

# COST-EFFECTIVENESS ANALYSIS OF THE INFORMATION TECHNOLOGY AIDED RELAPSE PREVENTION PROGRAMME IN SCHIZOPHRENIA (ITAREPS) IN THE CZECH REPUBLIC

Tomáš Mlčoch<sup>1†</sup>, Klára Kruntorádová<sup>1</sup>, Martina Mandelíková<sup>1</sup>, Tomáš Doležal<sup>1</sup>

<sup>1</sup>Institute of Health and Technology Assessment, iHETA, Prague

<sup>†</sup>Corresponding author: mlcoch@iheta.org



## BACKGROUND and OBJECTIVES

Information technology aided relapse prevention programme in schizophrenia (ITAREPS) is a unique mobile phone-based telemedicine solution (operated via short message service (SMS)) for weekly remote patient monitoring and disease management of psychotic disorders in general, particularly of schizophrenia. It was developed for rapid and targeted recognition of early warning signs of relapse and it improves and speeds up communication between the patient and her/his psychiatrist. Quick capture of early signs of relapse allows doctors to immediately adjust the patient's treatment and keep her in stable condition without relapse (see <https://www.itareps.com/en/?c=xx>).

Evidence from randomized clinical trials (RCTs) suggests that ITAREPS is very effective in decreasing hospitalization schizophrenia relapses [1,2]. Although it is highly effective, it is not reimbursed by some health insurance companies in the Czech Republic. Based on these RCTs, we performed a cost-utility analysis of ITAREPS compared to the treatment of schizophrenia without ITAREPS (non-ITAREPS) in the Czech Republic. This analysis should ideally support reimbursement and decrease the uncertainty related to cost and outcomes of this intervention.

## METHODS

We developed a 20-year Markov cohort model in TreeAge Pro 2015 with yearly cycle length and four health states, i.e. without relapse, with non-hospitalization relapse, with hospitalization relapse and death (see **Figure 1** for the model structure). **Table 1** summarizes the model settings.

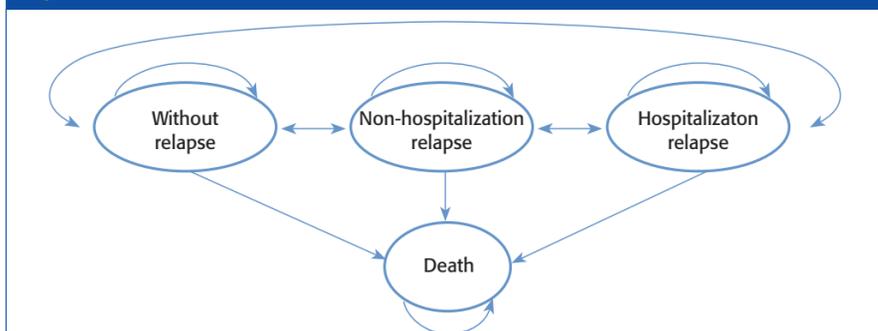
Transition probabilities (TPs) for relapses were derived from a RCT conducted in the Czech Republic [1]. Probability of death was calculated by multiplication of standardized mortality ratio (SMR) and general mortality [3,4]. TPs are summarized in **Table 2**.

Costs of hospitalization and medication were derived directly from the RCT and other published literature [1,5]. The costs were converted from CZK to EUR by exchange rate of 25.29 CZK/EUR [6] and transformed to 2014 prices [7]. The costs are summarized in **Table 3**.

Utilities/quality of life (QoL) data were derived from literature and for given health states are equal to 0.88 (without relapse), 0.74 (non-hospitalization relapse) and 0.57 (hospitalization relapse) [8]. However, the utilities while in relapse had to be weighted by the length of relapses [1] (30 days non-hospitalization relapse, 52.50 and 49.25 days hospitalization relapse within/without ITAREPS, respectively) which yielded final utilities equal to 0.87 and 0.84 for health states of non-hospitalization and hospitalization relapse, respectively. Costs and outcomes were discounted by 3%.

Probabilistic sensitivity analysis (PSA) with 3000 iterations was performed. The PSA setting is shown in **Table 4**. Lastly, scenario analysis of key model parameters was performed (i.e. discount rate 0 and 5%, time-horizon 10 and 5 years and  $\pm 50\%$  of probability of hospitalization relapse).

