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Analysis of the utilization of Hungarian one-day surgical treatment

Doctoral (Ph.D.) thesis

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1. INTRODUCTION

Health-related costs are rising steadily worldwide, particularly in countries with developed health systems. The main drivers of rising costs are technological advances, the deployment of significant human resources, and the continuing aging of the population. Healthcare funders such as governments, insurers, and households are increasingly interested in which systems and treatments contribute the most to health gains in terms of the resources used. In most sectors, resources are limited, so identifying and applying the most efficient ways of using them is key for policymakers and society, as health affects all levels of the population. Today, efficiency and quality indicators of healthcare systems have become important indicators for international comparisons of countries' competitiveness.

In the health care system, there are several types of care, each with a different purpose, so it is important to distinguish them sharply. In-patient care aims to provide curative, preventive, and rehabilitative activities in an in-patient care facility, with a predictable, usually short, period of care. The main aim is to restore health as soon as possible or, if this is not possible, to stabilize it and prevent complications.

In-patient care is currently the costliest type of care in the health sector. Increased cost pressures have led to societal, and policy demands to restore patients to health more quickly at lower unit costs. These needs later became the basis for the construction of the concept of one-day surgical care. One-day surgical care is "specialized out-of-hospital care requiring less than 24 hours of care in a specialized facility under conditions similar to those in a hospital. Day surgery is not to be confused with outpatient surgery."

In Hungary, the conditions and rules for one-day surgical care are laid down in the Health, Social and Family Affairs Ministerial Decree 16/2002 (XII.12.). The Decree defines the institutional, infrastructural, and professional conditions without which the provision of one-day surgical care is not feasible. It also specifies the procedures that could be carried out in a one-day surgery setting and the criteria that are expected to be met about the patient's condition and the home where the rehabilitation is carried out.

One of the main advantages of one-day surgical care is that the hospitalization period is shorter than for in-patient care, as the time spent in the institution should not exceed 24 hours. Shorter

hospital stays could result in a significant reduction in per-patient expenditure for healthcare institutions, as food, laundry, pharmaceutical, and hotel costs are incurred over a shorter period. The cost per case of nursing care is significantly lower in the case of one-day surgical care, as international results show a strong correlation between the number of days of hospitalization and the cost of care. An additional advantage of one-day surgical care is that it has a lower risk of nosocomial infections due to short hospital stays, a better ratio of medical staff per patient, can substantially reduce waiting lists, and also provides a high degree of patient safety and a low complication rate. The position taken by professional organizations is that preoperative pre-assessment and protocol-guided managed discharge practices are key to preventing complications following one-day surgical procedures and maximizing patient safety.

In previous decades, most patients with good general health status were only treated with one-day surgery. Nowadays, there has been an improvement in this regard, as chronic diseases such as type 2 diabetes, sleep apnea, obesity, or advanced age are not necessarily exclusion criteria for one-day surgery. This type of care nowadays offers key advantages that have led professional organizations to formulate guidelines for the widest possible use of one-day surgical care in both the pediatric and adult populations. The significant benefits are leading to a steady increase in the number of invasive procedures that used to require hospitalization for several days but could now be performed in a day case.

Given the benefits of one-day surgical care, there has been a varied pace of change in care management practices as one-day surgical care has become more widely used. In the international academic literature, the utilization rate of one-day surgical care has become an important indicator, most often tracked through on the flagship interventions.

In the context of the uptake of this care, the international literature shows mixed results, with Northern European countries predominantly being considered as countries with high rates of one-day surgery, while Central European countries are predominantly described by low volumes of one-day surgery. In addition, there are significant regional differences in the performance of healthcare institutions in terms of one-day surgery.

It is important to note that even in higher-income countries with advanced healthcare systems such as France, the market share of one-day surgical care was low at only 40% in the early 2010s. The 2010s marked the beginning of a period in which several countries, including Hungary, were establishing the basis for a wider uptake of one-day surgical care.

Initially, measures provided additional capacity to increase one-day surgical quotas on a smaller scale, but later on, universally available incentives were introduced, alongside which there was a rational basis for healthcare institutions to change their care management practices.

2. AIMS

The aim of the thesis is to analyze the utilization of one-day surgical care in the Hungarian public health care system, which is of increasing importance in the international health care sector.

The main objectives of the research can be summarized as follows:

1. To evaluate the change in performance indicators of one-day surgical care in the Diagnosis-related Groups (DRGs) financing system from 2010 onwards and to determine the level of community funding for one-day surgical care.
2. To determine the number of cases and DRG cost-weights of one-day surgical care from 2010 onwards, supplemented by the types of hospitals, the medical professions, the invasive procedures performed and the age characteristics of the patient population.
3. To identify the impact of changes in performance indicators for one-day surgical care on the number of in-patient cases and the number of hospital days.
4. Analyze the role of one-day surgery in a waiting list reduction program.
5. To evaluate the role of one-day surgical care in reducing the cataract surgery waiting list.

3. DETAILED RESULTS

3.1. DEVELOPMENT OF PERFORMANCE INDICATORS FOR ONE-DAY SURGICAL CARE IN THE DRG-BASED FINANCING SYSTEM

Introduction: A steady increase in the utilization of one-day surgical care has been observed in many European countries for more than a decade. In Hungary, the utilization of the treatment was not significant according to international rankings before 2010. From 2010 onwards, Hungarian policymakers have made it a priority to increase the share of one-day surgical care.

Aim: This study aimed to analyze the performance indicators of Hungarian same-day care in the HBCs-based performance funding system in Hungary over the past decade.

Materials and methods: The study database was provided by the National Health Insurance Fund Administration (NHFIA). The study compared key indicators (market share, number of cases, DRG cost-weights) related to one-day surgical treatment with those registered in in-patient care. To quantify the impact of one-day surgical care on in-patient utilization as accurately as possible, the change in the number of hospital days was also analyzed.

Results: The market share of one-day surgical cases increased from 42% to 80% between 2010 and 2019. During the same period, the share of one-day surgical cases compared to in-patient surgical cases also increased significantly from an initial 20% (2010) to 45% (2019). In parallel to the steady increase in the number of cases, the number of hospital days in in-patient care decreased by 17%. The Case-Mix Index (CMI) has increased by 40%, confirming that increasingly complex procedures might be performed in one-day surgical care.

