

MIGRACIJA DIJAGNOSTIČKI SRODNIH GRUPA KAO POKAZATELJ POTENCIJALNO NEEFIKASNE MEDICINSKE INTERVENCIJE

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DIAGNOSIS RELATED GROUP MIGRATION AS AN INDICATOR OF A POTENTIALLY INEFFICIENT MEDICAL INTERVENTION

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SAŽETAK

Uvod: Migracija dijagnostički srodnih grupa (DSG) je pojava u kodiranju hospitalizacija, kojom se označava da je pacijent, nakon epizode bolničkog lečenja, iz jedne grupe prebačen u drugu, skuplju grupu, isključivo zbog komplikacija ili komorbiditeta koji su nastali tokom bolničkog lečenja ili medicinske intervencije.

Cilj rada: Cilj rada je bio da se ispituje: pojava DSG migracija, bolnički troškovi i dužina hospitalizacije kod kolektomija.

Metod: Sprovedena je retrospektivna sekundarna analiza podataka o dijagnostički srodnim grupama (DSG), za serije bolničkih epizoda pacijenata ($n = 4.939$), starosti 18 i više godina, koji su podvrgnuti proceduri kolektomije, u 49 bolnica u Republici Srbiji, u periodu od 2018. do 2020. godine, a čije su epizode bolničkog lečenja grupisane u tri dijagnostički srodne grupe: G02A grupu, izdvojenu G02A grupu sa T81-T88 dijagnozama za komplikacije hirurškog lečenja, i G02B grupu.

Rezultati: U posmatranom trogodišnjem periodu, incidencija DSG migracije je iznosila 7,4%. Bolničko lečenje pacijenata svrstanih u dijagnostičku grupu G02A (T81-T88), koja predstavlja DSG migraciju, bilo je statistički značajno skuplje, a ovi pacijenti su statistički značajno duže bili hospitalizovani. Ukupan iznos fakture, za dijagnostičku grupu G02A (T81-T88), bio je 509.651,7 dinara (cca 4.320 €), a prosečna dužina epizode bolničkog lečenja je bila 23 dana. U grupi G02B ukupan iznos fakture je bio 231.989,0 dinara (cca 1.960 €), uz prosečnu dužinu hospitalizacije od 11 dana.

Zaključak: Kolektomije sa komplikacijama produžavaju dužinu hospitalizacije i podrazumevaju veću potrošnju resursa u Republici Srbiji. Analiza troškova u vezi sa DSG migracijama, po bolničkom danu i pacijentu, može ukazati na neefikasnost medicinskih intervencija.

Ključne reči: DSG migracija, kolektomija, trošak, hospitalizacija, Srbija

ABSTRACT

Introduction: Diagnosis related group migration (DRG) is a phenomenon in coding hospitalizations that indicates that a patient has been transferred from one group to a different, more costly group, after an episode of hospital treatment, solely because of complications or comorbidities that occurred during hospital treatment or medical intervention.

Objective: The objective of the study was to examine the following: occurrence of DRG migrations, hospital costs, and length of hospitalization for colectomies.

Methods: A retrospective secondary analysis of DRG data was conducted for a series of episodes of hospital treatment ($n = 4,939$) in patients aged 18 and above, who underwent colectomy in 49 hospitals in the Republic of Serbia, in the period between 2018 and 2020, and whose episodes of hospital treatment were grouped into three diagnosis related groups: the G02A group, a separate G02A group with T81-T88 diagnoses for surgical treatment complications, and the G02B group.

Results: In the observed three-year period, the incidence of DRG migration was 7.4%. Inpatient treatment of patients classified in the diagnostic group G02A (T81-T88), which represents DRG migration, was statistically significantly more costly and these patients had a statistically significantly longer hospital stay. The total invoice amount for the diagnostic group G02A (T81-T88) was 509,651.7 dinars (approximately 4,320 euros), and the average length of an episode of hospital treatment was 23 days. In group G02B, the total invoice amount was 231,989.0 dinars (approximately 1,960 euros) with an average length of hospital stay of 11 days.

Conclusion: Colectomies with complications prolong the length of hospitalization and imply a higher consumption of resources in the Republic of Serbia. Cost analysis related to DRG migration, per patient day and patient, may indicate the ineffectiveness of medical interventions.

Keywords: DRG migration, colectomy, cost, hospitalization, Serbia

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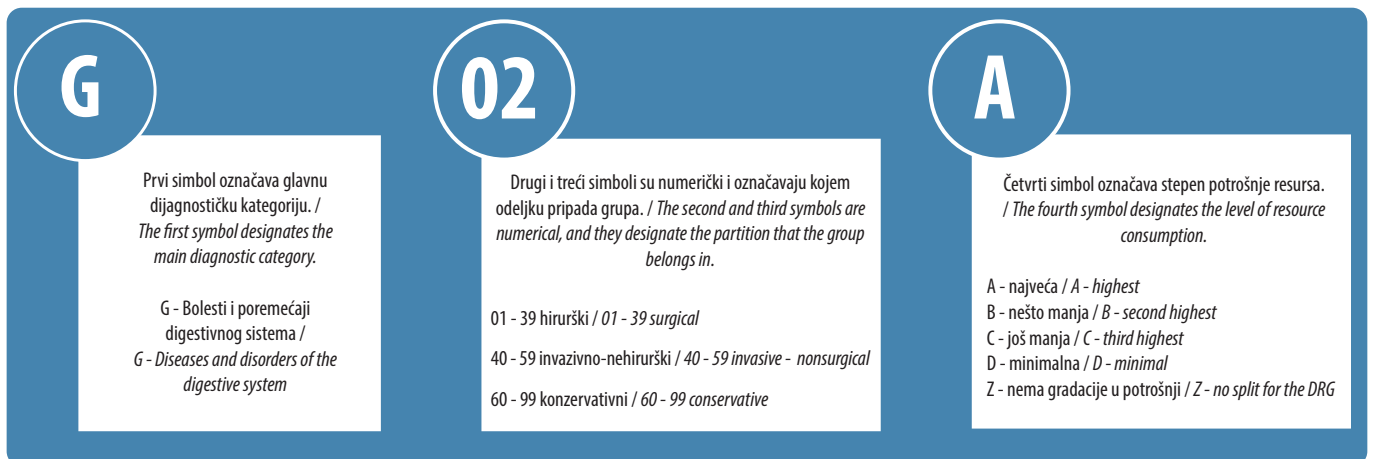
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UVOD

Sistem dijagnostički srodnih grupa (DSG) predstavlja moderan sistem klasifikacije bolnički lečenih pacijenata u grupe kojima se opisuju različite kombinacije slučajeva kod pacijenata (engl. *casemix*). Ovaj sistem se primenjuje širom sveta u cilju unapređivanja modela finansiranja, kontrole resursa i plaćanja bolničkih usluga. *Casemix* je izraz međunarodne terminologije kojim se opisuje konzistentna metodologija za klasifikaciju pacijenata, epizoda bolničkog lečenja i ukupnih troškova, na osnovu: 1) potrošnje bolničkih resursa zbog lečenja pacijenta i 2) kliničkih manifestacija bolesti pacijenta. Svaka epizoda bolničkog lečenja, odnosno pacijent, svrstava se u jednu od dijagnostički srodnih grupa. U okviru svake DSG, objedinjuju se sve zdravstvene usluge, lekovi i materijal koji su tokom epizode lečenja potrošeni za lečenje jednog pacijenta [1], tako da se bolnički troškovi mogu analizirati po dijagnostički srodnim grupama. Bolnice koje primenjuju plaćanje po DSG sistemu mogu biti podstaknute da smanjuju troškove putem skraćivanja dužine hospitalizacije, preusmeravanja na lečenje u dnevnoj bolnici, i smanjivanja broja dijagnostičkih i terapijskih procedura [2]. Sa druge strane, primena DSG sistema povlači rizik da bolnice postanu previše orijentisane ka štednji, što rezultira prevremenim otpustom pacijenata, uštedama na lekovima i paketu usluga, a čime se dovodi u pitanje kvalitet lečenja [2]. Stoga je analiziranje DSG migracija višestruko važno. Na primer, na individualnom nivou, može rasvetliti proces bolničkog lečenja svakog pacijenta; na nivou bolnice, doprinosi detaljnom praćenju njenog poslovanja; na nivou bolničke zdravstvene zaštite, olakšava upoređivanje rada bolnica; a sa aspekta finansiranja, može da podstakne pravičnu raspodelu sredstava među bolnicama i unutrašnji nadzor troškova lečenja, a naročito spoljašnji nadzor i kontrolu troškova.

