BUDGET IMPACT ANALYSIS (BIA) OF MECHANICAL THROMBECTOMY IN ACUTE PHASE OF ISCHEMIC STROKE (AIS)

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Background

Treatment of stroke episodes in acute phase (AIS) in Poland is financed under hospital stay. Patient hospitalization due to stroke is reimbursed within specific Diagnostic Related Group (DRG): A58 to A51, depending on detailed diagnosis and treatment. At the time of this analysis, treatment of AIS with mechanical thrombectomy (MT) was not reimbursed in Poland. However, according to expert opinion, there are few stroke centers in Poland where some patients are treated with MT.

Objective

To estimate the impact of MT, using a stent retriever, on budget of public payer's in Poland. Additionally, as treatment of long-term stroke consequences require patient's co-payment, a perspective of public payer+patient was considered.

Methodology

General Assumptions

Analysis was performed from two perspectives in a 2-year time horizon (2017-2018). It was assumed that MT, using a stent retriever, will be added to best standard care (BSC) and patients treated with BSC can be divided into 2 subgroups:

- treated with IV rt-PA (and MT is added to BSC defined as IV rt-PA),
- unsuitable to IV rt-PA (and MT is added to BSC defined as other than IV rt-PA).

For key parameters and assumptions (target population size, prevalence of MT, cost data) one-way sensitivity analysis (OWSA) were performed.

Population size

Based on available data presented by NHF as DRG stats [1] it was possible to estimate total number of patients who will be treated with IV rt-PA in subsequent years. In this subgroup of patients MT added to BSC can be applied to a certain percentage of the subgroup. This was calculated based on data received from one stroke center in Poland [2]. Based on these data also number of patients in a subgroup unsuitable to IV rt-PA who can be treated with MT was estimated.

Total number of strokes in 2009-2014 was between 72,489 to 79,102. It was assumed that in subsequent years total number of stroke episodes will be constant at 77,946 patients as in 2014. Percentage of strokes treated with IV rt-PA will be increasing in subsequent years (2015-2018). Based on linear regression it was estimated on 10.7% in 2017 and 12.0% in 2018.

Data received from one stroke center in Poland contain information on patients with stroke treated between January 2013 and April 2016: total number of stroke episodes, total number of performed MT added to BSC defined as IV rt-PA or other treatment. Assuming that 12% of strokes will be treated with IV rt-PA the percentage of patients treated with MT + BSC in a subgroup of patients treated with IV rt-PA was estimated as 7.64%. Those patients are 62.2% of all treated with MT added to BSC.

Table 1. Total number of strokes and IV rt-PA treatment in Poland

Category	2009	2010	2011	2012	2013	2014
Number of strokes	75,544	72,489	77,708	79,102	79,527	77,946
IV rt-PA treatment	678	1,193	2,254	3,138	4,373	5,580
% of strokes treated with IV rt-PA	0.9%	1.6%	2.9%	4.0%	5.5%	7.2%

Table 2. Prevalence of MT in a subgroup of patients treated with IV rt-PA

Category	Value	Comment
Number of strokes	5,017	Total number of patients with stroke treated in stroke center
IV rt-PA treatment	602	Estimation based on previous calculations, that 12% of strokes (in 2018) will be treated with IV rt-PA
IV rt-PA treatment with additional MT	46	Number of patients with stroke treated with MT added to IV rt-PA in stroke center
	7.64%	Percentage esstimated based on above data

Table 3. Patients treated with MT in stroke center (subgroups)

Category	N	Percentage
Total number of MT	74	100%
IV rt-PA with additional MT	46	62.2%
unsuitable for IV rt-PA	28	37.8%

Table 4. Estimated size of target population – summary of calculations

Category		2017	2018
Total number of stroke episodes		77,946	77,946
Percentage of strokes treated with IV rt-PA		10.7%	12.0%
Number of strokes treated with IV rt-PA		8,359	9,357
Percentage of IV rt-PA treated with additional MT		7.64%	
Treated with MT+BSC with IV rt-PA		639	715
Percentage of patients treated with MT between subgroups	treated with IV rt-PA	62.2%	
	unsuitable for IV rt-PA	37.8%	
Treated with MT+BSC without IV rt-PA		389	435
Total number of patients can be treated with MT		**1,028**	**1,150**

Prevalence of MT

According to clinical expert opinion there are some limitations that have negative impact on total number of patients who can be treated with MT:

- insufficient number of clinical specialists with experience in treatment of stroke with MT,
- insufficient number of clinical centers providing a non-stop specialist care.

Due to that it was arbitrary assumed that in 1st year of MT reimbursement only 50% of available patients will receive such treatment. In 2nd year all available patients will be treated with MT+BSC.

Cost data

Following cost categories were included: cost of MT+BSC or BSC alone, cost of adverse events management and cost of health state.

