Discrepancy between Admission and Discharge Diagnoses in Central Serbia: Analysis by the Groups of International Classification of Diseases, 10th Revision

Natasa MIHAJLOVIC¹, Dragan VASILJEVIC¹,², Vesna MILICIC³, Marina LUKE\textsc{tina SUNJKA}⁴, Snezana RADO\textsc{vanovi}⁵,⁶, *Biljana MILICIC⁶, Sanja KOCIC¹,⁵

¹. Institute of Public Health Kragujevac, Kragujevac, Serbia
². Department of Hygiene and Ecology, Faculty of Medical Sciences, University of Kragujevac, Kragujevac, Serbia
³. Department of Dermatovenerology, Faculty of Medical Sciences, University of Kragujevac, Kragujevac, Serbia
⁴. European Center for Peace and Development, University for Peace Established by the United Nations, Belgrade, Serbia
⁵. Department of Social Medicine, Faculty of Medical Sciences, University of Kragujevac, Kragujevac, Serbia
⁶. Department for Medical Statistics and Informatics, School of Dental Medicine University of Belgrade, Belgrade, Serbia

*Corresponding Author: Email: biljana.milicic@stomf.bg.ac.rs

(Received 13 Jun 2019; accepted 25 Aug 2019)

Abstract

Background: Repeated research while using the same methodology can be useful and it can enable relevant conclusions in the same health care system. The aim of our study was to perform comparative analysis of the agreement between admission and discharge diagnostic groups in period 2014-2017 with period 2006-2013 in the Clinical Center of Kragujevac, Serbia.

Methods: The 5\% simple, random sample was made from the basic set of all hospital reports from Clinical Centre Kragujevac, Serbia, in the period 01.01. 2014 - 31.12. 2017 (n=10228). The first four digits of ICD-10 codes at admission and discharge were compared for agreement. We used discharge diagnosis as a "golden standard". Statistical analysis was performed using Cohen’s Kappa statistic.

Results: In the period 2014-2017, agreement between diagnosis among the most ICD10 groups increased in comparison with the period 2006-2013. Disagreements between diagnosis in the period 2014-2017 in comparison with period 2006-2013 was associated with increased length of stay in the hospital (7.5 vs. 9.1 days, \( P<0.01 \)), patients were younger (54 vs 49.6 yr, \( P<0.01 \)), number of males declined (26.3\% vs 16.2\%, \( P<0.05 \)), kappa value decreased in XV ICD10 group and XI ICD10 group and kappa value increased in XIV ICD10 group.

Conclusion: Agreement between admission and discharge diagnosis among the most ICD10 diagnostic groups increased. Introduction of a new web application has increased the quality of data, but interpreting it requires the skill of researchers. Further research should identify modifiable causes of discrepancy between admission and discharge diagnoses.

Keywords: Admission diagnosis; Discharge diagnosis; Hospital databases

Introduction

Since the term health care quality was introduced in 1965, its definition has been constantly developing and changing (1). Indicators for a subjective and objective assessment of the quality of health care starting from Donabedian Avedis are continually improving. In 2002, the European

Available at:  http://ijph.tums.ac.ir
Commission launched a program called "The Health Care Quality Indicators Project" with the aim of measuring and comparing the quality of health services provided in various European countries (2-4). The International Classification of Diseases (ICD) as an standard diagnostic classification is used to translate diagnoses of diseases and other health problems from words into an alphanumeric code, which permits easy storage, retrieval and analysis of the data. The Tenth Revision of ICD (ICD-10) as a seven-character, alphanumeric code was endorsed in May 1990 by the WHO (5,6).

Admission diagnosis and discharge diagnosis were recorded as 4-digit numbers. Agreement of diagnoses is defined as the match within the ICD10 groups of the disease (4-digit numbers). In Serbia, until 2014, every institute for public health entered their reports of hospitalization for stationary health institutions from the territories for which it was responsible into the access database. The Public Health Institute of Serbia would merge all access databases into one. Since 2014, a web application has been introduced which enables the centralized collection of data of stationary patients in the health system of the Republic of Serbia, which increases the accuracy of the data, and the data are obtained in a simple, easy and fast manner (7).

