Authors have nothing to disclose with regard to commercial support.

underreporting by a small proportion of hospitals, rather than to “systemic undercoding of transfusions” as concluded by Mullan and colleagues.¹ Although excluding hospitals with low transfusion rates may improve sensitivity, because there is substantial variability in transfusion rates across hospitals, doing so may result in loss of valid data.^{3,4}

Further, the lower transfusion rates (17.3%) in our study compared with those in the Society of Thoracic Surgeons and American College of Cardiology (STS/ACC) Transcatheter Valve Therapy (TVT) Registry (30.1%) during the same period may also be due to important differences in the study populations.^{2,5} We excluded records of patients with RBC transfusion before the day of transcatheter aortic valve replacement (TAVR) and those for whom TAVR was not performed on day 0 or 1 of admission (21.1% of all TAVR procedures).² The latter group likely includes hospitalized patients who underwent nonelective TAVR and were thus more likely to receive RBC transfusion.⁶ On the other hand, the STS/ACC TVT Registry does not include TAVR procedures performed as part of investigational device exemption trials, and previous studies have shown lower rates of transfusion in clinical trial populations.^{7,8}

Finally, the results of our current study using the National Inpatient Sample (NIS) database² are consistent with findings from a single-center study⁹ as well as the STS/ACC TVT Registry,¹⁰ both of which also demonstrated that RBC transfusion was associated with worse outcomes in patients undergoing TAVR. Thus, despite the modest sensitivity of ICD-9-CM codes for RBC transfusion, we believe that the results of our propensity-matched analysis with the NIS database are reliable and provide important insights into the association between RBC transfusion and outcomes in patients undergoing TAVR. Prospective studies are needed to confirm our findings and to determine the utility of and optimal threshold for RBC transfusion in patients undergoing TAVR, especially among those with overt bleeding.

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**REPLY: “SENSITIVITY”
AND “SPECIFICITY”
REDUCTION OF BLOOD
TRANSFUSION AFTER
TRANSCATHETER
AORTIC VALVE
REPLACEMENT: IS**

THAT ALL THAT MATTERS?

Reply to the Editor:

Administrative data are readily available, inexpensive, and potentially very useful sources of clinical information; however, the accuracy of these data might represent an issue. With regard to blood transfusion, the most optimistic studies reported the *International Classification of Diseases, Ninth Edition* procedure codes to have a sensitivity and specificity of 83% and 100%, respectively; others described a 71.6% sensitivity and 92.6% specificity.^{1,2}

Mullan and colleagues³ properly highlighted this potential weakness of administrative database regarding the validity of the *International Classification of Diseases, Ninth Edition* coding for RBC transfusion and suggested a systematic undercoding of transfusion in the National Inpatients Sample (NIS) databases. We do agree with

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them; however, Kolte and colleagues⁴ clearly reported in their brilliant study the limitations of NIS data, which usually do not provide sufficient granularity to determine the accuracy and temporal relationship between transfusion and complications. Moreover, the large sample size (n = 9342) and the robust methodology (propensity-matched cohort of 7995 pairs with and without red blood cell [RBC] transfusion) counterpoise the likely systematic undercoding of transfusions in the NIS and indubitably show the important decline in RBC transfusion in patients undergoing transcatheter aortic valve replacement in the United States. Rates decreased by approximately 60% from 2012 to 2015, and this represents a significant matter of fact despite unreliability “NIS effect” in the propensity score matching process.

These findings are consistent with data from the Transcatheter Valve Therapy registry⁵ during the same period and confirm the improvement and evolution of transcatheter aortic valve replacement treatment in terms of expertise and of health and cost benefits. A recent large analysis evaluated the clinical coding data across Australia and New Zealand to determine causes of critical bleeding in patients receiving massive transfusion.⁶ That study showed both *International Classification of Diseases, Ninth Edition* and diagnosis-related group codes to be highly sensitive (92% and 62%, respectively, in case of trauma) and accurate to determine the cause of critical bleeding in patients requiring transfusion, with good to excellent agreement with clinical history.⁶ The outcomes of this study have particular significance for researchers, health

authorities, and blood services to examine their administrative data reliably and report on blood utilization.

In summary, is the probability of detection of blood transfusion (sensitivity) and the ability to detect patients without transfusion (specificity) in national health care databases after transcatheter aortic valve replacement all that matters?

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