Conclusion: The Hungarian health policy strategy to increase the utilization of one-day surgical care has led to the identification of improvements in several key performance indicators between 2010- 2019. Given that Hungary is a low- and middle-income country, the results of the study are of increased interest in international comparison.

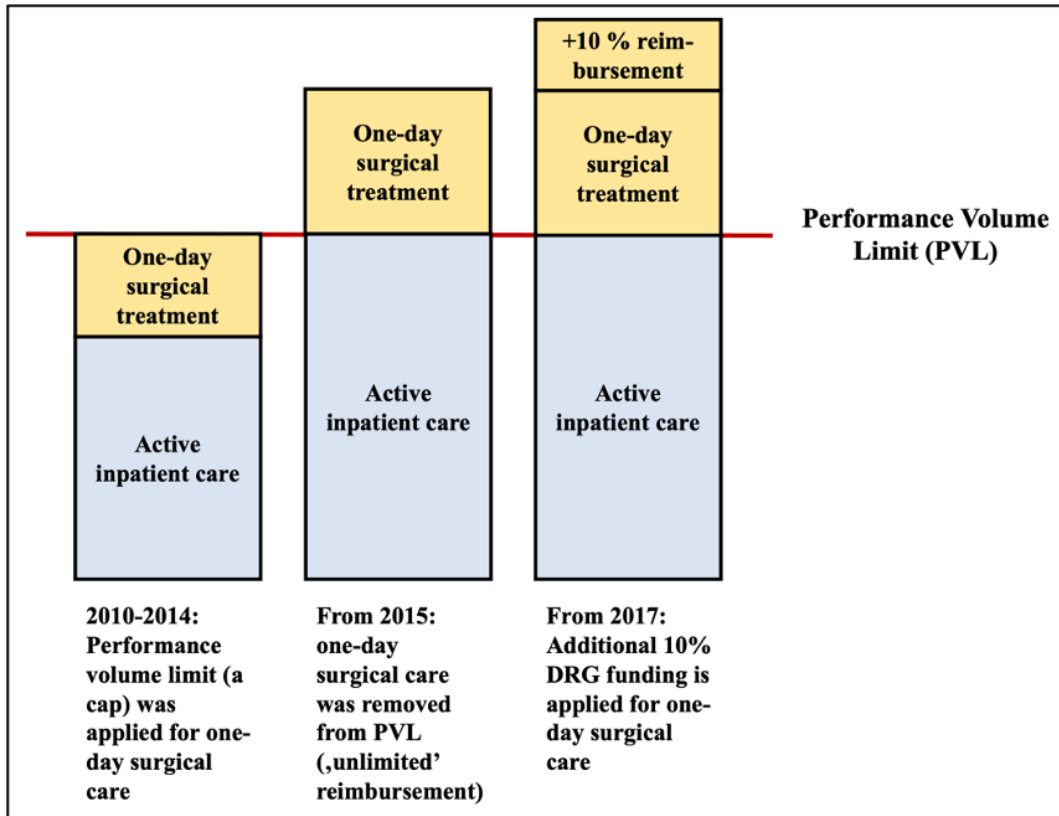


Figure 1: Overview of the financing of publicly funded one-day surgical care in Hungary (2010-2019)

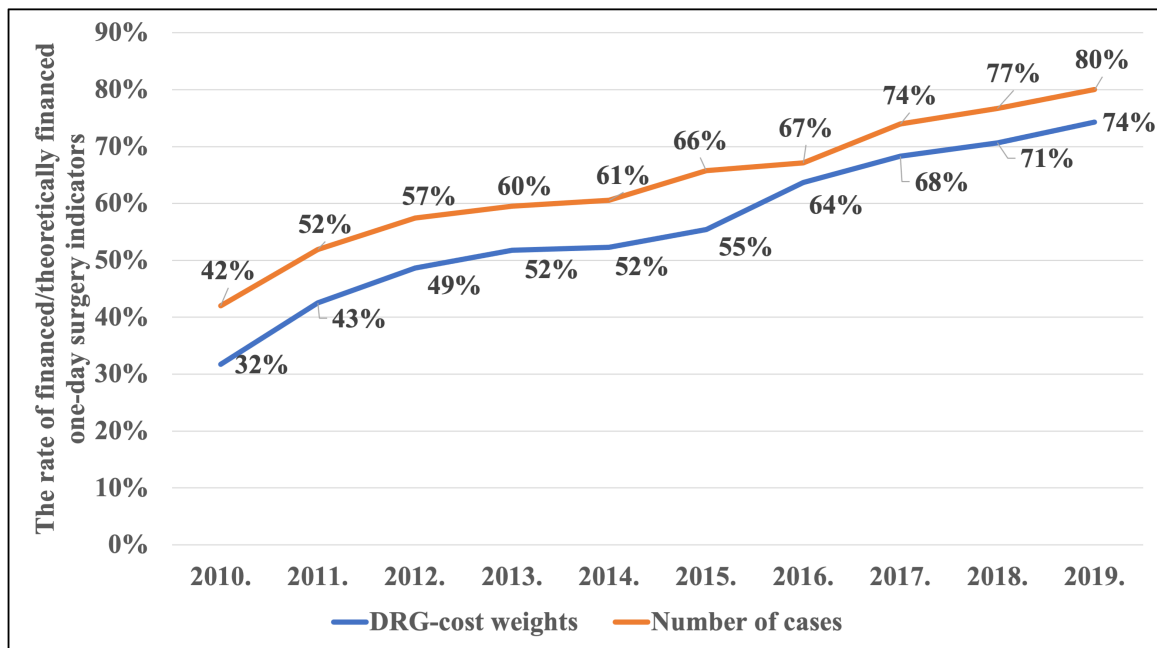


Figure 2: Share of one-day surgical number of cases and DRG cost-weights compared to the theoretical maximum set by legislation (2010-2019)

3.2. ANALYSIS OF THE NUMBER OF CASES OF ONE-DAY SURGICAL CARE BY PATIENT POPULATION, HEALTH CARE INSTITUTIONS, MEDICAL PROFESSIONS, AND INVASIVE INTERVENTIONS

Introduction: One of the most dynamically evolving healthcare treatment in recent decades is one-day surgical care, which has the potential to predict a number of systemic and policy benefits.