Clinical Center of Kragujevac, as one of four clinical centers in Serbia, conducts a highly specialized, consultative and stationary healthcare activity. In this health care institution of tertiary level, the most serious patients are from the territory of Central and Western Serbia, where more than 2 million inhabitants live. In this Clinical Center, more than 60,000 hospitalizations are performed annually and more than 430,000 hospital days are performed, over 7,500 operations are done together with 2,500 births. Clinical Center of Kragujevac is also a medical science research center and a teaching base of the Faculty of Medical Sciences of the University of Kragujevac for undergraduate and postgraduate academic education and professional education for doctors on internships and specialization, as well as an educational base for students of the Faculty of Medical Sciences (8).

The aim of this study was to do comparative analysis of the agreement between the admission diagnosis and the discharge diagnosis in the period 2014-2017. with the period 2006-2013. in Central Serbia based on the Hospitalization Report.

Materials and Methods

The research was designed as a retrospective cohort study in which the basic set consists of all hospital reports for patients from Clinical Centre of Kragujevac, Serbia who were hospitalized in the period from 01.01. 2014 - 31.12. 2017.

Institute of Public Health Kragujevac, as a reference institution, has a database of hospital reports data from Clinical Centre of Kragujevac. Research hospital databases is the obligation of the employees at the Institute for public health, so when it does not contain patient Identification data Ethics approval is not required

From the basic set, we isolated a representative subset in the form of a 5% simple, random sample without repetition, which contained 10228 hospital reports. The complete reports with the admission diagnosis and discharge diagnosis were analyzed, n=9555.

We analyzed dual agreement. First, we performed the analysis of the admission diagnosis with discharge diagnosis and then the agreement of the basic cause of the disease with admission diagnosis. As a "golden standard", a discharge diagnosis was used. To test the robustness of our definition of discrepancy between admitting and discharge diagnoses, we created a second variable that compared the admitting diagnosis ICD10 group with the ICD10 group discharge diagnosis.

If the admitting diagnosis code did not match with ICD10 group discharge diagnosis codes, the diagnosis codes were classified as discrepant. Then, the discrepancy between diagnoses in each ICD10 group in period 2014-2017 was compared with discrepancy in period 2006-2013.

We described continuous variables as the mean ± standard deviation. Comparison between each
group was performed using an independent t-test or a Mann-Whitney U test, as appropriate. We described categorical variables as numbers and percentages, and between-group comparisons were performed using a chi-square test. Analysis of the agreement of diagnoses by IDC10 groups was performed by using Cohen’s Kappa statistics. SPSS 19.0 software (SPSS Inc., Chicago, IL, USA) was used in this study for statistical analysis.

The use of hospital databases without patient identification data by the researchers from the Institute of Public Health does not require the Ethics approval.

Results

Out of a total number of 10,228 hospitalization reports, the admission diagnosis was missing in 673 reports (6.6%). By analyzing the complete reports with the admission diagnosis, 9,555, it was noted that in 17.4% of cases, there was a disagreement of the ICD10 diagnostic groups on admission with diagnostic groups on discharge. Hospitalization reports with the discrepancy between admission and discharge diagnoses had statistically significantly higher LOS, the patients were older, more often females during the period 2006-2013. It was similar during the period 2014-2017, except for the age, where the patients with the discrepancy between diagnoses were younger (Table 1).

In the period of 2014-2017, the most consistent agreement of the admission diagnosis and discharge diagnosis was noted in Certain infectious and parasitic diseases (kappa=0.84, 95%CI=0.79-0.89) and Neoplasms (kappa = 0.83, 95%CI=0.81-0.85). A more detailed analysis showed that in 45.6% of these reports, the admission diagnosis was Supervision of other high-risk pregnancies (Z35.8) and Supervision of high-risk pregnancy (Z35.9), and discharge Single spontaneous delivery (O80) or Single delivery by C-section (082), which can not be considered a discrepancy. Similarly, kappa value increases with