Detailed cost data were taken directly from economic analysis or were estimated based on the results of economic analysis *(COST-EFFECTIVENESS ANALYSIS OF MECHANICAL THROMBECTOMY IN ACUTE PHASE OF ISCHEMIC STROKE (IN POLAND))*.

- 20% of patients need 2 thrombectomies per stroke episode,
- costs of adverse events treatment were estimated based on detailed data on safety and cost of adverse events management.
- costs of health states were estimated based on detailed data on effectiveness and mortality and result of Polish cost study [3].

Results

Population

Estimated size of target population is 8,748 in 2017 and 9,792 in 2018. This include all patients who will be treated with IV rt-PA (regardless of MT availability) and all patients who will be treated with BSC other than IV rt-PA (all available for MT). In current scenario none of patient is treated with MT+BSC. In predicted scenario MT will be added to BSC in 514 patients in 1st and 1,150 in 2nd year of reimbursement.

Table 5. Estimated size of target population – current scenario

Number of patients		2017	2018
BSC	IV rt-PA	8,359	9,357
	other than IV rt-PA	389	435
MT + BSC	IV rt-PA	0	0
	other than IV rt-PA	0	0
Total		**8,748**	**9,792**

Table 6. Estimated size of target population – predicted scenario

Number of patients		2017	2018
BSC	IV rt-PA	8,040	8,642
	other than IV rt-PA	194	0
MT + BSC	IV rt-PA	319	715
	other than IV rt-PA	194	435
Total		**8,748**	**9,792**

Expenditures

In current scenario estimated NHF expenditures in target population will be ca 151.2 mPLN in 2017 and 192.1 mPLN in 2018. When perspective of public payer+patient is taken then total expenditures will be 152.2 mPLN in 2017 and 195.4 mPLN in 2018.

Table 7. Estimated expenditures – current scenario [mPLN]

Cost category	2017	2018
NHF perspective		
Intervention	113.7	127.3
Adverse events	1.9	2.1
Health state	36.5	62.7
Total expenditures	**151.2**	**192.1**
NHF+patient perspective		
Intervention & adverse events	as in NHF perspective	
Health state	36.6	65.9
Total expenditures	**152.2**	**195.4**

Intervention cost is a sum of cost related to: diagnosis, hospital stay, treatment procedure, device for MT
Health state cost is a sum of cost related to: patient's rehabilitation (acute phase only), ambulatory care and pharmacotherapy (acute and rest-of-life phase) and additional hospitalization (rest-of-life phase only)

In predicted scenario estimated NHF expenditures in target population will be ca 173.7 mPLN in 2017 and 242.4 mPLN in 2018. When perspective of public payer+patient is taken then total expenditures will be 174.7 mPLN in 2017 and 245.7 mPLN in 2018. This implies that positive decision on reimbursement of MT will results in increase of total expenditures within 2-year time horizon (22.5 mPLN in 1st and 50.3 mPLN in 2nd year, regardless of perspective).

It can be seen that despite of increase in total expenditures there are savings in categories related to health states. This is due to fact that adding MT to BSC is more effective than BSC alone and cost related to treatment of long-term consequences of stroke are lower.

Table 8. Estimated expenditures – predicted scenario [mPLN]

Cost category	2017	2018
NHF perspective		
Intervention	135.6	176.2
Device for MT	20.3	45.5
Adverse events	2.8	4.1
Health state	35.3	62.1
Total expenditures	**173.7**	**242.4**
NHF+patient perspective		
Intervention & adverse events	as in NHF perspective	
Health state	36.4	65.4
Total expenditures	**174.7**	**245.7**

Table 9. Estimated expenditures – incremental results [mPLN]

Cost category	2017	2018
NHF perspective		
Intervention	21.8	48.9
Adverse events	0.9	2.0
Health state	-0.3	-0.6
Total expenditures	**22.5**	**50.3**
NHF+patient perspective		
Intervention & adverse events	as in NHF perspective	
Health state	-0.2	-0.6
Total expenditures	**22.5**	**50.3**

OWSA indicate on variability of incremental results ranging from 19.1 to 45.0 mPLN in 2017 and from 42.7 to 65.4 mPLN in 2018.

Conclusions

Our findings suggest that positive decision on reimbursement of mechanical thrombectomy, using a stent retriever, will cause increase in public payer (or public payer+patient) expenditures for treatment of AIS. However, there is a possibility for some savings in long-term time horizon.

References

1. https://prog.nfz.gov.pl/app-jgp/Start.aspx
2. 2. Stroke Centre in Cracow (CITO)
3. 3. ECONOMEDICA. Stroke

AIS	*Acute ischemic stroke*	**IV rt-PA**	*Intravenous tissue plasminogen activator*	**OWSA**	*One-way sensitivity analyses*	**NHF**	*National Health Found*
BSC	*Best standard care*	**MT**	*Mechanical thrombectomy*	**DRG**	*Diagnostic Related Group(s)*		