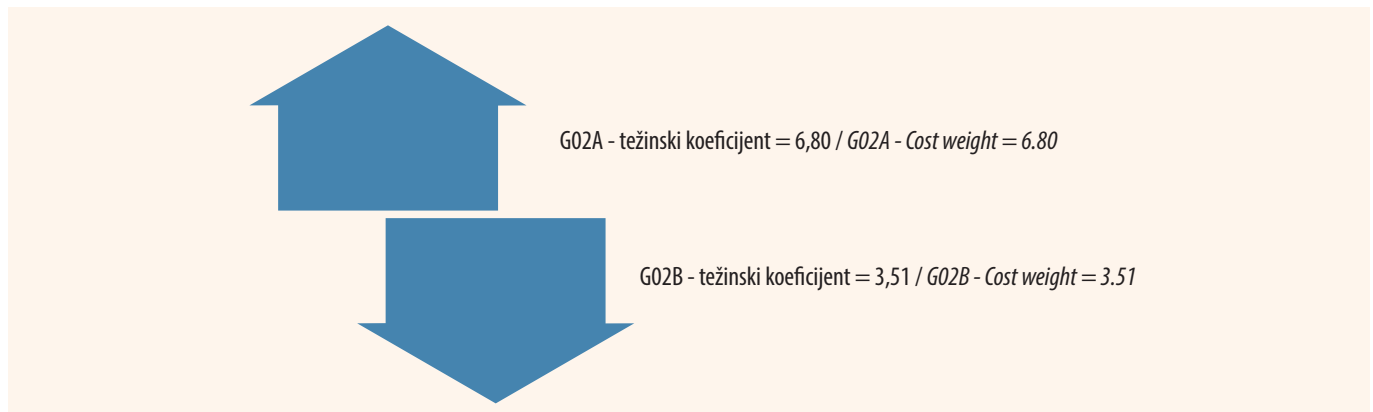
INTRODUCTION

The system of diagnosis related groups (DRG) is a modern system for classifying patients treated in hospital (inpatients) into groups which describe different combinations of cases in patients – *casemix*. This system is being used all over the world with the aim of improving financing models, resource control, and hospital services payment. *Casemix* is an international term describing the consistent methodology for classifying patients, episodes of hospital treatment (patient episodes), and overall costs (consumption), on the basis of the following: 1) the consumption of hospital resources for patient treatment and 2) clinical manifestations of a disease in a patient. Each episode of hospital treatment, i.e., each patient, is classified into one of the diagnosis related groups. All health services, drugs, and materials spent during a single episode of hospital treatment of one patient are integrated within each DRG [1], in such a way as to enable the analysis of hospital costs by DRGs. Hospitals implementing payment on the basis of the DRG system, may be stimulated to reduce costs by shortening hospital stay, redirecting patient treatment to day hospitals, and reducing the number of diagnostic and treatment procedures [2]. On the other hand, the application of the DRG system carries the risk of hospitals becoming excessively oriented towards cutting costs, which consequently means premature patient discharge and saving on medication and service packages, thus jeopardizing the quality of treatment [2]. Therefore, analyzing DRG migrations is important for a number of reasons. For instance, at the individual level, it helps in clarifying the hospital treatment process of each patient; at the level of the hospital, it contributes to detailed monitoring of the hospital's operation and management; at the level of hospital health care, it facilitates the comparison of the mode of operation between hospitals; and at the financial level, it may



Slika 1. Simboli DSG grupe G02A – Velike procedure na tankom i debelom crevu, sa vrlo teškim komplikacijama i komorbiditetima

Figure 1. Symbols of the DRG G02A – Major small and large bowel procedures, major complexity and comorbidity



Slika 2. Težinski koeficijenti grupe G02A – Velike procedure na tankom i debelom crevu, sa vrlo teškim komplikacijama i komorbiditetima i grupe G02B – Velike procedure na tankom i debelom crevu, bez vrlo teških komplikacija i komorbiditeta

Figure 2. Cost weight of the G02A group – Major small and large bowel procedures, major complexity and comorbidity; cost weight of the G02B group – Major small and large bowel procedures, intermediate complexity and comorbidity

Metodologija sistema DSG grupisanja je izuzetno sofisticirana i zavisi od kvaliteta korišćenih podataka. Zato je kvalitet bolničke medicinske dokumentacije od presudnog značaja da pokaže da li stepen potrošnje resursa kod hirurških i konzervativnih epizoda lečenja korelira sa težinom kliničke slike pacijenta, odnosno stepenom složenosti komorbiditeta i/ili komplikacija. Ove informacije se dobijaju iz četvoromesne alfanumeričke šifre svake DSG (Slika 1).

Svaka DSG, u skladu sa pripadajućom kategorijom, odeljkom i stepenom potrošnje, ima definisan težinski koeficijent, na osnovu kojeg se računa i monetarna vrednost grupe (Slika 2).

Na prijemu u bolnicu, pacijent se svrstava u odgovarajuću dijagnostički srodnu grupu, prema glavnoj dijagnozi zbog koje je pacijent hospitalizovan, a uz pomoć posebne funkcije DSG softvera za grupisanje – „Gruper“ (engl. *Grouper*), koji koristi niz algoritama za obradu podataka o pacijentu, kliničkom stanju i lečenju. Na kraju epizode bolničkog lečenja, „Gruper“ proverava podatke o intervencijama/procedurama u toku epizode lečenja, kako bi svrstao epizodu, ili u hirurški odeljak, ili u invazivno nehirurški odeljak, ili u konzervativni odeljak; proverava starost i pol pacijenta, prateće dijagnoze, ishod lečenja, te utvrđuje dužinu trajanja epizode bolničkog lečenja. DSG migracija podrazumeva da se pacijent, odnosno epizoda bolničkog lečenja, svrsta, ne u istu već u drugu, skuplju grupu, isključivo zbog komplikacija koje su se dogodile tokom lečenja ili operativne procedure. To znači da je lečenje dovelo do određenog pogoršanja stanja pacijenta, kao i do povećane potrošnje resursa. Zato se DSG migracija u jednoj zdravstvenoj ustanovi (ili pojedinačnom odeljenju) može koristiti kao pokazatelj za sagledavanje efikasnosti i kvaliteta zdravstvene zaštite koja se pruža. Ovo je posebno značajno za hirurške grane medicine, koje su skupe, i neretko zahtevaju dug period oporavka u bolničkim uslovima, kao i značajna finansijska sredstva [4].

stimulate an equitable distribution of funds amongst hospitals, as well as internal control of treatment costs, and, especially, external monitoring and control of costs.

The methodology of the system of DRG grouping is highly sophisticated and depends on the quality of the data that is used. This is why the quality of hospital medical records is of vital importance in showing whether the degree of resource consumption in episodes of surgical and of conservative treatment correlate with the severity of patient presentation, i.e., with the level of complexity of the comorbidities and/or complications. This information is obtained from the four alphanumeric characters comprising the code for each DRG (Figure 1).

Each DRG, in keeping with the corresponding category, the partition, and the level of consumption, has a defined cost weight, which is used as the basis for calculating the monetary value of the group (Figure 2).

At hospital admission, the patient is classified into the appropriate diagnosis related group, according to the main diagnosis which was the cause for hospitalization. This is done with the aid of the special function of the DRG grouping software – *Grouper*, which uses a series of algorithms for processing patient data, the patient's clinical state of health, and the treatment received by the patient. At the end of the episode of hospital treatment, the *Grouper* checks data on procedures within the episode, in order to categorize the episode, either in the surgical partition, the invasive nonsurgical partition, or the conservative partition. The *Grouper* checks the age and sex of the patient, the underlying diagnoses, and the treatment outcome, and it determines the length of the episode of hospital treatment. DRG migration means that the patient, i.e., the episode of hospital treatment becomes categorized, not in the same, but in a different, more costly group, exclusively due to complications occurring during treatment or surgical procedure. This

U nekim bolnicama, postoje zaposleni koje se bave DSG kodiranjem i kontrolom pre predaje dokumentacije osiguravajućim kućama [3]. U Republici Srbiji, Republički fond za zdravstveno osiguranje (RFZO) je dominantni kupac usluga bolnica u javnoj svojini. Od 1. januara 2019. godine, RFZO primenjuje model plaćanja po dijagnostički srodnim grupama, uz linijsko (nemensko) budžetiranje – budžet se ugovara na osnovu ugovora iz prethodne godine, a eventualno uštedena sredstva se vraćaju RFZO-u. Trenutno se 95% predračunom definisanih finansijskih sredstava svakog meseca prenosi zdravstvenim ustanovama po namenama, dok je preostalih 5% finansijskih sredstava varijabilni deo budžeta i njegova isplata zavisi od DSG učinka [5]. Za procenu DSG učinka, koristi se verzija 6.0 Australijske DSG klasifikacije, koja ima i prateći softver za grupisanje podataka. U periodu od 2018. do 2020. godine, prema procenama Drugog projekta razvoja zdravstva Srbije, godišnje se izdvajalo, u proseku, oko 142 milijarde dinara (cca 1,21 milijarda €) za ustanove na sekundarnom i tercijarnom nivou zdravstvene zaštite, od čega za bolnice, više od jedne trećine (oko 44,8 milijardi dinara godišnje), a za hirurška odeljenja, u proseku, 32% ukupnog budžeta zdravstvene ustanove, dok je u nekim bolnicama to iznosilo i preko 90% [6].