Table 1: Sample Characteristics, Central Serbia, 2006-2013/2014-2017

| Variable       | 2006.-2013. yr |           | 2014. -2017. yr |           |
|----------------|----------------|-----------|----------------|-----------|
|                | Agreement      | Disagreement | P             | Agreement | Disagreement | P             |
|                | x̄ ± SD        | x̄ ± SD    |                | x̄ ± SD   | x̄ ± SD      |                |
| LOS (d ± SD)   | 7.2 ± 8.8      | 7.5 ± 7.8  | <0.01          | 6.7 ± 9   | 9.1 ± 10.5   | <0.01          |
| Age (yr ± SD)  | 47.4 ± 22.2    | 54.0 ± 21.5| <0.01          | 51.1 ± 21.9 | 49.6 ± 24.1 | <0.05          |
| Female (%)     | 7927 (81.8)    | 1758 (18.2)| <0.01          | 4116 (81.5) | 932 (18.5)   | <0.05          |
| Male (%)       | 6257 (73.7)    | 2231 (26.3)|                | 3779 (83.8) | 728 (16.2)   |                |

sd - standard deviation

Available at:  http://ijph.tums.ac.ir
By comparing the discharge diagnoses with admission diagnosis in two analyzed periods, it is noted that the value of the kappa coefficient after 2013 is increasing in the most common ICD10 groups. The exceptions are the diseases of the ear and mastoid process where the kappa coefficient value dropped from 0.6 to 0.4. Further analysis showed that every fourth hospitalization in which the discharge diagnosis was diseases of the ear and mastoid process the admission diagnosis was Certain conditions originating in the perinatal period (Table 3).

Table 2: Admission diagnostic groups of ICD10, Kappa statistics and 95% CI, Central Serbia, 2006-2013/2014-2017

| Admission diagnoses (ICD 10) | 2006 - 2013. yr | 2014 - 2017. yr |
|-----------------------------|----------------|----------------|
| n  | Agreement n (%) | Disagreement n (%) | Kappa 95% CI | n | Agreement n (%) | Disagreement n (%) | Kappa 95% CI |
|--------------------------------|----------------|----------------|
| Certain infectious and parasitic diseases | 671 | 639 (95.2) | 32 (4.8) | 0.84 | 0.81–0.87 | 257 | 238 (92.6) | 19 (7.4) | 0.84 | 0.79–0.89 |
| Neoplasms | 3426 | 3351 (97.8) | 75 (2.2) | 0.94 | 0.93–0.95 | 2424 | 2140 (88.3) | 284 (11.7) | 0.83 | 0.81–0.85 |
| Diseases of the blood and blood-forming organs | 318 | 294 (92.5) | 24 (7.5) | 0.88 | 0.84–0.92 | 309 | 278 (90) | 31 (10) | 0.78 | 0.73–0.83 |
| Endocrine, nutritional and metabolic diseases | 454 | 366 (80.6) | 88 (19.4) | 0.75 | 0.71–0.79 | 368 | 330 (89.7) | 38 (10.3) | 0.72 | 0.67–0.77 |
| Mental and behavioural disorders | 469 | 425 (90.6) | 44 (9.4) | 0.79 | 0.75–0.83 | 310 | 303 (97.7) | 7 (2.3) | 0.8 | 0.75–0.84 |
| Diseases of the nervous system | 981 | 748 (76.2) | 233 (23.8) | 0.67 | 0.64–0.70 | 499 | 431 (86.4) | 68 (13.6) | 0.77 | 0.73–0.81 |
| Diseases of the eye and adnexa | 409 | 387 (94.6) | 22 (5.4) | 0.93 | 0.85–0.99 | 213 | 208 (97.7) | 5 (2.3) | 0.3 | 0.21–0.37 |
| Diseases of the ear and mastoid process | 59 | 45 (76.3) | 14 (23.7) | 0.68 | 0.56–0.80 | 33 | 26 (78.8) | 7 (21.2) | 0.5 | 0.33–0.68 |
| Diseases of the circulatory system | 1403 | 1144 (81.5) | 259 (18.5) | 0.61 | 0.58–0.64 | 1039 | 763 (73.4) | 276 (26.6) | 0.48 | 0.45–0.51 |
| Diseases of the respiratory system | 1030 | 876 (85) | 154 (15) | 0.59 | 0.56–0.62 | 529 | 470 (88.8) | 59 (11.2) | 0.7 | 0.66–0.74 |
| Diseases of the digestive system | 1192 | 1092 (91.6) | 100 (8.4) | 0.77 | 0.75–0.79 | 614 | 537 (87.5) | 77 (12.5) | 0.62 | 0.58–0.66 |
| Diseases of the skin and subcutaneous tissue | 172 | 138 (80.2) | 34 (19.8) | 0.73 | 0.67–0.79 | 122 | 98 (80.3) | 24 (19.7) | 0.71 | 0.63–0.8 |
| Diseases of the musculoskeletal system and connective tissue | 449 | 414 (92.2) | 35 (7.8) | 0.72 | 0.68–0.76 | 294 | 249 (84.7) | 45 (15.3) | 0.68 | 0.62–0.73 |
| Diseases of the genitourinary system | 2313 | 634 (27.4) | 1679 (72.6) | 0.21 | 0.19–0.23 | 565 | 493 (87.3) | 72 (12.7) | 0.72 | 0.69–0.76 |
| Pregnancy, childbirth and the puerperium | 1696 | 1677 (98.3) | 29 (1.7) | 0.75 | 0.73–0.77 | 149 | 132 (88.6) | 17 (11.4) | 0.43 | 0.35–0.51 |
| Other subgroups of ICD10 | 3130 | 1963 (62.7) | 1167 (37.3) | 0.48 | 0.46–0.50 | 1830 | 1199 (65.5) | 631 (34.5) | 0.56 | 0.53–0.58 |

