

## LETTERS TO THE EDITOR

# What Determines Propensity Score Depends on What We Are Determining Propensity For

## Comment on a Recent Analysis of Arterial Access Route in Acute Myocardial Infarction

Valgimigli et al. (1) presented a retrospective analysis of the risk of bleeding and vascular complications with a transradial approach versus transfemoral access in patients presenting with acute myocardial infarction and reported a significantly lower rate of adverse events with transradial intervention. While we believe strongly in the benefits of transradial access, we have some serious reservations regarding the way that propensity score matching was used in this study.

In their analysis, the authors sought to derive 2 comparable groups of patients from a highly biased registry and propensity matching is a very good method to achieve this, particularly considering the high quality of clinical information contained in the registry. However, our concern regarding the analysis centers on their inclusion of angiographic data in the derivation of the propensity score. Details, such as culprit vessel, lesion length, and type of stent cannot possibly be known before the route of access is decided. It is therefore not appropriate to control for these elements through propensity matching (2,3), as they cannot influence the choice of arterial approach.

We do, however, agree that these important variables should be accounted for in the final analysis, but they would be more appropriately addressed with multivariable regression, as would be done for post-procedure data. What impact this had on the magnitude and direction of the results remains to be determined.

\*Brian J. Potter, MDCM  
Samer Mansour, MD  
Jacques Leloir, MD, PhD

\*Interventional Cardiology  
Centre Hospitalier de l'Université de Montréal  
3840 Street-Urbain  
Montréal, Québec H2W1T8  
Canada  
E-mail: brian.potter@umontreal.ca

<http://dx.doi.org/10.1016/j.jcin.2012.02.015>

## REFERENCES

1. Valgimigli M, Saia F, Guastaroba P, et al. Transradial versus transfemoral intervention for acute myocardial infarction: a propensity score-adjusted and -matched analysis from the REAL (REgistro Regionale AngiopLastiche dell'Emilia-Romagna) multicenter registry. *J Am Coll Cardiol Intv* 2012;5:23-35.
2. Rosenbaum PR, Rubin DB. The central role of the propensity score in observational studies for causal effects. *Biometrika* 1983;70:41-55.

3. Austin PC. Primer on statistical interpretation or methods report card on propensity-score matching in the cardiology literature from 2004 to 2006: a systematic review. *Circ Cardiovasc Qual Outcomes* 2008;1:62-7.

## Reply

We welcome the comments provided by Dr. Potter and colleagues on our recent article on the transradial intervention REAL (REgistro Regionale AngiopLastiche Dell'Emilia-Romagna) multicenter registry (1).

The way our propensity-matched and adjusted comparison between transradial versus transfemoral intervention was constructed follows the nonparsimonious principle (2). We first analyzed all variables included in the database, which were significantly not homogeneously distributed between the 2 study arms. This model is frequently referred to as a parsimonious explanatory model that identifies the common denominators of group membership. "Parsimonious" means "simple," meaning a model limited to factors deemed statistically significant.

Once this traditional modeling was completed, a further step was taken to generate the "propensity model." The traditional model was augmented by other factors, even if not statistically significant. Thus, the propensity model was not parsimonious. The goal was to balance patient characteristics by incorporating "everything" recorded that might relate to either systematic bias or simply bad luck. We agree on the concept that, in the setting of an ideal scenario, angiographic data are not known at the time of access site selection and therefore cannot influence the choice toward transradial versus transfemoral access site. Yet, as acknowledged by Dr. Potter and colleagues, the retrospective assessment of whether the access site selection impacted on outcomes in the setting of a highly biased registry is far more problematic, because it would be impossible to adjust for nonmeasured confounders.

Let us consider the case-base scenario of a "fragile" lady with multiple comorbidities and bleeding history undergoing primary intervention. This hypothetical patient is far more likely to receive bare-metal than a drug-eluting stent implantation at the time of intervention. Clearly, the stent choice has no role in explaining the propensity of this lady to undergo transradial or transfemoral access site. Yet, factoring the stent choice into the model might help correcting for biases, which might not have been properly captured in the case report form of the registry. Although our dataset is extensive and allows correcting for multiple factors—as nicely acknowledged by Dr. Potter and colleagues—in a nonrandomized setting it might be difficult to truly eliminate all potential confounders between groups.

We have introduced, in other terms, the angiographic data into the propensity model as potential "marker" of variables, which were unmeasured and as such could potentially bias the study results. Imagine a patient whose coronary anatomy is known to be particularly complex for the presence of massive tortuosity and calcification thanks to a previous coronary angiogram—which was

not followed by intervention—that is now presenting to you with ongoing ST-segment elevation myocardial infarction. Even in experienced hands, the operator might feel more comfortable to intervene via the transfemoral route in this scenario. Failure to include in the model the complexity and extension of coronary artery disease might lead to a critical bias in assessing the a priori probability of this single patient to undergo transradial versus transfemoral intervention.

Finally, we respectfully disagree with Dr. Potter and colleagues on the statement that angiographic data should have been preferentially included in the multivariable model. Unlike the adjustment via the use of the propensity score, a traditional multivariable approach including multiple covariates is more exposed to the risk of overfitting and/or collinearity, which might make the model-derived estimates unreliable. In conclusion, the consistency of the results after the execution of multiple propensity models to adjust or select comparable patient pairs in conjunction with the traditional multivariable adjustment observed in our analysis might further reassure on the validity of the observations reported in our recent manuscript.

**\*Marco Valgimigli, MD, PhD**  
**Francesco Saia, MD, PhD**  
**Paolo Guastaroba, MSc**

\*Cardiovascular Institute  
University of Ferrara  
Arcispedale S. Anna Hospital  
Corso Giovecca 203  
Ferrara 44100  
Italy  
E-mail: [vlgmrc@unife.it](mailto:vlgmrc@unife.it)

<http://dx.doi.org/10.1016/j.jcin.2012.04.007>

#### REFERENCES

1. Valgimigli M, Saia F, Guastaroba P, et al. Transradial versus transfemoral intervention for acute myocardial infarction: a propensity score-adjusted and -matched analysis from the REAL (REgistro Regionale AngiopLastiche dell'Emilia-Romagna) multicenter registry. *J Am Coll Cardiol Intv* 2012;5:23-35.
2. Blackstone EH. Comparing apples and oranges. *J Thorac Cardiovasc Surg* 2002;123:8-15.