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DRG SYSTEM IN THE CZECH REPUBLIC AND ITS IMPLICATIONS

MASTER THESIS

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Year: 2017

Hereby, I declare that I wrote my graduation thesis by myself and I used the literature and other sources which are properly listed in the enclosed references.

Bc. Dušan Kučera
In Prague, dne 8th December 2017

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I would like to express my gratitude to my thesis supervisor, Paola Bertoli, M.A., MSc, Ph.D. for her patience and deep knowledge of the subject.

Abstract

The aim of this thesis is to provide an overview of the Czech healthcare system, with focus on specialities of the healthcare product and market, describing different factors that play a role in the process. Main focus will be put on payment schemes for hospital care according to different approaches. The theoretical part will provide necessary tools to analyse the dataset in the practical part. The goal is to analyse the remuneration data from 3 different diagnosis and check for structural changes in the healthcare provision after the payment scheme was changed and the DRG was implemented. However, mainly statistical and economical description of the data will take place, I will include some medical explanations to broaden the reach of the work and analyse the dataset from different approach. The conclusion will be an answer to the question, how the DRG system changes the structure of healthcare and whether the change is beneficial both for the system and for the patients.

Keywords: DRG, diagnosis related, groups, implications, structure, healthcare, insurance, patients, vascular, surgery, endovascular

JEL: C40, H50

Abstrakt

Cílem této práce je poskytnou obrázek o systému českého zdravotnictví se zaměřením na specifika produktu zdravotnictví a trhu se zdravotnictvím, zatímco budu popisovat různé faktory, které v celém procesu hrají roli. Hlavní zaměření bude na úhradové mechanismy pro nemocniční péči. Teoretická část poskytne nezbytné nástroje pro analýzu datového souboru v praktické části. Cílem je analyzovat data s úhradami za 3 různé diagnózy a najít strukturální změny v poskytování zdravotnických služeb po zavedení DRG systému jako systému úhrad. I když bude hlavní část věnována statistickému a ekonomickému popisu dat, zařadím do práce i medicínské poznatky, abych rozšířil teoretický rozsah této práce a analyzoval data i z jiného pohledu. Závěrem práce bude odpověď na otázku, jak systém DRG mění strukturu zdravotnictví a jestli je tato změna prospěšná pro pacienty i systém.

Klíčová slova: DRG, diagnosis, related, groups, důsledky, struktura, zdravotnictví, pojištění, pacienti, cévní, chirurgie, endovascular

JEL: C40, H50

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Introduction

Healthcare is one of the largest industry in the world, closing onto 10% of global GDP[1] and health is a fundamental aspect of every human's life. Being free of pain, illness or injury not only gives us joy and improve the quality of life, but in terms of economic impact the healthy population means productive population. Those are the reason why healthcare is such an important issue in every country including ours and why it is a subject of my work.

In this diploma thesis, I will concentrate on providing enough theory and practical analysis to answer following questions:

1. Has the change of the payment system caused the structure of the healthcare?
2. What implications does the DRG system have for the interested parties?

As the questions hint, the main focus will be on Diagnosis Related Groups system and its implications for the Czech Republic. Czech Republic has evolved from 1992 significantly in terms of healthcare provision and payment mechanisms until now, when the governmental officials try to implement a foreign system for measuring the production of healthcare providers as a payment scheme. My attention is centred around the idea, what impact does a new system have on the structure of healthcare in the field of vascular surgeries. The reason for this choice is because I have a unique opportunity to access the data of a private hospital in Moravian-Silesian region and interview a high manager of the same hospital. Those sources give me the necessary subjects for analysis. Before I get to that, the first chapters will be focused on overview of the hospital care provision, particularities of the healthcare market, different payment systems and their evolution abroad and home. Such information together with extensive use of home and foreign sources will equip me with necessary tools to statistically analyse and interpret the obtained dataset and make a conclusion about the structure of healthcare and overall implications of the Diagnosis Related Groups on the situation with vascular surgeries. Through generalization, I will make a conclusion about the usage of DRG system as a

[1] *World Health Statistics 2016: Monitoring health for the SDGs* [online]. 2006, **2006**(1) [cit. 2017-12-08]. Available at: http://www.who.int/gho/publications/world_health_statistics/2016/en/

whole on every other field of medicine and provide suggestion about the future development.

1. Czech healthcare system

This chapter provides a quick overview of the Czech healthcare system which is highly regarded for its accessibility of the healthcare, its quality and overall performance. On following pages, I will briefly summarize the structure of the system of hospitals, its contradictory forces of demand and supply and different actors in the field of healthcare.

1.1 Features of the healthcare system

Firstly, before I get into details of the Czech healthcare system, I must put forward distinctive points that are specific for the healthcare market and that distinguish healthcare market from any other market, which is ruled by standard economic approaches and rules. Healthcare is different from standard competitive market mainly in following areas:

1. Nature of demand
2. Nature of supply
3. Features of the product

1.1.1 Nature of demand

Demand for healthcare can be described by following economic determinants:

- **Price elasticity of demand**: Empirical data and different sources tend to agree, that price elasticity of healthcare is price inelastic, showing that 1% increase in the price of the healthcare would lead to less than 1% decrease in the demand (the number revolves around -0,2).
- **Income elasticity of demand**: Situation with income elasticity is relatively similar showing that demand for healthcare is also income inelastic (data shows values ranging from 0 to 0,2) meaning that 1% change in income will lead to very small increases in demand for healthcare (less than 1%)[2].
- **Moral hazard:** Third specialty of the healthcare market on the side of demand is potential for market failure known as moral hazard which is demonstrated, when the healthcare consumers are not directly payers of the healthcare, but contribute to the system in the form of taxes, which could lead to overuse of the system.

[2] RINGEL, Jeanne, Susan HOSEK, Ben VOLAARD a Sergej MAHNOVSKI. The elasticity of Demand for healthcare. *National Defense Research institute*[online]. 2005, **2005**(1355), 20-27 [cit. 2017-11-01]. Available at: https://www.rand.org/content/dam/rand/pubs/monograph_reports/2005/MR1355.pdf

- **Asymmetric information:** Fourth specialty and also a market failure is a presence of asymmetric information on the side of demand. In practice, supplier of the healthcare (doctors, hospitals etc.) are in many cases better informed and more educated about the product they offer, which could lead to selective diagnosing, over diagnosing and over treating and vice versa.

1.1.2 Nature of Supply

As well as demand for healthcare, supply of healthcare shows some differences from standard economic and market analysis:

- **Supply induced demand:** One of the features of the supply in the healthcare market is supply induced demand, which illustrates a situation, when a payment system of healthcare motivates doctors and suppliers of healthcare to increase the supply in order to gain financial increases. Consumers in this situation have no incentive to reject such healthcare, which may lead to the overuse of the system and market distortions.
- **Barriers of entry:** Relatively higher barriers of entry for new subjects, mainly in the market of hospital care, which is strictly controlled and regulated by the payers of the healthcare (insurance companies), who decide which hospital/private establishment gets the contract and whose product would they acquire.
- **Asymmetric information:** Already mentioned in the sub-chapter about the demand.
- **Principal agent problem:** On the side of healthcare supply we encounter principal agent problem. It arises when one entity delegates its rights on another entity (patient – doctor relationship), where patients delegate their decision-making power onto the practitioner. On both sides, there is an information asymmetry and contradictory intentions arising from different utility functions.

1.1.3 Features of the product

Among other typical features of the healthcare market, there are some typical features concerning the product – healthcare:

- **Nature of the product:** It is difficult to categorize healthcare using the standard economic approaches and distinction of products in categories either Private or

Public good and also distinguish among quality or homogeneity. Healthcare is treated as an exception with respect to features mentioned in chapters about supply and demand.

- **Third-party actor:** Market is not created by the clash of supply and demand, but between them there is a third-party player (insurance company) who serves both as a payment agent for healthcare consumed by the patients and as a regulator, who decides the price and amount of funds distributed among suppliers.
- **Adverse selection:** Other distinctive feature about the product, where consumers (and subsequently payers) cannot rate and evaluate quality of the acquired goods and services. It enables one party overrate the product because of information asymmetry on the side of supply and demand.
- **Uncertainty of the product:** Both patient (consumer) and doctor (supplier) have incomplete and asymmetric information about the good they buy (patient) and supply (doctor). The result and final good is therefore uncertain and cannot be predicted (measured) in advance.

1.2 Overview of the system

In the Czech Republic system worked 49 102 doctors and 18 552 health professionals (nurses, physiotherapists etc.) by the end of the year 2016 which is an increase of 0,5% in comparison to 2015 among doctors and 1% increase among health professionals in the same perspective.

Which concerns health care facilities and providers of the healthcare, the situation was, in the same studied years, as follows:

	2015	2016	Yearly change (%)
Total providers	31 188	32 064	+2,8%
Independent establishment of out-patient care	52,2%	51,0%	-1,2%
Special Health establishments	2,3%	2,6%	+0,3%
Hospitals in-patient care	23,8%	42,9%	+0,9%
Hospitals out-patient care	18,2%		
Specialised therapeutic institutes	26,0%	26,0%	0%
Spas	0,6%	0,7%	+0,1%
Other	0,4%	0,5%	+0,1%

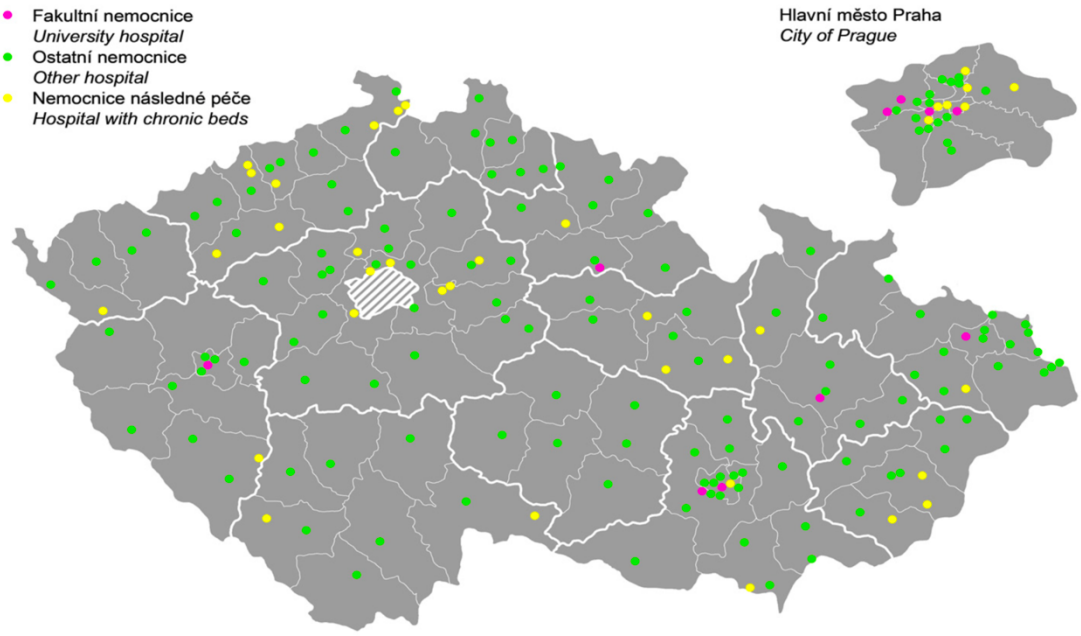
Table 1: Providers of healthcare (2015 – 2016), own creation[3]

There is a shift in the division of the healthcare in the Czech Republic in selected years, mainly there was a significant increase in the number of healthcare providers together with an increase in the healthcare provided by hospitals (0,9% increase in hospital care) and decrease in independent establishment care (1,2% decrease). That is interpreted as a trend in centralizing the healthcare in larger facilities, where the economies of scale and scope can be realized, where the healthcare can be pushed to its efficient areas and where the costs and profits are easily measured and controlled by professional businessmen who more and more often turn their attention to the healthcare business.

In accordance with the aim of the diploma thesis, the main focus is put towards hospitals and hospital care. Firstly, I include the overall picture of the hospital care in the Czech Republic which shows, that hospital care is omnipresent in the whole country with a fairly dense distribution of locations, with clearly visible clusters of hospitals around big cities

[3] Zdravotnická ročenka České republiky 2016. *Zdravotnická ročenka České republiky* [online]. 2016, **2016**(1), 101-103 [cit. 2017-11-01]. Available at: http://www.uzis.cz/katalog/rocenky/zdravotnicka-rocenka-ceske-republiky, Zdravotnická ročenka České republiky 2016. *Zdravotnická ročenka České republiky* [online]. 2015, **2015**(1), 103-105 [cit. 2017-11-01]. Available at: http://www.uzis.cz/katalog/rocenky/zdravotnicka-rocenka-ceske-republiky,

such as Prague, Ostrava, Brno and Pilsen, altogether there has been 187 hospitals in 2015 and 189 hospitals in 2016[4]:



Picture 1: Distribution of hospitals in the Czech Republic[5]

Hospitals can be divided by numerous features and viewpoints, but foot the purposes of this work I divide hospitals by the owner and provider of the healthcare:

1. State-owned hospitals: Most of the hospitals under this category are governed by the Ministry of Healthcare (MH) or Other Central Governments (OCGH) and are predominantly established as Teaching hospitals and other healthcare facilities, that provide highly specialised care and are established by the law 219/2000 Sb.[6]
    - Such hospitals are by the law contributory organisations, whose part of the financial funds come directly from the state budget

[4] V letech 2012 až 2015 bylo v ČR v nemocnicích zrušeno 10 289 lůžek!. *Odborný svaz zdravotnictví a sociální péče ČR* [online]. Praha: Odborný svaz zdravotnictví a sociální péče ČR, 2015 [cit. 2017-11-01]. Available at: http://osz.cmkos.cz/cz/clanky/15-6-2016-snizovani-poctu-luzek-v-nemocnicich.aspx

[5] *Zdravotnická ročenka České republiky 2016.* Zdravotnická ročenka České republiky *[online]. 2016,* ***2016****(1), 101 [cit. 2017-11-01]. Available at: http://www.uzis.cz/katalog/rocenky/zdravotnicka-rocenka-ceske-republiky*

[6] Zákon č. 219/2000 Sb.: Zákon o majetku České republiky a jejím vystupování v právních vztazích. *Sbírka zákonů ČR* [online]. 2000, **2000**(219), 1 [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/2000-219

2. Non-state-owned hospitals: Under this category fall three types of hospitals, namely hospitals established by Region (RH), City (CH) and Privately established (PH):
    - RH and CH are established by the entities with own authority and such hospitals can be established either under the same regime as state-owned hospitals in a way that part of the RC and CH budget come directly from regional or city budget by the law 250/2000 Sb.[7], or as business corporations by the law 90/2012 Sb.[8]
    - PH are established by private entities such as entrepreneurs or other business corporations by the law 90/2012 Sb.[9] and must comply with the law 372/2011 Sb.[10], that stipulates conditions that have to be met by private entity in order to run a private hospital

Which concerns the distribution of hospital care among the owners and controllers of such hospitals, there has not been a significant change in the selected years of 2015 and 2016 as is shown in the table:

	2015	**2016**	**Yearly change (%)**
Total hospitals	187	189	+1%
Ministry of Healthcare (MHH)	27,80%	27,50%	-0,3%
Region (RH)	45,60%	44,80%	-0,8%
Other Central Governments (OCGF)	2,30%	2,20%	-0,1%
Other legal body (PH)	16,30%	16,60%	+0,3%
City, Municipality (CH)	8,00%	9,00%	+1,0%

Table 2: Distribution of beds in hospitals by owner (2015 – 2016), own creation[11]

[7] Zákon č. 250/2000 Sb.: Zákon o rozpočtových pravidlech územních rozpočtů. *Sbírka zákonů ČR* [online]. 2000, **2000**(250), 1 [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/2000-250

[8] Zákon č. 90/2012 Sb.: Zákon o obchodních společnostech a družstvech. *Sbírka zákonů ČR* [online]. 2012, **2012**(90), 1 [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/2012-90

[9] Zákon č. 90/2012 Sb.: Zákon o obchodních společnostech a družstvech. *Sbírka zákonů ČR* [online]. 2012, **2012**(90), 1 [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/2012-90

[10] Zákon č. 372/2011 Sb.: Zákon o zdravotních službách a podmínkách jejich poskytování. *Sbírka zákonů ČR* [online]. 2011, **2011**(372), 1 [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/2011-372

[11] Ekonomické výsledky nemonic 2016. *Ústav zdravotnických informací a statistiky ČR* [online]. 2016, **2016**(1), 3-13 [cit. 2017-11-01]. Available at: http://www.uzis.cz/category/tematicke-rady/zdravotnicka-zarizeni/nemocnice

It shows that 16,3% in 2015 respectively 16,6% in 2016 of the overall bed capacity is in hands of private owners (businessmen or other private entities). Those privately owned are relatively small hospitals with main focus on more profitable fields of medicine rather than on the scope of provided healthcare, which is the largest in hospitals that are run by the Ministry of Healthcare (MH) or other state governed entities. Such hospitals represent together 83,4% of the bed capacity in hospitals in 2016 in the Czech Republic. Bed capacities in respective years are shown in the table:

	2015	2016	Yearly change (%)
Bed capacity overall	59 960	60 221	+0,4%
Publicly controlled hospitals	50 187	50 224	+0,1%
Private hospitals	9 773	9 997	+0,3%

Table 3: Distribution of bed capacity among hospitals by ownership (2015-2016), own creation[12]

Bed care is provided in numerous forms, in the studied field of hospital care we distinguish:

a) Acute care standard: provided to a patient diagnosed with sudden illness or sudden worsening of the chronic illness, which endanger him/her on life, but do not lead to acute failing of primal life functions. Under this category belongs also care, which is provided to a patient who is to undergo a procedure, which cannot be performed in an out-patient establishment.
b) Acute care intensive: Provided to a patient in a direct endangering of life and acute failing of life functions or when such a situation can be expected.
c) After care: provided to a patient, whose general diagnoses has been established and his/her health situation has been stabilised. Such a care is provided in order to offer a health rehabilitation and recovery services. Similar care is provided to patients who are semi or completely dependent on life support.
d) Long term after care: provided to a patient, whose health situation cannot be ameliorated by acute or intensive care, but without constant provision of

[12] NOVÁKOVÁ, Zdeňka. Zdravotnictví ČR: Lůžková péče 2016. Ústav zdravotnických informací a statistiky ČR [online]. 2016, 2016(1), 1-20 [cit. 2017-11-01]. Available at: http://www.uzis.cz/katalog/zdravotnicka-statistika/luzkova-pece

healthcare services, rehabilitation and aftercare his/her health situation would degrade.[13]

For purposes of this work we simplify those four categories into two: Acute Care Beds (ACB) and After Care Beds (AFB).

Division among those two types of healthcare provided in hospitals has been:

	2015	2016	Yearly change (%)
Acute Care Beds (ACB)	49 038	48 511	-1,1%
After Care beds (AFB)	28 899	29 463	+2,0%

Table 4: Division of Acute and After care beds in hospitals (2015-2016), own creation[14]

1.3 Health insurance in the Czech Republic

In the Czech Republic, the system of health insurance is called public health insurance (PHI). It is a type of obligatory insurance, which guarantees full or partial healthcare for the insured person with an aim to preserve or ameliorate the health state. Scope of the public insurance is legally enacted in the law 48/1997 Sb.,[15] which stipulates authority of the healthcare insurance companies and stipulates which services can or cannot be covered by the obligatory insurance.

1.3.1 Beginning and termination of the insurance

Healthcare insurance begins by the day of births of all people whose mother has the permanent residence in the Czech Republic, or by the day, when the person without permanent residence in the Czech Republic became employed in the country or gained a permanent residence. All the exhaustive options are enacted in the law 586/1992 Sb.[16]

Health insurance is terminated by the moment of death, his announcement as being dead or by the moment of termination of his permanent residence.

[13] Druhy zdravotní péče. *Veřejné zdravotní pojištění* [online]. 2014, **2014**(1), 1 [cit. 2017-11-01]. Available at: https://www.mzcr.cz/Cizinci/obsah/druhy-zdravotni-pece_2627_22.html

[14] Zdravotnická ročenka České republiky 2016. *Zdravotnická ročenka České republiky* [online]. 2016, **2016**(1), 101 [cit. 2017-11-01]. Available at: http://www.uzis.cz/katalog/rocenky/zdravotnicka-rocenka-ceske-republiky

[15] Zákon č. 48/1997 Sb.: Zákon o veřejném zdravotním pojištění a o změně a doplnění některých souvisejících zákonů. *Sbírka zákonů ČR* [online]. 1997, **1997**(48) [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/1997-48

[16] Zákon č. 586/1992 Sb.: Zákon České národní rady o daních z příjmů. *Sbírka zákonů ČR* [online]. 1992, **1992**(586), 1 [cit. 2017-11-01]. Dostupné z: https://www.zakonyprolidi.cz/cs/1992-586

1.3.2 Choice of Healthcare insurance company (HIC)

Every person eligible for insurance by the above-mentioned conditions is free to choose any insurance company they like. They can choose and change the company once every 12 calendar months and the change is valid from the 1st of January following year. Change of the HIC is employee announce to the employer and employer has to provide a written approval. Request for a change must be accepted by the HIC. There is no time limitation for a person being insured at one HIC and this company cannot terminate the insurance. One person can be insured only at one HIC providing obligatory health insurance and the employer pays the insurance in its lawful value to the selected insurance (if the person is employed) or the person itself pay the insurance, if the engages in self-employment or belong to another category I will discuss later.

Free choice of health insurance company does not apply in following cases:

- At a birth of a child the insurance company is assigned to the baby and is the same as mother's insurance
- Among active soldiers and students of military schools, who have to be insured at VOZP (military insurance company)
- When two HIC merge or one acquire another, all insured people from the terminated HIC are transferred to the successor HIC

1.3.3 Type of payers of the insurance

A. Employer pays for the employee – employer pays in total 13,5% of the assessed base. Those 13,5% are deducted from the wage of the employee automatically without any notice. 1/3 of it pays the employee and 2/3 pays the employer. Assessed base is calculated as a gross wage in the month in which the insurance is paid
B. Self-employed person – such a person is also obliged to pay the insurance for himself/herself. The amount is the same as for the employed people (13,5%) from the assessed base. The amount of assessed base is 50% from the incomes from self-employment after deduction of necessary expenditures for obtaining, maintaining and securing such income.
C. Person without taxable income – is such a person, that is not employed, does not have any self-employment, is not covered by the state paid insurance and belongs to this category for whole calendar month. In this category belong, students

attending school, that has not been approved by the ministry of education as an educational facility, students over 26 years, unemployed person who is not signed up at the labour office, student who does not start working right after finishing school and other subjects named in the law 586/1992 Sb. Such person has to announce the situation of being without taxable income in 8 days after it happens to the HIC and the insurance will be calculated for such a person according to the law 592/1992 Sb.

D. The state – People, whose insurance is paid directly by the state by the law 48/1997 Sb. in the value of 13,5% of the assessed base for the state. The exhaustive list of such people can be found in the 48/1997 Sb. but the highest percentage are students up to 26 years of age, people who receive pensions (disabilities', old-age, widow's, widower's, orphan's), mothers on a maternity leave or parent's leave, seekers for employment and others.

1.3.4 Procedures covered by the insurance

Every insured person has the right to following healthcare:[17]

- Preventive healthcare
- Regular monitoring of the health by doctor
- Diagnostic care
- Emergency and rescue medical services
- Pharmaceutical services
- Clinically-pharmaceutical services
- Rehabilitation care
- Medical spa treatment
- Expert assessment care
- Day care
- Palliative care
- And others…

[17] Veřejné zdravotní pojištění. *Ministerstvo zdravotnictví České republiky* [online]. Praha, 2016 [cit. 2017-12-08]. Dostupné z: http://www.mzcr.cz/KvalitaABezpeci/obsah/verejne-zdravotni-pojisteni-v-cr_3347_29.html

1.3.5 Income and expenses in the system of public healthcare insurance

In this subchapter, I provide analysis of the incomes and expenses into the public healthcare insurance. Since the ÚZIS (Bureau for healthcare information and statistics) does not update economic information regularly and its publications provide rather chaotic overview, I compiled from publicly accessible sources of all HIC the data into an overview of the healthcare account in 2015. For 2016 the data has not been completely provided by the all influential parties.

1.3.5.1 Income

Based on the data from 2015 and 2014, there was an overall increase in total incomes from 240,72 billion kč to 252,59 billion kč, which represents an increase of 4,7%.
Income from insurance represents insurance payments from employers, self-employed people and people without taxable income. They account for 74% of all incomes and experienced an increase of 5,7% from 2014 to 2015. Income from state budget are insurance payments for all those people that I have mentioned above and whose insurance is paid by the state. They accounted for 24% of the total income with an increase of 1,8%. Lastly, I mention the section "Other income from PHI", this fraction comes mainly from penalties and does not vary over the selected years as well as income from foreign HIC and income from taxable services

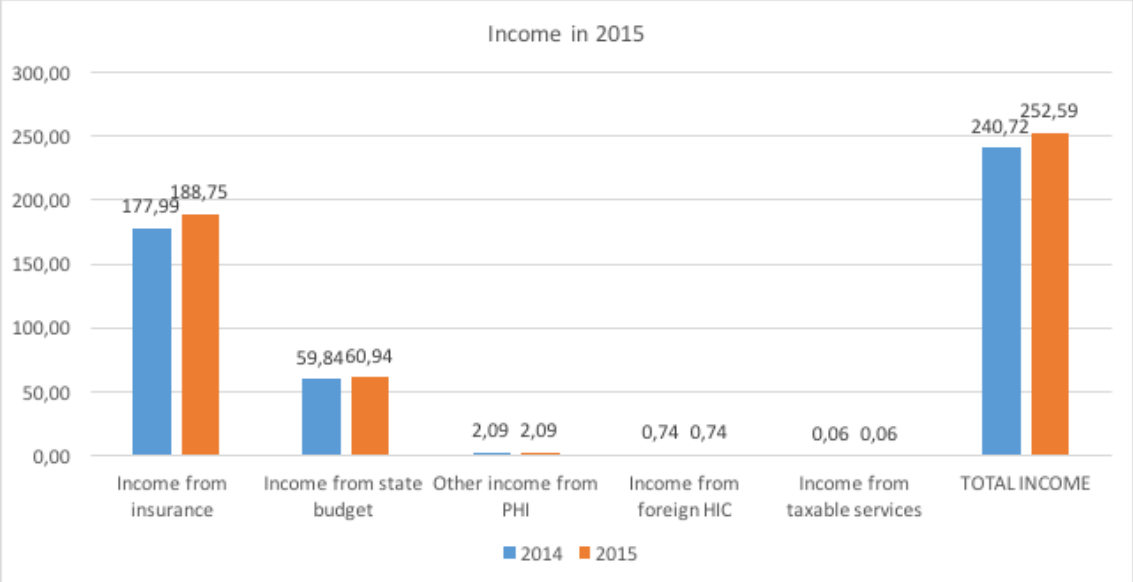


Chart 1: Income in 2014 and 2015 to PHI, own creation

Average total income from 1 person insured was 24 435 kč (yearly increase of 4,6%).

1.3.5.2 Expenses

Expenditures in the selected years are marked by the rather generous and extensive modifications in the regulation 324/2014 Sb.,[18] which stipulates the annual values of point for payment mechanisms. Due to significant increase in the point value, the overall total expenditures rose from 238,39 billion kč to 252 billion kč making up to an increase of 5,4%. For one insured person, it makes yearly 24 179 kč. Expenditures for medical services accounted altogether 97,1% of the overall expenses with an increase of 5,6%. The only expense account worth mentioning is the account operating expense, where we include wages of workers in HICs, overhead costs, bonuses for employees etc.

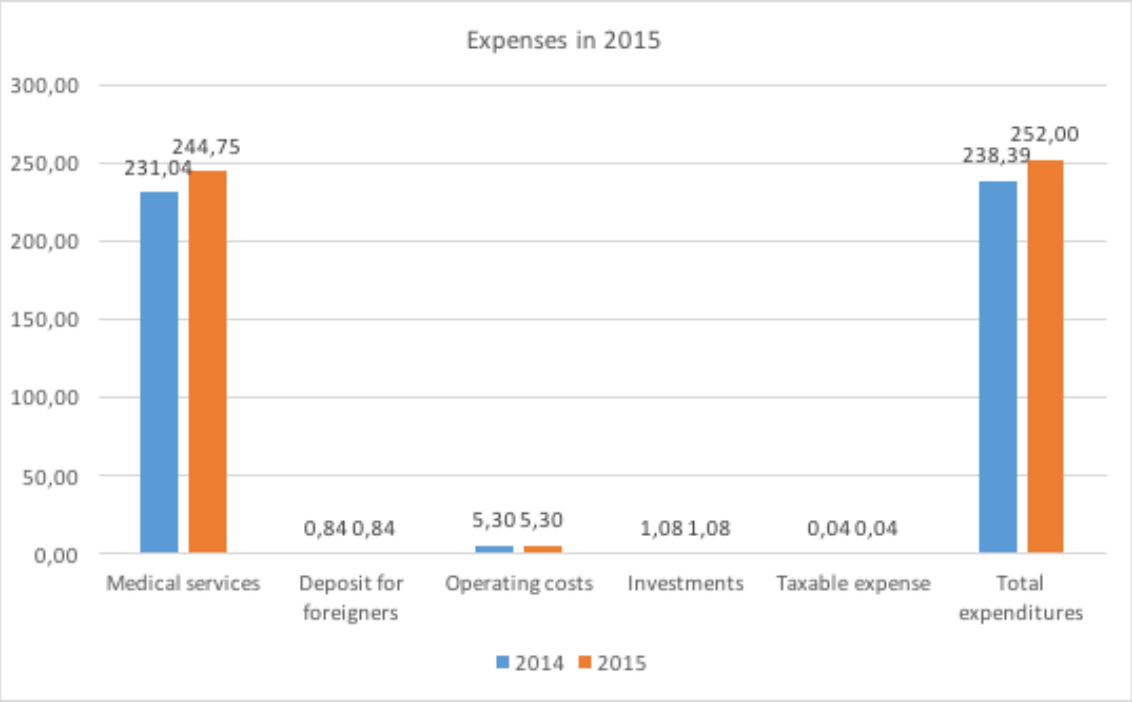


Chart 2: Income in 2014 and 2015 to PHI, own creation

1.3.5.3 Balance of the PHI

Through collected data from years 2009-2014, I can visualize the positive balance in 2015 of 0,6 billion kč, whereas in 2014 it was 2,2 billion kč. Throughout the selected years the PHI in the Czech Republic was constantly in deficit, coming out of it in the economic conjunction in 2014 and 2015, but the trend is already downwards, as the chart shows.

[18] Vyhláška č. 324/2014 Sb.: Vyhláška o stanovení hodnot bodu, výše úhrad hrazených služeb a regulačních omezení pro rok 2015. *Sbírka zákonů ČR*[online]. 2014, **2014**(324), 1 [cit. 2017-11-01]. Dostupné z: https://www.zakonyprolidi.cz/cs/2014-324

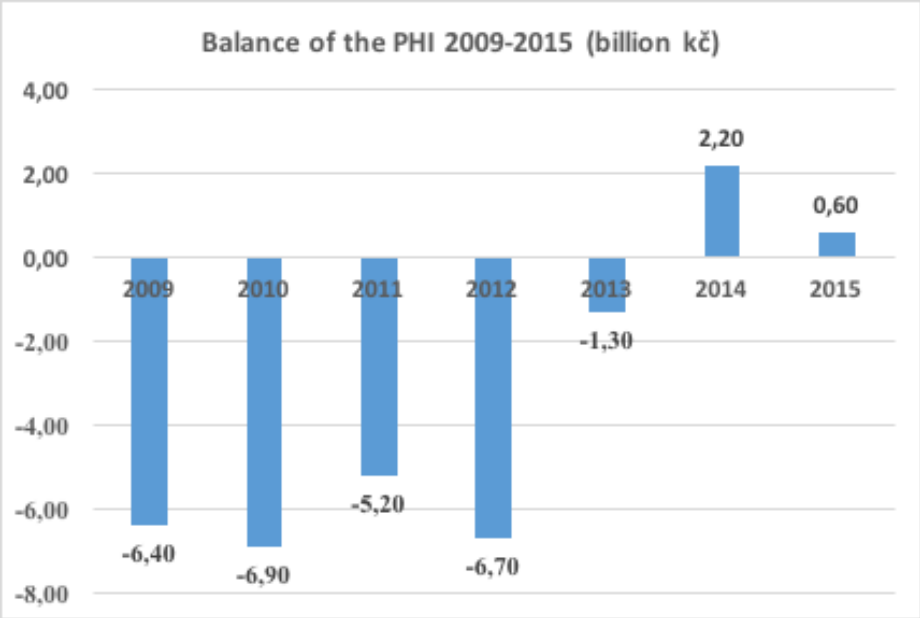


Chart 3: Balance of the PHI 2009 – 2015, own creation

1.3.6 Allocation and redistribution system of the funds

The collected funds are redistributed according to the solidary law 592/1992 Sb. later on altered by the novel 438/2004 Sb. According to those laws, 100% of the collected funds are redistributed according to the 2 solidary mechanisms:

1) Redistribution is based on the cost indexes of insured people of respective HICs. Indexes are created on the basis of age and sex and group them into 36 groups,
2) Redistribution takes into consideration insured people, that received excessively costly services. It should redistribute the funds to those HICs, that have such people in their books. Excessively costly people fall into that category, if they receive (15 * average costs per insured person) in one year.

Such mechanisms should limit discrepancies in the structure of people that are insured by different HIC and assure fair redistribution of funds among them.

It is expected that in 2018 the new system of redistribution should be implemented and the funds would be redistributed not only by age and sex groups, but also by newly established pharmaceutical cost groups that should limit discrepancies evolving from chronically ill people and their high expenditures.

2 Payment mechanisms for healthcare

Each country either invented or incorporated already used schemes and mechanisms for payment of the healthcare. Following sub-chapters describe the mechanisms used and implemented in the Czech Republic following by the chapter briefly describing the history and evolution of such systems.

2.1 Payment per capita

This form is ideal for general practitioners for both adults and kids (hereinafter "GP"). This GPs register their patients. GPs are given monthly payments per capita from the patients registered with health insurance company. The payment is variable determined by the number of registered patients, age structure of patients and the working hours of the GPs. The payment per capita is paid to GPs even when there is no visit of the patient at the GP.[19]

Payment per capita is a monthly payment from HIC which is used to plan the future incomes. It reduces the administration costs, but it is less profitable for the GPs working in less populated areas.

GP can do selected performances which are not covered in the payment per capita. The HIC refund those performances by the amount of points reported to the HIC. In the case, where GP uses both payment per capita and payment by point the method is called Capitation combined with Pay per Performance.

2.2 Payment per nursing day

This method is used when there is a necessity of hospitalizing the patient in the specialized medical institute, long-term hospital, hospice-type facilities.

The basic unit is the cost of the care for one patient per day depending on the type of facility the patient is treated in. This amount is guaranteed by the HIC. It can be determined for the medical expertise or for every diagnosis.

When calculating the amount cost we value these items: direct used material, cost of cleaning, cost of bed linen, transport of patient, depreciation of amenities of medical

[19] ŠATERA, Karel. *Zdravotní pojištění a ekonomika*. Zlín: Univerzita Tomáše Bati ve Zlíně, 2010, s. 65-70. ISBN 9788073189716.

facility, general expenses, general operating costs and performances daily maintained in the unit or in the determined diagnosis.[20]

In the hospitals, the common payment method is also flat rate. It means that the HIC pays the hospital certain amount on a regular basis (eg. every half-year) depending on the number of patients treated in the reference time period. In the case, that the number of treated patients is higher than the number of patients treated in the reference time period, the HIC can remunerate the pay off.

2.3 Payment per performance

This type of payment is used when there is a necessity to pay by the performance, where every single act is paid separately. Every performance is evaluated by points and amount in CZK.

The value of one point is determined by the expertise or by the type of hospital facility. Nowadays the value of one point varies and the point value is set by the law[21]. This type of payment is used by the outpatient care – ambulant specialists or ambulant hospitals.

This model of payment was widely used in the first half of 1990's. Medical facilities were billing redundant medical care in the vision of maximizing the profits. In the scope of public health care system (hereinafter "PHC") there was a tendency to install regulative instruments to minimized the serving of unnecessary health care.

This type of payment motivates the doctors to perform and remunerates them based on performed work and leads to unnecessary augmentation of performances and linked costs. The income of doctor is therefore based on the illness of the patients, but there is also a chance that the performances which were billed to the HIC were never performed.[22]

2.4 Global Budgets system

Global budgets system allocates available resources among hospitals (providers) of healthcare usually for one year. The main idea is that a certain budget is prospectively set

[20] ŠATERA, Karel. *Zdravotní pojištění a ekonomika*. Zlín: Univerzita Tomáše Bati ve Zlíně, 2010, s. 65-70. ISBN 9788073189716.

[21] Vyhláška č. 348/2016 Sb.: Vyhláška o stanovení hodnot bodu, výše úhrad hrazených služeb a regulačních omezení pro rok 2017. *Sbírka zákonů ČR*[online]. 2016, **2016**(348), 1 [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/2016-348

[22] ŠATERA, Karel. *Zdravotní pojištění a ekonomika*. Zlín: Univerzita Tomáše Bati ve Zlíně, 2010, s. 65-70. ISBN 9788073189716.

for each individual hospital so everyone knows how much they can spend in a given year and managers of the hospitals have to make all necessary actions in order to meet the budgetary constraint. In this system hospitals have a goal to reduce costs of output so the volume of services could be higher given the budget.[23] Typically, the budget is set historically, when the payee set the initial (base) year and all following budgets are set in accordance with the base year with a negotiated increase based on evidence based on technical investments in the facility or other cost enlarging factors with a direct benefit for the patients.

Among benefits of such system, it directly forces hospitals to reduce per patient costs, improve efficiency and reduce redundant procedures. It is also beneficial for the provider for strategic planning, because they know the budgetary constraints beforehand and they can prioritize the consumption and investments among the whole year, in other words improve efficiency. For the payee, it brings the same benefits for budget planning and reducing excessive spending, when the global budget is known in advance. It also provides tools for efficiency and quality measurements, when the HIC can directly compare facilities on the basis of budget and volume of procedures basis.

On the contrary, global budgets reduce competitiveness among providers, when the budget does not account for quality and performance measurements. Historically, hospitals under the global budget rather limited output than searched for effectiveness and economies in the production. And lastly, if the budgetary increases are not adequately set on the performance and quality attributes and are rather set on the macroeconomic attributes such as GDP growth and inflation, hospitals lack incentive to include new technologies or innovative approaches with a vision, that they would never get adequate remuneration and would have to limit the volume of output in order to meet the global budget.

2.5 DRG payment – payment per diagnosis

The DGR is a shortcut for diagnosis related group. DRG is a system for classification of diseases which sorts the cases of hospitalization by the illness attributes to the DRG groups.

[23] BERENSON, Robert, Suzanne DELBANCO a Roslyn MURRAY. Payment Methods and Benefit Designs: How They Work and How They Work Together to Improve Health Care: Global Budgets for Hospitals. *Catalyst for Payment Reform* [online]. Urban Institute, 2016, **2016**(1), 1-13 [cit. 2017-11-01]. Available at: https://www.urban.org/sites/default/files/05_global_budgets_for_hospitals.pdf

This system has existed in the Czech Republic since 1997. Nowadays it is used for partial payments for hospitals with the global budget system. This payment system sets the payment for the specific diagnosis and it is intended for the in-house patient care. Terms associated with the DRG system used in this work[24]:

Attributes - clinical or demographic signs of the patient to place the cases in DRG classifications,

Average length of stay (ALOS) – the median of the hospitalization; in the context to DRG it is the median hospitalization length in DRG class.

DRG Base – the medium class in the DRG classification. The term DRG Base emanates from the term "base group"

Case mix (CM) – the sum of the relative weights of the cases – to define the unit (e.g. hospital, county, Czech Republic) and time period (e.g. year). The term case mix means the composition or set of the hospitalized cases,

Case mix index (CMI) – the sum of relative weights of the cases divided by the number of the cases treated in the specific time period. The value shows the index of medial uses of the sources per case. The synonym for the case mix index is medial relative weight,

Complication & Comorbidity (CC) – in the DRG context it is a complication and the associated illness. Associated illness exists when the patient is admitted under specific principal diagnosis but the complications arises after being admitted,

Table of relative weights – the table consisting of DRG's parameters valid for certain period,

DRG marker – the coded information useful for right classification of the cases transferred in the same platform as the performances (from the list of the performances with the point values)

Grouper – the computer program which sorts the hospitalized cases by the primal information about the case,

High Trim Point – the upper limit of the length of the treatment which is considered to be standard in the DRG system. It is set by one or more statistical methods or is set by the experts,

Length of Stay (LOS) – the length of individual hospitalization, in the DRG context it is the length of each case determined by the DRG methodology,

[24] Fetter, Robert B. "Diagnosis Related Groups: Understanding Hospital Performance." *Interfaces*, vol. 21, no. 1, 1991, pp. 6–26. *JSTOR*, JSTOR, Available at: www.jstor.org/stable/25061437.

Low trim point – the lower limit of the length of the treatment which is considered to be standard in the DRG system,

DRG's case relative weight (RW) – index describing the value of the average costs of the necessary care provided to the patients in one DRG class. It is set as average cost of discharges per DRG divided by average cost of all discharges

Principal Diagnosis (PD) – the summary of data in the platform used by the grouper to classified DRG class. The main data of the case's entering sentence are:

- main diagnosis
- ulterior diagnosis
- critical performance (mainly surgeries)
- the age on the admitting day
- weight of a new-born
- length of hospitalization
- means of dismissal

Base rate (BR) – represents contractual or arbitrary set rate for a given hospital facility used in the DRG system used for setting the money value for the care of the case with the relative weight = 1

Outlier adjustments (OA) – Sum of money hospitals receive if the overall costs for the treatment of unique patient overpass the threshold set by the regulation

Structural adjustment (SA) – Structural adjustment rate takes into consideration demographic and other area specific features that may influence the cost structure of a hospital facility

Grouping – the process on which the specific case of hospitalization is assigned to the DRG class. The assigning process is based on main algorithm and case's attributes.

2.5.1 DRG basics and methods

Firstly, the DRG system was developed as a tool for measuring the production of hospital facilities. However, the results and output it provided was largely seen as a great tool which could lead to payment scheme for the hospital care in general, because the production is easily measured, comparable, relatable and reliable.

DRG system is based on similarities in medical procedures that can group the procedures into categories based on its shared features. In order to create such a system, it has to bear following features:

- Provided services and procedures under one diagnosis to the patients must be similar or homogenous (taking into consideration cost and medicine features)
- DRG groups should incorporate the whole scope of healthcare provided by hospital facilities
- Number of DRG groups should be limited and comprehensive
- DRG groups should exclude one another in order to limit the confusions when assigning diagnosis
- DRG groups should be hierarchically listed for easy navigation among them[25]

Considering those requirements are met, I will briefly describe the basic formulas to calculate remuneration for the diagnosis and consequently for the hospital facility.
Every system based on the payment per diagnosis revolves around relative weights (RW), that are a key element in creating the remuneration volumes. I include the formula that calculates the DRG payment:

$$PAYMENT_{DRGi} = RW_{DRGi} * BR * SA$$

Sum evolving from such equations is the payment that should the hospital receive after performing the procedure.
When knowing all the attributes that DRG system consists of, we could calculate the overall budget of the hospital using the formula[26]:

$$BUDGET_{DRG} = CMI * BR * \text{number of procedures} = CM * ZS$$

$$CM = \Sigma\, RW_{DRGi}$$

$$CMI = CM / \text{number of procedures}$$

[25] ROUBAL, Tomáš. *Aplikace DRG v České Republice* [online]. Univerzita Karlova, 2005 [cit. 2017-11-01]. Available at: http://ies.fsv.cuni.cz/work/index/show/id/607/lang/cs
[26] Medicare Hospital Prospective Payment System: How DRG Rates Are Calculated and Updated. *Office of Inspector General* [online]. 2001, **2001**(8), 1-18 [cit. 2017-11-01]. Available at: https://oig.hhs.gov/oei/reports/oei-09-00-00200.pdf

When excluding for national specialities and other unusual variables that may be included in the calculation of the DRG payments and budgets based on the DRG system, overall, the payment scheme is rather simple and highly intuitive in case of production analysis. If such a system is well described and applied in all hospital facilities, it could be useful tool to compare and analyse production of each individual establishment.
Other than benefits which the system brings to healthcare management, I will discuss the threats and shortcoming in the practical part of this thesis.

3 Evolution of payment mechanisms of the hospital care in the Czech Republic

The Czech Republic and its systems of healthcare largely depend on the historical facts and our evolution as a country. Before 1992, every hospital had its own budget which was approved on the national level by the government and its bodies, with no room for discussion or modifications. It was a part of governmental planning which was a typical act of the communist regime that was in charge until 1989, and the same system prevailed until 1992. After 1992, the budgetary politics of financing the hospital care was exchanged for payment per performance. As the costs and the financial burden under the pay per performance rose over acceptable level, the system changed again towards hospital budgets again, but the budgets were constructed differently than it was before 1992. Last evolution in the matter of financing the healthcare is implementation of the DRG as a key indicator of the hospital production and remuneration scheme.
I will not get into details of central planning budgets before 1992, but concentrate on evolution since then starting with payment per performance.

3.1 Pay per performance

Since 1993, the production of hospitals was remunerated on the basis of pay per performance. In practice it meant, that every provision of healthcare (diagnostic, surgical etc.) was paid by full by the insurance companies to the provider. The amount of money per each performance was annually edited and revised mainly by regulation from the government or the MH. Pay per used material and pay per day was also part of the total remuneration. The main role in the process played two attributes:

1. Register of procedures with point values (RPPV): Every procedure done by hospital to the patient was evaluated by points and the healthcare facility received money based on number of points they performed over a specific amount of time. RPPV was created in coalition of specialized doctor associations, MH and all healthcare insurance companies (HIC). The clash over the numbers of points assigned to specific procedure was large as every specialization tried to inflate the number as much as possible in order to inflate the income for its member doctors. First attempts to regulate the point system was incorporation of time limitation for certain procedures meaning that patient

can undergo certain procedure once over a specific amount of time. Secondly, it was decided that the register would be revised and edited every year in order to take into consideration technological evolution which may inflate the costs of certain procedures on one hand or make certain procedures cheaper hence lower the points assigned for it.

2. Arguing proceedings: Based on the law 550/1991 Sb.[27] the amount of money assigned to a point from the RPPV was a subject of arguing proceedings annually.

The problems with the pay per performance can be visible from the description of the two main attributes of the system. Firstly, number of points assigned to certain procedures were based solely on the negotiation power of the specialized association of doctors which caused, that some specialization was very lucrative and some was rather undervalued. Secondly, the same cause can be made about the value of a point during the arguing proceeding. The more negotiation power in the hands of doctors, the bigger was the value of one point. Thirdly, pay per performance system found its shortcomings in the idea, that every performance would be remunerated. It caused overtreatment and over indication in order to maximize income for the facility. Lastly, the administrative burden was large in this scheme because every procedure had to be well documented and HIC had to investigate all the cases. All those reasons led to a decision to switch the system to Global Budgets system.

3.2 Global Budgets System

Overall healthcare spending became unsustainable with ever rising costs and billings to hospitals, so by the law 48/1997[28] in the year 1997, the system of pay per performance was changed to global budgets system. Together with the change of the pay per performance system, the new RPPV was introduced with revised point values. It was set, that if the healthcare facility meets at least 90% of the point values from the base year, it would receive the same budget as the previous year. Most of the hospitals understood the system and realized, that id does not push them to increase the volume of the output or

[27] Zákon č. 550/1991 Sb.: Zákon České národní rady o všeobecném zdravotním pojištění. *Sbírka zákonů ČR* [online]. 2015, **1991**(550), 1 [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/1991-550/zneni-19960701?porov=19960101

[28] Zákon č. 48/1997 Sb.: Zákon o veřejném zdravotním pojištění a o změně a doplnění některých souvisejících zákonů. *Sbírka zákonů ČR* [online]. 1997, **1997**(48) [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/1997-48

increase the efficiency. That was also the argument of the HIC, because they saw that the global budgets do not incentivize hospitals to increase the quality and efficiency.[29] Other shortcoming of the system was the fact, that hospital care is divided into two categories ACB and AFB. AFB can be planned, but ACB cannot be planned, which led hospitals to limit their ACB due to the fear, that they would surpass the budgetary constraints because of higher than expected ACB. In that perspective patients were several months on the waiting list for planned procedures, in other words strategic behaviour. Lastly, the newly established system in 1997 led to a situation, that in consecutive years the healthcare market remained the same, because all hospitals had their base year 1997. Smaller hospitals with smaller output in the year 1997 could not grow or rapidly invest into new technologies, because they could not afford it. On the other hand, large facilities with immense outputs in 1997 had the same output guaranteed for years to come, which made them less susceptible to lack of funds and could prosper.

3.3 Breakthrough in 2001

As a result, from rather unsuccessful previous payment methods, in 2001 the MH together with Czech government enacted a law 487/2000 Sb.[30] which slightly but definitely changed the system towards the DRG or case-mix systems.

It defined a new system how the global budget should be calculated. It stated, that the total remuneration is based on number of unique patients treated multiplied by point value for the given diagnosis. In the meantime, there was a limitation of number of patients based on the base year that stipulated, how many patients should the hospital treat in order to receive the same budget as the reference year. In practice, it worked like this:

- If the hospital treated in a given period less than 101% of unique patients (with a given diagnosis) than in the reference year, the budget for this type of procedure remained the same
- If the hospital treated more than 101% unique patients and less than 105% unique patients with the same diagnosis, the rules were as follows:
    - For the first 101% the reference budget remained the same

[29] ROUBAL, Tomáš. *Aplikace DRG v České Republice* [online]. Univerzita Karlova, 2005 [cit. 2017-11-01]. Available at: http://ies.fsv.cuni.cz/work/index/show/id/607/lang/cs

[30] Nařízení vlády č. 487/2000 Sb.: Nařízení vlády, kterým se stanoví hodnoty bodu a výše úhrad zdravotní péče hrazené z veřejného zdravotního pojištění pro I. pololetí 2001. *Sbírka zákonů ČR* [online]. 2000, **2000**(487), 1 [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/2000-487

    - Between 101% and 105%, the reference budget is reduced by 50%
- If the hospital treated more than 105% unique patients, the budget for the reference diagnosis was reduced to 20% for all patients above the 101% of unique patients in comparison to the reference year

This system enabled HIC to keep the number of treated patients on the sustainable level, hospital could not over treat patients, since the remuneration is based on the unique patient per diagnosis and subsequently keep the global budgets on sustainable levels.
More importantly, the regulation 487/2000 Sb. made a statement in paragraph 2, that the payment mechanisms could be alternatively based on the payment per diagnosis. It opened the door for legally implementing the DRG payment scheme into the Czech public insurance system.
Between 2001 and 2007 the system remained the same which concerns the calculation of budgets for hospitals with annual point value definitions. Meanwhile, the efforts of HIC and MH in their pilot projects were underway looking for a suitable grouper and DRG system to be implemented which came into reality in 2008, which was the first year in which the DRG system was used for partial payments of the AC in hospitals reducing the part of the budget coming from the Global Budgets mechanism.
Evolution of the payment mechanisms after the year 2007 is described in chapter *Implementation of the DRG in the Czech Republic.*

4 Historical process of implementing DRG system in the USA and Czech Republic

4.1 Implementing DRG system in the USA

The term DRG – Diagnosis Related Groups – defines classification system, which is based on a cost and clinical similarities of the medical methods of specific diseases. It represents one of the first instruments of payments for the medical facilities by the method of the payment by the case.

This system was developed in the second half of 1960's by R. B. Fetter and J. D. Thompson from Yale University with the financial help from Health Care Financing Administration – HCFA (nowadays known as a Centres for Medicare and Medicaid Services – CMS).[31]

Main impulse for creating DRG, as a tool to evaluate production of medical facilities and its costs, was enormous augmentation in the costs of the medical hospitalization in USA. For example, the payments by the Medicare program to the inpatient medical facilities rose from 3 billion dollars in 1967 up to 33 billion dollars in 1982. In last 3 years of that time the costs of one day of hospitalization rose by 18% a year. In 1982 the cost of medical care rose by 15,5% which was treble the value of inflation.[32]

The reason of that augmentation was the way of the payment for the provided medical care. Medicare used retrospective payment for the invoices of the costs used for the treatment of the patients – medical facilities were paid for almost every medical cost no matter the effectiveness. That situation was stimulating for the growth of the variety of the medical services and using the most modern technologies no matter the benefits or the costs. In some case it led to the prolongation of the duration of the hospitalization.

After being used first in New Jersey, the DRG classification system was implemented in 1983 by the name HCFA-DRG as a tool to pay the inpatient hospital facilities in the Medicare system in all USA states. The liability for the cultivation and maintenance of this system was carried out by HCFA. Since 1987 the HCFA-DRG has been enacted as an alternative billing system for the patients outside Medicare system in New York. Due

[31] Fetter RB, Thompson JD, Mills RE. A System for Cost and Reimbursement Control in Hospitals. *The Yale Journal of Biology and Medicine*. 1976;49(2):123-136.

[32] GIBBONS, JH. Diagnosis Related Groups (DRGs) and the Medicare Program: Implications for Medical Technology - A Technical Memorandum. *Office of Technology Assessment Library of Congress* [online]. 1983, 3-5 [cit. 2017-11-01]. ISSN 83-600560. Available at: http://govinfo.library.unt.edu/ota/Ota_4/DATA/1983/8306.PDF

to the differences in the spectre of the patients and the performances between Medicare program's clients and the rest of the population (depending mainly on the age structure and health situation of the patients enrolled in the Medicare system) it was necessary to modify the HCFA-DRG system. The company 3M was entrusted with the modification of HCFA-DRG system and the result was APDRG system version which created the base of all the mutations of the DRG system used today.[33]

4.2 The impact of the DRG's implementation on the health market in USA

The result of the implementation of the payment per case – DRG – was widely expected in the matter of limiting the augmentation of the cost for the hospitalization care. Changing to the new was of billing the medical care was linked to the impulses for the medical facilities concerning the quality of provided care, duration of hospitalization and the spectre of in-house patients. Description and evaluation of those effects were subjects of the whole scale of studies and analysis whose results were widely used to predict the results of DRG implementation in random country.

The change to more prospective method of payment is riskier for the medical facilities than the payment by the load used before. The medical facilities are undertaking the risk of the unpredictable costs due to the firmly set value of payment for the DRG class caused by the prolongation of the hospitalization, more expensive methods of diagnosis or more expensive therapy. The supposed reaction of the medical facilities is described by 3 basic phenomena:

1. The medical facilities are accommodating the amount of the services to the limits set out for each DRG class. The most common example is limiting the hospitalization's duration and earlier dismissal of the patient or transfer to another medical facility. Due to the fact, that this is financial motivation and not the medical one, this phenomenon is described as a **moral hazard.**
2. The second phenomenon to which the transfer to DRG system can lead is the effect of **selection of patients** (sometimes called as a cream skimming effect). It is the case, when the medical facility is choosing more lucrative patient over the others. The patients are selected either by being more cost effective or being classified in the more payable DRG class.

[33] GIBBONS, JH. Diagnosis Related Groups (DRGs) and the Medicare Program: Implications for Medical Technology - A Technical Memorandum. *Office of Technology Assessment Library of Congress* [online]. 1983, 23-26 [cit. 2017-11-01]. ISSN 83-600560. Available at: http://govinfo.library.unt.edu/ota/Ota_4/DATA/1983/8306.PDF

3. The third reaction of medical facility to the new payback method are **changes in the market share values.** If there is a systematic transfer of patients from one type of medical facility to another (e.g. due to differently set basic rates for each hospital types), then there is also a change in the complete care regarding certain diagnosis.[34]

It was repeatedly described that in the first two years after DRG implementation in the Medicare program there was a significant shortage of the length of the hospitalization (average length of stay – ALOS) in those facilities, where there was previously used the system of prospective payment. This result cannot be linked only to the moral hazard. It was also proven, that the shortage of the hospitalization was caused by the transfer of the patient to another medical facility whose contract was not based on prospective billing method. There were less serious cases in the facilities paid by the DRG method and the shortage of LOS was caused by the patient selection.

Well described model of the changes caused by the implementation of GRD system is the implementation of the DRG system in New Hampshire, USA. Medicaid program stopped paying the medical facilities by the loads in 1989 and then transferred its payments to the DRG method. According to the main diagnosis classes (MDC) the medical facilities were divided into the groups for which the payment classes were set. For example there were 3 categories of the psychiatric hospitals according to the specialization and care difficulty (the same differentiation is typical for Czech psychiatric hospitals), that lead to the fact, that the payment for the patient who was diagnosed with the schizophrenia in the facility with the highest specialization was three times bigger than the payment for the same patient in the facility with the complex care (thee difference in the payment amount was 7 000 USD to 2 200 USD). The assumed consequences were: shortage of the medial of hospitalization length in private hospitals, higher percentage of more medically serious cases in the tracked facilities (the result of case selection in the more profitable DRG classes) and the transfer of the patients from public to private medical facilities. This transfer was stimulated by the fact, that the payment based on DRG method was applied

[34] Ellis, Randall and McGuire, Thomas G., (1986), Provider behaviour under prospective reimbursement: Cost sharing and supply, *Journal of Health Economics*, 5, issue 2, p. 130-135, https://EconPapers.repec.org/RePEc:eee:jhecon:v:5:y:1986:i:2:p:129-151.

only towards private facilities and the amount of the payment was set to be more profitable than the classic payment method.[35]

This massive transfer towards private facilities was widely visible. The simplest fact to see and describe of the DRG implementation was the change in market shares of each individual classes of medical facilities. As predicted, there was a significant shortage of the length of the hospitalization. This decrease was most visible in the public facilities. On the other hand, in the private facilities there were two different motivations – one was the moral hazard previously mentioned – to stimulate the medical facilities to shorten the LOS – the other was the selection effect – which on the other hand leads to prolongation of the LOS due to more complicated and more difficult case care. Based on the analysis of each different patient classes in private facilities was stated, that both tendencies are in use, but with the different intensity. The effect of the phenomenon stated above was most visible in the highly specialized medical facilities (those with the highest DRG payment). The average length of hospitalization decreased by 3,8 days – from which the moral hazard caused decrease by 6,5 days and selection effect caused increase of the ALOS by 2,7 days.[36]

Based on the fact described above we can assume, that the implementation of DRG as a case of prospective payment method in the relation provides – payee will lead to the market share changes for each medical facility (until there is an equality among all medical facilities) and also will lead to the shortage of ALOS. The shortage of LOS will not be visible in all DRG groups. It will be cloaked partly in the selection effect dominating mostly among the most specialized facilities. The shortage of ALOS does not necessary means the deterioration of the medical situation of the population and is it mostly described as a positive result on productivity and effectiveness of whole health system. There is also light transfer from hospitals to ambulant facilities.

4.3 Implementation of the DRG in the Czech Republic

First ideas of implementing the DRG system in the Czech Republic dates back into 1995, when the General Insurance Company (GIC – body responsible for allocating resources

[35] Coulam RF, Gaumer GL. Medicare's prospective payment system: A critical appraisal. *Health Care Financing Review*. 1992;1991(Suppl):45-77.

[36] Ellis, Randall and McGuire, Thomas G., (1986), Provider behaviour under prospective reimbursement: Cost sharing and supply, *Journal of Health Economics*, 5, issue 2, p. 133-141, Available at: https://EconPapers.repec.org/RePEc:eee:jhecon:v:5:y:1986:i:2:p:129-151.

from the obligatory health insurance) contacted American governmental agency USAID and company 3M, which was the creator of the first and most used DRG systems. With a vision of implementing the DRG system in the Czech Republic, GIC initialized a pilot project.[37]

4.4 Pilot project of the GIC

Based on the DRG system as a tool for measuring healthcare as a product and categorizing providers of such product, GIC made two phases of a pilot project in order to fully implement a new way of payment scheme based on the results provided by the two pilot phases.

4.4.1 1st phase

The goal of the first phase was to break down, analyse and understand the cost structure of provided healthcare in the Czech Republic and try to analyse, if Czech hospitals are capable of working with DRG system. Firstly, data collection from 19 volunteer hospitals lasted from 1997 to 1999.[38]

Together with US governmental agency USAID and company 3M, Czech GIC selected the most suitable type of grouper number 12.0 All Patient Diagnosis Related Groups. This grouper was altered and implemented for purposes of a Czech specific conditions. From the data collected in the first phase, the first Czech DRG Grouper was created with relative weights specific for the Czech hospitals over the studied period of time. GIC decided that the allocation of available resources for the hospitals would be 20% based on the results from the 1st phase of the pilot project and 80% of the payments would be based on the current system of retrospective payments. As a result, the hospitals failed to correctly divide patients into groups by the diagnosis. Overall impression was that the lack of information and lack of teaching materials would prevent the system from being implemented. Hospitals after all received less money than before which caused frustration and dissatisfaction with the new system. GIC concluded that the first phase was not a failure altogether, because it showed shortcomings and imperfections of the newly proposed system.

[37] ZBUZKOVÁ, Lydie. *Ekonomické aspekty systému klinické klasifikace a financování akutní lůžkové péče typu DRG (Diagnosis Related Group): DRG v ČR - historie a současnost.* Praha: [s.n.], 2004. 54 s.
[38] KOŽENÝ, Pavel. *Klasifikační systém DRG*. Praha: Grada, 2010, p. 25-36, ISBN 978-802-4727-011.

4.4.2 2nd phase

Second phase was announced in January 2000 based on the information obtained during the first phase. Delegates from hospitals and delegates from GIC came to a conclusion, that the DRG system should continue in its attempts to be implemented and decided on the second phase of pilot project. Altogether 82 hospitals took part in the second phase. From those 82 hospitals, 7 were large teaching hospitals.[39] Goal was to try for a second time, if the hospitals are able to segment patients based on their diagnosis and DRG groups and also to validate the new DRG grouper, which originated from the first phase. Second phase, similarly to the first phase, ended with a failure to successfully validate the system and grouper, because most of the hospitals in the selected group failed to correctly divide patients according to diagnosis, correctly create a principal diagnosis, include Complications & Comorbidity etc. Overall, every hospital from the selected group would receive less money than before and delegates from both hospitals and GIC decided, that the payments for the healthcare would not reflect the results from the second phase. Again, the representatives from the GIC did not consider the second phase as a total failure. As a success they considered the fact, that hospitals showed an interest in participating in such activities to improve and measure the provision of the healthcare in the Czech Republic. They discovered, that more profound grouper, more precise relative weights, better data collection from hospitals and more detailed manual must be put in place in order to successfully implement the DRG system.[40]

4.5 Project of the Ministry of Health

After the pilot project run by GIC and its two rather unsuccessful phases that both ended with malcontent from the side of healthcare providers and unsatisfactory data collection from the side of GIC, it was Ministry of Healthcare (MH) who took over the initiative to implement and start off using the DRG in the Czech Republic. In February 2001, MH together with delegates from patient associations and associations of healthcare providers set up the Expert Committee consisting of delegate from all three bodies, which should oversee and advise MH in their attempts to resuscitate the DRG attempts[41]. It was decided

[39] ROUBAL, Tomáš. *Aplikace DRG c České Republice* [online]. Univerzita Karlova, 2005 [cit. 2017-11-01]. Available at: http://ies.fsv.cuni.cz/work/index/show/id/607/lang/cs
[40] KOŽENÝ, Pavel. *Klasifikační systém DRG*. Praha: Grada, 2010, p. 168-173, ISBN 978-802-4727-011.
[41] KOŽENÝ, Pavel. *Klasifikační systém DRG*. Praha: Grada, 2010, p. 25-36, ISBN 978-802-4727-011.

to create National Reference Centre (NRC), which has been both the executive and expert establishment for the whole DRG system since 1st of September 2003.[42] NRC is a shared interest group, whose members are associations of providers of healthcare and all healthcare insurance companies.

Meanwhile, in 2001 the MH announced a tender searching for provider who would invent and validate the system for using DRG in the Czech Republic. The goal was to find a suitable grouper together with definition manual and relative weights applicable in the Czech environment. The winner of the tender was Institute for post gradual education in healthcare (IPVZ) with a system IR-DRG (International Refined DRG) invented by the company 3M. This system was chosen for its profound and undeniable benefits. It classifies the whole acute healthcare, originates fully from International Classification of Diseases version 10 (ICD-10), includes 1 175 DRG groups and is sophisticated in its approach towards CC, when the overall CC is based on the highest CC of all complications.[43]

4.5.1 First phase of the pilot project of MH

Based on the selected IR-DRG system, 21 hospitals of all sizes and specializations together with all healthcare insurance companies participated in the 1st phase of pilot project of MH with a goal to validate and check for applicability of the system beginning in spring 2003. Part of the first phase was to standardize and audit the information systems of selected hospitals, relevancy of data provided by such system and overall methodology of cost analysis. The reason for such activities was experience from the 1st and 2nd phase of the GIC pilot project which found its shortcomings mainly in different standardization of information management.

The results from the first phase were once and again rather unsuccessful, because the hospitals showed rather chaotic and inaccurate assigning of diagnosis, there was no system for correcting faultily put diagnosis and the definition manual together with grouper consisted of series of inaccuracies in terminology used in hospitals. Lack of binding manual and rules for coding prevented the accurate data collection which resulted

[42] ROUBAL, Tomáš. *Aplikace DRG c České Republice* [online]. Univerzita Karlova, 2005 [cit. 2017-11-01]. Available at: http://ies.fsv.cuni.cz/work/index/show/id/607/lang/cs

[43] KOŽENÝ, Pavel. *Klasifikační systém DRG*. Praha: Grada, 2010, p. 192, ISBN 978-802-4727-011.

in impossibility of creating relative weights based purely on data collected from the first phase of the pilot project of the MH.[44]

4.5.2 Pre-Cultivation and Cultivation of the DRG

After all the experience collected from numerous attempts of the DRG implementation, NRC together with IPVZ and MH launched firstly a project of pre-cultivation of the DRG and subsequently cultivation project.

The first was launched in 2006 and its goal was to cultivate, validate and incorporate the IR-DRG system as a payment mechanism for AC in 2008. Necessary steps for doing that was elimination of the misunderstandings with correct coding, creating a new definition manual and also creating a new set of relative weights. A group of medical and economic experts worked on the problem for 6 months using the data from all insurance companies. The result was a new definition manual, new set of relative weights, actualization of the methodology for assigning codes and diagnosis and changes in the algorithm of the grouper.[45] DRG version in this form was called IR-DRG 1.2 revision 005.2008 and was used for partial payments of the AC in the year 2008 based on the regulation of the MH 383/2007 Sb.[46]

Second phase called Cultivation of the DRG 2008 consisted of mainly the same activities of cultivating, adopting, precision and altering the relative weights, definition manual, adding and explaining some of the misunderstood diagnosis and editing the grouper. At the end of those activities was a new version of the IR-DRG revision 006.2009 which was used for partial payments of the AC in the year 2009 based on the regulation of the MH 464/2008.[47]

Those two mentioned phases (Pre-Cultivation and Cultivation 2008) marked a trend on which the IR-DRG system is revised and adopted by the NRC every year and is incorporated by law into the payment mechanism for Acute Care. For the year 2016 it

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[44] KOŽENÝ, Pavel. *Klasifikační systém DRG*. Praha: Grada, 2010, p. 180, ISBN 978-802-4727-011.

[45] Historie DRG. *Ministerstvo zdravotnictví České republiky* [online]. Praha: Ministerstvo zdravotnictví České republiky, 2015 [cit. 2017-11-01]. Available at: https://www.mzcr.cz/obsah/drg_1057_3.html

[46] Vyhláška č. 383/2007 Sb.: Vyhláška o stanovení hodnot bodu, výše úhrad zdravotní péče hrazené ze zdravotního pojištění a regulačních omezení objemu poskytnuté zdravotní péče hrazené z veřejného zdravotního pojištění pro rok 2008. *Sbírka zákonů ČR* [online]. 2007, **2007**(383), 1 [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/2007-383

[47] Vyhláška č. 464/2008 Sb.: Vyhláška o stanovení hodnot bodu, výše úhrad zdravotní péče hrazené z veřejného zdravotního pojištění a regulačních omezení objemu poskytnuté zdravotní péče hrazené z veřejného zdravotního pojištění pro rok 2009. *Sbírka zákonů ČR* [online]. 2008, **2008**(464), 1 [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/2008-464

was version IR-DRG revision 013.2016 and the law for the payments of the healthcare was 273/2015 Sb.[48]

[48] Vyhláška č. 273/2015 Sb.: Vyhláška o stanovení hodnot bodu, výše úhrad hrazených služeb a regulačních omezení pro rok 2016. *Sbírka zákonů ČR*[online]. 2015, **2015**(273), 1 [cit. 2017-11-01]. Available at: https://www.zakonyprolidi.cz/cs/2015-273

5 Practical part – DRG and its implications in cardiovascular care

In order to relate the data from the theoretical part to the actual situation in the Czech Republic, I have collected a dataset from a private hospital on which I will demonstrate:

- Disadvantages for the patients after the implementation of the DRG
- Advantages for the hospital facility after the implementation of the DRG

The dataset consists of data from hospital's information system for 3 diagnoses, that can be treated by two different approaches – surgical and non-invasive. While the non-invasive approach is less harmful and with better CC results for the patient, it is costlier for the hospital. I will try to find an answer to the following questions:

- Has the structure of medical procedures changed after the implementation of the DRG system in the selected field of medicine?
- What implications does the DRG system have for the interested parties?

The practical part is mainly focused on different incentives on the side of healthcare provider management, doctors and patients. I will discuss possible reasons for such behaviour taking into consideration information from the theoretical part and results from statistical analysis of the dataset.

5.1 Incentives for different actors in the DRG system

DRG as a system of categorizing and measuring the production of the hospital care provides numerous implications for the players in the field of healthcare.

5.1.1 Implications for the payers of healthcare

DRG system provides large number of advantages for the payers of the healthcare, namely HICs. It provides large amount of data about the production of providers, which can be easily measured, interpreted and analysed for cost breakdown and cost containment. It provides unique possibility of benchmarking of different establishments meaning that different hospitals can be effectively compared. Altogether, it leads to feasible control over spending and efficiency of providers which in turn lead to possibility of shaping and correcting the current situation in the field.

When speaking about the budgetary concerns of the whole system of healthcare, DRG system provides a tool how to control and limit the spending of hospitals through BR, which helps containing and planning the spending of a system as a whole. It leads to better planning and controlling of effectivity and shape of the whole web.

5.1.2 Implications for the providers

Implementation of the DRG system brings many implications for the providers, both advantageous and disadvantageous. When not talking about initial investment into the software and hardware products, training of the hospital personnel and other one-time expenditures, we may summarize implications of the providers as follows:

- **Better control for management:** information asymmetry on the side of doctors in relation to the management is limited by the DRG system. It provides the management with a quantitative tool how to measure and evaluate the production of different units in the hospital. It can work as a unifying element of the production which is freed from medical particularities
- **Selection of patients:** DRG provides the management with clear and understandable expenditures of patients with different diagnosis, which may lead to negative effect of selecting the patients with most favourable diagnoses and transferring the patients with not such favourable conditions to other hospitals, mainly to large teaching hospitals, that have to treat patients irrespectively on condition or hospital they come from
- **Upcoding:** one of the main arguments of the opponents of the DRG system is a negative effect called upcoding. In reality, it is a form of strategic coding, which can be manifested in numerous forms:
    - **Erroneous principal diagnosis:** principal diagnosis is set wrongly leading to higher remuneration for the facility
    - **Higher CC assigned to the case:** if the CC is assigned to the case with an intention to boost up the remuneration and DRG payment
    - **Higher material costs:** boosting up material costs that have been allegedly used during the procedure
- **Downcoding:** negative effect that is brought by the DRG system and is the opposite of upcoding is called downcoding. It is a situation, when doctor not intentionally code the case wrongly and the total remuneration is smaller than it should be

- **Strategic behaviour:** it may occur in many forms, but the most visible on is selecting material that are cheaper and provide the highest profit for the provider when coding the diagnoses. Some hospitals may use the most advanced materials that are costly and some may use cheaper versions that provide an opportunity to make a profit on the case. On paper both hospitals provide the same treatment

5.1.3 Implications for the doctors

The DRG system, initially as a tool for measuring the production and effectiveness of the system of hospital care, does not bring as many advantages for the doctors as it brings to the HIC and management of hospitals. Doctors, must treat the patients according to their best knowledge and expertise, DRG system or not. The problem comes when the head doctors or management of the hospital forces doctors to treat patients according to the cost effectiveness rather than medical benefits.

Information systems of hospitals provide the doctors which predicted remuneration for the case and doctors can upcode the case in order to meet the costs they already put into the case. On the other hand, selective coding is frequently forced upon the doctors and wards in hospitals in order to diagnose patients with the most favourable diagnosis, which brings the most profitable income. In other words, rationalization of the production is expected from the doctors, which may in some cases influence the quality of the care.

It is a key element in my work later on, which I will demonstrate on my dataset and in my analysis.

5.1.4 Implications for the patients

Because of the information asymmetry on the side of patients, when they are not well equipped with information to decide what is the best possible care for them, patients do not feel the direct implications of a new payment mechanism for healthcare. What they can feel and encounter are complications and negative effects of lower quality of healthcare, that is provided due to a pressure on doctors to limit the costs and increase the efficiency of treatment. Beneficial implications for patients may be seen in profits the hospitals make, if they are reinvested back into the facility, which may in turn improve the technological and personal equipment of hospitals that make positive profits.

5.2 Analysis of the strategic behaviour in a private hospital

The chapter analyses current situation in a hospital care among both privately owned hospitals and hospitals whose funds come from public sources. In the first chapter I divided them into 5 categories based on the owner and controller, namely those were:

- Hospitals run by ministry of healthcare (MHH) – mainly large teaching hospitals
- Hospitals run by regional body (RH) – large regional hospitals
- Hospitals run by other central governments (OCGF) – army hospitals etc.
- Hospitals run by municipalities (CH) – municipal hospitals with limited scope
- Hospitals run by other legal body (PH) – private hospitals run by church or private owner

For simplicity, I will group those 5 categories into only 2, because we find some similarities among them what concerns budgets they receive. PH are privately owned establishment that receive part of their funds directly from the state budget (MHH and OCGF), or indirectly from the smaller national entities (RH and CH). Such hospitals I group under the Public-Sector Hospitals **(PSH).** Remaining hospitals are directly owned by a private entity, meaning the funds come directly from the budget of private corporations and business units **(PH).**

How those groups are successful in achieving efficiency and profit creating summarizes the next table:

	Costs (mil CZK)	Revenues (mil CZK)	Economic outcome (mil CZK)
Ministry of Health (MH)	70 990	71 061	+71
Region (RH)	50 583	50 258	-325
Other Central Governments (OCGF)	3 534	3 535	+1
Other legal body (PH)	14 451	14 725	+274
City, Municipality (CH)	7 394	7 370	-24

Table 5: Economic outcomes of hospitals by ownership in 2016, own creation[49]

Table summarizes the economic outcomes of all hospitals in the Czech Republic with respect to the ownership. It clearly shows differences in profit creating with respect to the ownership and controlling power. On one hand, PSH hospitals provide the majority of healthcare, with the largest scope of provided services, on the other hand there is a clear signal that management of those hospitals is unable to find effectiveness and economies in their production hence such hospitals finish the year in red numbers. It may have numerous reasons, but the most striking and well known is the fact, that the management of PSH hospitals is not under pressure to find economies and rationalize the production because the ownership belongs to the government or other central bodies. When the funds come directly from the public accounts, and the ownership is also "public", it brings the feeling, that the funds are limitless. It negates the initial reason for implementing the DRG which is finding effectiveness and benchmarking hospitals. Such business entities would never sustain, if it would be 100% privately owned.[50]

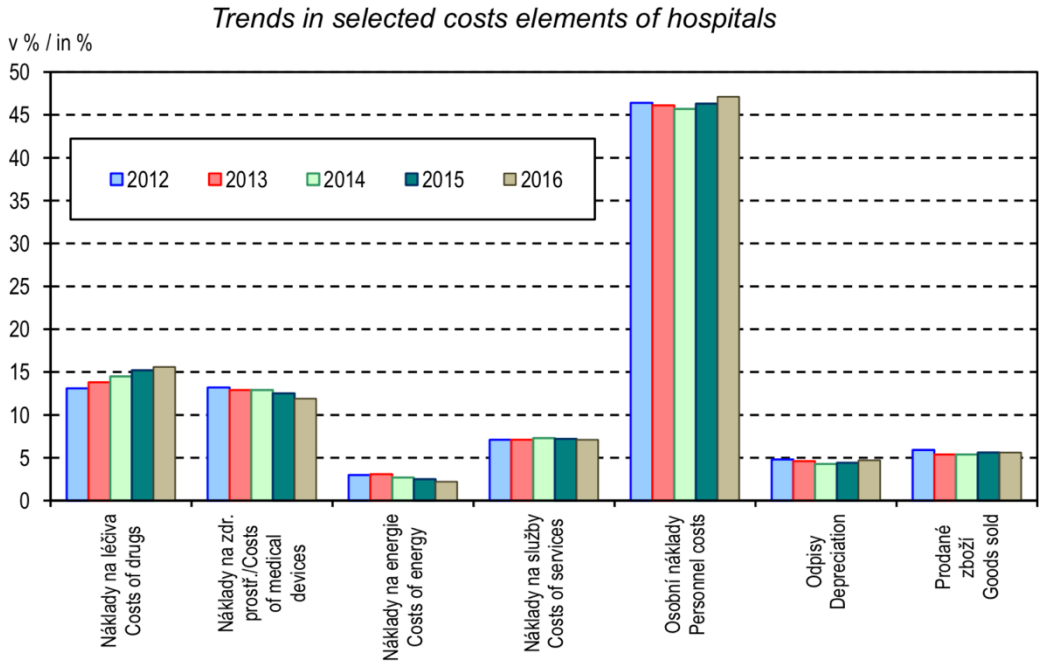
However, PH are able to end years in black numbers, which may be addressed to the fact, that primary intentions of every business unit is to generate the profit. Such hospitals

[49] Ekonomické výsledky nemonic 2016. *Ústav zdravotnických informací a statistiky ČR* [online]. 2016, **2016**(1), 3-13 [cit. 2017-11-01]. Available at: http://www.uzis.cz/category/tematicke-rady/zdravotnicka-zarizeni/nemocnice

[50] Information obtained during interview with a manager of a private hospital

adopted to the new system quickly, rationalized its production, costs and revenues which brought them into black numbers. On the other hand, such activities are not necessarily with the best possible outcome for patients[51] as I show in my analysis.

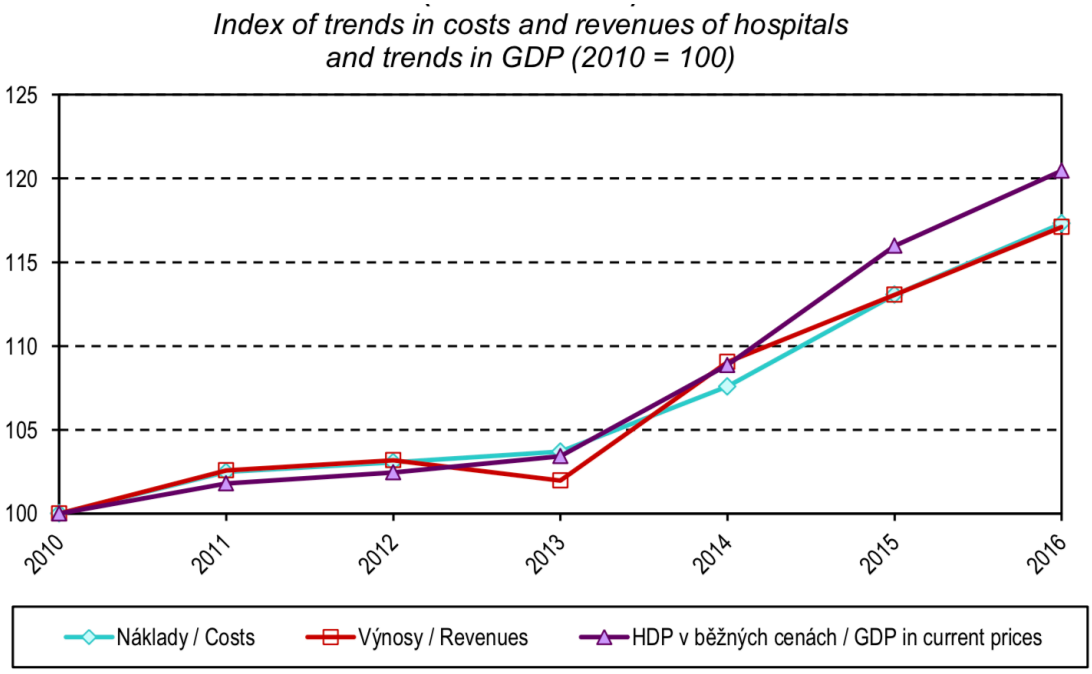
Following graphs and pictures provide and insight, how the costs evolved in the last 4 years showing, that there was not a striking plummet in the costs over the years, rather there was a decline in costs for medical devices and overhead costs. Also in the picture *Index of trends in costs and revenues of hospitals* it visualizes, that costs and revenues were positively correlated.



Picture 2: Trends in selected cost elements of hospitals[52]

[51] Information obtained during interview with a manager of a private hospital

[52] Ekonomické výsledky nemocnic 2016. *Ústav zdravotnických informací a statistiky ČR* [online]. 2016, **2016**(1), 3-13 [cit. 2017-11-01]. Available at: http://www.uzis.cz/category/tematicke-rady/zdravotnicka-zarizeni/nemocnice



Picture 3: Index of trends in costs and revenues of hospitals and trends in GDP[53]

5.3 Statistical analysis of the production in the cardiovascular healthcare of PH

5.3.1 Methodology

For the description of the data, descriptive statistics was used (median, arithmetic average, standard deviation, frequency tables with absolute and relative numbers).

For evaluation of the hypothesis, chi-squared test was used and nonparametric Mann-Whitney test for two selections. When analysing the quantitative data, Shapiro-Wilk normality test was used, normality was not confirmed, above mentioned nonparametric test was used.

For graphical interpretations, column and box graphs were used (lower quartile – 25. percentile, midpoint – median, upper quartile – 75. percentile).

Statistical tests were run on 5% statistical importance levels in the software Stata version 13.

[53] Ekonomické výsledky nemocnic 2016. *Ústav zdravotnických informací a statistiky ČR* [online]. 2016, **2016**(1), 3-13 [cit. 2017-11-01]. Available at: http://www.uzis.cz/category/tematicke-rady/zdravotnicka-zarizeni/nemocnice

5.3.2 Characteristics of the dataset

Dataset was provided by a private hospital in Moravian-Silesian region. Based on interview with manager from the hospital, I decided to compile a dataset for three diagnoses and select years before the implementation of the DRG system for payments and after the implementation. The reason for such selection is based on the alleged pressure on doctors to shift and indicate treatment that is more favourable in terms of costs and remuneration, but less favourable for the patients in terms of ALOS, CC and reoperations.

For such comparison, we selected following diagnoses:

- Atherosclerosis of limb arteries (DG1)
- Acute arterial thrombosis of the lower extremities (DG2)
- Abdominal aortic aneurysm without rupture (DG3)

The reason for selecting those three diagnoses is that all three can be treated by two different approaches of arterial surgery:

- Minimally invasive approach **(MIA)** – most advanced and safest approach consisting of inserting a catheter through a vein to the affected area and performing the treatment procedure
- Surgical approach **(SA)** – regular surgical approach with making a large cut and performing the procedure with scalpel and other surgical apparatus

Due to the fact, that this work is economical rather than medical, I will describe the medical phenomena and aspects on data and relatively simplified.

Because those particular diagnosis have been implemented into the DRG based remuneration in 2010, I have selected years 2008, 2009, 2014, 2015 for my analysis. The first two represent the situation before the DRG based payment scheme, the latter represent current situation, when the remuneration is based on the DRG system.

Relatively up-to-date software, that is being used in the hospital, provides information about the remuneration by both approaches; by the point value assigned to the diagnosis (approach in years 2008-2009) and by the DRG system (approach in the years 2014-2015). This fact enables us to compare the values of remuneration in both selected periods with respect to the fact, that costs of both approaches have not varied intensively over the selected time. When assuming that costs for both approaches remained the same and did

not vary, the remuneration is the key deciding factor for the hospital, when looking at the hospital as business entity.