95% CI - confidence intervals

Available at: http://ijph.tums.ac.ir
Table 3: Discharge diagnoses of ICD10, Kappa statistics and 95% CI, Central Serbia, 2006-2013/2014-2017

| Admission diagnoses (ICD 10) | 2006 - 2013, yr | 2014 - 2017, yr |
|------------------------------|-----------------|-----------------|
|                              | Agreement n (%) | Disagreement n (%) | Kappa 95% CI | Agreement n (%) | Disagreement n (%) | Kappa 95% CI |
| Certain infectious and parasitic diseases | 772 | 639 (82.8) | 133 (17.2) | 0.63 | 0.59–0.67 | 281 | 238 (84.7) | 43 (15.3) | 0.77 | 0.72–0.82 |
| Neoplasms | 3602 | 3351 (93) | 251 (7) | 0.81 | 0.80–0.82 | 2270 | 2140 (94.3) | 130 (5.7) | 0.89 | 0.87–0.9 |
| Diseases of the blood and blood-forming organs | 330 | 294 (89.1) | 36 (10.9) | 0.66 | 0.61–0.71 | 301 | 278 (92.4) | 23 (7.6) | 0.81 | 0.76–0.86 |
| Endocrine, nutritional and metabolic diseases | 457 | 366 (80.1) | 92 (19.9) | 0.55 | 0.51–0.59 | 361 | 330 (91.4) | 31 (8.6) | 0.73 | 0.68–0.78 |
| Mental and behavioural disorders | 464 | 425 (91.6) | 39 (8.4) | 0.7 | 0.66–0.74 | 317 | 303 (95.6) | 14 (4.4) | 0.78 | 0.73–0.83 |
| Diseases of the nervous system | 921 | 748 (81.2) | 173 (18.8) | 0.7 | 0.67–0.73 | 457 | 431 (94.3) | 26 (5.7) | 0.87 | 0.83–0.91 |
| Diseases of the eye and adnexa | 391 | 387 (99) | 4 (1) | 0.95 | 0.92–0.98 | 220 | 208 (94.5) | 12 (5.5) | 0.29 | 0.22–0.35 |
| Diseases of the ear and mastoid process | 82 | 45 (54.9) | 37 (45.1) | 0.6 | 0.49–0.71 | 41 | 26 (63.4) | 15 (36.6) | 0.4 | 0.25–0.55 |
| Diseases of the circulatory system | 1640 | 1144 (69.8) | 496 (30.2) | 0.38 | 0.36–0.40 | 869 | 763 (87.8) | 106 (12.2) | 0.58 | 0.55–0.62 |
| Diseases of the respiratory system | 1139 | 876 (76.9) | 263 (23.1) | 0.52 | 0.49–0.55 | 553 | 470 (85) | 83 (15) | 0.67 | 0.63–0.71 |
| Diseases of the digestive system | 1366 | 1092 (79.9) | 275 (20.1) | 0.55 | 0.53–0.57 | 671 | 537 (80) | 134 (20) | 0.57 | 0.53–0.61 |
| Diseases of the skin and subcutaneous tissue | 166 | 138 (83.1) | 28 (16.9) | 0.65 | 0.58–0.72 | 119 | 98 (82.4) | 21 (17.6) | 0.74 | 0.66–0.82 |
| Diseases of the musculoskeletal system and connective tissue | 488 | 414 (84.8) | 74 (15.2) | 0.54 | 0.50–0.58 | 272 | 249 (91.5) | 23 (8.5) | 0.73 | 0.68–0.78 |
| Diseases of the genitourinary system | 768 | 634 (82.6) | 134 (17.4) | 0.66 | 0.63–0.69 | 550 | 493 (89.6) | 57 (10.4) | 0.75 | 0.71–0.78 |
| Pregnancy, childbirth and the puerperium | 1721 | 1667 (96.9) | 54 (3.1) | 0.73 | 0.71–0.75 | 263 | 132 (50.2) | 131 (49.8) | 0.24 | 0.19–0.29 |
| Other subgroups of ICD10 | 3865 | 1967 (50.9) | 1905 (49.1) | 0.36 | 0.35–0.37 | 2010 | 1199 (59.7) | 811 (40.3) | 0.51 | 0.49–0.53 |

