Cost-effectiveness of landiolol, an ultra-short-acting beta-blocker, for prevention of postoperative atrial fibrillation in Germany

Evelyn Walter*, Karin Schalle*
*IPF Institute for Pharmacoeconomic Research, Vienna, Austria

Objectives

Postoperative atrial fibrillation (POAF) is common among surgical patients and associated with a worse outcome. Arterial fibrillation (AF) is the most frequent complication arising after coronary-artery-bypass-grafting (CABG) surgery, occurring in 30% of cases. The incidence of this complication is even higher after valve-replacement surgery (30–40%) and after complex and operative procedures (40–60%). Beta-blockers reduce POAF and supraventricular tachycardia and have direct antiarrhythmic activity. Landiolol hydrochloride, is an ultra-short-acting beta-blocker half-life of approximately 4 min. The selectivity ratio of landiolol is higher than other beta-blockers.

Methods

A decision-model was developed to reflect the cost-effectiveness of landiolol vs. no-prevention, standard-of-care (SoC) and esmolol for the patient groups with different cardiac surgeries and a subgroup of CABG. The model benefits is expressed in a reduction in POAF episodes and reduced complications. Clinical data were derived mainly from the meta-analysis of Li et al. (2015) involving 807 patients (9 RCTs). Based on meta-analysis findings a decision tree model for two patient populations, (1) for patients with cardiac surgery in general and (2) for patients with CABG was developed. The model calculates total inpatient costs (incl. surgery, ICU, complication and re-hospitalization) over the hospital length-of-stay (LOS). Costs from published sources were used (2016 Euro) from the German hospital perspective. A one-way deterministic sensitivity-analysis accounts for uncertainty.

Clinical Data

The economic model of landiolol was designed based on clinical trial data of the RCTs and the meta-analysis of Li et al. (2015). In addition, a recent publication from Sezai and colleagues (2015) was added. The AF protecting effect of landiolol in the all-surgery patient population was: - The POAF incidence was 12.4% with landiolol and 36.7% for the control group. - AF incidence for landiolol exhibits 13.5% compared to 35.5% for the control group. - AF incidence was 19.1% for landiolol and 39.2% for SoC. The AF-protecting effect of landiolol in the CABG patient population is illustrated as follows: - The POAF incidence was 12.1% with landiolol and 34.2% for the control group. - AF incidence for landiolol exhibits 13.0% compared to 35.5% for prevention. - AF incidence was 8.8% for landiolol and 30.4% for SoC. - For the indirect comparison the net effect of esmolol vs. control was calculated and expressed as adjusted trial difference of the SoC effect (30.4%) in the landiolol trial.

Resource Use and Costs

Resource use data were derived via literature search including German data to reflect the German clinical practice. The CEA collects hospitalization costs due to cardiac surgery (including ICU costs), costs of complication and hospital readmission. Medication costs for POAF prevention are covered in the German G-DRG lump sum. All costs were derived from public price lists, tariff catalogues and the literature. When necessary, prices were adjusted to 2016 prices using the consumer price index. Due to the short time horizon of the model, discounting of costs is not necessary.

Results

Patients with POAF had a higher incidence of mortality, morbidity and LOS including ICU and more frequent readmissions and finally higher costs. Per patient costs in the all-surgery population with landiolol are estimated between 24,234.21 €-25,910.02 € and AF occurred in 12.4%-19.1% of cases. Analyzing the CABG subgroup, per patient costs with landiolol are estimated between 23,938.66 € - 24,234.21 € and 8.8% POAF, 13.0% AF incidence for landiolol surgery patients. Compared to comparators landiolol is able to reduce costs between 1,536.92 € (no-prevention) and 1,448.23 € (esmolol).

Sensitivity Analysis

Deterministic sensitivity analysis (SA) was carried out. Fig. 3A displays results for the all-surgery patient population. POAF patient population shows similar results. The major proportion of cost reduction is associated with the reduced hospital length of stay (985.07 € - 1,250.92 €) followed by decreased ICU stay costs (223.65 € - 290.36 €) (Fig.2A). The analysis for CABG patients shows similar results. The major proportion of cost reduction is associated with the reduced hospital length of stay (1,004.23 € - 944.37 €) followed by a reduced stay costs to manage complications (205.72 € - 233.79 €) (Fig.2B).

Conclusion

The economic analysis of landiolol shows that the use is highly cost-effective - represent the lowest total cost in both patient populations and is associated with a superior effect compared to POAF. Landiolol generates cost savings from the hospital perspective as well as the German Health care system as whole.

References


ICERs of landiolol versus control ranged from -6,777.51 to -8,789.27 €. The effect on costs hospital stay, hospital LOS and costs of ICU stay shows the greatest influence. Landiolol remains the dominant strategy in all variations of SA.

Fig. 1: Model Design

Fig. 2A: Results, CABG patient population

Fig. 2B: Results, All-surgery patient population

Fig. 3A: Cost components, CABG population vs. Control

Fig. 3B: Cost components, All-surgery population vs. Control

ICERs of landiolol versus control ranged from -5,992.7 € to -7,875.98 €. Variations of costs hospital stay, hospital LOS and the mortality rate demonstrate the greatest influence. Landiolol remains the dominant strategy in all variations of SA.

Fig. 3A: Probabilistic SA, All-surgery population

Fig. 3B: Probabilistic SA, CABG population

Additional literature with the author.