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Trends in systematic recording errors of blood pressure and association with outcomes in Canadian and UK primary care data: a retrospective observational study

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Introduction

End digit preference (EDP) or systematic bias in the recording of blood pressure (BP) measurement is prevalent in primary care: up to 60% of BP readings end in zero. High blood pressure (BP) is a leading cause of increased morbidity in adults and errors in measurement may contribute to increased rate of adverse cardiovascular outcomes.

Objectives and Approach

We studied EDP trends, uptake of Automated Office BP (AOBP) measurement, and cardiovascular outcomes in the UK and Canada.This is a retrospective observational study using routinely collected Electronic Medical Record data for patients age 18 or more.

We used bootstrap method to estimate the odds ratios where logistic regression was fitted on one thousand independently sampled replicates of the CPCSSN and RCGP datasets. We implemented the unsupervised algorithm of k-nearest neighbor across all sites to find the optimal decision boundary to classify the sites into the three categories: (1) strong EDP; (2) some EDP; (3) no EDP.

Results

The mean rate of end digit zero for both systolic and diastolic BP decreased from 26.6% in 2006 to 15.4% in 2015 in Canada and from 24.2% in 2001 to 17.3% in 2015 in the U.K. There was a gradual decline in EDP in the three years following the purchase of an AOBP machine. Sites categorized as having high levels of EDP had lower mean sBP levels than sites with potentially no EDP in both Canada and UK. Patients in sites with high levels of EDP had higher yearly prevalence of stroke (Standardized morbidity ration or SMR 1.11), myocardial infarcts (SMR 1.15), and angina (SMR 1.27) than patients in sites with no EDP.

Conclusion/Implications

There is systematic recording errors including rounding down of BP readings associated with higher rates of EDP and presumably more use of manual BP measurement. Higher rates of EDP were associated with greater prevalence of adverse cardiovascular outcomes. Consideration should be given to using AOBP machines in primary care.

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