Discussion

The admission diagnosis code reflects the amount of information known at the time of admission but is retrospectively coded. The admission diagnosis code specificity may depend on a variety of patient and physician-related factors, and neither the quality of the information collected at admission nor the specificity of the coded information is externally regulated. The researchers use the discharge diagnosis codes to classify a patient's condition, identify comorbidities, and measure severity of illness (9). Agreement of the patient's admission diagnosis with the discharge diagnosis, which is determined at the end of hospital treatment is one of the indicators of the quality of the work of doctors in primary health care (10). Agreement of the admission and discharge diagnosis affects not only the possibility of starting the treatment on time (the initial treatment is initiated in relation to the recommended diagnosis) but the outcome of the treatment as well. Discrepancy of diagnoses can be expected in situations where the patient is hospitalized due to additional diagnostic procedures, as well as in re-

Available at: http://ijph.tums.ac.ir
hospitalizations that are caused not by the main disease, but by the associated diseases (comorbidities) (11).

Indicators for assessing the quality of health care are not synonymous with the set goals of health policy, but they are measures of scope in which the intended goals are achieved. They provide information for both comparison and monitoring, management and policy making within a given health care system (12-14). The agreement of diagnoses in the way shown in this study is a general, objective (measurable) indicator. However, in the research in which the agreement of certain diagnoses is being analyzed, or the diagnosis of certain health disorders or on certain clinics, the indicator is no longer general but specific for a given health disorder or for a given clinic (15,16).

Various factors can cause a discrepancy of the admission and discharge diagnosis: complexity of the medical problem, poor pre-hospital diagnostics, comorbidities, mistakes in the work of doctors in primary health care, coding errors (17-20).

Discrepancy of the diagnosis in admission and discharge is associated with an increase in the morbidity and mortality rate of hospitalized patients, the length of hospitalization, the rate of re-hospitalization and the total increase in treatment costs. Similarly, in a survey conducted in Israel, it has been shown that disagreement between admission diagnosis and hospital discharge diagnosis is associated with increases in morbidity and mortality (21,22).

Diagnosis discrepancy is associated with longer length of stay, which is shown not only in this study but also in a large number of studies conducted across Europe and America (23,24). A higher re-hospitalization rate can also be observed in the disagreement of diagnosis (25). All of the above can cause an increase in total costs of treatment for patients with discrepancy between admission and discharge diagnoses (26).

Guides to good clinical practice and disease registers play a major role in agreement admission and discharge diagnosis, as well as monitoring individual health disorders. Guides to good clinical practice as guidelines for the treatment of certain clinical conditions reduce the diagnosis and treatment errors and discrepancy among diagnoses (27-29). So far, 20 National Guides for Good Clinical Practice have been developed in Serbia. At the same time, registries of diseases can provide health care professionals and researchers with first-hand information about people with certain conditions, both individually and as a group, and over time, increase our understanding of that condition. Some registries collect information that can be used to track trends about the number of people with diseases, treatments, and more.