Aim: The aim of the study is to analyze the number of cases and invasive interventions of one-day surgical treatment in Hungary in different aspects, which were publicly funded during the 2010-2021.

Materials and methods: The retrospective, quantitative study was delivered was based on a database provided by NHFIA, which included the number of publicly- funded and eligible one-day surgical cases, gender and age of patients, county of residence, type of hospital, type of treatment, and identification codes of invasive medical interventions according to the International Classification of Health Interventions (ICHI).

Results: The annual number of cases treated in one-day surgical treatment in Hungary increased significantly over the period 2010-2021, from 130,995 in 2010 to 187,675 in 2021. The mean age of patients receiving one-day surgical care also increased significantly, from 47.4 years in 2010 to 53.1 years in 2021. In 2010, only 42% of eligible one-day surgical cases were delivered by hospitals as one-day surgical cases, compared to 77% in 2021.

Conclusion: Ophthalmology, obstetrics and gynecology, surgery, traumatology, and urology are the leading medical professions in Hungary in terms of one-day surgical treatment. In view of the indicators evaluated, there has been an outstanding development of one-day surgery in Hungary, especially in obstetrics-gynecology and ophthalmology.

Examined year	Number of cases			Mean age		
	Male	Female	Total	Male	Female	Total
2010.	32.286	98.709	130.995	54,74	44,93	47,36
2011.	52.138	129.853	181.991	54,34	47,55	49,49
2012.	61.941	145.483	207.424	55,20	49,51	51,21
2013.	66.665	150.498	217.163	56,18	50,62	52,32
2014.	70.356	156.239	226.595	57,02	51,51	53,22
2015.	81.005	170.323	251.328	57,80	52,92	54,50
2016.	86.635	178.006	264.641	56,70	51,82	53,38
2017.	103.844	194.855	298.699	56,30	52,05	53,50
2018.	113.142	204.471	317.613	57,72	54,36	55,56
2019.	124.106	215.057	339.163	57,65	54,66	55,75
2020.	98.192	177.156	275.348	58,13	53,28	55,01
2021.	65.733	121.942	187.675	59,41	53,59	55,63
Total	956.044	1.942.591	2.898.635	56,77	51,40	53,08

Table 1: Number of cases in one-day surgical care according to the patient population by gender, by year (2010-2021)

3.3. CHANGES IN THE UTILIZATION OF ONE-DAY SURGICAL TREATMENT COMPARED TO IN-PATIENT CARE

Introduction: One-day surgical care has become an increasingly important part of health care management in recent decades, as it provides treatment with high patient safety and short hospitalization times at significantly lower costs than in-patient care.

Aim: The aim of this study is to analyze the performance indicators of one-day surgical care in the Hungarian publicly funded healthcare system over the period 2010-2021.

Materials and methods: The study database consisted of the NHFIA financing database, which was retrieved from the Pulvita Health Data Warehouse. The study database included the number of cases and DRG cost-weights, the number of hospitalized days, and the codes of DRGs.

Results: Between 2010-2019, the number of cases and DRG cost-weights per day of surgery followed a linear upward tendency, with a decrease identified between 2020-2021 due to the COVID-19 pandemic. In 2021, the number of cases increased by 43% and DRG cost-weights by 83% compared to the 2010 baseline. While in 2010, one-day surgical cases accounted for 20% of all study samples accounted for in in-patient care, in 2021 this proportion was over 35%. A negative-sign correlation ($r=-0.8093$) was observed between the volume of one-day surgical cases and the change in hospitalized days in in-patient care. A total of 5,422,280 cases were identified during the study period that could have been completed as one-day surgical cases based on the DRGs, however, the proportion of one-day surgical cases was only 53% ($n=2,898,635$).

Conclusion: A significant increase in the utilization of one-day surgical care could be identified in several aspects over the study period. The incentive funding-technique for increasing the utilization of one-day surgical care might play a significant role. Based on the data evaluated, it might be concluded that there is still considerable potential for an increase the number of delivered one-day surgical procedures.

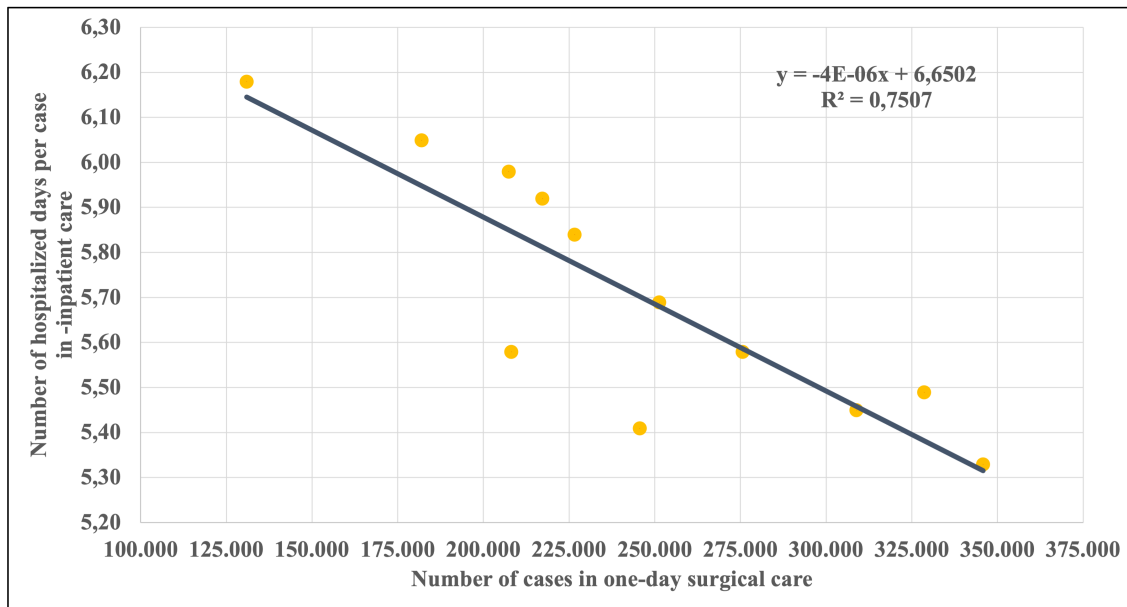


Figure 3: Impact of the number of one-day surgical cases on in-patient hospitalized days

3.4. THE ROLE OF ONE-DAY SURGICAL TREATMENT IN THE DECREASE OF WAITING LISTS

Introduction: A systematic waiting list reduction program ("X" reimbursement category) was launched in Hungary to significantly reduce waiting times in 2015.

