NEW APPROACH TO BUDGET IMPACT ANALYSIS – IBRUTINIB IN TREATMENT OF RELAPSED/REFRACTORY CLL PATIENTS IN THE CZECH REPUBLIC

OBJECTIVES

Chronic lymphocytic leukemia (CLL) is a life-threatening disease causing formation of cancerous and reduced immunogenic production. CLL represents 25 to 30% of all leukaemia and is the most common type of adult leukaemia in all countries (1). People suffering from CLL is estimated at 72 cases per 100,000 people (5). Incidence of CLL in Europe is about 14 cases per 100,000 persons per year but significantly varies in different parts of the continent (4). Nearly 70% of newly diagnosed patients are treated in the 2nd line therapy from the CLL affects mostly older patients.

METHODS

Budget impact analysis (BIA) was performed from the healthcare payer’s perspective. A patient-level model was developed based on real-world data from Fort Washington, PA National Comprehensive Cancer Network. It was assumed that this patient population represents approximately 20% of all CLL patients in the Czech Republic and number of patients was extrapolated accordingly. The estimated number of patients receiving treatment in 2013 was 16,985 SGP per year. The structure of current treatment mix used in the budget impact model was also based on data from the hospital University Hospital Brno (7). Only the most common and more expensive treatments (e.g. BIA, ibrutinib) were considered in the model and were recalculated to from 2013 % of treatments. It was assumed that escalation has occurred in the reference period (72%) - BIA – ibrutinib (27%) – results of clinical study in the Czech Republic were considered:

- treatment (patient meets the criteria for treatment initiation);
- without treatment (patient does not meet the criteria for treatment initiation);
- death.

The model works with yearly probabilities of remaining in the same line of treatment and with yearly probabilities of death. It was assumed that each patient can be in each year in one of the 5 different states.”

The B model was constructed as a Markov state structure (see Figure 2). Three health states in line with real clinical practice of BIA, CLL treatment in the Czech Republic were considered:

- treatment (patient meets the criteria for treatment initiation);
- without treatment (patient does not meet the criteria for treatment initiation);
- death.

For a more detailed comparison of the influence of each parameter BIA outcomes a tornado diagram was constructed (Figure 7). The graph shows the effect of changing the parameter from the best case scenario to the worst case scenario. The rightmost column on the chart indicates the influence on the BIA result for each parameter.

CONCLUSIONS

Ibrutinib treatment is associated with significantly prolonged survival, decreased risk of progression and higher total costs, largely due to ibrutinib continuous administration which enables patients to remain much longer in progression-free state. CLL is an orphan indication and ibrutinib’s budget impact in the Czech Republic is negligible compared to total healthcare or oncology expenditures.

Novel approaches of budget impact modelling (including real-world data and transition-state modelling) provide more reliable and more precise budget impact estimation and are thus extremely important for high value drugs where the budget impact is expected to be considerable compared to less effective and more outdated standards of care. For this reason, ibrutinib treatment costs were counted continuously until disease progression or death. Given that no data are available for PFS or OS respectively in the database, we used historical data from real-world data (RWD) studies.

Drug acquisition costs, hospital admission costs, administration costs, follow-up care and Best Support Care (BSC) costs were considered. Costs were assigned to the specific line of treatment according to the time of their occurrence.

Table 1 - Median times between treatment transitions based on real-world evidence.

Table 2 - Resulting transition probabilities between treatment lines based on standard of care.

For a more detailed comparison of the influence of each parameter BIA outcomes a tornado diagram was constructed (Figure 7). The graph shows the effect of changing the parameter from the best case scenario to the worst case scenario. The rightmost column on the chart indicates the influence on the BIA result for each parameter.

Table 4 - BIA results.

Table 5 - BIA results.

For a more detailed comparison of the influence of each parameter BIA outcomes a tornado diagram was constructed (Figure 7). The graph shows the effect of changing the parameter from the best case scenario to the worst case scenario. The rightmost column on the chart indicates the influence on the BIA result for each parameter.

Table 6 - BIA results.

For a more detailed comparison of the influence of each parameter BIA outcomes a tornado diagram was constructed (Figure 7). The graph shows the effect of changing the parameter from the best case scenario to the worst case scenario. The rightmost column on the chart indicates the influence on the BIA result for each parameter.

Table 7 - BIA results.

For a more detailed comparison of the influence of each parameter BIA outcomes a tornado diagram was constructed (Figure 7). The graph shows the effect of changing the parameter from the best case scenario to the worst case scenario. The rightmost column on the chart indicates the influence on the BIA result for each parameter.

Table 8 - BIA results.

For a more detailed comparison of the influence of each parameter BIA outcomes a tornado diagram was constructed (Figure 7). The graph shows the effect of changing the parameter from the best case scenario to the worst case scenario. The rightmost column on the chart indicates the influence on the BIA result for each parameter.

Table 9 - BIA results.

For a more detailed comparison of the influence of each parameter BIA outcomes a tornado diagram was constructed (Figure 7). The graph shows the effect of changing the parameter from the best case scenario to the worst case scenario. The rightmost column on the chart indicates the influence on the BIA result for each parameter.

Table 10 - BIA results.

For a more detailed comparison of the influence of each parameter BIA outcomes a tornado diagram was constructed (Figure 7). The graph shows the effect of changing the parameter from the best case scenario to the worst case scenario. The rightmost column on the chart indicates the influence on the BIA result for each parameter.

DISCUSSION

This budget impact model incorporated some assumptions which can increase the uncertainty of the results. These assumptions include real-world data which were only available in limited quality. A deeper analysis of the real-world data would increase the accuracy of this model. The data could be taken from the whole Czech Republic and instead of time between initiating subsequent treatment lines, dates of disease progressions in separate lines of individual treatments could be analyzed.

Also the ibrutinib data could be evaluated separately in specific lines of treatment to get more reliable results. All of those proposed changes in the input data of this analysis were not available at the time of analysis so these estimated results are the most reliable to date. The model was calibrated to give estimates which correspond to the real world data available at the time of the analysis.

Figures

Figure 1 - Real-world CLL/IR patient population structure.

Figure 2 - Budget impact model structure.

Figure 3 - Scenario of treatments and costs.

Figure 4 - Budget impact development in time.

Figure 5 - Comparison of the properties of populations alive during 5-year horizon.

Figure 6 - Interval of budget impact in each year studied by BIA.

Figure 7 - tornado diagram.