The Health Technology Report Series has been developed by the Institute of Family Medicine and Public Health of the University of Tartu

Health effects of genotype-guided treatment in cardiovascular diseases and cost effectiveness of genotype-guided antiplatelet treatment in ischemic heart disease in Estonia

Summary

Background: Effectiveness and side effects of several drugs in cardiovascular diseases (CVD) depend on genetic variation. Thus, genotype-guided treatment can improve treatment outcomes and limit healthcare expenditures.

Objective: To estimate the health effects of genotype-guided treatment for CVDs and the cost-effectiveness and budget impact of the intervention in Estonia.

Methods: A systematic literature search was performed in PubMed to identify randomised controlled trials (RCT) on the effectiveness and safety of genotype-guided treatments in CVD and to select the most promising interventions for further analyses. A meta-analysis of the effectiveness and safety and a systematic review of the cost-effectiveness of the selected intervention was conducted. A Markov cohort model and a budget impact model were constructed to estimate the cost-effectiveness and budgetary effects of the selected intervention in Estonia.

Results: Four individual drugs or drug groups, known for drug-gene interactions, were identified with evidence from RCTs on the effectiveness of genotype-guided treatment compared to standard care in CVD. Three of them, warfarin, statins, and rostafuroxin, were discarded from the following analyses because of nonreliable effectiveness evidence or limited use in clinical practice in Estonia. Thus, the report focused on genotype-guided clopidogrel treatment in ischemic heart disease.

Based on the meta-analysis of eight RCTs, genotype-guided antiplatelet treatment is effective in reducing major cardiovascular events in ischemic heart disease compared to usual care without notable trade-offs with safety. According to the literature review, the intervention may also be cost-effective – a conclusion made in twelve studies out of sixteen. Both the effectiveness and cost-effectiveness evidence were mostly based on the acute coronary syndrome (ACS) population.

A clinical workflow analysis revealed the target groups that could benefit from genotype-guided antiplatelet treatment in Estonia. The intervention is feasible only in clopidogrel-treated patients, i.e., in patients with chronic coronary syndrome (CCS) undergoing percutaneous coronary intervention (PCI). Ticagrelor is the first-line treatment for ACS in Estonia; applying a genotype-guided antiplatelet treatment in this population would suggest a switch to a less-effective alternative for some patients. The timing of the gene test should be also considered. If the goal is to provide genotype-guided antiplatelet treatment for all the CCS patients undergoing PCI, then a gene test should be ordered concurrently with the decision for selective coronarography (SCG). As the need for PCI is decided during SCG, the tests are also ordered for patients who do not require PCI and thus, an antiplatelet treatment. Alternatively, if the goal is to minimise the number of unnecessary gene tests, then a gene test should be ordered when the PCI decision is made. Due to the time gap between ordering and receiving the results of the gene test, the genetic information is available at the beginning of the antiplatelet treatment only for patients whose PCI is performed after SCG, leaving aside patients whose PCI is performed during SCG. Both scenarios, including wide and narrow populations, respectively, were included in the cost-effectiveness and budget impact analysis. Current gene donors were included in both populations as their genetic information will be instantly available in near future.

The incremental cost-effectiveness ratios were 25,700 and 37,400 euros per quality-adjusted life-year for the narrow and wide target populations, respectively. Therefore, genotype-guided antiplatelet treatment is cost-effective in patients with CCS undergoing PCI, using a cost-effectiveness threshold of 40,000 euros, regardless of which scenario will be selected for Estonia. Applying genotype-guided antiplatelet treatment in the narrow or wide target population would cost an additional 66,000 and 677,000 euros annually, respectively, for Estonian Health Insurance Fund compared to usual care.

Conclusions: Genotype-guided antiplatelet treatment is effective in ischemic heart disease compared to usual care, but its feasibility, cost-effectiveness, and affordability were demonstrated only in patients with CCS undergoing PCI in Estonia.

Citation: Alloja J, Saar A, Põld M, Milani L, Juus E, Jürisson M. TTH62 Farmakogeneetilise analüüsi tervisekasu südame-veresoonkonnahaiguste ravis ja farmakogeneetilise analüüsi juhitud antiagregantravi kulutõhusus Eestis südame isheemiatõve korral. Tartu: Tartu Ülikooli peremeditsiini ja rahvatervishoiu instituut; 2022.