Aim: In the study, an evaluation was delivered to capture the distribution of cases according to the type of treatment settled in the "X" reimbursement category in the period 2015-2018.

Materials and methods: The retrospective, quantitative study was based on a database provided by NHFIA, which included the number of cases settled under reimbursement category X, established in 2015 to finance the waiting list reduction program, between 2015 and 2018. The database included the gender and age of the patients, county of residence, county, and type of hospitals, and the performed medical interventions.

Results: 27,716 cases (average age 68.05 years) were reported in the study period, with a female majority (63.1%). Per 10,000 inhabitants, the highest number of cases was reported in the counties of Baranya (84.63), Somogy (60.17) and Zala (58.89). 71.6% of the reported cases were treated in the county of residence of the patients. The highest number of financed cases was related to cataract intervention.

Conclusion: Significant disparities were identified in the number of cases by the waiting list reduction program. In addition, the institutional involvement in the program showed remarkable differences.

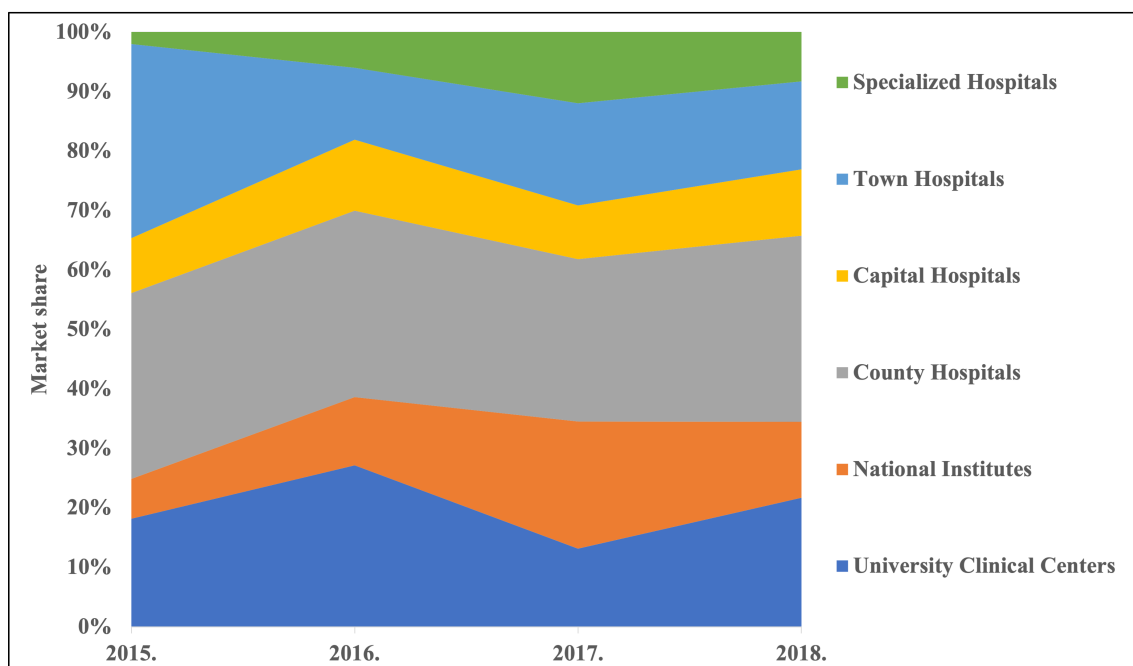


Figure 4: Breakdown of the number of cases according to major waiting list in the waiting list reduction program (2015-2018)

		Location of the hospital																				
Location of the patient	Denomination of the county	Baranya	Bács-K-K	Békés	Borsod-A-Z	Csongrád-Cs	Fejér	Győr-M-S	Hajdú-B	Heves	Komárom-E	Nógrád	Pest	Somogy	Szabolcs-Sz-B	J-N-Szolnok	Tolna	Vas	Veszprém	Zala	Budapest	Total
	Baranya	2.960	0	0	0	0	1	1	0	0	1	0	0	0	58	1	0	33	0	0	4	48
Bács-K-K	35	725	1	0	9	103	1	0	1	1	0	1	1	2	1	1	0	0	0	1	154	1.037
Békés	7	0	641	0	12	0	0	3	0	5	0	0	0	0	0	0	0	0	0	0	69	737
Borsod-A-Z	8	0	0	1.185	0	4	0	156	26	12	38	0	1	29	0	1	0	0	0	0	161	1.620
Csongrád-Cs	7	1	46	0	208	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	48	313
Fejér	22	0	0	0	0	1.109	0	1	0	29	0	0	21	0	0	0	0	0	1	2	329	1.514
Győr-M-S	18	0	0	0	0	1	975	0	0	83	0	0	0	0	0	0	1	8	3	229	1.318	
Hajdú-B	0	0	0	1	0	0	3	223	0	2	0	0	0	7	2	0	0	0	0	0	52	290
Heves	0	0	0	9	0	2	0	47	867	8	53	0	0	1	2	0	0	2	0	0	377	1.368
Komárom-E	5	5	0	0	0	11	19	0	0	214	0	4	2	2	0	0	2	0	0	1	339	604
Nógrád	0	0	0	1	0	0	0	0	22	1	596	27	0	0	0	0	0	0	0	0	224	871
Pest	14	8	0	0	0	14	1	1	12	80	7	120	0	3	14	1	3	2	1	2.280	2.561	
Somogy	131	1	0	0	0	36	1	0	0	11	0	0	1.263	0	34	8	8	2	219	138	1.852	
Szabolcs-Sz-B	5	0	0	3	0	1	0	97	0	7	0	0	0	2.417	0	0	0	0	0	0	82	2.612
J-N-Szolnok	7	0	7	1	8	0	0	25	23	6	6	0	0	2	176	0	0	0	2	171	434	
Tolna	98	3	0	0	0	19	0	1	0	13	0	0	79	0	0	71	0	0	1	63	348	
Vas	15	0	1	0	0	3	17	0	0	19	0	0	3	0	0	1	507	2	79	34	681	
Veszprém	12	0	0	0	0	44	34	0	0	56	0	0	2	0	0	3	5	513	43	150	862	
Zala	66	1	0	0	0	6	3	1	0	115	0	1	8	0	3	3	10	0	1.287	109	1.613	
Budapest	11	1	0	2	3	8	3	2	1	143	0	5	2	3	0	1	1	0	5	3.780	3.971	
Total	3.421	745	696	1.201	240	1.362	1.058	557	952	807	700	158	1.442	2.467	232	123	537	530	1.648	8.837	27.716	

