Dokumenttyp: journal article

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Titel des Beitrags: Stratification of coronary artery disease patients for revascularization procedure based on estimating adverse effects.

Abstract: Percutaneous coronary intervention (PCI) is the most commonly performed treatment for coronary atherosclerosis. It is associated with a higher incidence of repeat revascularization procedures compared to coronary artery bypass grafting surgery. Recent results indicate that PCI is only cost-effective for a subset of patients. Estimating risks of treatment options would be an effort toward personalized treatment strategy for coronary atherosclerosis. In this paper, we propose to model clinical knowledge about the treatment of coronary atherosclerosis to identify patient-subgroup-specific classifiers to predict the risk of adverse events of different treatment options. We constructed one model for each patient subgroup to account for subgroup-specific interpretation and availability of features and hierarchically aggregated these models to cover the entire data. In addition, we deviated from the current clinical workflow only for patients with high probability of benefiting from an alternative treatment, as suggested by this model. Consequently, we devised a two-stage test with optimized negative and positive predictive values as the main indicators of performance. Our analysis was based on 2,377 patients that underwent PCI. Performance was compared with a conventional classification model and the existing clinical practice by
estimating effectiveness, safety, and costs for different endpoints (6 month angiographic restenosis, 12 and 36 month hazardous events). Compared to the current clinical practice, the proposed method achieved an estimated reduction in adverse effects by 25.0% (95% CI, 17.8 to 30.2) for hazardous events at 36 months and 31.2% (95% CI, 25.4 to 39.0) for hazardous events at 12 months. Estimated total savings per patient amounted to $693 and $794 at 12 and 36 months, respectively. The proposed subgroup-specific method outperformed conventional population wide regression: The median area under the receiver operating characteristic curve increased from 0.57 to 0.61 for prediction of angiographic restenosis and from 0.76 to 0.85 for prediction of hazardous events. The results of this study demonstrated the efficacy of deployment of bare-metal stents and coronary artery bypass grafting surgery for subsets of patients. This is one effort towards development of personalized treatment strategies for patients with coronary atherosclerosis that could significantly impact associated treatment costs.

Zeitschriftentitel / Abkürzung:
BMC Med Inform Decis Mak

Jahr: 2015
Band: 15
Seiten: 9
Sprache: eng

TUM Einrichtung:
Klinik für Herz- und Kreislauferkrankungen

Occurences:
- Einrichtungen > Fakultäten > Fakultät für Medizin > Kliniken und Institute > Lehr- und Forschungskooperationen mit den Kliniken und Instituten am Deutschen Herzzentrum > Klinik für Herz- und Kreislauferkrankungen im Erwachsenenalter (Prof. Schunkert) > 2015

entries: