



# Expenditure variation across hospital departments: The evidence of endovascular treatment of lower extremity arterial disease in China.

Dai Y<sup>1</sup>, Ye M<sup>2</sup>, Hu M<sup>1</sup>

<sup>1</sup>Fudan University, School of Public Health, Department of Health Economics, Shanghai, China

<sup>2</sup>Renji Hospital, School of Medicine, Shanghai Jiaotong University, Shanghai, China

## BACKGROUND

- Expenditure variations across hospital departments have been confirmed by previous studies.
- Part of the expenditure variations are justified and often driven by differences in patient health and needs(such demographics, health status and disease severity). Treatment factors may also contribute to expenditure variations. However, some of the variations may be unanticipated and caused by non-clinical factors such as management practices, organization size, external competition, medical service pricing as well as provider payment methods and incentives, etc.
- While ensuring that patient health and needs are comparable, exploring treatment factors and non-clinical factors that impact expenditure variations may suggest opportunities for cost reduction and efficiency improvement.

## OBJECTIVES

- Our study aimed to examine the expenditure variation of endovascular treatments for patients with lower extremity arterial disease (LEAD) among hospital departments in China and to attribute it to clinical and non-clinical factors.

## METHODS

- We used cohort data from the VascuBase registry with patients from vascular departments of 10 tertiary hospitals scattered in 7 provinces in China. The registry records patient information, disease and treatment details.
- The surgeon survey provided information on non-clinical factors related to department characteristics, while medical service pricing and payment methods were obtained through public information.
- Multilevel generalized linear mixed models were performed to estimate endovascular expenditures adjusting for patient demographics and health, disease severity, treatment factors, department characteristics as well medical service pricing and payment.
- A gamma distribution with log transformation was used to account for the skewed distribution of expenditure data.

## RESULTS

- A total of 2,543 patients with femoral-popliteal artery intervention were included.
- The mean endovascular expenditure was \$12,935(SD=\$5,631). Across 10 departments, the mean expenditure ranged from \$7,957(SD=\$3,180) to \$15,677(SD=\$5,720) and showed significant differences( $p<0.001$ ).
- Regression on variables showed that medical service pricing and payments as well as department characteristics had the highest explanation for expenditure variance, which could explain 18.8% and 17.7% of the variance, respectively. Followed by disease severity(13.4%) and treatment factors (10.6%). Patient demographics and health status could explain only 2.4% of the variance.