5.4 Atherosclerosis of limb arteries (DG1) analysis

There were 2 562 patients diagnosed with DG1 in selected years 2008-2009 and 2014-2015. Patients treated by the S approach accounted for 24% and patients treated by MIA accounted for 76%. First evidence of a shifting priorities can be seen on percentages of patients treated by SA in selected year periods. In 2008-2009, number of patients treated by SA was 19%, in the second period 2014-2015 the percentage rose to 26-27%.

Approach	SA		MIA		TOTAL	
year	number	%	number	%	number	%
2008	85	19%	373	81%	458	100%
2009	94	19%	406	81%	500	100%
2014	212	26%	603	74%	815	100%
2015	214	27%	575	73%	789	100%
total	605	24%	1957	76%	2562	100%

Table 6: Number of patients treated by SA and MIA for DG1 in selected years, own creation

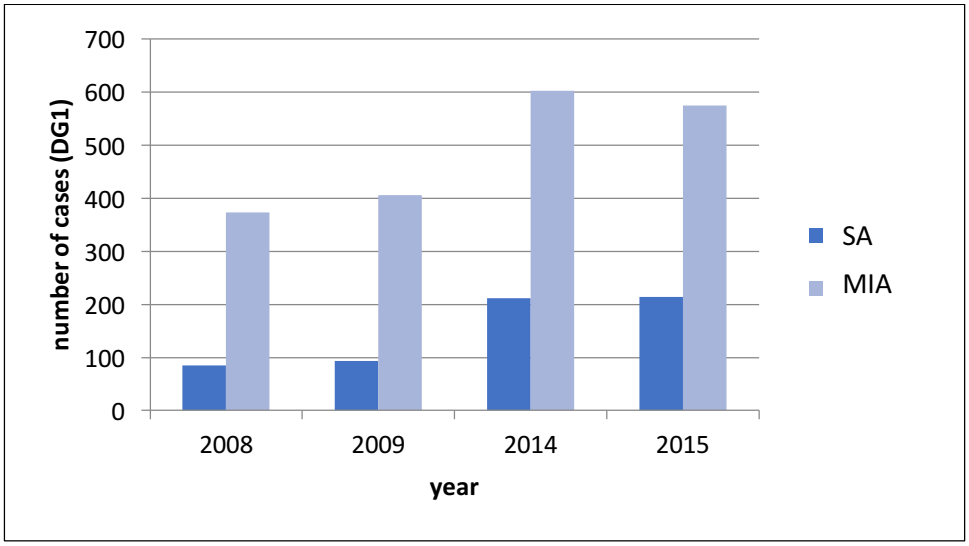


Chart 4: Number of cases DG1, own creation

In a table and graph below, there are total values of remuneration using both payment systems, by point value and by the DRG system. In the years 2008-2009, the remuneration

was based on the point system, in the years 2014-2015 the remuneration was based on the DRG system.

From the graph and the table is visible, that in the years 2008-2009, when comparing DRG remuneration and Point remuneration, MIA approach was better remunerated in payment scheme by Point than by DRG. Reverse assumption can be made about the SA approach, in 2008-2009 the remuneration by the DRG was higher than by Point and in the years 2014-2015 it changed rapidly and the SA approach was better appraised and the DRG payment overpassed the point based payments.

year	Approach	Different approaches for remuneration	
		DRG	Point
2008	SA	5 486 690 Kč	5 512 347 Kč
	MIA	16 593 847 Kč	29 903 369 Kč
2009	SA	9 226 141 Kč	6 454 175 Kč
	MIA	25 940 706 Kč	36 961 638 Kč
2014	SA	20 145 711 Kč	16 520 949 Kč
	MIA	57 111 020 Kč	63 208 524 Kč
2015	SA	21 972 758 Kč	17 538 353 Kč
	MIA	44 808 150 Kč	58 021 957 Kč

Table 7: Remuneration for DG1 by the approach, own creation

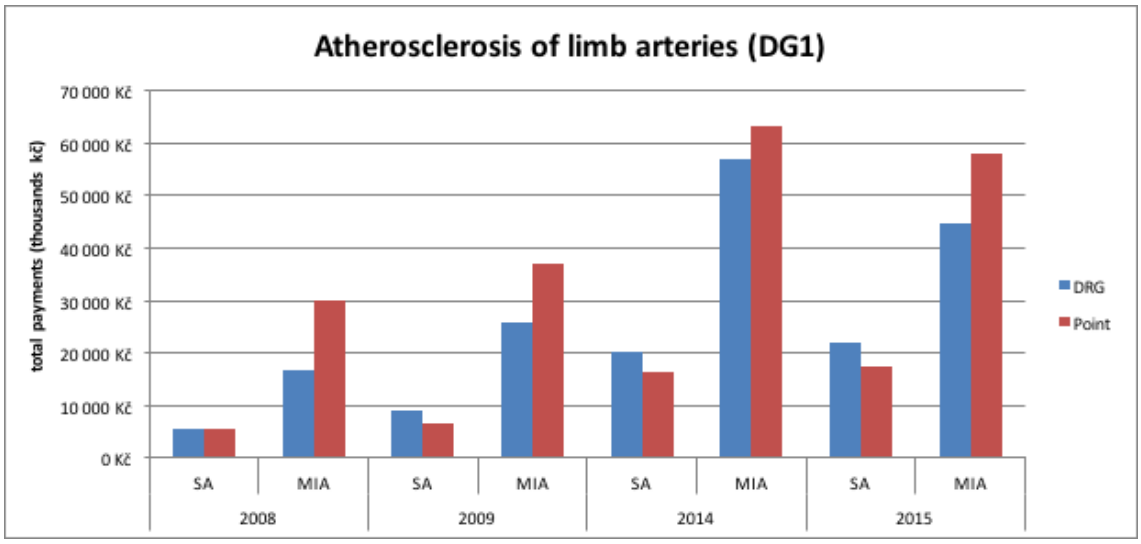


Chart 5: Total remuneration by the payment approach to DG1, own creation

Table below shows, that the remuneration over the years shifted from more favourable approach in 2008-2009 being the MIA approach and over the years 2014-2015 most favourable approach was SA. The conclusion is being drawn from the fact, that in 2008-2009 the DRG payment in comparison to Point payment was lower for SA and higher for MIA and in the years 2014-2015 vice versa. Incentive for the management was to perform more MIA surgeries in 2008-2009 and more SA surgeries in 2014-2015.

Values by case	Approach	year	number	median	Arithmetic average	Standard deviation	min.	max.
Length of stay	SA	2008	85	9	10,8	4,5	5	28
		2009	94	9	9,9	3,6	3	22
		2014	212	9	10,6	4,7	2	29
		2015	214	8	10,6	7,9	4	65
	MIA	2008	373	2	3,7	3,6	1	40
		2009	406	2	3,4	3,2	2	31
		2014	603	3	4,5	4,1	2	58
		2015	575	3	4,4	4,7	2	65
DRG payment	SA	2008	85	54 412	64 549	32 031	45 571	160 095
		2009	94	78 785	98 150	39 909	59 089	225 185
		2014	212	64 684	95 027	50 468	55 800	271 827
		2015	214	69 671	102 676	60 790	44 140	388 057
	MIA	2008	373	46 952	44 488	11 797	24 167	115 759
		2009	406	67 984	63 893	21 768	39 393	230 059
		2014	603	101 003	94 711	30 686	45 325	359 858
		2015	575	67 389	77 927	28 381	42 694	277 309
Point	SA	2008	85	50 856	64 851	41 925	26 397	247 987
		2009	94	54 263	68 661	41 119	31 302	247 635
		2014	212	57 085	77 929	55 761	13 473	329 095
		2015	214	67 282	81 955	63 456	15 923	647 546
	MIA	2008	373	70 546	80 170	49 454	28 219	388 184
		2009	406	75 602	91 039	59 708	31 732	464 888
		2014	603	86 686	104 823	53 013	35 969	505 960
		2015	575	87 988	100 908	45 860	36 136	378 107

Table 8: Values by case for DG1, own creation

Following table provides the same attributes but values are accounted for one day of stay. The reason for shift in approach between the selected years is even more visible when the

values are transferred to a per day numbers. It clearly shows that the SA was boosted in the DRG system and on the other hand the MIA was supressed.

Divided by cases and LOS	**Approach**	**year**	**number**	**median**	**Arithmetic average**	**Standard deviation**	**min.**	**max.**
DRG payment	SA	2008	85	6 042	6 665	3 449	2 236	17 788
		2009	94	9 848	10 742	4 617	3 090	25 021
		2014	212	8 086	9 837	5 071	2 722	34 203
		2015	214	9 028	10 693	5 120	3 209	27 792
	MIA	2008	373	14 003	16 092	6 315	2 843	24 167
		2009	406	22 661	24 193	8 913	3 727	75 481
		2014	603	25 251	25 783	9 781	3 022	80 685
		2015	575	20 376	21 665	8 693	3 630	54 521
Point	SA	2008	85	5 089	6 231	3 374	2 694	17 713
		2009	94	5 829	7 229	4 564	3 183	35 376
		2014	212	5 984	7 525	4 929	1 919	34 887
		2015	214	7 191	8 049	4 037	2 420	21 688
	MIA	2008	373	23 938	27 580	17 151	3 440	169 319
		2009	406	31 234	33 005	18 863	3 756	157 742
		2014	603	24 690	27 477	13 717	3 896	95 117
		2015	575	25 007	27 705	13 365	3 598	94 527

Table 9: Values per day for DG1, own creation

The total number of patients treated by the two approaches was statistically evaluated. Between the two periods there is statistically significant difference ($p < 0{,}001$). In the second period 2014-2015 there was 8% increase of patients treated by SA.

Approach	SA		MIA		Total	
year	number	%	number	%	number	%
2008-2009	179	19%	779	81%	958	100%
2014-2015	426	27%	1178	73%	1604	100%
Total	605	24%	1957	76%	2562	100%
chi^2-test, $p < 0{,}001$						

Table 10: Shift of patients for DG1, own creation

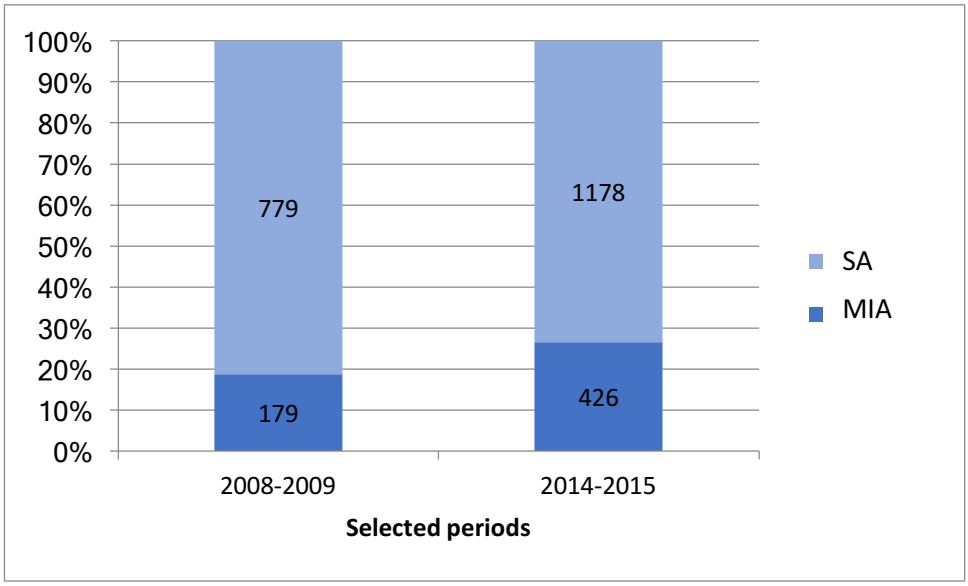


Chart 6: Shift of patients for DG1, own creation

The table below shows, that length of stay is significantly longer by SA than MIA in both periods ($p < 0{,}001$). Payment per point per patient is significantly higher by MIA than SA in both periods ($p < 0{,}001$). Payment per DRG in the first period was significantly higher by SA than MIA ($p < 0{,}001$), but in the second period the difference was not statistically significant ($p = 0{,}3852$).

Value per case	term	Approach	Number	Median	Ar. average	SD	min.	max.	p-value
Length of stay	2008-2009	SA	179	9	10,3	4,1	3	28	<0,001
		MIA	779	2	3,6	3,4	1	40	
	2014-2015	SA	426	9	10,6	6,5	2	65	<0,001
		MIA	1178	3	4,5	4,4	2	65	
Point payment	**2008-2009**	**SA**	**179**	**52 259**	**66 852**	**41 430**	**26 397**	**247 987**	**<0,001**
		MIA	**779**	**73 686**	**85 834**	**55 270**	**28 219**	**464 888**	
	2014-2015	SA	426	62 121	79 951	59 715	13 473	647 546	<0,001
		MIA	1178	86 932	102 912	49 668	35 969	505 960	
DRG payment	2008-2009	SA	179	75 043	82 195	39 993	45 571	225 185	<0,001
		MIA	779	48 333	54 601	20 182	24 167	230 059	
	2014-2015	**SA**	**426**	**64 684**	**98 870**	**55 958**	**44 140**	**388 057**	**0,3852**
		MIA	**1178**	**86 846**	**86 519**	**30 739**	**42 694**	**359 858**	

Table 11: Analysis of values per case for DG1, own creation

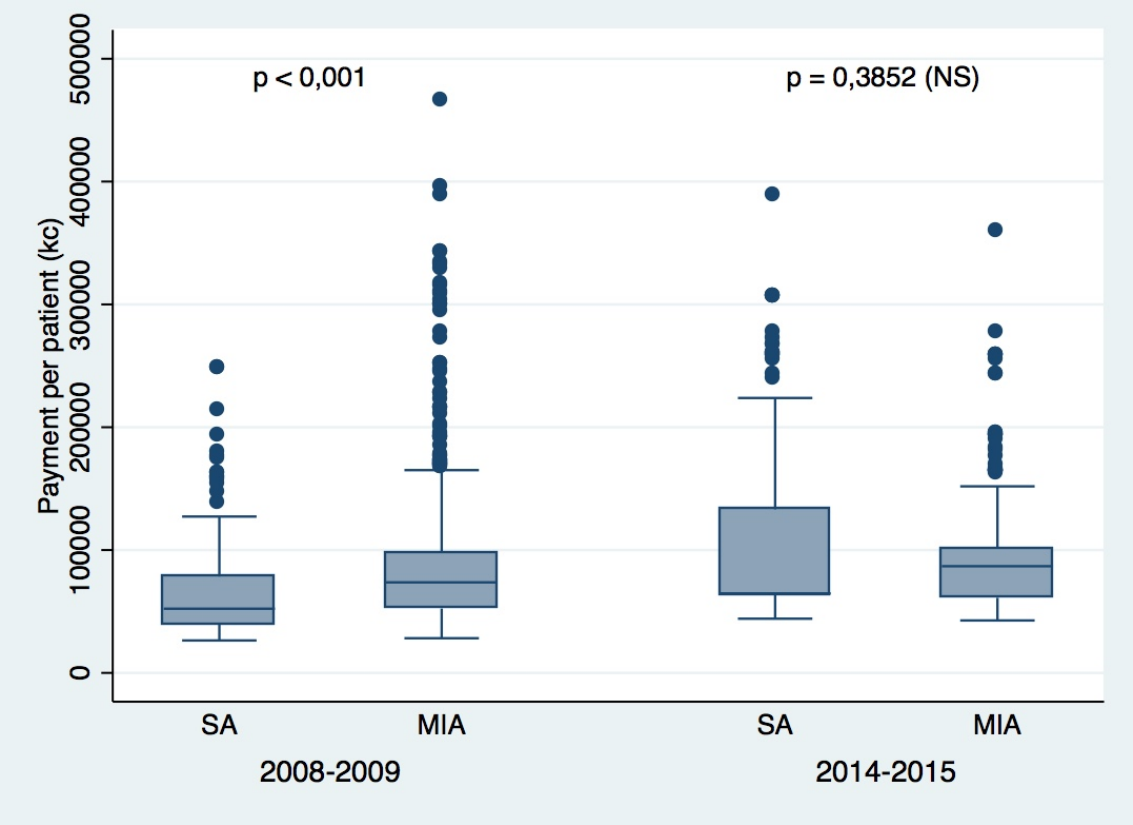


Chart 7: Payment per patient distribution in DG1, own creation

5.5 Acute arterial thrombosis of the lower extremities (DG2) analysis

There were 441 patients treated and diagnosed with DG2 over the analysed years 2008-2009 and 2014-2015. Patients treated by SA accounted for 27% and patients treated by MIA 73%. In the years 2008-2009, the fraction of patients treated by SA was 33-38%, in the second period the fraction declined to 24-25%. Absolute numbers are visible in the table below.

