A COST-UTILITY ANALYSIS OF CINACCALT IN SECONDARY HYPERPARATHYROIDISM (SHPT) IN FIVE EUROPEAN COUNTRIES

Iannazzo S1, Pradelli L1, Chirolli S2
1AdRes HE&OR, Torino, Italy, 2Amenge Europe GmbH, Zug, Switzerland

INTRODUCTION

- Cinacalcet is effective in controlling imbalanced levels of parathyroid hormone (PTH), serum calcium (Ca) and phosphorous (P) [1-6] in dialysis patients with secondary hyperparathyroidism (SHPT).
- Interventions in mineral metabolism parameters are often associated with increased risk of cardiovascular (CV), death and fracture [7,8].
- A probabilistic, patient-level simulation Markov model was developed with TreeAge Pro 2009 to perform the cost-utility analysis of cinacalcet in SHPT patients [9].
- In the patient-level simulation, each patient was defined with its unique characteristics of sex, age, type of dialysis and levels of serum Ca, P and PTH. The model calculated the dynamics of PTH, Ca and P for each patient based on the OPTIMA study, a European multicentre, open-label, 23-week study [8].
- Published correlations between these levels, mortality and morbidity (CV events, fractures, and parathyroidectomy) were incorporated.
- Simulation horizon was patient lifetime; standard treatment (vitamin D sterols and phosphate binders) and cinacalcet plus standard treatment (ST) were compared.

OBJECTIVE

- The application of the cost-utilty model to five European countries is presented: Italy, Spain, Portugal, Switzerland and Czech Republic. Results are compared in order to evaluate the impact of the therapy in different healthcare settings.

METHODS

- The adaptation of the model to different country setting affected mainly the cost structure and epidemiologic data (mortality in dialysis, relative frequencies of hemodialysis and peritoneal dialysis).
- Costs were evaluated from the national healthcare system perspective of the five countries. Considered costs were related to cinacalcet and ST (vitamin D sterols and phosphate binders) purchasing, dialysis, CV events, fracture management, and PTH procedures and were valued according to current local prices and tariffs [10-21].
- Switzerland and Czech Republic analysis were performed in local currency and final results were converted to Euro [22].
- Natural mortality was provided from Eurostat [23] or National Statistical Institutes [24-26]. This value was multiplied by the relative risk of death for dialysis patients [23, 27-30].
- Characteristics of the patient, drug consumption and mineral metabolism parameters were based on data from the OPTIMA study.
- Health Utility Indexes derived from literature and took into account dialysis, CV events and fractures.
- The annual discount rate of 3.5% was applied to costs and benefits. Results were calculated with 10,000 iterations for each country. The effectiveness was measured as life expectancy (LE) and quality-adjusted life expectancy (QALE).
- The probabilistic sensitivity analysis was performed to take into account two levels of uncertainty: the inter-individual variability and the uncertainty on model parameters. Results were elaborated as scatterplot on the CE plane and cost-effectiveness acceptability curves (CEAC).

RESULTS

- In the simulated cohort, mean LE extension was 1.20 life-years (LY) in Italy, 1.10 LY in Spain, 1.18 LY in Portugal, 1.40 in Switzerland and 1.10 LY in Czech Republic. The QALE increase (cinacalcet vs. ST) was 0.89, 0.83, 0.89, 1.01 and 0.80 quality-adjusted life years (QALY) in the same countries, respectively (Table 1).
- The lifetime average cost increase, calculated not taking into account the cost for dialysis, was €28,161 in Italy, €23,875 in Spain, €27,932 in Portugal, CHF 49,308 (corresponding to €34,630) and CZK 83,914 (€527,751) in Czech Republic (Table 1).
- The incremental cost-effectiveness ratio (ICER), which represents the increase in cost for payers to obtain the unit benefit, was between €20,000/LY and €30,000/LY in all countries (Figure 1).
- According to the WHO, health interventions, whose cost/LY gained is below the annual per capita gross domestic product (GDP), can be considered ‘very cost-effective’; strategies for the cost for gaining LE is below 1 and 3 times the per capita GDP (Table 2) should be considered ‘cost-effective’ [31].
- The cost-effectiveness acceptability curve (CEAC) is a conventional graphic format to assess the uncertainty of the estimates from a probabilistic model [32]. Results are similar in Italy, Spain, Portugal and Switzerland where cinacalcet has an estimated 85-96% probability of being cost-effective compared with ST alone if the decision maker is willing to pay up to €40,000 for an average patient to gain one QALY. In Czech Republic at the same threshold the probability is 51% (Figure 2). CONCLUSIONS

- Cinacalcet treatment could be considered a cost-effective treatment of SHPT in all reported countries.
- Results appear more homogeneous in the three southern countries. In Switzerland the cost of dialysis is very high (more than double other countries). In Czech Republic the cost-effectiveness ratio is higher than other countries, probably due to high mortality rates and to the relatively higher cost of cinacalcet.

REFERENCES

ACKNOWLEDGEMENTS

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Table 1. Resulting outcomes and costs

<table>
<thead>
<tr>
<th>Country</th>
<th>LE (LY)</th>
<th>LE (QALY)</th>
<th>ST (LY)</th>
<th>ST (QALY)</th>
<th>Cost (€/QALY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>1.10</td>
<td>1.01</td>
<td>1.18</td>
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</tr>
<tr>
<td>Spain</td>
<td>1.10</td>
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<td>1.18</td>
<td>0.83</td>
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<tr>
<td>Portugal</td>
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<td>0.89</td>
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</tr>
<tr>
<td>Switzerland</td>
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<td>1.18</td>
<td>0.89</td>
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</tr>
<tr>
<td>Czech Republic</td>
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<td>0.89</td>
<td>1.18</td>
<td>0.80</td>
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</tr>
</tbody>
</table>

Figure 1: Incremental cost-effectiveness ratio (€/QALY) in the five countries

Figure 2: Cost-effectiveness acceptability curve (€/QALY – not including the cost for dialysis), WTP: willingness to pay

Table 2. GDP 2008 (EUR/2000)

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP 2008 (€)</th>
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<tr>
<td>European Union</td>
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</tr>
<tr>
<td>Italy</td>
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<td>Spain</td>
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<tr>
<td>Portugal</td>
<td>18,900</td>
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<tr>
<td>Switzerland</td>
<td>35,950</td>
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<tr>
<td>Czech Republic</td>
<td>20,100</td>
</tr>
</tbody>
</table>

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