Table 2: Breakdown of the number of cases registered by county (2015-2018)

3.5. EVALUATION OF THE IMPACT OF ONE-DAY SURGICAL TREATMENT ACCORDING TO ITS ROLE IN CATARACT WAITING LIST REDUCTION

Introduction: Waiting lists are solid indicators that have received considerable international attention when comparing the quality of healthcare systems. Cataract surgery is one of the most common waiting list procedures worldwide and it has particular importance.

Aim: The aim of this study is to analyze the role of one-day surgical treatment in reducing the waiting list in relation to cataract surgery in Hungary in the period 2014-2019.

Materials and methods: The database contained the number of patients on cataracts waiting list and cataract pre-registration waiting list, the mean waiting times on waiting list and pre-registration list, the distribution of the number of cases according to the type of care, the medical interventions according to codes (WHO ICHI) and the name of the interventions, as well as the type of health care institution providing care.

Results: The average actual waiting time was 104 days in 2014, which decreased to 39 days in 2019. Cases were typically settled in one-day surgical care. During the study period, the number of surgical cases changed significantly only between 2014 and 2015. The most performed procedure was phacoemulsification surgery combined with curved artificial lens implantation fixed with WHO ICHI code 51474, which accounted for 96.1% of all procedures included in the study (n=529,013).

Conclusion: The number of waiting list patients did not increase significantly during the study period. The annual number of surgical cases did not change significantly from 2015; however, the actual average waiting time decreased remarkable. This demonstrates that the average waiting time has been reduced without a significant increase in the number of surgical cases, which highlights the importance of waiting list management and the organization of care.

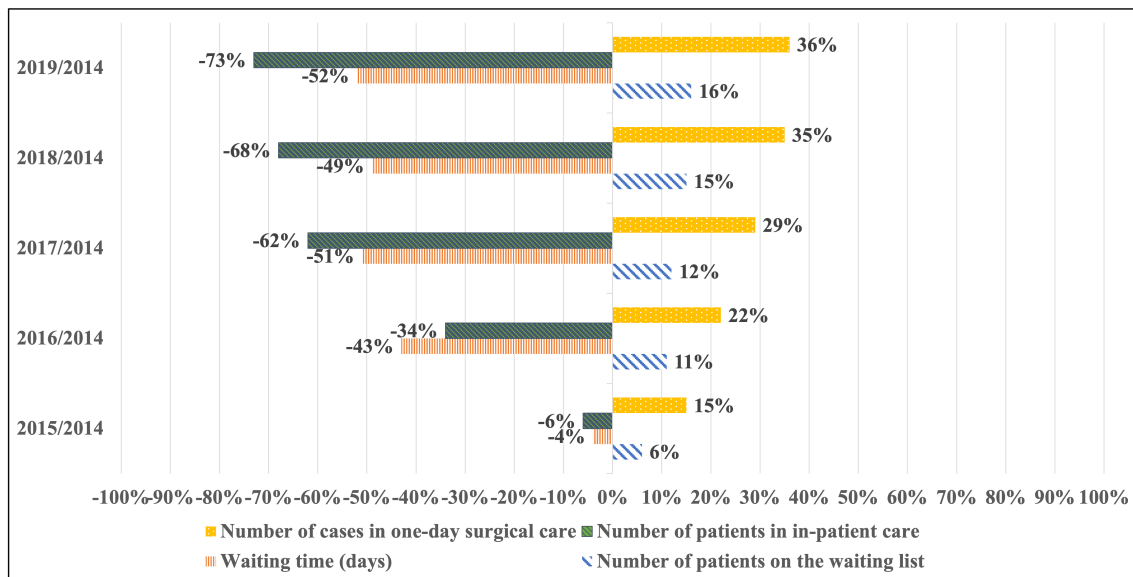


Figure 5. Change in the main indicators of the waiting list (%) compared to the 2014 baseline

4. DISCUSSION

The performance of publicly funded one-day surgical care in Hungary increased significantly over the study period. Since the beginning of the 2010s, policy initiatives have emerged in several phases, with the combined aim of increasing the share of one-day surgical cases and making it more widely available. Central measures have focused on increasing the performance of one-day surgery through financial incentives, and it should be highlighted that the range of procedures that could be performed in one-day surgery has been steadily expanding through advances in surgical and anesthetic procedures. In 2010, there were a total of 409 invasive procedures that were eligible for one-day surgery; in 2021, the number of procedures reached 782.

Between 2010-2019, the utilization of one-day surgical care increased at a linear rate. The findings were also confirmed in terms of the number of cases and DRG cost-weights, as well as the theoretical maximum for one-day surgery – i.e., the number of procedures that are legally eligible for one-day surgical care. In 2010, only 42% of cases eligible were performed in a one-day surgical setting; in 2019, this proportion reached 80%. In addition, it could be noted that there has also been a significant increase in the share of one-day surgery cases and DRG cost-weights compared to the surgical performance of in-patient care. In 2010, only 7% of all surgical DRG cost-weights were related to one-day surgery; in 2019, this share reached 20%. International academic literature also reports a steady increase in the proportion of one-day surgical cases compared to in-patient care. In the United States, the market share of one-day surgery based on all invasive procedures was 52.7% in 2014, and 33.1% in Hungary in the same year.

In Hungary, until the beginning of the COVID-19 pandemic, the proportion of one-day surgery cases increased steadily, resulting in a decreasing trend in the number of days of care registered in in-patient care at the national level and in the number of hospitalized days per case. At the same time, the CMI for one-day surgery has steadily increased, demonstrating that increasingly complex procedures might be performed with a high level of patient safety and that not only the simplest procedures could nowadays be performed in one-day surgery form.

Given the fundamental and multidimensional benefits of this certain treatment (institutional finance, patient satisfaction, length of time out of the labor market), governments should aim to favor cost-effective types of treatment with shorter hospitalization where medically justified. In Hungary, the amount of central budget resources allocated to publicly funded one-day

surgical care more than tripled between 2010 and 2019 in US Dollar (USD). Over the same period, public funding for in-patient care increased by a lower amount (1%).

Comprehensive academic literature highlights that the medical professions represent different roles in one-day surgical care. Ophthalmology, obstetrics-gynecology, surgery, orthopedics, interventional cardiology, urology, and otorhinolaryngology are those medical professions that might have relevant one-day surgical potential to relieve the financial pressure on governments because they could replace the expensive in-patient treatment without major care management reforms.

In Hungary, cataract lesions were associated with the highest number of one-day surgical cases during the study period. In addition to the high rate of one-day surgical performance at diagnosis, it should be noted that not 100% of cataract cases were treated in a one-day surgical setting. The rate of cataract procedures performed in one-day surgery is a remarkable indicator. In the international academic literature, the projection base for measuring performance is the rate of cataract surgery recorded in the one-day surgery. The annual OECD publications reported a low rate in Hungary in the early years, but as the study period progressed, the country's performance steadily caught up with the OECD average.

It is also important to highlight the one-day surgical performance in obstetrics and gynecology, as several procedures (curettage interruption, uterine polypectomy) were identified which are predominantly performed in a one-day surgery setting. These interventions are also reported in the international academic literature as being performed largely in a one-day surgical form.

Significant regional differences were identified in the utilization of one-day surgical care in Hungary. These were followed up at both county and institutional levels as well. Several of our studies have reported that a higher number of cases than the national average was reported in counties with a university clinical center. Although the most significant number of one-day surgical cases were reported by county and city hospitals. The one-day surgical performance of universities at the top of the progressive patient care hierarchy is also remarkable. In the first period of the study interval, one-day surgical cases could only be performed by hospitals with a lower CMI – all of which had individually defined one-day surgical quotas. Since 2015, the opportunity to perform one-day surgical cases has been significantly expanded with the inclusion of institutions at higher progressivity levels. Initially, the funding for one-day surgery was free of the institutional quotas, and then 110% of the DRG cost base has been applied to hospitals. This technique led many types of hospitals to change their patient care practices and shift the cases to less cost-demanding one-day surgical treatment. In the countries reviewed in

this thesis, most of the one-day surgical care is organized in dedicated one-day surgery centers, but it is common practice in Hungary and other countries that a facility-specific portfolio of interventions and DRG characterizes one-day surgical care.

There are publications in the international academic literature that highlights that the widespread utilization of one-day surgical care might help to reduce waiting lists. In Hungary, there are currently 255 medical interventions with waiting list obligations. These include 30 procedures that could be performed in one-day surgery, which are related to waiting lists such as cataract surgery, transurethral prostate surgery, gynecological surgery for non-malignant processes, sinus and processus mastoid surgery, cardiac electrophysiology, large and radiofrequency catheter ablation, and coronary interventions. The results show that cataract surgery is predominantly performed in a significant proportion of cataract operations in a one-day surgical setting. It did a significant contribution to Hungary offering one of the lowest waiting times for cataract waiting list patients among OECD Member States. The ability of one-day surgical treatment to reduce waiting lists among the remaining institutional waiting lists could be the subject of future analysis.

One-day surgery may be particularly beneficial for working-age social groups, as the short hospitalization period and low surgical workload allow for shortening the period of sick leave. In our studies where we had the opportunity to analyze the Hungarian one-day surgical patient population, the results reported in the international academic literature were confirmed, as a predominance of middle-aged female patients was found.

In the wake of the COVID-19 pandemic, the continuity of patient care and the financial stability of healthcare institutions required a review of financing techniques. Accordingly, the capacity framework for in-patient care was reallocated, which includes the one-day surgical treatment as well. As a result, although the funding of one-day surgical care provided by in-patient care facilities remains at 110% of the DRG basic fee, the principle of institutional one-day surgical quotas settlement has been abolished. The institutional quotas for institutions with a financing contract for independent one-day surgical care are also based on the performance of the base year.

In Hungary, one-day surgical treatment has developed significantly over the last 10 years: at the beginning of the decade, it had marginal significance, but later, it has now become a high-patient safety alternative treatment that meets real societal needs and may further prove its suitability in the future to relieve the burden of expensive in-patient care.

5. NEW RESULTS

Our analysis presented in this thesis includes several new findings, practical applications and suggestions for the future, which are summarized below:

New results:

1. An overview of the central-level incentive techniques for publicly funded one-day surgical care, the extent of community resources allocated for this treatment, and their impact on one-day surgical performance indicators was provided.
2. The number of cases and DRG cost-weights of one-day surgical care recorded over the past decade were established. The utilization was supplemented with the distribution of several cases between medical professions, the identification of the largest number of procedures performed, the associated DRGs, and the age characteristics of the patient population.
3. The assessment of the performance indicators of one-day surgery compared to surgical cases in in-patient care was delivered, with the impact of one-day surgery on hospital days.
4. The identification of the role of one-day surgical care in the waiting list reduction program was delivered, which was predominantly related to ophthalmology and invasive cardiology procedures.
5. The number of cataract waiting list cases and the average waiting time for cataract waiting list patients were described, and the market share of one-day surgery in the total number of cases served was evaluated.