Approach	SA		MIA		Total	
year	Number	%	Number	%	Number	%
2008	15	38%	25	63%	40	100%
2009	18	33%	36	67%	54	100%
2014	31	25%	94	75%	125	100%
2015	54	24%	168	76%	222	100%
Total	118	27%	323	73%	441	100%

Table 12: Number of patients treated by SA and MIA for DG2 in selected years, own creation

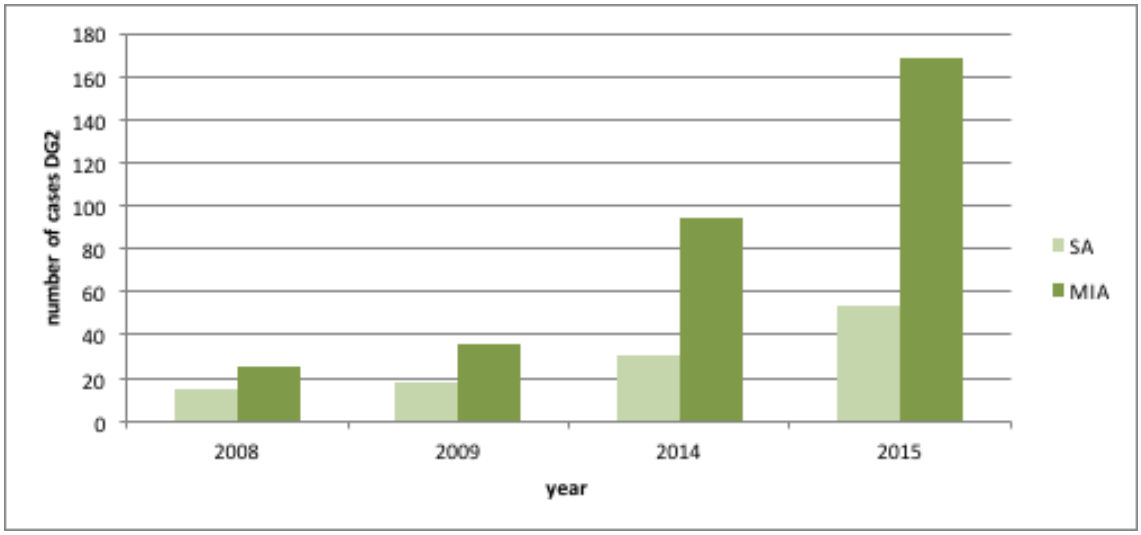


Table 13: Number of cases DG2, own creation

Both approaches rose in cumulative numbers, but more importantly, the division of the approaches shifted towards the MIA, when comparing results from 2008-2009 (63-67%) and results from 2014-2015 (76-73%). The costs for both approaches remained relatively stable over the selected timeframe as well as other defining factors,[54] then the incentive for a change in approach should lie elsewhere.

DG2	Approach	Different approaches for remuneration	
year		Total by DRG for all cases	Total by Point for all cases
2008	SA	844 832 Kč	902 773 Kč
	MIA	1 390 961 Kč	2 575 371 Kč
2009	SA	1 651 622 Kč	1 465 025 Kč
	MIA	2 753 035 Kč	4 876 616 Kč
2014	SA	2 749 430 Kč	4 298 304 Kč
	MIA	8 244 552 Kč	14 263 497 Kč
2015	SA	4 661 810 Kč	5 665 455 Kč
	MIA	18 173 958 Kč	23 718 508 Kč

Table 14: Remuneration for DG2 by the approach, own creation

Better view provides the table showing remunerations divided by the cases and length of stay:

[54] Information obtained during interview with a manager of a private hospital

Divided by cases and LOS	Approach	Year	Number	Median	Arithmetic average	sd	min.	max.
DRG (Kč)	SA	2008	15	4 947	5 857	3 079	2 201	13 603
		2009	18	6 565	9 120	5 930	3 581	27 165
		2014	31	6 835	7 984	5 740	2 681	27 121
		2015	54	7 319	9 346	8 028	1 919	49 233
	MIA	2008	25	8 338	9 020	3 395	3 718	14 003
		2009	36	13 131	13 503	7 011	4 147	41 605
		2014	94	10 721	13 936	9 372	2 918	50 785
		2015	168	15 800	18 271	11 802	1 919	70 022
Point (Kč)	SA	2008	15	5 159	5 162	1 509	2 548	7 379
		2009	18	6 323	7 720	4 547	2 366	16 795
		2014	31	7 909	11 251	9 293	2 243	38 736
		2015	54	6 832	11 774	20 888	2 483	152 414
	MIA	2008	25	14 734	16 286	6 990	6 621	32 249
		2009	36	21 448	25 158	22 985	6 750	134 948
		2014	94	18 676	23 264	17 707	3 880	100 216
		2015	168	17 700	22 517	17 305	4 470	152 414

Table 15: Values per day for DG2, own creation

Comparing the years there is a reason for an increase on the side of MIA. It lies with the SA approach, whose payments in the DRG were decreased by the higher percentage than the MIA approach. In 2008 the payment by the point system for SA was 5 162 kč, in 2015 the payment for the same procedure would be according to the point system 11 774 kč, whereas in 201D the DRG based payment was 9 346 kč, which means relative decrease in evaluation by 56%. On the other hand, payments for MIA were in 2008 on average at the value of 16 286 kč and in 2015 it would be 22 517 kč, but according to DRG, the payments in 2014 were at 18 271 kč, which represents decrease of 18% in relative valuation. According to the hospital employees, the fact, that SA became less favourable in Point/DRG perspective, the focus shifted towards the MIA.[55]

[55] Information obtained during interview with a manager of a private hospital

Approach	SA		MIA		Total	
year	number	%	number	%	number	%
2008-2009	33	35%	61	65%	94	100%
2014-2015	85	24%	262	76%	347	100%
total	118	27%	323	73%	441	100%
chi^2-test, p = 0,039						

Table 16: Shift of patients for DG2, own creation

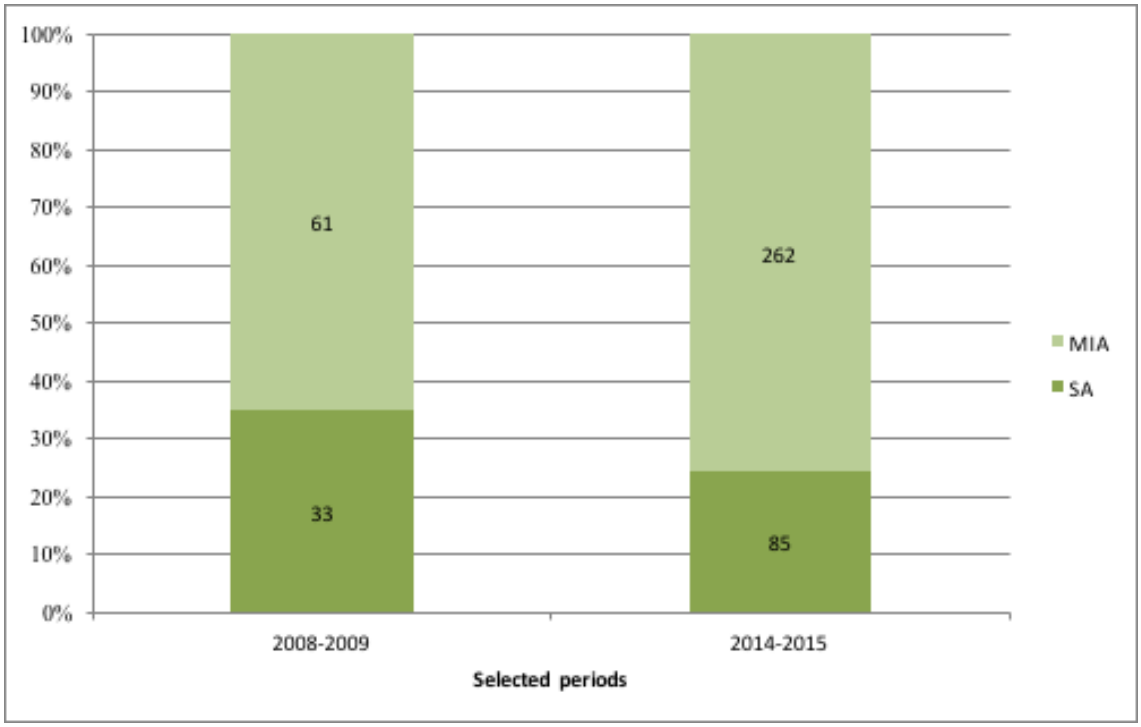


Chart 8: Shift of patients for DG2, own creation

The two periods show statistically important shift in number of patients treated by different approach. Between the periods the shift accounted for 11% (p = 0,039).

Values by case	period	approach	number	median	Arithmetic average	sd	min.	max.	p-value
Length of stay	2008-2009	SA	33	12	11,9	4,7	4	24	<0,001
		MIA	61	7	7,2	3,7	2	19	
	2014-2015	SA	85	11	13,2	8,1	1	53	<0,001
		MIA	262	7	8,4	5,9	1	43	
Point payment	**2008-2009**	**SA**	**33**	**68 338**	**71 751**	**39 452**	**24 770**	**196 237**	**<0,001**
		MIA	**61**	**115 101**	**122 164**	**51 982**	**57 681**	**285 812**	
	2014-2015	SA	85	88 257	117 221	83 213	22 416	392 035	<0,001
		MIA	262	132 922	144 970	70 482	13 064	394 347	
DRG payment	2008-2009	SA	33	75 043	75 650	32 419	46 952	225 185	**0,571**
		MIA	61	67 984	67 934	14 747	39 609	108 658	
	2014-2015	**SA**	**85**	**69 671**	**87 191**	**35 178**	**42 694**	**229 015**	**<0,001**
		MIA	**262**	**101 003**	**100 834**	**33 535**	**12 026**	**229 015**	

Table 17: Analysis of values per case for DG2, own creation

As the analysis show, the length of stay is significantly longer by SA than MIA in both periods (p <0,001). Payment by the point system was significantly different in the first and second period, in both periods the MIA payment was higher than SA. In the DRG system, there was not a significant difference in the first period, but in the second period the payment by DRG was significantly higher by the MIA (p < 0,001).

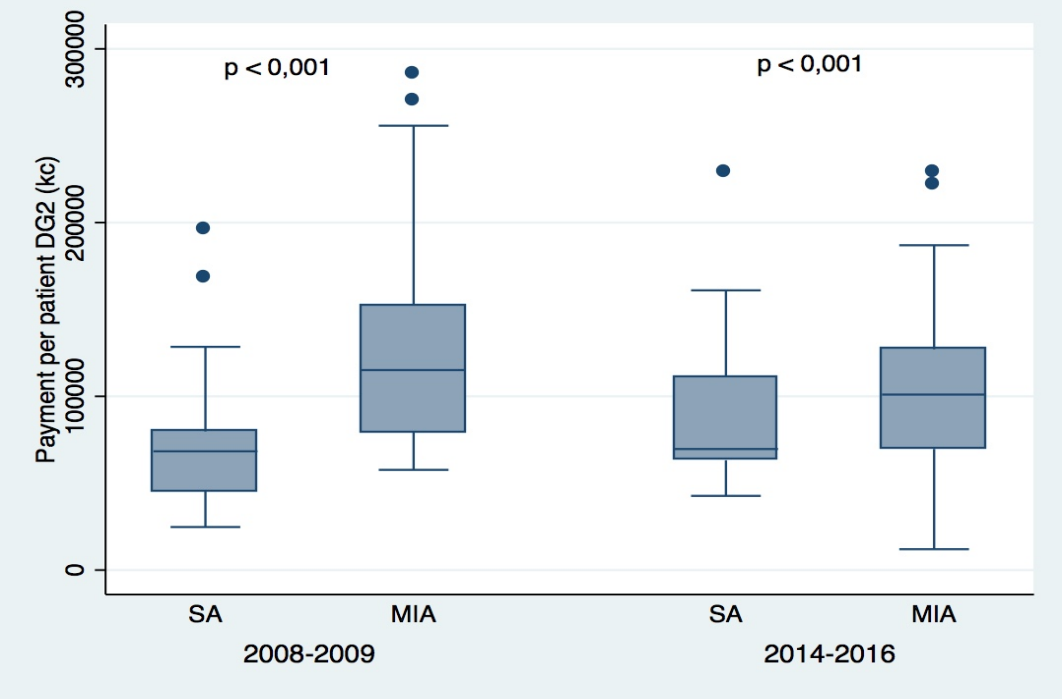


Chart 9: Payment per patient distribution in DG2, own creation

5.6 Abdominal aortic aneurysm without rupture (DG3) analysis

Third diagnosis selected for the analysis is Abdominal aortic aneurysm without rupture, which is considered also problematic in terms of approach selection based on the other than medical reasons.[56]

As the following table shows, the overall numbers of the procedures performed rose dramatically in the selected periods and the distribution among the procedures SA and MIA changed its course as well. In 2008-2009, by SA was treated 38% of the patients respectively 36%, on the other hand in 2014-2015 the percentage rose to 77% respectively 78%.

approach	SA		MIA		Total	
year	number	%	number	%	number	%
2008	5	38%	8	62%	13	100%
2009	5	36%	9	64%	14	100%
2014	23	77%	7	23%	30	100%
2015	32	78%	9	22%	41	100%
total	65	66%	33	34%	98	100%

Table 18: Number of patients treated by SA and MIA for DG3 in selected years, own creation

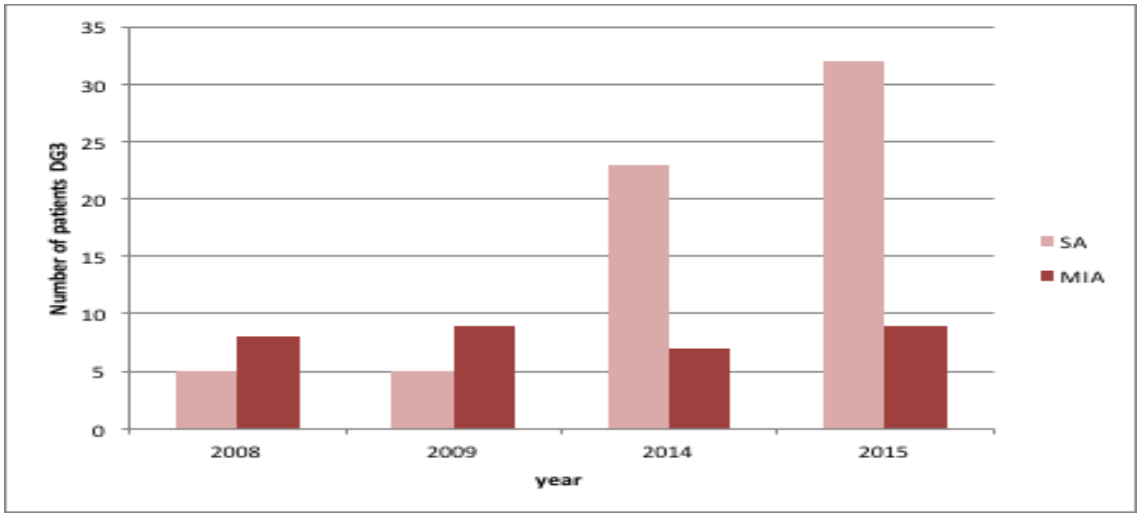


Chart 10: Number of cases DG3, own creation

[56] Information obtained during interview with a manager of a private hospital

In the next table, there is a view on total remunerations for all cases of DG2 in selected years. What is the most interesting is the difference between the total remunerations in point system and in DRG system. In 2008 and 2009, the remunerations for MIA were higher than the hospital would receive in the DRG system, which in turn led to more patients being treated by the MIA approach. In fact, remunerations by the point were 6 times higher in 2008 and 4 times higher in 2009. On the other hand, SA were only slightly higher in 2008 if we compare the point value and the DRG value and in the 2009 the DRG value even surpassed the point value. In the second period the remunerations changed its course towards higher evaluation of the SA in the DRG system while the MIA approach was undervalued. In practice, the MIA approach, would receive in 2015 for the performances 3,6 million if the system has not changed, but in the DRG system they received only 2,7 million. On the other hand, by the SA, hospital would receive by the point system 5,6 million, but in practice they received 6,6 million by the DRG based payment.

DG3	Approach	Different approaches for remuneration	
year		Total by DRG for all cases	Total by Point for all cases
2008	SA	657 838 Kč	784 932 Kč
	MIA	337 390 Kč	1 766 686 Kč
2009	SA	1 125 927 Kč	701 404 Kč
	MIA	448 463 Kč	1 606 893 Kč
2014	SA	4 612 445 Kč	4 093 850 Kč
	MIA	2 355 334 Kč	2 888 946 Kč
2015	SA	6 606 920 Kč	5 604 055 Kč
	MIA	2 754 195 Kč	3 651 219 Kč

Table 19: Remuneration for DG3 by the approach, own creation

The graph also shows, that in 2008-2009, the MIA approach based on the Point system generated more income than it would generate under the DRG. In the following years of 2014 and 2015, it was SA approach that was more beneficial under the DRG, when payments generated by SA in DRG were superior to the respective payments by the Point. The situation with MIA was the opposite.

