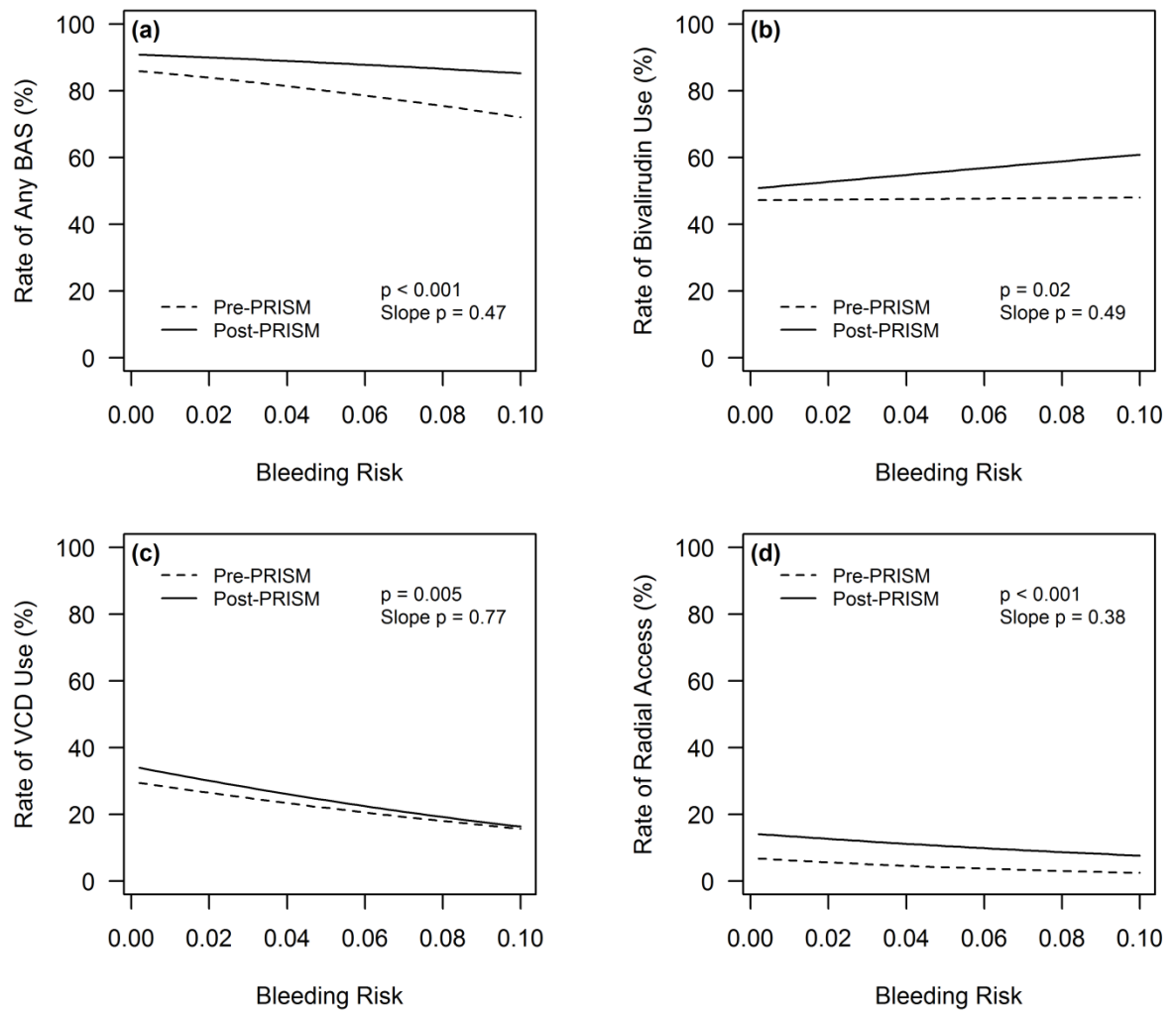
I consent to any photographing or videotaping of the procedure(s). The pictures or the words describing the pictures will not reveal my identity. I also consent to students or equipment representative being in the procedure room. This is for medical education or to get important product information.