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7. PUBLICATION LIST

Publications on the subject of the thesis

1. **Pónusz R.** Endrei D, Kovács D, Pónusz E, Kis Kelemen B, Elmer D, Németh N, Vereczkei A, Boncz I. The development of one-day surgical care in Hungary between 2010 and 2019. BMC Health Services Research. 2022; 22 (1): 798. (impact factor: 2,908).
2. **Pónusz R.** Boncz I, Kovács D, Csonka D, Gázsó T, Molics B, Ludman I, Endrei D. A magyarországi várólista-csökkentési program orvosszakmai összetételének, igénybevételi mutatóinak és területi megoszlásának elemzése 2015–2018 időszakában. Lege Artis Medicinae. 2022; 32 (3): 121-131.
3. **Pónusz R.** Endrei D, Kovács D, Németh N, Schiszler B, Molics B, Raposa LB, Gulácsi L, Mohamed GE, Boncz I. Az egynapos sebészeti ellátás igénybevételi mutatóinak elemzése Magyarországon Orvosi Hetilap. 2019; 160 (17): 670-678. (impakt faktor: 0,497).
4. **Pónusz R.** Endrei D, Kovács D, Csutak A, Boncz I. Az egynapos sebészet szerepe a szürkehályog műtét várólista csökkentésében. Interdiszciplináris Magyar Egészségügy (IME). 2022; 22(4): 3-10.

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1. **Pónusz R.** Endrei D, Kovács D, Boncz I. Az egynapos sebészet teljesítmény volumenének vizsgálata az aktív fekvőbeteg-ellátás tükrében. Egészség Akadémia

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Cited conference abstracts published on the topic of the dissertation

1. **Pónusz R**; Endrei D, Kovacs D, Boncz, I. Annual health insurance treatment cost of senile cataract based on routinely collected health care financing data. Value in Health 2022; 25 (1): S103-S103.
2. **Pónusz R**, Endrei D, Kovacs D, Nemeth N, Molics B, Danku N, Csakvari T, Boncz I. Epidemiology disease burden of other cataract based on routinely collected health insurance claims data. Value in Health. 2022; 25(1): S129-S129.
3. **Pónusz R**, Endrei D, Kovacs D, Nemeth B, Molics B, Danku N, Csákvári T, Boncz I. Annual Health Insurance Treatment Cost of Other Cataract Based on Routinely Collected Health Care Financing Data. Value in Health. 2022; 25(1): S104-S104.
4. **Pónusz R**, Kovács D, Kis Kelemen B, Németh N, Pónusz E, Molics B, Csákvári T, Boncz I, Endrei, D. DRG portfolio analysis of the state funded Hungarian waiting-list reduction program. Value in Health. 2020; 23(Suppl 1): S324.
5. **Pónusz R**, Kovács D, Kis Kelemen B, Németh N, Pónusz E, Boncz I, Endrei, D. Territorial distribution of case numbers related to the Hungarian waiting-list reduction program between 2015-2018. Value in Health. 2020; 23(Suppl 1): S305.
6. **Pónusz R**; Kovács D; Boncz I, Endrei D. Betegütemzés a magyarországi várólista csökkentési programban. In: Barna, Boglárka Johanna; Kovács, Petra; Molnár, Dóra; Pató, Viktória Lilla (szerk.) XXIII. Tavasz Szél Konferencia 2020. Absztraktkötet: MI és a tudomány jövője. Budapest, Magyarország. Doktoranduszok Országos Szövetsége (DOSZ) 2020; 454-456.
7. **Pónusz R**, Kovacs D, Molics B, Boncz I, Endrei, D. Analysis of the utilization of one-day surgery among cases related to the diseases of the musculoskeletal system or connective tissue. Value in Health. 2019; 22 (Suppl 3): S897-S897.
8. **Pónusz R**, Kovacs D, Boncz I, Endrei D. The change of Case-mix Index in the publicly financed Hungarian one-day surgery care. Value in Health. 2019; 22 (Suppl 3): S896-S896.
9. **Pónusz R**, Kovacs D, Molics B, Boncz I, Endrei, D. Analysis the progression of market share of one-day surgery among Hungarian universities. Value in Health. 2019; 22(Suppl 3): S896-S897.
10. **Pónusz, R**, Nemeth N, Kovacs D, Molics B, Endrei D, Boncz I. The role of one-day surgery in waiting-list reduction in Hungary. Value in Health. 2019; 22 (Suppl 3): S370-S371p.
11. **Pónusz R**, Nemeth N, Kovacs D, Molics B, Boncz I, Endrei D. Increase of one-day surgery case numbers in light of health care institutions. Hungarian experiences between 2008-2017. Value in Health. 2019; 22 (Suppl 3): S300-S300.

