Original Research Article

Regional inequalities of hospital morbidity and associations with mortality in Lithuania

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ABSTRACT

Background and objective: In Lithuania, hospitalization was planned to be reduced with the approval of the national healthcare restructuring program. The aim of this study was to describe regional inequalities of hospitalization and hospital morbidity in Lithuania and to associate them with mortality in the regions.

Materials and methods: Routine hospital discharge data of Lithuanian hospitals, reimbursed by the Compulsory Health Insurance Fund and registered in database SVEIDRA, was used. Age-adjusted general hospitalization and hospital morbidity rates (per 1000 population) due to cardiovascular diseases (CVD), malignant neoplasms and external causes were calculated. Contribution of diseases, causing major public health problems, to general hospitalization was evaluated by analysis of components. Association of general hospitalization or hospital morbidity and mortality of respective causes was evaluated using non-parametric Spearman correlation.

Results: General hospitalization and hospital morbidity of CVD, malignant neoplasms and external causes had increased from 2005 to 2011. Inequalities of hospitalization and hospital morbidity existed between regions of Lithuania. In Šiauliai, Klaipėda, Utena and Panevėžys regions, general hospitalization remained higher than national level. In Marijampolė, Alytus and Kaunas regions, general hospitalization became lower than Lithuanian average. There was no statistically significant correlation between variation in hospitalization and mortality rates in the regions.

Conclusions: Despite national efforts to decrease hospital care, our study detected the failure of hospitalization reduction and revealed an increase of hospitalization with the existing regional inequalities in Lithuania.

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1. Introduction

Hospital sector as a complex and most resource-consuming part of the healthcare system has always been under great interest in any country. During the Soviet occupation, Lithuania had an extensive hospital system, resulting in high hospitalization rates and ineffective organization of inpatient care resources [1]. After regaining independence, the healthcare system in Lithuania was transformed following international recommendations – the priority was given to the development of primary and ambulatory healthcare services and hospital network reduction [2].

In the past 20 years of independence, the hospital network has undergone major structural changes. Since 1990, a significant number of hospitals were closed, merged or reorganized into inpatient hospices, which resulted in overall reduction of hospital beds. The hospitals were also classified by care level. Primary level hospitals involved hospices of nursing and palliative care; secondary, multiprofile acute care or specialized hospitals of local municipalities or counties; and tertiary, university or other region-central hospitals provided with the most advanced medical technologies and high-competence professionals for treating the most severe inpatient cases. However, the relative supply of hospitals and hospital beds was still too high in Lithuania compared to other European countries [1]. Moreover, a national consensus on hospital network organization was lacking.

More active hospital network reorganization began with the implementation of the Lithuanian healthcare restructuring program, first approved by the Lithuanian Government in 2003 and implemented in 3 stages: 2003–2005 [3], 2006–2008 [4] and 2009–2011 [5]. The program was aimed to continue decreasing extensive hospital network and high hospitalization through the strategic national plan, based on hospital effectiveness and community needs.

In the first stage, this was implemented mainly by continuing institutional reorganization – hospitals, which did not meet safety and effectiveness requirements, were either merged or reorganized. In the second stage aside further institutional changes, the restructuring reform involved introducing alternative forms of inpatient care services (i.e. day surgery, day care). The third stage set a different approach of restructuring by implementing coordination of inpatient care services delivery through national reimbursement of hospitals.

Until 2009, public hospitals were reimbursed from Compulsory Health Insurance Fund, on the basis of provided healthcare services within the limits of yearly contract with sickness funds. The level of hospital was not taken into account. The third stage of restructuring brought a new regulation mechanism through financial incentives. According to the healthcare level, available resources and community needs, hospitals were classified into 3 types: republic, region, and municipality. Under this classification, acute care hospitals were contracted and reimbursed for only those services which could be provided according to their type. In this way extensive hospitalization tended to be regulated. Needless to say, structural changes of hospital network and their services might have formed prerequisites for regional inequalities of inpatient care.

In the period of healthcare restructuring program 2003–2011, the overall number of general care hospitals decreased from 72 to 66, and hospitals beds (excluding nursing and palliative care) rate (per 1000 population) decreased from 8.96 to 7.05 [6], but acute care hospital bed rate (per 1000 population) decrease was not that intense (from 5.91 to 5.42) [7].

After restructuring reform, Lithuanian regions differed by the supply of hospital care resources – the distribution of different level hospitals and hospital beds was unequal in the regions, urban and rural populations did not have the same supply of inpatient healthcare. In 2011, the acute care hospital bed (per 1000 population) rates were different in the regions: 5.83 in Vilnius region, 7.05 in Kaunas, 6.41 in Klaipėda, 4.66 in Šiauliai, 5.09 in Panevėžys, 3.98 in Alytus, 3.33 in Marijampolė, 2.89 in Tauragė, 2.90 in Telšiai, 4.59 in Utena [7]; and differed by healthcare level [6]. Historically, the highest healthcare level was concentrated in Vilnius and Kaunas regions. Each of these two regions has university hospital, together placing a few hospitals of tertiary and secondary level. Approximately 50 percent of hospital beds in those regions belong to tertiary level hospitals. As major regional centers, Klaipėda, Šiauliai and Panevėžys also has multiprofile tertiary hospitals (around 10%–20% of total hospital beds in the region) and a few secondary level acute care hospitals. The other smaller regions (Alytus, Marijampolė, Tauragė, Telšiai and Utena) contain only local secondary level hospitals.

As the healthcare restructuring program was purposed to decrease hospitalization to the level of European Union (EU) average of approximately 180 (per 1000 population), hospitalization rate (excluding cases of nursing hospices) was 247 (per 1000 population) in 2011 [7]. The national hospitalization level was not reduced to the intended level. Furthermore, with unequal hospital care supply the differences in hospitalization might exist between the regions in Lithuania. Thus elaboration of investigations of hospitalization rates and their variation is needed. Possible explanations or reasons of the situation are also under interest.

The aim of this paper was to describe regional inequalities of hospitalization and hospital morbidity in Lithuania. Additionally, the associations of hospitalization and mortality rates were assessed in order to evaluate whether higher or lower prevalence of in-patient care is correlated to population health status in the regions.

2. Materials and methods

Age-adjusted hospitalization rates (per 1000 population) of 10 Lithuanian regions were calculated. The final year of healthcare restructuring reform stages were taken into account. Routine hospital discharge data were obtained from the Compulsory Health Insurance Fund database SVEIDRA; data on deaths, from the National Registry of Death Cases and Causes; and population numbers were received from the National Department of Statistics. Inclusion criteria for hospital data were discharge cases of acute care (nursing, rehabilitation, tuberculosis and psychiatric treatment cases were excluded). For disease-specific hospital morbidity and mortality, diagnosis of discharge or cause of death (based on ICD-10) were included as follows: cardiovascular diseases (CVD) comprised code

interval of I00-I99; malignant neoplasms, C00-C97; and external causes, S00-T98. Hospitalization and mortality rates were adjusted to the European standard population using direct standardization method. A statistically significant difference of rates was evaluated with the intersection of 95% confidence intervals. Analysis of components was applied in order to assess the impact of CVD, malignant neoplasms and external causes on the general hospitalization of the regions in Lithuania. Nonparametric Spearman correlation was used to evaluate association between hospitalization or hospital morbidity and adequate mortality rates of the regions. Statistical analysis was performed with MS Excel and IBM SPSS 20 software.

3. Results

Fig. 1 represents age-adjusted hospitalization rates of acute hospital care in Lithuania in the years of 2005, 2008 and 2011. In 2005, 182.88 hospital discharge cases of acute care (1000 population) were registered, and in 2011 this number reached 216.04 ($P < 0.05$). Similar trends were observed in male and female hospitalization: a statistically significant increase was observed for both male and female populations. Male and female hospitalization increased from 174.41 to 207.47 and from 195.25 to 228.93, respectively. Throughout the entire period under investigation female hospitalization rates were higher compared to male. This difference might be determined by the fact that hospital discharge cases of pregnancy, labor or postnatal period diseases were included into general statistics and comprised approximately 7%–9% of total discharges in 2005–2011.