Prema našim saznanjima, DSG migracija i analiza troškova operativnih procedura, sa i bez komplikacija, do sada nisu bile predmet naučnih istraživanja u Republici Srbiji. Po ugledu na razvijene zemlje, potrebno je da se naučno i stručno argumentuju troškovi najskupljeg lečenja, kao što je bolničko, posebno u situacijama kada su planirane velike investicije u stacionarne kapacitete [7]. Aktuelno je da se pažnja profesionalaca i javnosti usmerava na sagledavanje razlike u troškovima kolektomija, lečenja uz pomoć laparoskopskih procedura i otvorenih operacija na debelom crevu [8,9], kao i na praćenje troškova u primeni najsavremenije tehnologije i robotike [10]. Međunarodne publikacije pokazuju da se i DSG migracija koristi kao jedan od alata za procenu kvaliteta i efikasnosti rada, kako na nivou odeljenja ili bolnice, tako i na nacionalnom nivou [5].

Kolektomija, kao hirurška intervencija, koristi se u lečenju drugih oboljenja creva, pored karcinoma debelog creva, ali imajući u vidu da je karcinom kolona jedna od tri najčešće maligne bolesti u svetskoj populaciji, jasno je da se ove procedure neretko obavljaju. Prema dostupnim podacima, na listi vodećih lokalizacija u oboljevanju od karcinoma u opštoj populaciji u Republici Srbiji, karcinom debelog creva se nalazi na drugom mestu (11,2%) a na listi vodećih lokalizacija u umiranju od maligniteta, karcinom kolona je takođe na drugom mestu (12%) [11]. Stoga je cilj ovog rada da se ispituju: pojava DSG migracije kod kolektomija,

means that treatment has led to a certain level of deterioration of the patient's health status, as well as to an increase in resource consumption. This is why DRG migration in a healthcare facility (or an individual department) may be used as an indicator of the efficiency and quality of health care being provided. This is especially important for surgical branches of medicine, which are costly, and often require a long period of recovery in hospital, as well as significant funds [4].

In some hospitals, there are employees who deal with DRG coding and control before the records and documentation are handed over to the insurance companies [3]. In the Republic of Serbia, the National Health Insurance Fund of the Republic of Serbia (RFZO) is predominantly the buyer of services provided by the state-owned hospitals. As of January 1, 2019, the RFZO has been applying the payment model based on DRGs, along with line item (dedicated) budgeting – the budget is negotiated based on last year's contracts, while any remaining funds are returned to the RFZO. At the moment, 95% of funds are defined by estimate and transferred every month to healthcare institutions, by budget lines, while the remaining 5% of funds are the variable part of the budget whose payment depends on DRG performance [5]. DRG performance is assessed with the Australian Refined Diagnosis Related Groups Version 6.0, which also has software for data grouping. According to the assessment of the Second Serbia Health Project, in the period between 2018 and 2020, the amount of approximately 142 billion RSD (approximately 1.2 billion euros) was designated annually for health institutions at the secondary and tertiary levels of health care. Of this sum, more than one third (around 44.8 billion RSD a year) was designated for hospitals, while, on average, 32% of the budget of an individual hospital was allocated to surgical departments, with this percentage running as high as 90% or above, in some hospitals [6].

To the best of our knowledge, DRG migration and the cost analysis of surgical procedures, with and without complications, have as yet not been the subject of scientific research in the Republic of Serbia. In line with the practice of developed countries, it is necessary to scientifically and professionally justify the costs of the most expensive forms of treatment, such as hospital treatment, especially in situations when large investments are planned for inpatient facilities [7]. Currently, the attention of the professional circles as well as of the public is being directed towards determining the difference in costs among colectomies, treatment with laparoscopic procedures, and open surgery of the colon [8,9], as well as towards monitoring costs of the use of cutting-edge technology and robotics [10]. International publications have demonstrated that DRG

odnosno svrstavanje epizode lečenja pacijenta u DSG grupu koja se potencijalno odlikuje većim troškovima lečenja; bolnički troškovi; dužina hospitalizacije.

MATERIJALI I METODE

Sprovedena je retrospektivna sekundarna analiza podataka o DSG, za serije bolničkih epizoda pacijenata (n = 4.939), starosti 18 i više godina, koji su podvrgnuti proceduri kolektomije, u 49 bolnica iz Plana mreže zdravstvenih ustanova u Republici Srbiji [12,13], u periodu od 2018. do 2020. godine, čije su epizode bolničkog lečenja grupisane u tri dijagnostički srodne grupe:

1. G02A – Velike procedure na tankom i debelom crevu, sa vrlo teškim komplikacijama i komorbiditetima (težinski koeficijent 6,8);
2. G02A (T81-T88) – Velike procedure na tankom i debelom crevu, sa vrlo teškim komplikacijama i komorbiditetima (težinski koeficijent 6,8) – posebno izdvojene grupe sa dijagnozama koje mogu predstavljati komplikacije hirurškog lečenja koje su prouzrokovale DSG migraciju;
3. G02B – Velike procedure na tankom i debelom crevu, bez vrlo teških komplikacija i komorbiditeta (težinski koeficijent 3,51).

Izvor podataka korišćen u ovoj studiji jeste baza Drugog projekta razvoja zdravstva Srbije koju sprovodi Ministarstvo zdravlja [6] u kojoj se generišu i dalje analiziraju svi podaci dobijeni od javnih zdravstvenih ustanova posredstvom elektronskog fakturisanja. Za ovu analizu su izdvojeni podaci za period 1. 1. 2018. godine – 31. 12. 2020. godine.

U pogledu kolektomija, definisano je 12 različitih hirurških procedura sa odgovarajućim šiframa [14]:

1. 32003-00 Parcijalna resekcija debelog creva sa anastomozom
2. 32000-00 Parcijalna resekcija debelog creva sa formiranjem stome
3. 32003-01 Desna hemikolektomija sa anastomozom
4. 32000-01 Desna hemikolektomija sa formiranjem stome
5. 32005-01 Proširena desna hemikolektomija sa anastomozom
6. 32004-01 Proširena desna hemikolektomija sa formiranjem stome
7. 32006-00 Leva hemikolektomija sa anastomozom
8. 32006-01 Leva hemikolektomija sa formiranjem stome
9. 32005-00 Subtotalna kolektomija sa anastomozom
10. 32004-00 Subtotalna kolektomija sa formiranjem stome
11. 32012-00 Totalna kolektomija sa ileorektalnom anastomozom
12. 32009-00 Totalna kolektomija sa ileostomom.

migration is used as one of the tools for assessing the quality and efficiency of work, both at the department and hospital levels, as well as at the national level [5].

Colectomy, as a surgical procedure, is used in treating diseases of the colon other than colon cancer. However, bearing in mind that that colon cancer is one of the three most common malignant diseases in the world population, it is clear that this procedure is performed rather frequently. According to available data, colon cancer is second (11.2%) on the list of leading localizations of cancer-related morbidity in the general population of the Republic of Serbia, and it is also second (12%) on the list of leading localizations of malignancy-related mortality [11]. Therefore, the aim of this paper is to investigate the following: occurrence of DRG migration in colectomies, i.e., categorizing the patient episode into the DRG group which is potentially characterized by a higher treatment cost; hospital costs; length of hospital stay.

MATERIALS AND METHODS

A retrospective secondary analysis of data on DRG was performed, for series of episodes of hospital treatment (n = 4,939), in patients aged 18 and above, who had undergone colectomy, in 49 hospitals belonging to the Plan of the Republic of Serbia Healthcare Institutions Network [12,13], in the period between 2018 and 2020, and whose episodes of hospital treatment were grouped into three DRGs:

1. G02A – Major small and large bowel procedures, major complexity and comorbidity (cost weight = 6.8)
2. G02A (T81-T88) – Major small and large bowel procedures, major complexity and comorbidity (cost weight = 6.8) – separate associated diagnoses, which may represent complications of surgical treatment that were the cause of DRG migration
3. G02B – Major small and large bowel procedures, intermediate complexity and comorbidity (cost weight = 3.51).

The data source used for the study is the database of the Second Serbia Health Project implemented by the Ministry of Health [6], which generates and further analyses all data obtained from public healthcare institutions through electronic billing. For the purpose of this analysis, data for the period between January 1, 2018 and December 31, 2020 were taken from the database.

With respect to colectomies, 12 different surgical procedures have been defined, with associated codes [14]:

1. 32003-00 Limited excision of large intestine with anastomosis
2. 32000-00 Limited excision of large intestine with formation of stoma

Vodeći se naučnim radovima u ovoj oblasti [8,9], uzete su dijagnoze koje mogu predstavljati komplikacije hirurškog lečenja i koje su omogućile pretpostavku DSG migracije u grupu G02A (T81-T88), a to su:

1. T88.8 – Druge označene komplikacije hirurške i medicinske nege, neklasifikovane na drugom mestu
2. T81.0 – Krvarenje i krvni podliv kao komplikacije medicinskog postupka, neklasifikovani na drugom mestu
3. T81.3 – Poremećaj operativne rane, neklasifikovan na drugom mestu
4. T81.4 – Infekcija nakon medicinske intervencije, neklasifikovana na drugom mestu
5. T81.5 – Strano telo u operativnoj rani
6. T81.8 – Druge komplikacije medicinskih intervencija, neklasifikovane na drugom mestu
7. T81.9 – Neoznačena komplikacija medicinske intervencije.