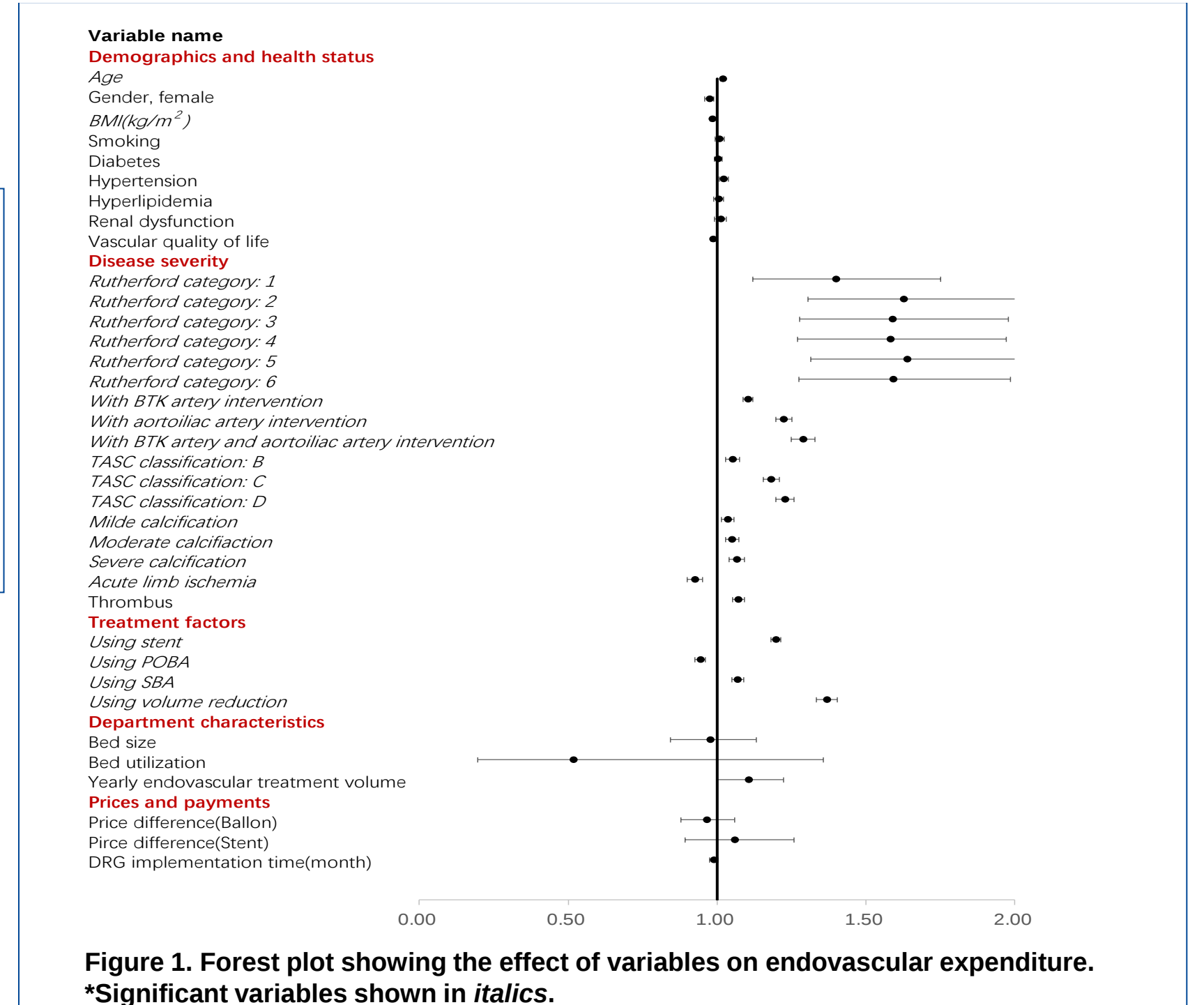
Table 1.Variance explained by variables.

| Model description                               | Variance explained by added variables<br>(Marginal R <sup>2</sup> ) |
|-------------------------------------------------|---------------------------------------------------------------------|
| No covariates                                   | 0.00%                                                               |
| Plus demographics and health                    | 2.40%                                                               |
| Plus disease severity                           | 13.40%                                                              |
| Plus treatment factors                          | 10.60%                                                              |
| Plus department characteristics                 | 17.60%                                                              |
| Plus medical service prices and payment methods | 18.80%                                                              |

## CONCLUSION & DISCUSSION

- Endovascular expenditures varied widely across hospital departments in China, which could be partially attributed to differences in patient health and needs and more importantly attributed to differences in treatment factors and non-clinical factors.
- Treatment and nonclinical factors contributing to the variation were mostly modifiable, and studies focusing on these factors could inform future cost-containment initiatives.
- Unexplained expenditure variations remained after adjustment for above-mentioned factors, highlighting the need for additional research to identify underlying causes for the variation.

- The fully adjusted model suggested that female patients who were older, had lower BMI, higher Rutherford category, received a combined intervention for below-the-knee(BTK) arteries and aortoiliac artery, had a higher TASC classification, more severe calcification, and did not have acute limb ischemia had higher endovascular expenditures (Figure 1).
- Besides, the use of special balloon angioplasty(SBA), stent and volume reduction as well as no use of the plain old balloon angioplasty(POBA) is associated with higher expenditures.



## CORRESPONDENCE

Min Hu, PhD, Associate Professor,  
Department of Health Economics, Fudan University  
E-mail: [humin@fudan.edu.cn](mailto:humin@fudan.edu.cn)