Repeated research with using the same methodology, such as this study, provides relevant conclusions in the same health care system in which there are no challenges in terms of defining, coding and interpreting results (30). The introduction of a portal for centralized data collection of stationary patients in the health system of the Republic of Serbia increased the quality of data. Thus, the lack of admission diagnosis declined from 10.7% to 6.6%. The new data entry system partially eliminated the confusion regarding the possibility of double coding of the same health disorder, which led to an increase in the agreement of the diagnoses in some ICD10 diagnostic groups. Namely, in the previous study it was shown that in 99.3% of hospital reports in whom the admission diagnosis was diseases of the genitourinary system, i.e. Renal failure (N17-N19) the Factors influencing health status and contact with health services, i.e. Care involving dialysis (Z49) was listed as the final diagnosis. In the new web application, all patients who are hospitalized due to dialysis have as discharge diagnosis Z49, and Renal failure is a follow-up diagnosis. However, the system itself requires an upgrade, and as this research showed that, we should be cautious when interpreting the noted discrepancy of the diagnoses in order for the results of the research to be relevant.

The results of the study indicate increased agreement of admission diagnosis with the discharge diagnosis among the most ICD10 groups when the period of 2014-2017 is

Available at:  http://ijph.tums.ac.ir
compared with the period 2006-2013. Disagreement diagnosis in the period 2014-2017 in comparison with period 2006-2013 was associated with increased length of stay (P<0.01), patients were younger and number of males declined. The kappa value decreased in XV group and XI ICD10 group. The kappa value increased in XIV ICD10 group as a result of introduction of a new web application which partially eliminated confusion concerning the possibility of double coding of the same health disorder. However, interpreting diagnosis results for ICD10 groups requires the knowledge and skill of researchers, given the imperfection of the system. Defining the factors which cause the discrepancy of admission and discharge diagnostic groups within ICD10 diagnostic groups can be the subject of a new research.

Conclusion

Introduction of a new web application has increased the quality of data. There are increased agreement of admission diagnosis with the discharge diagnosis among the most ICD10 groups. Further research should identify modifiable causes of discrepancy between admission and discharge diagnoses

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Acknowledgements

We did not receive any financial support for the study

Conflict of interest

The authors declare that there is no conflict of interest.

References

1. Babic M, Bjegovic Mikanovic V, Vukovic D (2012). Quality of health protection and patient safety. In: Social medicine book. Ed, S Simic. Faculty of Medicine University of Belgrade Publishing, dr Subotica 8, Belgrade, SERBIA, pp. 315-36.
2. Ayanian JZ, Markel H (2016). Donabedian's Lasting Framework for Health Care Quality. N Engl J Med, 375 (3): 205-7
3. OECD (2016). The Organisation for Economic Co-operation and Development (OECD). Definitions for health care quality indicators 2016-2017 HCQI Data Collection. http://www.oecd.org/els/health-systems/Definitions-of-Health-Care-Quality-Indicators.pdf
4. Carinci F, Van Gool K, Mainz J, et al (2015). Towards actionable international comparisons of health system performance: expert revision of the OECD framework and quality indicators. Int J Qual Health Care, 27 (2): 137-46.
5. World Health Organization (2011). International statistical classification of diseases and related health problems. 10th revision. 4th ed. Geneva: WHO Press, Switzerland.
6. Paoin W, Yuenyongsuwan M, Yokobori Y, et al (2018). Development of the ICD-10 simplified version and field test. Health Inf Manag, 47(2): 77-84.
7. Center for health informatics and biostatistics (2014). Institute of Public Health of Serbia "Dr Milan Jovanović Batut". Instructions for using a portal to form a database of stationary patients. www.batut.org.rs/download/uputstva/hospitalizacijaUputstvo03032014.pdf
8. Vlada Republike Srbije. Uredba o planu mreže zdravstvenih ustanova, Sl. glasnik RS, br. 2006-2018. https://www.paragraf.rs/propisi_download/uredba_o_planu_mreze_zdravstvenih_ustanova.pdf
9. Rattanaumpawan P, Wongkamhla T, Thamlikitkul V (2016). Accuracy of ICD-10 Coding System for Identifying Comorbidities and Infectious Conditions Using Data from a Thai University Hospital Administrative Database. J Med Assoc Thai, 99(4): 368-73.
10. Mihailović N, Trajković G, Simić-Vukomanović I, et al (2016). Agreement between admission and discharge diagnoses: analysis by the groups of International Classification of Diseases, 10th revision. Vojnosanit Pregl 73 (12): 1125-31.