\_\_\_\_\_

Supplemental Figure B: Study Design



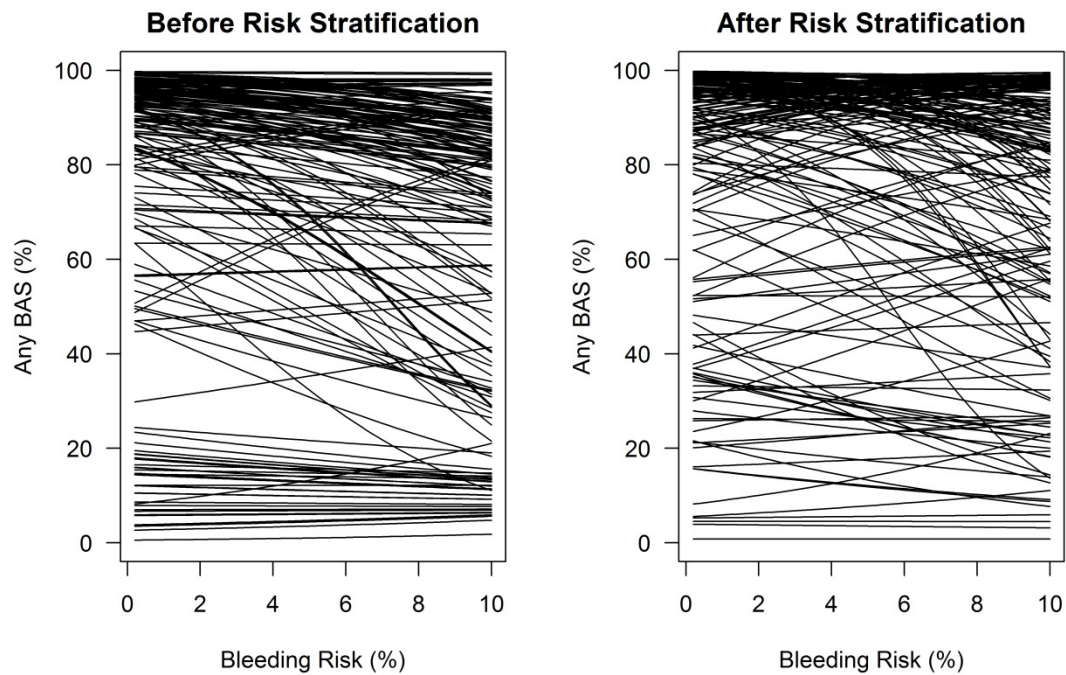
### Supplemental Figure C: BAS Use by Bleeding Risk Before and After Prospective Risk Stratification



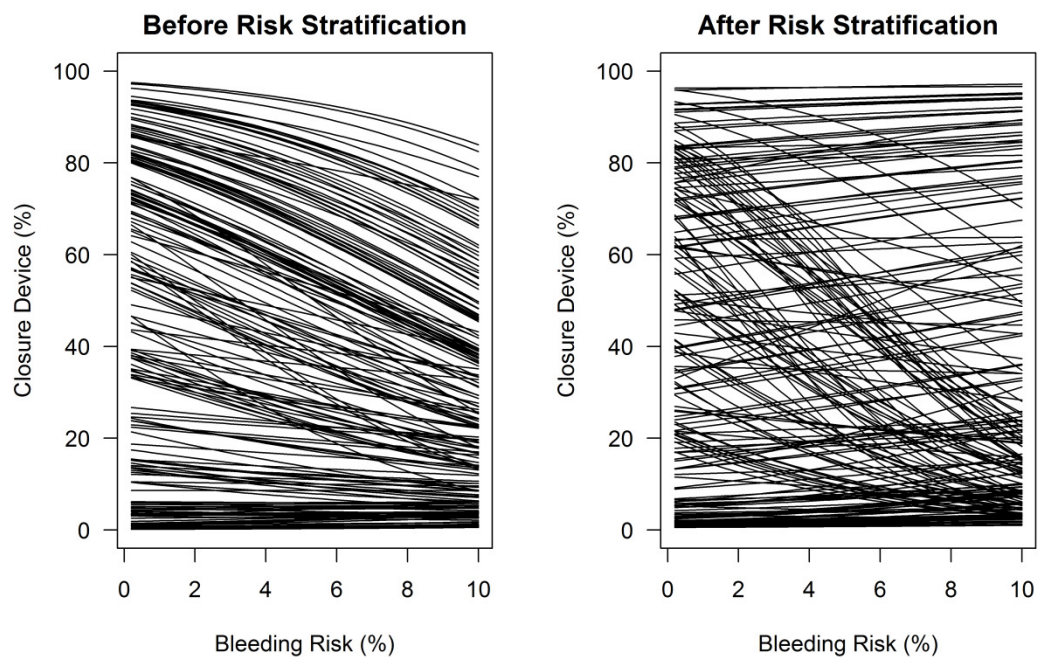


## Supplemental Figure D: Physician-Level Variability in the Use of Bleeding Avoidance Strategies

### A. Physician-level Variability of Any Bleeding Avoidance Strategy



### B. Physician-level Variability of Closure Device Use



### C. Physician-level Variability of Radial Artery Use