Varijable uključene u analizu DSG (G02A, G02A (T81-T88) i G02B) su:

1. Zastupljenost različitih dijagnoza koje predstavljaju osnovni uzrok hospitalizacije (OUH)
2. Starost pacijenta, izražena kao aritmetička sredina i standardna devijacija (SD)
3. Pol pacijenta
4. Dužina hospitalizacije (broj dana)
5. Troškovi bolničkog lečenja – sedam vrsta troškova koji su izraženi kao medijana (25. i 75. percentil), uključuju:
 - Vrednost pruženih usluga bez vrednosti bolničkog dana (B.O. dan)
 - Vrednost ostvarenih B.O. dana
 - Vrednost utroška za lekove
 - Vrednost utroška za krv i produkte krvi
 - Vrednost utroška za potrošni medicinski materijal
 - Ukupan iznos po fakturi.
6. Srbija, ukupno i regioni: Grad Beograd, Istočna Srbija, Južna Srbija, Centralna Srbija, Vojvodina, i Zapadna Srbija.

U posmatranom periodu od tri godine, bilo je ukupno 4.939 ispitivanih grupa, od čega je najzastupljenija bila grupa G02B, sa udelom od 70,5%.

Statistička analiza podataka

Podaci su analizirani metodama deskriptivne i analitičke statistike. Od metoda deskriptivne statistike, korišćene su mere centralne tendencije (aritmetička sredina, medijana), mere varijabiliteta (standardna devijacija i percentili), apsolutni i relativni brojevi. Normalnost raspodele je testirana grafičkim i matematičkim metodama. Za poređenje statistički značajne razlike između ispitivanih grupa, korišćen je ANOVA test (ili Kruskal-Willison test), odnosno t-test (ili Man-Vitnijev

3. 32003-01 Right hemicolectomy with anastomosis
4. 32000-01 Right hemicolectomy with formation of stoma
5. 32005-01 Extended right hemicolectomy with anastomosis
6. 32004-01 Extended right hemicolectomy with formation of stoma
7. 32006-00 Left hemicolectomy with anastomosis
8. 32006-01 Left hemicolectomy with formation of stoma
9. 32005-00 Subtotal colectomy with anastomosis
10. 32004-00 Subtotal colectomy with formation of stoma
11. 32012-00 Total colectomy with ileorectal anastomosis
12. 32009-00 Total colectomy with ileostomy.

Guided by scientific studies in this field [8,9], the following diagnoses, which may present complications of surgical treatment, and which provide the supposition of DRG migration to the group G02A (T81-T88), were taken:

1. T88.8 – Other complications of surgical and medical care, not elsewhere classified
2. T81.0 – Hemorrhage and hematoma complicating a procedure, not elsewhere classified
3. T81.3 – Disruption of operation wound, not elsewhere classified
4. T81.4 – Infection following a procedure, not elsewhere classified
5. T81.5 – Foreign body accidentally left in body cavity or operation wound following a procedure
6. T81.8 – Other complications of procedures, not elsewhere classified
7. T81.9 – Unspecified complication of procedure.

The variables included in DRG (G02A, G02A (T81-T88) and G02B) analysis, are as follows:

1. The predominance of different diagnoses which represent the basic cause of hospitalization (BCH)
2. Patient age, expressed as the mean and as standard deviation (SD)
3. Patient sex
4. Length of hospital stay (number of days)
5. Hospital treatment costs – seven types of costs expressed as the median (25th and 75th percentile), include the following:
 - Total value of services rendered (without patient days)
 - Total value of billed patient days
 - Total cost of medication
 - Total cost of blood and blood products
 - Total cost of disposable medical supplies
 - Total invoice amount.
6. Serbia, in total, and by regions – City of Belgrade, East Serbia, South Serbia, Central Serbia, Autonomous Province of Vojvodina, and West Serbia.

test), za numeričke podatke, te χ^2 test (ili Fišerov test), za nominalne podatke. Statistička značajnost je prihvaćena na nivou 0,05. Rezultati su prikazani tabelarno. Za obradu podataka korišćen je softverski paket SPSS 21.0.

REZULTATI

U periodu između 2018. i 2020. godine, u 49 bolnica Srbije, dijagnoze koje su bile najzastupljenije, kao osnovni uzrok hospitalizacije, u grupama G02A i G02B, bile su C18.7 – Zloćudni tumor sigmoidnog dela debelog creva i C18.2 – Zloćudni tumor uzlaznog dela debelog creva, nakon kojih sledi C18.0 – Zloćudni tumor slepog creva (Tabela 1). U grupi G02A (T81-T88), najviše je bilo pacijenata sa osnovnim uzrokom hospitalizacije K56.7 – Zavezano crevo, neoznačeno, K56.6 – Drugo zavezano crevo, neoznačeno i C18.0 – Zloćudni tumor slepog creva.

U posmatranom periodu, u dijagnostičkoj grupi G02A, bilo je ukupno 1.349 pacijenata, prosečne

In the observed three-year period, there was a total of 4,939 observed groups, amongst which group G02B was predominant, with a prevalence of 70.5%.

Statistical data analysis

Data were analyzed with the use of descriptive and analytical statistics methods. The following descriptive statistics methods were used: measures of central tendency (mean, median), measures of variability (standard deviation and percentiles), absolute and relative numbers. Normality of distribution was tested with graphic and mathematical methods. For the comparison of statistically significant difference amongst the analyzed groups, the ANOVA test (or the Kruskal-Wallis test) was used, i.e., the t-test (or the Mann-Whitney test), for numeric data, and the χ^2 test (or Fisher's test), for nominal data. Statistical significance was accepted at the level of 0.05. The results have been presented in tables. The SPSS 21.0 software package was used for data processing.

Tabela 1. Najzastupljenije dijagnoze kao osnovni uzrok hospitalizacije i broj epizoda lečenja, po dijagnostički srodnim grupama, za velike procedure na tankom i debelom crevu, Srbija, 2018 -2020. godina

Table 1. The most prevalent diagnoses as the basic cause of hospitalization and the number of treatment episodes, by DRGs, for major small and large bowel procedures, Serbia, 2018 -2020

DSG grupa / DRG group	Najzastupljenije dijagnoze kao osnovni uzrok hospitalizacije (MKB-10 klasifikacija) / Most prevalent diagnoses as the basic cause of hospitalization (ICD-10 classification)	Epizode lečenja n (%) / Treatment episodes n (%)
UKUPNO / TOTAL		4,939 (100%)
G02A - Velike procedure na tankom i debelom crevu sa vrlo teškim komplikacijama i komorbiditetima / G02A - Major small and large bowel procedures, major complexity and comorbidity	C18.7 Zloćudni tumor sigmoidnog dela debelog creva / C18.0 Malignant neoplasm of the appendix	157 (11.6%)
	C18.2 Zloćudni tumor uzlaznog dela debelog creva / C18.2 Malignant neoplasm of the ascending colon	157 (11.6%)
	C18.0 Zloćudni tumor slepog creva / C18.0 Malignant neoplasm of the appendix	123 (9.1%)
	K56.7 Zavezano crevo, neoznačeno / K56.7 Ileus, unspecified	95 (7%)
	C18.4 Zloćudni tumor poprečnog dela debelog creva / C18.4 Malignant neoplasm of the transverse colon	90 (6.7%)
	Ostale dijagnoze / Other diagnoses	727 (54%)
	Ukupno / Total	1,349 (100%)
G02A - (T81-T88) Velike procedure na tankom i debelom crevu sa vrlo teškim komplikacijama i komorbiditetima, sa izdvojenim pratećim dijagnozama / G02A - (T81-T88) Major small and large bowel procedures, major complexity and comorbidity, with separate associated diagnoses	K56.7 Zavezano crevo, neoznačeno / K56.7 Ileus, unspecified	10 (9.3%)
	K56.6 Drugo zavezano crevo, neoznačeno / K56.6 Other and unspecified intestinal obstruction	10 (9.3%)
	C18.0 Zloćudni tumor slepog creva / C18.0 Malignant neoplasm of the appendix	10 (9.3%)
	C18.2 Zloćudni tumor uzlaznog dela debelog creva / C18.2 Malignant neoplasm of the ascending colon	9 (8.3%)
	C18.4 Zloćudni tumor poprečnog dela debelog creva / C18.4 Malignant neoplasm of the transverse colon	6 (5.6%)
	Ostale dijagnoze / Other diagnoses	63 (58.3%)
	Ukupno / Total	108 (100%)
G02B - Velike procedure na tankom i debelom crevu bez vrlo teških komplikacija i komorbiditeta / G02B - Major small and large bowel procedures, intermediate complexity and comorbidity	C18.7 Zloćudni tumor sigmoidnog dela debelog creva / C18.7 Malignant neoplasm of the sigmoid colon	475 (13,6%)
	C18.2 Zloćudni tumor uzlaznog dela debelog creva / C18.2 Malignant neoplasm of the ascending colon	451 (13%)
	C18.0 Zloćudni tumor slepog creva / C18.0 Malignant neoplasm of the appendix	396 (11,4%)
	C18.4 Zloćudni tumor poprečnog dela debelog creva / C18.4 Malignant neoplasm of the transverse colon	186 (5,3%)
	C18.3 Zloćudni tumor jetrinske krivine debelog creva / C18.3 Malignant neoplasm of hepatic flexure	182 (5,2%)
	Ostale dijagnoze / Other diagnoses	1.792 (51,5%)
	Ukupno / Total	3.482 (100%)

starosti 69,8 godina, a u grupi G02B dva i po puta više pacijenata (3.482), prosečne starosti 64,9 godina. Iz G02B grupe je u izdvojenu grupu G02A (T81-T88) migriralo ukupno 108 (7,4%) pacijenata, kod kojih je registrovana neka komplikacija nakon hirurške intervencije, a koji su bili prosečne starosti 70,6 godina. U sve tri grupe, većina pacijenata je bila muškog pola. Utvrđene su statistički značajne razlike u svim posmatranim troškovima i u dužini hospitalizacije, prema posmatranim dijagnostički srodnim grupama (Tabela 2).