12. **Pónusz R**, Nemeth N, Kovacs D, Molics B, Endrei D, Boncz I. Evaluation of Hungarian one-day surgery in light of Diagnosis-related Groups' value. Value in Health. 2019; 22 (Suppl 3): S309-S309.
13. **Pónusz R**, Nemeth N, Kovacs D, Molics B, Boncz I, Endrei D. Assessment of the routes of patients in Hungarian one-day surgery. Value in Health. 2019; 22 (Suppl 3): S258-S258.
14. **Pónusz R**, Németh N, Kovács D, Molics B, Endrei D, Boncz I. The role of one-day surgery in waiting-list reduction in Hungary. Value in Health. 2019; 22(1): S370–S370.
15. **Pónusz R**, Kovács D, Varga V, Németh N, Boncz I, Endrei, D. Regional distribution of cases in waiting list reduction programme in Hungary between 2015-2018. In: Csiszár, Beáta; Bódog, Ferenc (szerk.) Medical Conference for PhD Students and Experts of Clinical Sciences: Book of abstracts. Pécs, Magyarország: Pécsi Tudományegyetem Doktorandusz Önkormányzat. 2019; 87 p. pp. 44-44. 2 p.
16. **Pónusz R**, Kovács D, Varga V, Németh N, Boncz I, Endrei D. Analysis of waiting list cases according to the type of the treatment in Hungary between 2015-2018 In: Csiszár, Beáta; Bódog, Ferenc (szerk.) Medical Conference for PhD Students and Experts of Clinical Sciences: Book of abstracts. Pécs, Magyarország: Pécsi Tudományegyetem Doktorandusz Önkormányzat 2019; 43-43.
17. **Pónusz R**, Kovács D, Németh N, Boncz I, Endrei D. Disproportionality between financed DRGs in Hungarian one-day surgery In: Bódog, Ferenc; Csiszár, Beáta (szerk.) VIII. Interdiszciplináris Doktorandusz Konferencia 2019: absztraktkötet=8th Interdisciplinary Doctoral Conference 2019: Book of Abstracts. Pécs, Magyarország: Pécsi Tudományegyetem Doktorandusz Önkormányzat 2019; 160-160.
18. **Pónusz R**, Kovács D, Németh N, Boncz I, Endrei D. A magyarországi egynapos sebészet területi egyenlőtlenségei In: Németh, Katalin (szerk.) Tavaszi Szél 2019 Konferencia. Nemzetközi Multidiszciplináris Konferencia: Absztraktkötet, Budapest, Magyarország: Doktoranduszok Országos Szövetsége (DOSZ) 2019; 569-570.
19. **Pónusz R**, Nemeth N, Kovacs D, Varga V, Gresz M, Boncz I, Endrei D. Analysis the number of cases of one-day surgical patient care in Hungarian university clinical centre's between 2010-2015. Value in Health. 2018; 21 (Suppl.1): S114-S115.
20. **Pónusz R**, Nemeth N, Kovacs D, Varga V, Gresz M, Boncz I, Endrei D. The impact of ophthalmology in the Hungarian one-day surgery. Value in Health. 2018; 21(Suppl.1): S114-S114.
21. **Pónusz R**, Endrei D, Németh N, Kovács D, Kis Kelemen B, Molics B, Gresz M, Boncz I. Change in the quantity of one-day surgery interventions between 1997-2017 in Hungary. Value in Health. 2018; 21(Suppl.1): S153.
22. **Pónusz R**, Boncz I, Németh N, Kovács D, Molics B, Gresz M, Endrei, D. Could the one-day surgery play a significant role in cataract waiting-list reduction process in Hungary. Value in Health. 2018; 21(Suppl.1): S 153.

23. **Pónusz R**, Boncz I, Németh N, Kovács D, Varga V, Molics B, Gresz M, Endrei, D. Analysis of one-day surgery interventions among patients under the age of 18 in Hungary. Value in Health. 2018; 21(Suppl.1): 153-154.
24. **Pónusz R**, Kovács D, Németh N, Boncz I, Endrei D. Experiences of one-day surgery in musculoskeletal disorders. In: Bódog, Ferenc; Csiszár, Beáta; Pónusz, Róbert (szerk.) Medical Conference for PhD Students and Experts of Clinical Sciences: Book of Abstracts Pécs, Magyarország: Pécsi Tudományegyetem Doktorandusz Önkormányzat. 2018; 62.
25. **Pónusz R**, Kovács D, Németh N, Endrei D, Boncz I. Egynapos sebészeti teljesítménymutatók elemzése a progresszív betegellátás felső szintjén. In: Bódog, Ferenc; Csiszár, Beáta; Pónusz, Róbert (szerk.) Medical Conference for PhD Students and Experts of Clinical Sciences: Book of Abstracts. Pécs, Magyarország: Pécsi Tudományegyetem Doktorandusz Önkormányzat. 2018; 35.
26. **Pónusz R**, Németh, N, Kovács D, Varga V, Gresz M, Endrei D, Boncz I. The Analysis of the Demographic Indicators in One-Day Surgery In Hungary. Value in Health. 2018; 21(Suppl.1): S44.
27. **Pónusz R**, Kovács D, Németh N, Varga V, Boncz I, Endrei D. Regional aspects of one-day surgery in Hungary. In: Bódog, Ferenc (szerk.) 7th Interdisciplinary Doctoral Conference 2018 book of abstracts. Pécs, Magyarország: Pécsi Tudományegyetem Doktorandusz Önkormányzat. 2018; 184-184.
28. **Pónusz R**, Kovács D, Németh N, Varga V, Boncz I, Endrei D. A Pécsi Tudományegyetem Klinikai Központjának Homogén betegcsoport-portfólió elemzése az egynapos sebészeti betegellátásban. In: Bódog, Ferenc (szerk.) VII. Interdiszciplináris Doktorandusz Konferencia 2018 absztraktkötet. Pécs, Magyarország: Pécsi Tudományegyetem Doktorandusz Önkormányzat. 2018; 19.
29. **Pónusz R**, Kovács D, Németh N, Boncz I, Endrei, D. Egynapos sebészet a magyarországi egyetemeken. In: Keresztes, Gábor (szerk.) Tavasz Szél 2018 Konferencia. Nemzetközi Multidiszciplináris Konferencia: Absztraktkötet. Budapest, Magyarország: Doktoranduszok Országos Szövetsége (DOSZ). 2018; 407-408.
30. **Pónusz R**, Németh N, Kovács D, Endrei D, Boncz I. The analysis of the number of same-day surgery cases in 2015 in Hungarian hospitals. Value in Health. 2017; 20: A899-A899. Paper: PHP4
31. **Pónusz R**, Boncz I, Endrei D. A 2015. évi egynapos sebészeti ellátások teljesítménymutatóinak elemzése. IME: Interdiszciplináris Magyar Egészségügy/ Informatika és menedzsment az egészségügyben. 2017; 6: 6.
32. **Pónusz R**, Boncz I, Endrei D. Egynapos sebészeti ellátások teljesítménymutatóinak értékelése a 2015. évi egészségbiztosítási adatok elemzésével,” in Nemzetközi Egészségtudomány-történeti Konferencia [International Conference on the History of Health Sciences], 2017; 1: 58–58.