**Figure 1.** Markov model structure



**Table 1.** Summary of the model settings

Perspective	Payer's, Public health insurance
Assessed intervention	Patients included in Information technology aided relapse prevention programme in schizophrenia (ITAREPS)
Comparator	Patients not included in ITAREPS (Non-ITAREPS)
Time horizon	20 years
Target population	Patients with schizophrenia
Outcomes	Quality-adjusted life year; QALY
Discount rate	3% for costs and outcomes
Sensitivity analysis	Probabilistic (PSA), Scenario analyses (SA)

**Table 2.** Transition probabilities

Transition probabilities	Value
Probability of non-hospitalization relapse	
non-ITAREPS	0.24 (6/25) [1]
ITAREPS	0.24 (17/70) [1]
Probability of hospitalization relapse	
non-ITAREPS	0.40 (28/70) [1]
ITAREPS	0.04 (1/25) [1]
Probability of death	
General Czech mortality tables	(age-dependent) [4]
SMR for people with schizophrenia	2.58 [3]

**Table 3.** Costs

Cost items	Costs
ITAREPS first year	€183/year [5]
ITAREPS consequent years	€140/year [5]
Hospitalization	
Non-ITAREPS	€2,642/event [1]
ITAREPS	€2,196/event [1]
Medication	
Non-ITAREPS	€3,379/year [1]
On ITAREPS	€3,576/year [1]

## References

[1] Spaniel F, Hrdlička J, Novák T, et al. Effectiveness of the Technology Aided Programme of Relapse Prevention in Schizophrenia (ITAREPS): A Randomized, controlled, double blind study. *J Psychiatr Pract* 2012;18:269–80. [2] Komatsu H, Yoshimoto S, Okamura N, et al. Effectiveness of Information Technology Aided Relapse Prevention Programme in Schizophrenia excluding the effect of user adherence: a randomized controlled trial. *Schizophrenia Res* 2013;150:240–4. [3] Saha S, Chant D, McGrath J. A Systematic Review of Mortality in Schizophrenia. *Arch Gen Psychiatry* 64 (2007): 1123–1131. [4] Czech mortality tables. Czech Statistical Office. Available online at [https://www.czso.cz/csu/umrtnostni\\_tabulky](https://www.czso.cz/csu/umrtnostni_tabulky) to 16/10/2015. [5] ITAREPS 2.0: relapse prevention programme of psychotic disorders. Prague 2011. Working material delivered to iHETA and consulted with the authors. [6] Exchange rates, monthly averages. Czech National Bank. Available online at [https://www.cnb.cz/cs/financni\\_trhy/devizovy\\_trh/kurzovy\\_devizoveho\\_trhu/prumerny\\_menaspomena=EUR](https://www.cnb.cz/cs/financni_trhy/devizovy_trh/kurzovy_devizoveho_trhu/prumerny_menaspomena=EUR) to 16/10/2015. [7] Harmonized index of consumer price. Eurostat. Available online at <http://ec.europa.eu/eurostat/web/hicp/statistics-illustrated> to 16/10/2015. [8] Graham C, Mausekopf J, Lawson H, Ascher-Svanum H, Bruhn D. Updating and Confirming an Industry-Sponsored Pharmacoeconomic Model: Comparing Two Antipsychotics in the Treatment of Schizophrenia. *Value in Health* 15 (2012): 55–64. [9] The European Mental Health Action Plan. WHO Europe. Available online at [http://www.euro.who.int/\\_data/assets/pdf\\_file/0004/194107/63wd11e\\_MentalHealth3.pdf?ua=1](http://www.euro.who.int/_data/assets/pdf_file/0004/194107/63wd11e_MentalHealth3.pdf?ua=1) to 16/10/2015.

**Table 4.** PSA setting

Input parameter	Distribution	Standard error/variation
Age	Uniform	32.9-37.9 (age range in RCT) [1]
Standardized mortality ratio	Normal	$\pm 0.0117$ [3]
Cost of hospitalization	Gamma	$\pm €616$ (non-ITAREPS), $\pm €1,828$ (ITAREPS) [1]
Cost of medication	Gamma	$\pm €40$ (non-ITAREPS), $\pm €90$ (ITAREPS) [1]
Non-hospitalization relapse duration	Gamma	$\pm 20\%$ (assumption)
Hospitalization relapse duration	Gamma	$\pm 11$ days (non-ITAREPS), $\pm 51$ (ITAREPS) [1]
Probability of relapses	Beta	$\pm 10\%$ (assumption)
Utilities	Beta	$\pm 10\%$ [8]

## RESULTS

Over a 20-year time horizon, ITAREPS compared to non-ITAREPS brings additional 0.21 QALY (12.33 vs. 12.12). The incremental total costs were  $-\text{€}5,554$  ( $\text{€}55,435$  vs.  $\text{€}60,989$ ) for ITAREPS. ITAREPS is thus dominant intervention while it brings more QALYs at lower costs (**Table 5**). The insignificantly higher costs of ITAREPS service itself ( $\text{€}183$  in the first and  $\text{€}140$  in subsequent years) are therefore vastly offset by savings of hospitalization relapse costs ( $\text{€}1,243$  vs.  $\text{€}11,748$ ); ITAREPS on average prevents 5 hospitalization relapses in 20-year time horizon (0.73 vs. 5.77 hospitalizations) per patient.