Za razliku od strukture po polu, u pogledu starosti pacijenata, razlika između tri grupe je bila statistički značajna, a najstariji pacijenti su pripadali grupi G02A (T81-T88) (Tabela 2). *Post hoc* analizom je utvrđeno da je razlika u starosti bila značajna između grupe G02A i grupe G02B, kao i između grupa G02A (T81-T88) i G02B, ali ne i između grupa G02A (T81-T88) i G02A (Tabela 3).

Ukupan iznos fakture za grupu G02A je bio 290.702,9 dinara (cca 2.460 €), a pacijenti sa ovom grupom hospitalizovani su u proseku 13 dana. Ukupan iznos fakture za grupu G02A (T81-T88) je bio 509.651,7 dinara (cca 4.320 €), a prosečna dužina epizode bolničkog lečenja je bila 23 dana, dok je ukupan iznos fakture za grupu G02B bio 231.989 dinara (cca 1.970 €), uz prosečnu dužinu hospitalizacije od 11 dana (Tabela 2).

Vrednost pruženih usluga bez B.O. dana, ukupna vrednost B.O. dana, ukupni troškovi za lekove, kao i troškovi krvi, bili su najviši u grupi G02A (T81-T88), a

RESULTS

In the period between 2018 and 2020, in 49 hospitals in Serbia, the diagnoses that were the most prevalent as the basic cause of hospitalization, in groups G02A and G02B, were C18.7 – Malignant neoplasm of the sigmoid colon and C18.2 – Malignant neoplasm of the ascending colon, followed by C18.0 – Malignant neoplasm of the appendix (Table 1). In the group G02A (T81-T88), the majority of the patients had, as the basic cause of hospitalization, the following diagnoses: K56.7 – Ileus, unspecified, K56.6 – Other and unspecified intestinal obstruction, and C18.0 – Malignant neoplasm of the appendix.

In the observed period, in the diagnostic group G02A, there were, in total, 1,349 patients. Their average age was 69.8 years. At the same time, in group G02B, the number of patients was 2.5 times greater (3,482), and their average age was 64.9 years. A total of 108 (7.4%) patients, in whom some complication was registered upon surgery and whose average age was 70.6 years, migrated from the G02B group to the separate group G02A (T81-T88). In all three groups, a majority of the patients were male. Statistically significant differences were determined in all the observed costs and in the length of hospital stay, in relation to all the observed DRGs (Table 2).

As opposed to the group structure pertaining to the sex of the patients, with regards to the age of the patients, the difference amongst the groups was statistically significant, with the oldest patients belonging

Tabela 2. Razlike u karakteristikama bolesnika, troškovima i dužini hospitalizacije, prema posmatranim dijagnostički srodnim grupama, Srbija, 2018 - 2020. godina

Table 2. The differences in patient characteristics, costs and length of hospital stay, by observed DRGs, Serbia 2018 - 2020

Variable / Variables	G021	G02A (T81-T88)	G02B	p
Starost u godinama / Age in years (mean ± SD)	69.8 ± 11.7	70.6 ± 10.8	64.9 ± 13	< 0.001
Pol muški n (%) / Male sex n (%)	778 (57.7%)	64 (59.3%)	1,921 (55.2%)	0.227
Pol ženski n (%) / Female sex n (%)	571 (42.3%)	44 (40.7%)	1,561 (44.8%)	
Vrednost pruženih usluga bez B.O. dana* / Value of services rendered (without patient days)*	162,391 (119,179.8 – 232,246.7)	267,729.3 (176,277.1 – 395,510.8)	128,448.1 (101,621.1 – 165,716.1)	< 0.001
Vrednost B.O. dana* / Value of patient days*	28,747.2 (19,533.8 – 42,000.2)	50,923.9 (30,292.6 – 75,034.9)	24,049.9 (17,493.9 – 33,142.8)	< 0.001
Ukupan trošak za lekove* / Total cost of medication*	40,036.9 (21,857.9 – 77,065.1)	78,587.1 (39,679.7 – 159,813.1)	25,130.6 (15,897.6 – 44,899.4)	< 0.001
Ukupan trošak za krv i labilne produkte od krvi* / Total cost of blood and labile blood products*	14,134.5 (7,067.2 – 28,622.3)	22,440.4 (9,060 – 41,932.3)	11,928.6 (7,067.2 – 21,201.7)	< 0.001
Ukupan trošak za potrošni medicinski materijal* / Total cost of disposable medical supplies*	34,876.5 (19,743.7 – 61,637.4)	45,187.4 (30,277.1 – 78,191.5)	32,586.1 (18,727.1 – 64,725.3)	< 0.001
Ukupan iznos naplaćene participacije* / Total amount of patient participation*	32,970.5 (15,495.1 – 62,544.3)	48,724.5 (21,265.2 – 85,313.9)	29,677.5 (13,542.9 – 54,755.7)	0.116
Ukupan iznos fakture* / Total invoice amount*	290,702.9 (213,227.8 – 415,879.4)	509,651.7 (312,222 – 677,846.7)	231,989 (184,692.9 – 298,871.3)	< 0.001
Broj dana / Number of days of hospital stay	13 (9 – 20)	23 (16 – 35.5)	11 (8 – 15)	< 0.001

* dinari, medijana (25. i 75. percentil) / RSD (dinars), median (25th and 75th percentile)

Tabela 3. Post hoc analiza karakteristika bolesnika, troškova i dužine hospitalizacije, prema posmatranim dijagnostički srodnim grupama, Srbija, 2018 – 2020. godina

Table 3. Post hoc analysis of patient characteristics, costs, and length of hospital stay, according to the observed DRGs, Serbia, 2018 – 2020

Varijable / Variables	G02A (T81/T88) naspram G02A / G02A (T81/T88) versus G02A	G02A naspram G02B / G02A versus G02B	G02A (T81-T88) naspram G02B / G02A (T81-T88) versus G02B
Starost u godinama (aritmetička sredina ± SD) / Age in years	0.482	< 0.001	< 0.001
Vrednost pruženih usluga bez vrednosti B.O. dana* / Total value of services rendered (without patient days)*	< 0.001	< 0.001	< 0.001
Vrednost B.O. dana* / Total cost of medication*	< 0.001	< 0.001	< 0.001
Ukupan trošak za lekove* / Value of services rendered (without patient days)*	< 0.001	< 0.001	< 0.001
Ukupan trošak za krv i labilne produkte krvi* / Total cost of blood and labile blood products*	0.007	< 0.001	< 0.001
Ukupan trošak za potrošni medicinski materijal* / Total cost of disposable medical supplies*	0.001	0.210	< 0.001
Ukupan iznos fakture* / Total invoice amount*	< 0.001	< 0.001	< 0.001
Broj dana hospitalizacije / Number of days of hospital stay	< 0.001	< 0.001	< 0.001

* dinari, medijana (25. i 75. percentil) / RSD (dinars), median (25th and 75th percentile)

za pacijente te grupe hospitalizacija je bila najduža. Post hoc analizom je utvrđeno da su razlike u vrednosti pruženih usluga bez B.O. dana, ukupnoj vrednosti B.O. dana, ukupnim troškovima lekova, kao i u broju dana hospitalizacije, statistički značajne između grupa G02A (T81-T88) i G20A, zatim između grupa G02A i G02B, kao i između grupa G02A (T81-T88) i G02B (Tabela 3). Posmatrano u svim regionima, statistička značajnost ovih razlika u troškovima je potvrđena (Tabela 4).

U svim regionima, osim u Zapadnoj Srbiji, ukupni iznos fakture je bio najviši za grupu G02A (T81-T88) ($p < 0,001$) i bio je u opsegu od 390.048 dinara (cca 3.300 €), u Centralnoj Srbiji, do čak 581.338,8 dinara (cca 4.930 €), u regionu Južne Srbije. Prosečna najduža hospitalizacija je zabeležena za grupu G02A (T81-T88) i bila je u opsegu od 21 dana, u Gradu Beogradu, do 31 dana, u regionu Centralne Srbije, dok je u regionu Zapadne Srbije bila najmanja (u proseku 11 dana) ($p < 0,001$) (Tabela 4).

