

Cost-effectiveness analysis of tobacco dependence treatment in the Czech Republic

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Objectives

There is no option of smoking cessation treatment reimbursed by public healthcare payers in the Czech Republic, except for small contributions paid by preventive funds of some health insurance companies. Tobacco dependence is a chronic, relapsing and lethal disease. Smoking harms nearly all organs in the body, causes many comorbidities and generally deteriorates health. The aim of this study is to compare costs and effectiveness of different treatment methods of tobacco dependence used in the Czech Republic from the perspective of the public healthcare payer.

Methods

Health-economic model

Discrete Event Simulation (DES) model developed in ARENA® was used to compare varenicline, bupropion and nicotine replacement therapy (NRT) as pharmacotherapy for tobacco dependence in lifetime horizon (100 years) (1).

The evaluation group (100 % evaluated intervention followed by treatment mix) was compared with treatment mix excluding evaluation product. The treatment mix includes the following methods of smoking cessation in fixed proportion (2): varenicline (9.5 %), bupropion (7 %), behavioural modification therapy (BMT) (9.9 %), NRT (27.6 %) and Cold turkey (unassisted method, smoker is trying to quit smoking without medicines or nicotine replacement) (46 %).

Efficacy

The model simulates smokers one by one depending on the baseline characteristics. Treatment response, duration of abstinence, time to next quit attempt or relapse is assigned individually to subjects using regression equations (1) estimated from data from clinical trials (3; 4; 5; 6; 7). Every subject is assigned an individual risk of developing smoking-related conditions based on smoking status (smoker or former smoker). Chronic obstructive pulmonary disease (COPD), myocardial infarction (MI), stroke and lung cancer were considered as smoking-related conditions. Incidence of smoking-related conditions results in higher mortality, lower quality of life and higher costs. DES models the benefits of smoking cessation in terms of reducing the risk of smoking-related conditions and thus higher gain of QALYs and lower costs.

Quality of life

Baseline utility was calculated by the following regression function (8):

$$Utility = -0,00002 * age^2 - 0,0007 * age + 0,9497$$

Utility value was decreased if smoking-related comorbidities were present according to the table below.

| | Year 1 | Subsequent years | References |
|-------------|--------|------------------|--------------|
| COPD | 0,76 | 0,76 | (9) (10) |
| Lung cancer | 0,61 | 0,50 | (11) |
| MI | 0,76 | 0,76 | (12) (13) |
| Stroke | 0,74 | 0,74 | (14) (15) |

Table 1: Parameters of regression function of VAS change

Costs

Among relevant costs (from the payer's perspective) drug costs, administration costs, monitoring costs, costs of treatment of comorbidities were considered. The cost analysis was based on the current list of reimbursed drugs (16), medical examinations (17) and expert opinion (18) in the Czech Republic. Discount rate was set to 3 %.

| Costs | Costs | Reference | | |
|-----------------------------|------------|-----------------------------------|------------|--------------|
| Drug costs (12week therapy) | | | | |
| Varenicline | 255,74 € | External price references 10/2014 | | |
| Bupropion | 61,44 € | (16) | | |
| NRT | 181,89 € | (18) | | |
| Monitoring costs | | | | |
| Administration costs | 24,77 € | (17) | | |
| Management costs | 75,14 € | (17; 18) | | |
| Comorbidities | Acute cost | Cost in 1 year | | |
| | | Annual cost in subsequent years | | |
| | | Reference | | |
| COPD | - | 1 162,85 € | 1 162,85 € | (16; 17; 18) |
| Lung cancer | - | 6 242,09 € | 3 725,80 € | (16; 17; 18) |
| MI | 904,75 € | 161,75 € | 123,03 € | (16; 17; 18) |
| Stroke | 1 098,50 € | 154,38 € | 115,66 € | (16; 17; 18) |

Table 1: Costs

Results

The ICER of varenicline, bupropion and NRT compared to the currently used treatment mix reached 1,229.74 €, 1,586.06 € and 3,572.23 € per QALY gained respectively. All these methods are highly cost-effective as willingness to pay (WTP) in the Czech Republic is 43,939.95 €.

| Evaluated intervention | Incremental costs | Incremental QALY | ICER/QALY |
|------------------------|-------------------|------------------|------------|
| Varenicline | 229.00 € | 1.862 | 1,229.74 € |
| Bupropion | 137.59 € | 0.086 | 1,586.06 € |
| NRT | 539.50 € | 0.151 | 3,572.23 € |

Table 1: Parameters of regression function of VAS change

Conclusion

Varenicline generates the most QALYs and results in the lowest ICER compared to other interventions. Therefore, varenicline can be considered the most cost-effective smoking cessation treatment in the Czech Republic.



Keywords

Cost-utility Analysis, Smoking cessation, tobacco dependence, varenicline, bupropion, nicotine replacement therapy, Czech Republic

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