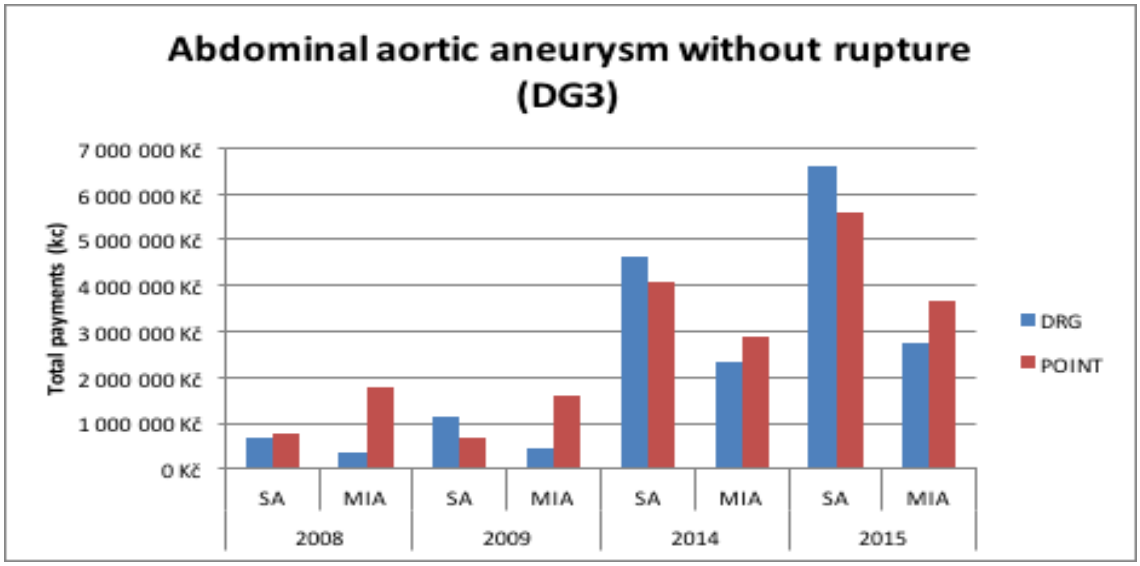


Chart 11: Total remuneration by the payment approach to DG3, own creation

Values by case	approach	year	number	median	Ar. average	sd	min.	max.
Length of stay	SA	2008	5	10	10,2	1,8	8	12
		2009	5	15	13,0	3,7	9	17
		2014	23	10	10,8	2,1	7	15
		2015	32	11	12,2	5,2	6	34
	MIA	2008	8	8	7,3	3,2	3	11
		2009	9	4	6,0	3,7	2	11
		2014	7	9	9,0	1,2	7	10
		2015	9	10	10,2	4,0	5	17
DRG payment	SA	2008	5	155 521	131 567	45 192	54 412	160 095
		2009	5	225 185	225 185	0	225 185	225 185
		2014	23	146 644	200 541	93 496	138 014	395 604
		2015	32	177 498	206 466	77 912	63 198	417 857
	MIA	2008	8	49 192	42 174	22 674	13 698	77 250
		2009	9	27 246	49 829	33 789	20 435	108 658
		2014	7	388 295	336 476	92 820	138 014	395 604
		2015	9	328 420	306 022	68 879	201 165	417 857
Point payment	SA	2008	5	124 083	156 987	83 298	104 654	305 109
		2009	5	119 202	140 281	72 086	78 023	265 140
		2014	23	100 463	177 993	149 351	76 678	498 293
		2015	32	117 245	175 127	137 227	54 130	503 918
	MIA	2008	8	323 423	220 836	157 648	27 393	342 418
		2009	9	27 102	178 544	183 481	21 979	416 352
		2014	7	422 973	412 706	117 093	159 446	498 293
		2015	9	409 682	405 691	64 233	277 599	503 918

Table 20: Values by case for DG3, own creation

The number of patients and the difference between the two periods was evaluated as statistically important ($p < 0,001$). In the second period (2014-2015), the number of patients treated by SA rose by 40%.

Approach	SA		MIA		Total	
year	number	%	number	%	number	%
2008-2009	10	37%	17	63%	27	100%
2014-2015	55	77%	16	23%	71	100%
Total	65	66%	33	34%	98	100%
chi^2-test, $p < 0{,}001$						

Table 21: Shift of patients for DG3, own creation

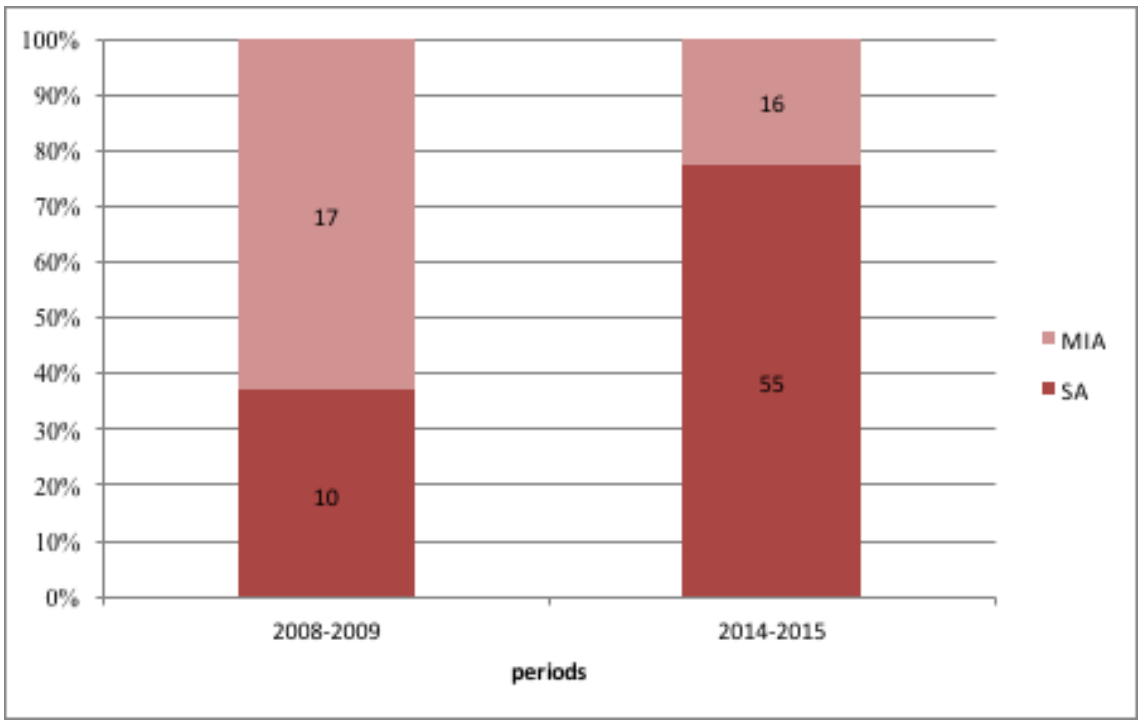


Chart 12: Shift of patients for DG2, own creation

5.7 Expert Background

In the previous chapters I analysed the revenues for the hospitals coming from different approaches. In this chapter I provide necessary medical and legal background for making a conclusion about the whole analysis and shifts associated with different payment schemes. Following chapters are compiled from interviews with experts in the field of endovascular procedures as well as with head doctors of different chambers and associations for medical specialties.

5.7.1 Expert conclusion about the payment schemes

Professional doctor associations[57] contacted by a letter at 21. January 2013 the NRC and MH with a request to investigate setting and classification of endovascular periphery interventions in the DRG system. According to their expert opinions, Czech DRG classification is created with disproportional variance in costs and payment remunerations. The reason for this variance is that endovascular interventions by MIA and procedures by SA are included in the same base and were included in the same base when creating the table of relative weights. In turn, more costly MIA procedures were harmed by the process of creating relative weights, when in the same base were together with cases by SA. On the other hand, the current relative weights are more beneficial for the SA. Such set up leads managements of hospitals to preferring SA procedures over the MIA procedures, because the relative weight and DRG payment is higher than the actual costs.

More importantly, current setup of the Low Trim Point and High Trim Point for those diagnoses are skewed towards the SA approach. Currently, the setup is interval between 3 and 11 days for the inliers, but most of the MIA procedures could be performed in one day visit. The setup of the system forces doctors performing the MIA procedure to keep the patients artificially longer in order to meet the inlier status.

The setup is skewed towards the longer stays because of the SA approach, which includes extensive surgery and longer recovery time (usually at least 5 days).

All those factors lead to a run-down of endovascular procedures, because the payment scheme incentivises the SA. The consequence is a run-down of procedures, that are less problematic for the patient in comparison to the SA, which brings a risk of amputations lower extremities especially in context of epidemic of diabetes and a problem of diabetic foot.[58]

[57] Czech society of angiology ČSL JEP, Czech society of interventional radiology ČSL JEP, Cerebrovascular section of Czech neurological society ČSL JEP

[58] Information obtained during interview with a manager of a private hospital

5.7.2 Expert conclusion about the medical standpoint

From the medical standpoint, the two approaches differ in the implications and consequences that cannot be overlooked when choosing the approach. Among the most common CCs are following with incidence among the cases:[59]

1. Infection - approaches differ in the invasion of the procedure. SA approach is demonstrated by the surgically extensive cuts, removals, sewing and extrusions, MIA is demonstrated by small incision to the vein through which the catheter is inserted and operated manually from outside of the body
    a. SA – incidence 2%
    b. MIA – incidence 0,2%
2. Anaesthesia complications – SA approach is in majority performed under general anaesthesia with all its complications (respiratory suspension, aspiration, hypertension, allergic reaction etc.). On the other hand, the MIA approach is performed under local anaesthesia
    a. SA – incidence 1%
    b. MIA – incidence 0%
3. Reoperation – both approaches are under a risk of closing the vein when performing the procedure of clearing the vein, highest risk is involved in 24 hours after the procedure
    a. SA – incidence 8%
    b. MIA – incidence 2%
4. Cardiovascular complication – Stress for the body from the operation may induce in some people cardiovascular conditions such as arrhythmia, hypertension, hypotension, stroke etc.
    a. SA – incidence 4%
    b. MIA – incidence 0,8%
5. Renal Complications – most common complications include renal failure and renal colic as a consequence from the excessive blocking of the blood flow
    a. SA – incidence 2%
    b. MIA – incidence 2%

[59] Data collected from the hospital's database

6. Mortality – the most serious consequence of performing a surgery which is death of the patient. Most frequently the cause of death is a direct consequence of one or more complications listed above
    a. SA – incidence 3%
    b. MIA – incidence 0,5%

Following any of those complications, there is one more attribute that should be mentioned and it is ALOS for both approaches over the selected years. By SA the average ALOS is 11,6 days and by the MIA the average ALOS is 5 days.

5.7.3 Conclusion of the theoretical part

By the analysis I came to the conclusion and the answer to the questions I set up in the preface:

1. Has the change of the payment system caused the structure of the healthcare?

The answer to this question is yes, the DRG implementation as the remuneration mechanism for acute bed care has caused a significant shift in indicating procedures in the field of endovascular and surgical vascular procedures. The analysis for DG1 and DG2 provide a proof, that between the two periods 2008-2009 and 2014-2015, the focus shifted from MIA procedures towards the SA procedures. DG2 does not show the same results, but as was analysed, both the approaches were undervalued in the DRG system in comparison to the system by Point, but the MIA procedures were undervalued less than SA, that is the rationale why the SA procedures were not preferred for the second diagnosis as well.

2. What implications does the DRG system have for the interested parties?

The answer to this research question must be divided into 4 categories: Implications for the HIC, providers, doctors, patients.

A. Implications for the HIC: Firstly, HIC received from the DRG system a better tool for controlling the production of the hospitals. Well defined manual and system of coding is a necessary for planning, overseeing, analysing, controlling and limiting the production of the whole system. Secondly, the HIC can benchmark

the hospitals and its productions and strategic behaviour. Never have they ever had such profound statistical background.

B. Implications for the providers: Firstly, providers received an opportunity to engage in strategic behaviour, which was demonstrated both in my dataset and in interviews with medical experts. Strategically favourable SA procedures, that received higher remuneration in the DRG system, due to the fact, that the relative values were created together with MIA procedures, that are costlier, were discover to be indicated more after the implementation of the DRG. Secondly, providers of the healthcare received through the DRG system a tool for planning and controlling the revenues and pressuring doctors to indicate the most favourable approach to a certain diagnosis irrespectively on the clinical implications. Thirdly, implications for the providers are profits made from the engagement in strategic behaviour.

C. Implications for the doctors: Implications for the doctors are less visible than implications for the provider or HIC, but there are twofold. Firstly, new system of coding the diagnoses have been implemented, which creates confusion and, according to the interviews, have not been properly discussed and explained, which brings a high percentage of erroneous coding. Secondly, the DRG system brought doctors to a point, where they are forced to disregard the best medical judgement and under the threat of penalties or lower salary, they must comply with the strategic behaviour of the whole establishment.

D. Implications for the patients: Because of the information asymmetry on the side of patients, they do not observe the negative impact of the DRG system, but as I have analysed, the DRG implementation brings the negative effects of complications associated with the more favourable diagnosis for the management, but less favourable for the patients.

5.8 Suggestion

As demonstrated in the dataset on the data from vascular procedures, grouping, relative weights, trim points and resulting remunerations does not comply with medical or logical rules. DRG system is far from being ready as a payment scheme for the whole scope of hospital healthcare in the Czech Republic. My suggestion is to restart the DRG implementation, return to the round table with delegates from all interested parties and revise the table of relative weights according to the suggestions and notes from the

professional medical associations. On one exemplary field of medicine there could be demonstrated, that the results of pre-cultivating, cultivating and following revisions of the grouper are far from perfection creating discrepancies and shifts of the provided healthcare in spite of the best interest of the patients. The best solution would be to contain the situation for one or two years on the budgetary levels in healthcare with approved appreciation according to the GDP growth and return to the definitions of DRG system as a whole.

Conclusion

This work addressed the issue of implementing and using the DRG based system as a payment mechanism in the Czech Republic for the acute hospital healthcare. The research questions were selected according to the interviews with healthcare specialists, who understand the DRG system as a threat to the best practice and evidence based medicine. Firstly, I had to find the tools to make any assumptions. In the first chapters, I have briefly described the situation in the hospital care, witch focus on quantitative details.

Such a description led me to next step, which was to understand, how is the healthcare market different from others competitive markets and what roles there exist witch focus on payers of the healthcare, patients, doctors and providers. Since I knew the players, I described the redistribution and creation of funds in the system of Public Healthcare Insurance. Knowing where, who and how, it led me to the question when. In other words, how the payment mechanisms evolved in the Czech Republic and how the subject of my diploma thesis, the DRG system, evolved in the USA and in our homeland.

Using all that information, with focus on advantages and disadvantages for different players, I continued to the practical part, which consisted of a dataset from a private healthcare establishment. In the practical part I successfully answered the question, whether and how the structure of the healthcare changed after the implementation of the DRG and what were the reasons. All the information I discussed with a manager from the establishment and he validated my conclusions with his private experience. In the practical part I juxtaposed the statistical results with the medical realities of complications and even mortalities associated with the observed change in structure. It provided me with a conclusion, that the structural change is neither beneficial for the patients, nor for the doctors. It brings its benefits to the providers of the healthcare in form of higher profits and better control, and to the payers, who receive more control over the spending and a tool for benchmarking the hospitals. Lastly, with the knowledge acquired from interviews with highly acclaimed professional, who is involved in negotiation process of adjusting relative weights, we discovered, that discrepancies in the DRG system come from the fact, that the necessary conditions for the DRG systems are not met. Especially, the condition, that the DRG groups should be homogenous in terms of approach. In the vascular care the condition was not met, there are high peer variations which provides room for strategic behaviour of the healthcare providers. In the end I provided a suggestion, how the DRG implementation process should evolve from now. By saying it

should be revised and all the stakeholders should negotiate intensively over the more precise and fair distribution, I simply state the fact, that in my opinion the DRG system is riddled with errors and misunderstandings that prevent it from being able to serve as a payment tool at the moment.

Table of figures

Table of abbreviations

GDP – Gross Domestic product
DRG – Diagnosis Related Groups
MH – Ministry of Healthcare
OCGH – Other Central Government Hospitals
RH – Regional Hospitals
CT – City Hospitals
PH – private hospitals
MHH – Ministry of Health Hospitals
ACB – Acute Care Beds
AFB – After Care Beds
PHI – Public Health Insurance
HIC – Healthcare insurance company
VOZP – Army Insurance Company
ÚZIS – Bureau for Healthcare Information and Statistics
Kč – Czech crowns
GP – General Practioner
PHC – Public Healthcare system
Alos – Average Lenght of Stay
CM – Case Mix
CMI – Case Mix Index
CC – Complication & Comorbidity
LOS – Lenght of stay
RW – Relative Weight
PD – Principal Diagnosis
BR – Base Rate
OA – Outlier Adjustments
SA – Structural Adjustments
RPPV – Register of Procedures with Point Values
CMS – Centres for Medicare and Medicaid Services
GIC – General Insurance Company
IPVZ – Institute for Postgradual Education in Healthcare
IR-DRG – International Refined DRG
ICD – International Clasification of Diseases
PSH – Public Sector Hospitals
PH – Private Hospitals
MIA – Minimally Invasive Approach
SA – Surgical Approach

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