DISKUSIJA

Tokom posmatranog trogodišnjeg perioda, DSG migracija je zabeležena kod 108 (7,4%) epizoda bolničkog lečenja, što znači da su pacijenti usled komplikacija (dijagnoze T81-T88) nastalih u toku hospitalizacije svrstani u drugu dijagnostički srodnu grupu, sa većim koeficijentom. Međutim, ovaj podatak se mora uzeti sa rezervom, s obzirom na to da u procesu analize podataka nisu mogle biti izdvojene sve komplikacije koje potencijalno dovode do DSG migracije. Naime, najčešće komplikacije nakon resekcije debelog creva jesu različite infekcije rane i unutrašnjih organa, a slede ih gastrointestinalne komplikacije motiliteta, uključujući ileus i opstrukciju creva [14]. Međutim, za navedene

to the group G02A (T81-T88) (Table 2). Post hoc analysis determined a statistically significant difference between groups G02A and G02B, as well as between groups G02A (T81-T88) and G02B, but not between groups G02A (T81-T88) and G02A (Table 3).

The total invoice amount for group G02A was 290,702.9 RSD (approximately 2,460 euros), and the average hospital stay was 13 days. The total invoice amount for group G02A (T81-T88) was 509,651.7 RSD (approximately 4,320 euros), while the average episode of hospital treatment was 23 days. The total invoice amount for group G02B was 231,989 RSD (approximately 1,970 euros), with an average hospital stay of 11 days (Table 2).

The value of services rendered without patient days, the total value of patient days, the total cost of medication, as well as the cost of blood and blood products, were the highest in group G02A (T81-T88), and for these patients, hospital stay was the longest. Post hoc analysis has determined that the differences in the values of services rendered without patient days, in the total value of patient days, the total medication costs, as well as in the number of patient days, were statistically significant between group G02A (T81-T88) and group G20A, between groups G02A and G02B, as well as between groups G02A (T81-T88) and G02B (Table 3). The statistical significance of these differences in costs has been confirmed at the level of all the regions (Table 4).

In all the regions, except West Serbia, the total invoice amount was the highest for group G02A (T81-T88) ($p < 0.001$) and ranged between 390,048 RSD (approximately 3.300 euros), in Central Serbia, to as much as 581,338.8 RSD (approximately 4,930 euros), in the South Serbia region. The longest average hospital stay was registered for group G02A (T81-T88) and ranged from

Tabela 4. Razlike u karakteristikama bolesnika, troškovima i dužini hospitalizacije, prema posmatranim dijagnostički srodnim grupama, Srbija, 2018 - 2020. godina**Table 4.** The differences in patient characteristics, costs and length of hospital stay, by observed DRGs, Serbia 2018 - 2020

Region / Region	Varijable / Variables	G02A	G02A (T81-T88)	G02B	p
Grad Beograd / The City of Belgrade	Ukupan iznos fakture / Total invoice amount	292,397.8 (224,873.6–434,404.8)	451,224.8 (271,906.4–822,026.1)	244,222.7 (195,514.7–311,865.3)	< 0.001
	Broj dana hospitalizacije / Number of days of hospital stay	12 (9 – 20)	21 (12 – 32)	11 (8 – 14)	< 0.001
Istočna Srbija / East Serbia	Ukupan iznos fakture / Total invoice amount	280,336.5 (231,734.8 – 384,200.4)	512,103.2 (373,152.7 – 626,516.5)	271,696.4 (216,759.2 – 351,204.8)	< 0.001
	Broj dana hospitalizacije / Number of days of hospital stay	12 (8 – 20)	29.5 (25 – 39)	14 (11 – 19)	< 0.001
Južna Srbija/ South Serbia	Ukupan iznos fakture / Total invoice amount	258,989.8 (186,943.4 – 404,702.4)	581,338.8 (264,184.6 – 893,674)	203,086.9 (159,515.1 – 255,794.9)	< 0.001
	Broj dana hospitalizacije / Number of days of hospital stay	11 (8 – 16)	26.5 (16.5 – 37)	10 (8 – 14)	< 0.001
Centralna Srbija / Central Serbia	Ukupan iznos fakture / Total invoice amount	307,995 (217,097.7 – 428,826.4)	390,048 (249,080.9 – 700,264.9)	234,968.6 (184,884.6 – 306,681.4)	< 0.001
	Broj dana hospitalizacije / Number of days of hospital stay	13 (8 – 19)	31 (16.5 – 40.5)	12 (8 – 16)	< 0.001
AP Vojvodina / Autonomous Province of Vojvodina	Ukupan iznos fakture / Total invoice amount	302,596.1 (213,808.2 – 411,959.1)	561,971.3 (368,837.8 – 669,199)	214,990.3 (179,504.8 – 275,306.4)	< 0.001
	Broj dana hospitalizacije / Number of days of hospital stay	14 (9 – 21)	23.5 (18 – 36)	10 (8 – 13)	< 0.001
Zapadna Srbija / West Serbia	Ukupan iznos fakture / Total invoice amount	274,765.7 (196,785.6 – 410,079.4)	218,098.1 (214,042 – 234,916)	256,400.4 (187,771.2 – 330,216.6)	0.051
	Broj dana hospitalizacije / Number of days of hospital stay	14 (10 – 21)	11 (8 – 13)	12 (9 – 16)	0.004

dijagnoze se ne može sa sigurnošću reći kada su nastale i u kom periodu hospitalizacije – pre, za vreme ili nakon hirurške intervencije, za razliku od posmatranih dijagnoza u analizi T81-T88, čiji naziv jasno ukazuje na komplikacije nastale kao posledica hirurške intervencije ili lečenja. Ovaj problem je posledica načina izveštavanja o radu zdravstvenih ustanova ka RFZO-u, jer elektronska fakura sadrži osnovni uzrok hospitalizacije i sve prateće dijagnoze koje su bile značajne za epizodu lečenja, ali one nisu razvrstane na komorbiditete sa kojima je pacijent primljen i komplikacije koje su se desile tokom bolničkog lečenja.

Za razliku od razvijenijih zemalja, u kojima se primenjuje neki od modela plaćanja po učinku, u Republici Srbiji, ni pružaoci ni ugovarač zdravstvenih usluga nisu u potpunosti prihvatili značaj detaljnog prikazivanja slučajeva i dokumentacije kojom se pravdaju sredstva utrošena za lečenje. Razlog za to je što se novac zdravstvenim ustanovama, još uvek, u najvećoj meri (95%) prenosi po namenama na osnovu predračunom ugovorenih sredstava, dok se preostali, varijabilni deo od 5%, obračunava na osnovu zbira težinskih koeficijenata DSG. Tek po određivanju baznog koeficijenta, može se doći i do cena DSG grupa, nakon čega se može smatrati da je potpuno završena implementacija modela plaćanja po DSG sistemu. Kada se zdravstvenim ustanovama bude definisao budžet na osnovu vrednosti njihovih DSG grupa, onda će se povećati značaj ispravnog

21 days, in the City of Belgrade, to 31 days, in the region of Central Serbia, while it was the shortest in the region of West Serbia (11 days on average) ($p < 0.001$) (Table 4).

DISCUSSION

During the observed three-year period, DRG migration was registered in 108 (7.4%) episodes of hospital treatment, which means that patients, due to complications (diagnoses T81-T88) which had developed during hospital stay were categorized into another DRG, with a greater cost weight. However, this data must be considered with certain reservations, since not all complications potentially leading to DRG migration could be identified in the process of data analysis. Namely, the most frequent complications following large intestine excision are different wound infections and infections of internal organs, followed by gastrointestinal motility complications, including ileus and bowel obstruction [14]. However, for the said diagnoses, it cannot be determined with certainty when they developed and in which part of the patient's hospital stay – before, during or after the surgical procedure, as opposed to the observed diagnoses in the analysis of T81-T88, whose name clearly indicates complications occurring as the result of a surgical procedure or treatment. This problem is the result of the method used for reporting on the functioning of healthcare institutions to the RFZO. Namely, the electronic invoice does state the basic cause of hospital-

izveštavanja, kako za bolnice, tako i za RFZO, naravno iz dijametralno suprotnih razloga. Interes zdravstvene ustanove je da opravda finansijska ulaganja, dok je interes RFZO-a da racionalizuje potrošnju sredstava.

Kada se posmatra distribucija grupa G02A, G02A (T81-T88) i G02B, od ukupno 4.939 grupa pacijenata, koliko ih je zabeleženo u periodu od 1. 1. 2018. do 21. 12. 2020. godine, 2.779 njih, odnosno 56,26%, su bile grupe pacijenata lečenih u jedanaest od ukupno 49 bolnica koje izvode kolektomije. Svih jedanaest zdravstvenih ustanova pripada tercijarnom nivou zdravstvene zaštite, što je i očekivano, imajući u vidu kompleksnost samih procedura i težinu kliničke slike pacijenata koja zahteva izvođenje kolektomije. U pogledu DSG migracije, trećina (33 od 108) grupa G02A (T81-T88) pripadala je pomenutim tercijarnim ustanovama, a DSG migracija je iznosila samo 1,58%. Kako se DSG migracija može posmatrati kao mera kvaliteta rada zdravstvene ustanove, ustanove tercijarnog nivoa koje imaju najbolju medicinsku opremu i najobučeniji subspecialistički kadar imaju i najmanju DSG migraciju [15,16].