11. Johnson T, McNutt R, Odwazny R, et al (2009). Discrepancy between admission and discharge diagnoses as a predictor of hospital length of stay. J Hosp Med, 4 (4): 234-9.

12. AHRQ (2016). The Agency for Healthcare Research and Quality’s (AHRQ). Databases Used for Hospital Quality Measures. Available from: www.ahrq.gov/professionals/quality-patient-safety/talkingquality/create/hospitals/databases.html

13. Boufford JI, Cassel CK, Bender KW, et al (2003). The Future of the Public’s Health in the 21st Century. Washington: The National Academies Press. Columbia.

14. Oderkirk J, Ronchi E, Klazinga N (2013). International comparisons of health system performance among OECD countries: Opportunities and data privacy protection challenges. Health Policy, 112(1-2):9-18.

15. Mihailović NM. The effect of health care utilization patterns in public and private sector on patients’ self-assessment of their health condition and satisfaction with the health care system in the Republic of Serbia [PhD thesis]. Faculty of Medical Sciences, University of Kragujevac, Kragujevac; 2017.

16. Maresso A, Mladovsky P, Thomson S, et al (2015). Economic crisis, health systems and health in Europe country experience. 1nd ed. Denmark: European Observatory on Health Systems and Policies. Copenhagen.

17. Catherine Foot C, Naylor Ch, Imison C (2010). The quality of GP diagnosis and referral. 1nd ed. UK: The King’s Fund. London.

18. Zwaan L, Singh H (2015). The challenges in defining and measuring diagnostic error. Diagnosis (Berl), 2(2): 97–103.

19. Ilgen JS, Humbert AJ, Kuhn G, et al (2012). Assessing diagnostic reasoning: a consensus statement summarizing theory, practice, and future needs. Acad Emerg Med, 19(12): 1454-61.

20. Hautz SC, Schuler L, Kämmer JE, et al (2016). Factors predicting a change in diagnosis in patients hospitalised through the emergency room: a prospective observational study. BMJ Open, 6(5): e011585.

21. Eames J, Eisenman A, Schuster RJ (2016). Disagreement between emergency department admission diagnosis and hospital discharge diagnosis: mortality and morbidity. Diagnosis (Berl), 3 (1): 23-30.

22. A Shrestha, D Zikos, L Fegaras. (2018). Seasonality of Discrepancies between Admission and Discharge Diagnosis for Medicare Patients. Technologies, 6: 111.

23. Chen D, Liu S, Tan X, Zhao Q (2017). Assessment of hospital length of stay and direct costs of type 2 diabetes in Hubei Province, China. BMC Health Serv Res, 17 (1): 199.

24. Agboado G, Peters J, Donkin L (2012). Factors influencing the length of hospital stay among patients resident in Blackpool admitted with COPD: a cross-sectional study. BMJ Open, 2 (5): e000869.

25. Hughes LD, Witham MD (2018). Causes and correlates of 30 day and 180 day readmission following discharge from a Medicine for the Elderly Rehabilitation unit. BMC Geriatr, 18 (1): 197.

26. McNutt R, Johnson T, Kane J, et al (2012). Cost and quality implications of discrepancies between admitting and discharge diagnoses. Qual Manag Health Care, 21(4):220-7.

27. Victor Sarli Issa, Layara Fernanda Lipari Dinardi, Thiago Vicente Pereira, et al (2017). Diagnostic discrepancies in clinical practice. An autopsy study in patients with heart failure. Medicine (Baltimore), 96(4): e5978.

28. Hâheim LL, Helgeland J (2014). Agreement between referral information and discharge diagnoses according to Norwegian elective treatment guidelines – a cross-sectional study. BMC Health Services Research, 14: 493.

29. Fischer C, Anema HA, Klazinga NS (2012). The validity of indicators for assessing quality of care: a review of the European literature on hospital readmission rate. Eur J Public Health, 22 (4): 484-91.

30. Nass SJ, Levit LA, Gostin LO (2009). Beyond the HIPAA Privacy Rule: Enhancing Privacy, Improving Health Through Research. 1en ed. Washington: The National Academies Press. Washington.

Available at: http://ijph.tums.ac.ir