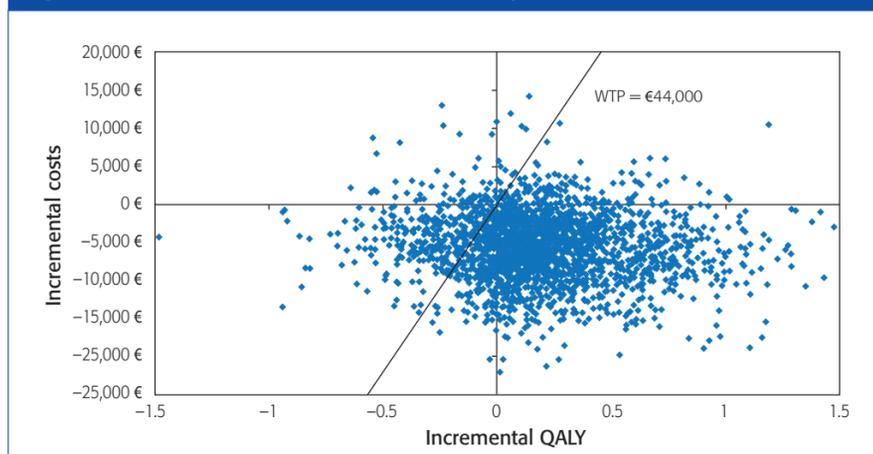
The results of the PSA show that ITAREPS is cost-effective in 93% iterations under the WTP threshold equal to  $\text{€}0$  and in 87% iterations under the WTP threshold of 3-times GDP per capita which is equal to  $\text{€}44,000$  (**Figure 2** and **3**).

A scenario analysis of the most influential variables confirmed the base-case results ITAREPS was dominant in all scenarios except for  $-50\%$  of hospitalization in non-ITAREPS arm scenario where the ICER was equal to  $\text{€}3,415$ .

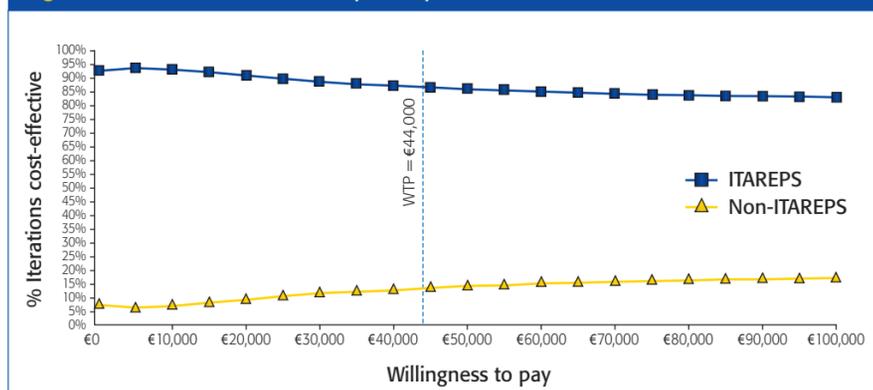
**Table 5.** The results of cost-effectiveness analysis

	ITAREPS	Non-ITAREPS	Increment
Total costs	€55,435	€60,989	– €5,554
- Cost of hospitalization	€1,243	€11,748	– €10,505
- Cost of medication	€52,104	€49,241	€2,863
- Cost of ITAREPS	€2,088	€0	€2,088
Hospitalization relapses	0.73	5.77	5.04
QALY	12.33	12.12	0.21
ICER (€/QALY)	–	–	Dominant (–26,196)

**Figure 2.** Incremental Cost-Effectiveness scatter plot (ITAREPS vs. Non-ITAREPS)



**Figure 3.** Cost-effectiveness acceptability threshold



## CONCLUSIONS

ITAREPS is a highly cost-effective intervention in patients with schizophrenia and it is even a dominant intervention in comparison with non-ITAREPS since it is more effective in terms of QALYs gained and cheaper at the same time. There is even 93% probability of ITAREPS being cost-effective at the WTP threshold equal to  $\text{€}0$ .

This and similar interventions are especially needful in the light of recent Mental Health Action plan in Europe which points out the vast array of problems of the care in people with mental disorders including schizophrenia; also, mental disorders are, as they put it, one of the greatest public health challenges in the Europe [9].