Međunarodna praksa je pokazala da je kod tzv. otvorenih operacija veći rizik od nastajanja komplikacija, a samim tim je i duži period oporavka pacijenta, odnosno veći je rizik od produžavanja hospitalizacije. Prelazak na minimalno invazivne, odnosno laparoskopске kolektomije bi u ovom slučaju imao pozitivan efekat na ishode i uštede [17]. Međutim, ono što bi bilo najvažnije jeste redovno merenje ovog pokazatelja efikasnosti zdravstvene zaštite i inkorporiranje ekonometrije u zdravstvenu politiku, jer je merenje troškova, koje u sistemu generišu komplikacije, i to na način koji je zasnovan na dokazima, kao što je prikazano u ovom istraživanju, od velikog značaja [18]. Pojedine studije pokazuju da određene komplikacije kolektomija mogu iznositi i preko 8% ukupnih bolničkih troškova [19].

Redovnim praćenjem troškova i pokazatelja kvaliteta rada bolnica mogu se detektovati one ustanove koje predstavljaju centre izuzetnosti za određenu patologiju. Prepoznavanje centara izuzetnosti je veoma značajno, s obzirom da se pacijenti onda mogu usmeravati na lečenje tamo gde je volumen određene patologije značajan, a međunarodna praksa pokazuje da je u tom slučaju procenat neželjenih događaja smanjen, kvalitet zdravstvene zaštite bolji i troškovi lečenja manji [20]. To sugeriše i potrebu da donosioci odluka razmotre model organizacije pružanja usluga u kojem bi se slučajevi kolektomije uspešnije rešavali u tercijarnim ustanovama i još nekoliko referentnih centara, koji imaju najbolju medicinsku opremu i najobučeniji subspecialistički kadar, i stoga i manju DSG migraciju.

U pogledu procedura kolektomije, prosečna potrošnja na ove intervencije u periodu 2018 – 2020.

ization and all the underlying diagnoses that were significant for the episode of hospital treatment, but these are not further classified to show which comorbidities the patient had been admitted with and which complications occurred during hospital treatment.

As opposed to the more developed countries, where one of the performance-related payment models is applied, in the Republic of Serbia, neither the service provider nor the service contractor have completely accepted the significance of more detailed case reports and files whose purpose is to account for the funds spent on treatment. The reason for this is that money is still mostly (95%) allocated to healthcare institutions, by dedicated budget lines, based on funds contracted on the basis of estimate, while the remaining, variable part, amounting to 5%, is calculated based on the sum of DRG cost weights. Only after the base rate is determined can the costs of each DRG group be defined, upon which the implementation of the payment model based on the DRG system can be considered completely finished. When the practice of defining the budget of healthcare institutions on the basis of the value of their DRG groups becomes prevalent, the significance of proper reporting will increase, both for the hospitals, but also for the RFZO, naturally, for opposing reasons. The interest of the healthcare institution is to justify financial investment, while the interest of the RFZO is to rationalize the consumption of resources.

When the distribution of groups G02A, G02A (T81-T88) and G02B is observed, out of a total of 4,939 patient groups recorded in the period between January 1, 2018 and December 31, 2020, 2,779 groups, i.e., 56.26%, were groups of patients treated at 11 out of a total of 49 hospitals, where colectomies are performed. All of the eleven healthcare institutions are at the tertiary level of health care, which is to be expected, bearing in mind the complexity of the procedures themselves as well as the severity of patient presentation requiring colectomy. With regards to DRG migration, a third (33 out of 108) of the G02A (T81-T88) groups belonged to the abovementioned tertiary healthcare institutions, and DRG migration was only 1.58%. As DRG migration can be considered a measure of the quality of work of a healthcare facility, the tertiary-level institutions with the best medical equipment and the best trained subspecialists also have the lowest DRG migration [15,16].

International practice has shown that in, so called, open surgery procedures the risk of complications is higher, and thereby the recovery period for the patient is longer, i.e. the risk of prolonged hospital stay is higher. Transitioning to minimally invasive, i.e., laparoscopic colectomies would, in this case, have a positive effect on both outcomes and cost reduction [17]. However, what would

bila je oko 488,8 miliona dinara (cca 4,2 miliona €) po godini. Rezultati dobijeni u ovom radu pokazuju statistički značajne razlike u iznosima faktura. Oni takođe pokazuju da su, u proseku, najskuplje bile fakture za grupu G02A (T81-T88). Isto tako, najduže hospitalizacije se vezuju za ovu grupu. Kada je stopa DSG migracije od 7,4% ekstrapolirana na sve pacijente kojima je u Republici Srbiji u posmatranom periodu od tri godine urađena procedura kolektomije, dobijeno je povećanje ukupnog iznosa faktura za 2,6% (12,5 miliona dinara, odnosno cca 106.500 €), kao i povećanje broja B.O. dana za 1.771 dan [18]. To praktično znači da postoji povećanje od oko 590 B.O. na godišnjem nivou, odnosno skoro dva zauzeta kreveta tokom cele godine na račun komplikacija iz spektra T81-T88, samo kod izvođenja procedure kolektomije. Zato je praćenje DSG migracija vrlo dobar indikator za detekciju neefikasnih medicinskih intervencija.

Procenat komplikacija tokom bolničkog lečenja je jedan od pokazatelja kvaliteta zdravstvene zaštite, a praćenje DSG migracija usled komplikacija nastalih u toku procedura obavljenih tokom hospitalizacije preciznije ukazuje na kvalitet rada u bolnicama. U Republici Srbiji, praćenje kvaliteta zdravstvene zaštite je definisano posebnim Pravilnikom [21]. Komplikacije definisane dijagnozama T81-T88 su pre svega različite infekcije u vezi sa hirurškom intervencijom, o kojima su zdravstvene ustanove u obavezi da izveštaju u okviru pokazatelja bezbednosti pacijenata na hirurškim odeljenjima. Prema poslednjem javno dostupnom Izveštaju o unapređenju kvaliteta rada u zdravstvenim ustanovama Republike Srbije [22], stopa incidencije infekcije operativnog mesta je oko 1%. Međutim, još uvek ne postoji svest institucija o važnosti evidentiranja ovih neželjenih događaja, kao ni o njihovom značaju, ne samo za zdravlje pacijenata, već i za sveukupne troškove u sistemu zdravstvene zaštite, na šta ukazuje ovo istraživanje.

Prednosti ovog istraživanja ogledaju se u tome što je ono pružilo uvid u parametre kao što su: distribucija pacijenata kojima je urađena procedura kolektomije po posmatranim grupama, prosečan trošak i prosečna dužina hospitalizacije za svaku od dijagnostički srodnih grupa, te procenat DSG migracija, na osnovu izdvojenih komplikacija. S druge strane, imajući u vidu da nedostaci u procesu prikupljanja podataka u Republici Srbiji dovode do nekompletnih ili nepreciznih podataka o svim mogućim komplikacijama nakon resekcije debelog creva (već pomenute infekcije rane i unutrašnjih organa, komplikacije motiliteta, ileus i opstrukcija creva), kroz ovu analizu nisu mogli biti obuhvaćeni i analizirani svi potencijalni slučajevi DSG migracije.

be most important is performing regular measuring of this indicator of health care efficiency and incorporating econometrics into health policy, since measuring costs, which are generated in the system by complications, particularly evidence-based measuring – as shown in this study, is of great significance [18]. Individual studies have shown that certain complications of colectomies may amount to more than 8% of overall hospital costs [19].

Regular monitoring of indicators of hospital costs and work quality enables the detection of those hospitals which are centers of excellence for certain pathologies. Identifying centers of excellence is very important, since patients can then be referred for treatment to those facilities where the volume of a certain pathology is significant – and international experience has shown that, in such cases, the percentage of adverse effects decreases, the quality of health care improves, and treatment costs drop [20]. This suggests the need for decision makers to consider an organizational model of service provision wherein colectomy cases would be more successfully resolved at tertiary healthcare institutions and at several referral centers, which have the best medical equipment and the best trained subspecialists, and therefore lesser DRG migration.

Regarding colectomies, the average expenditure for these procedures, in the period 2018 – 2020, was around 488.8 million RSD (approximately 4.2 million euros), per year. The results obtained in this study show statistically significant differences in invoice amounts. They also show that the costliest invoices were for group G02A (T81-T88). Also, the longest hospital stays are related to this group. When the rate of DRG migration of 7.4% was extrapolated to all the patients in the Republic of Serbia who had undergone colectomy in the observed three-year period, the result was an increase in the total invoice amount of 2.6% (12.5 million RSD, i.e., approximately 106,500 euros), as well as an increase in the number of patient days by 1,771 days [18]. This practically means that there is an increase of around 590 patient days a year, i.e., almost two occupied beds during the entire year resulting from complications from the T81-T88 spectrum, in colectomy procedures alone. This is why monitoring DRG migrations is a very good indicator for detecting inefficient medical procedures.

The percentage of complications during hospital treatment is one of the indicators of the quality of health care, while the monitoring of DRG migrations occurring as the result of complications developing during procedures performed in the course of hospitalization more specifically indicate the work quality in hospitals. In the Republic of Serbia, the control of the quality of health care is defined by a special Rulebook [21]. The complications defined by the diagnoses T81-T88 are primarily

ZAKLJUČAK

Na nacionalnom nivou, i na skoro svim regionalnim nivoima u Republici Srbiji, statistički značajno stariji od ostalih jesu pacijenti koji su izdvojeni u dijagnostičku grupu G02A (T81-T88), koja predstavlja DSG migraciju, i njihovo lečenje je statistički značajno duže i skuplje, u pogledu vrednosti pruženih usluga, vrednosti B.O. dana, vrednosti lekova, vrednosti krvi i produkata krvi, kao i ukupne vrednosti fakture. Kolektomije sa komplikacijama, kao posledicama bolničkog lečenja ili medicinske intervencije, dovode do svrstavanja date epizode bolničkog lečenja u dijagnostički srodnu grupu koja podrazumeva veću potrošnju resursa i veću dužinu hospitalizacije. DSG migracija kao pokazatelj efikasnosti i kvaliteta pružene zdravstvene zaštite može biti valjan signal za kontrolu i upravljanje procesima i kvalitetom rada u jednoj zdravstvenoj ustanovi ili njenoj organizacionoj jedinici.

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LITERATURA / REFERENCES

1. Clinical Casemix Handbook 2012-2014. Perth (WA): Government of Western Australia Department of Health; 2012.
2. Vodič kroz sistem Dijagnostički srodnih grupa. RFZO; 2013. [Internet]. [pristupljeno 16.1.2022.]. Dostupno na: <https://site.zus.rfzo.rs/dsg/dokumenta/Vodic%2025-10-2013.pdf>.
3. Hughes BD, Mehta HB, Sieloff E, Shan Y, Senagore AJ. DRG migration: A novel measure of inefficient surgical care in a value-based world. *Am J Surg.* 2018 Mar;215(3):493-496. doi: 10.1016/j.amjsurg.2017.09.035.
4. Fetter RB. Casemix classification systems. *Aust Health Rev.* 1999;22(2):16-34; discussion 35-8. doi: 10.1071/ah990016.
5. Hughes BD, Moore SA, Mehta HB, Shan Y, Senagore AJ. Diagnosis-Related Group in Colon Surgery: Identifying Areas of Improvement to Drive High-Value Care. *Am Surg.* 2019 Mar 1;85(3):256-60.
6. Drugi projekat razvoja zdravstva Srbije. Ministarstvo zdravlja Republike Srbije. [Internet]. [pristupljeno 16.1.2022.]. Dostupno na: <https://www.zdravlje.gov.rs/tekst/335731/drugi-projekat-razvoja-zdravstva-srbije.php>.
7. Hospital spending 2019-2020. Canadian Institute for Health Information. [Internet]. [pristupljeno 12.8.2021.]. Dostupno na: <https://www.cihi.ca/en/what-are-hospitals-spending-on>.
8. Dor A, Koroukian S, Xu F, Stulberg J, Delaney C, Cooper G. Pricing of surgeries for colon cancer: patient severity and market factors. *Cancer.* 2012 Dec 1;118(23):5741-8. doi: 10.1002/cncr.27573.
9. Salloum RM, Bulter DC, Schwartz SI. Economic evaluation of minimally invasive colectomy. *J Am Coll Surg.* 2006 Feb;202(2):269-74. doi: 10.1016/j.jamcollsurg.2005.10.002.
10. Chung J, Postoev A, Filatov A, Latin L, Farinas A, Pico CXC, et al. Postoperative Outcomes of Surgical Sutureless Aortic Valve Replacement vs Transcatheter Aortic Valve Implantation for Severe Symptomatic Aortic Stenosis. *Journal of the American College of Surgeons.* 2015; 221(4):S26. doi: 10.1016/j.jamcollsurg.2015.07.047.
11. Maligni tumori u Republici Srbiji. IJZS „Dr Milan Jovanović – Batut“; 2020. [Internet]. [pristupljeno 16.1.2022.]. Dostupno na: <http://www.batut.org.rs/download/publikacije/MaligniTumori2018.pdf>.

different infections related to surgical procedures, which healthcare institutions are obliged to report on, within the indicators of patient safety in surgical wards. According to the latest available Report on the Improvement of Work Quality in Healthcare Institutions of the Republic of Serbia [22], the incidence rate of surgical site infection is around 1%. However, awareness in the institutions on the importance of recording these adverse effects is still lacking, as is the awareness of their importance, not only for the health of the patient, but also for the overall healthcare system costs, as shown in this study.

The advantages of this study are reflected in the fact that it has offered insight into parameters, such as: distribution of patients who had undergone colectomy by groups, average cost and average length of hospital stay for each of the diagnosis related groups, as well as the percentage of DRG migration, based on the separate complications. On the other hand, bearing in mind that the drawbacks in the process of data collection in the Republic of Serbia lead to the generation of incomplete and imprecise data on all the possible complications following large intestine excision (the already mentioned infections of the wound and internal organs, motility complications, ileus, and intestinal obstruction), this study could not encompass and analyze all potential cases of DRG migration.

CONCLUSION

At the national level, and at almost all the regional levels in the Republic of Serbia, the patients classified in the diagnostic group G02A (T81-T88), which represents DRG migration, are statistically significantly older than the others, and their treatment is statistically significantly longer and more costly, with regards to the value of the services provided, the value of the patient days, the cost of the medication administered, the cost of the blood and blood products, as well as with regards to the total invoice amount. Colectomies with complications, resulting from hospital treatment or medical procedures, lead to the categorization of the given episode of hospital treatment in the diagnosis related group that entails a greater consumption of resources and longer hospital stay. DRG migration, as an indicator of efficiency and quality of provided health care may be a valid signal for control and management of the work process and its quality, in a healthcare institution or its organizational unit.

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12. Uredba o planu mreže zdravstvenih ustanova. („Sl. glasnik“ br. 5/2020, 11/2020, 52/2020, 88/2020, 62/2021, 74/21 i 95/21). [Internet]. [pristupljeno 16.1.2022.]. Dostupno na: https://www.paragraf.rs/propisi/uredba_o_planu_mreze_zdravstvenih_ustanova.html.
13. Pravilnik o nomenklaturi zdravstvenih usluga na sekundarnom i tercijarnom nivou zdravstvene zaštite. („Sl. Glasnik RS“ br. 154/2020). Ministarstvo zdravlja RS.
14. Or Z, Hakkinen U. Diagnosis-Related Groups in Europe: Towards Efficiency and Quality; DRGs and quality: For better or worse. 8th European Conference on Health Economics, Helsinki, 7-10 July 2010. [Internet]. [pristupljeno 16.1.2022.]. Dostupno na: <https://eurodrp.projects.tu-berlin.de/publications/DRGs%20and%20quality-Helsinki.pdf>.
15. Or Z, Hakkinen U. DRGs and quality of care: for better or worse? in DRGs in Europe: Moving towards transparency, efficiency and quality in hospitals; R. Busse et al. (eds). European Observatory on Health Systems and Policies, Open University Press, 2011.
16. Kirchoff P, Clavien PA, Hahnloser D. Complications in colorectal surgery: risk factors and preventive strategies. *Patient Saf Surg.* 2010 Mar 25;4(1):5. doi: 10.1186/1754-9493-4-5.
17. Healy MA, Regenbogen SE, Kanters AE, Suwanabol PA, Varban OA, Campbell DA Jr, et al. Surgeon Variation in Complications With Minimally Invasive and Open Colectomy: Results From the Michigan Surgical Quality Collaborative. *JAMA Surg.* 2017 Sep 1;152(9):860-7. doi: 10.1001/jamasurg.2017.1527.
18. Topalović M. DSG migracija kao mera neefikasne medicinske intervencije. Specijlistički rad iz Socijalne medicine. Medicinski fakultet Univerziteta u Beogradu, Beograd, 2021.
19. Zogg CK, Najjar P, Diaz AJ, Zogg DL, Tsai TC, Rose JA Jr, et al. Rethinking Priorities: Cost of Complications After Elective Colectomy. *Ann Surg.* 2016 Aug;264(2):312-22. doi: 10.1097/SLA.0000000000001511.
20. Chang AL, Kim Y, Ertel AE, Hoehn RS, Wima K, Abbott DE, et al. Case mix-adjusted cost of colectomy at low-, middle-, and high-volume academic centers. *Surgery.* 2017 May;161(5):1405-13. doi: 10.1016/j.surg.2016.10.019.
21. Pravilnik o pokazateljima kvaliteta zdravstvene zaštite. („Sl. glasnik RS“ br. 49/2010). [Internet]. [pristupljeno 16.1.2022.]. Dostupno na: https://www.rfzo.rs/download/pravilnici/mz/pravilnik_kvalitet.pdf.
22. Izveštaj o unapređenju kvaliteta rada u zdravstvenim ustanovama Republike Srbije. IZJS „Dr Milan Jovanović-Batut“, 2018. [Internet]. [pristupljeno 16.1.2022.]. Dostupno na: <https://www.batut.org.rs/index.php?content=1857>.