Age-adjusted hospitalization rates by diseases (hospital morbidity), causing the major burden in Lithuania, are depicted in Table 1. As the general hospitalization rate increased, so did hospital morbidity rates. A statistically significant increase was observed in the hospital morbidity rates due to cardiovascular diseases (from 36.57 to 41.67), malignant neoplasms (from 10.53 to 12.66) and external causes (from 16.93 to 17.27) in 2005–2011.
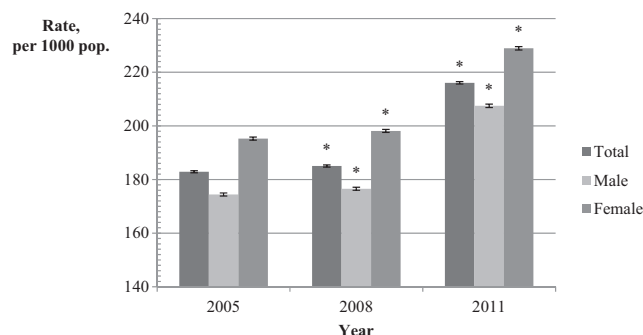

Fig. 1 – General hospitalization (with 95% confidence intervals) in Lithuania *P < 0.05, compared to the year 2005.

A statistically significant increase in the rates of hospital morbidity due to CVD and malignant neoplasms was found both in male and female populations (Table 1). In 2008, there was a statistically significant decrease in both male and female hospital morbidity due to external causes. However in 2011, the rates reached the previous level of 2005.

The impact of hospital morbidity due to particular diseases on the general hospitalization rate was evaluated (Table 1). In the structure of hospitalization, the impact of CVD and external causes was found to be decreasing. The impact of malignant neoplasms remained steady. In total, hospital morbidity of cardiovascular diseases, malignant neoplasms and external causes comprised around one third of all hospitalizations: 35.02% in 2005, 34.51% in 2008 and 33.14% in 2011. Similar trends of the impact of hospital morbidity on overall hospitalization were observed in both male and female populations. Total impact of CVD, malignant neoplasms and external causes in males exceeded 40% in every accounting year (44.02% in 2005, 43.70% in 2008, 41.42% in 2011), while in females it was less than 30% (27.54% in 2005, 26.93% in 2008, 26.17% in 2011).

Table 1 – Hospital morbidity (1000 population) rates by disease group and sex with 95% confidence interval (CI) in Lithuania and impact to general hospitalization rate.

Disease group	Rate (95% CI)			Impact to general hospitalization rate, %		
	Year			Year		
	2005	2008	2011	2005	2008	2011
Cardiovascular diseases						
Male	40.70 (40.40;41.00)	40.51 (40.21;40.81)	46.91 (46.60;47.23)	23.34	22.95	22.61
Female	33.36 (33.14;33.58)	33.17 (32.95;33.39)	37.48 (37.26;37.71)	17.09	16.74	16.37
Total	36.57 (36.39;36.75)	36.32 (36.15;36.50)	41.67 (41.48;41.85)	20.00	19.63	19.29
Malignant neoplasmsm						
Male	12.95 (12.78;13.13)	15.06 (14.87;15.25)	15.88 (15.69;16.08)	7.43	8.53	7.65
Female	9.32 (9.19;9.45)	9.80 (9.67;9.94)	10.90 (10.76;11.05)	4.77	4.95	4.76
Total	10.53 (10.43;10.63)	11.66 (11.55;11.77)	12.66 (12.54;12.77)	5.76	6.30	5.86
External causes						
Male	23.11 (22.87;23.34)	21.57 (21.34;21.80)	23.16 (22.91;23.40)	13.25	12.22	11.16
Female	11.09 (10.94;11.24)	10.39 (10.24;10.54)	11.53 (11.37;11.70)	5.68	5.24	5.04
Total	16.93 (16.80;17.07)	15.87 (15.73;16.00)	17.27 (17.13;17.42)	9.26	8.58	7.99

Table 2 – General hospitalization (1000 population) rates with 95% confidence interval (CI) in Lithuanian regions.

Region	Rate (95% CI) Year		
	2005	2008	2011
Vilnius	**155.02**[*] (154.27;155.76)	**163.03**[*] (162.28;163.79)	**199.11**[*] (198.28;199.94)
Kaunas	186.61[*] (185.72;187.49)	185.11 (184.23;186.00)	**212.05**[*] (211.06;213.04)
Klaipėda	204.86[*] (203.61;206.10)	210.31[*] (209.05;211.57)	239.96[*] (238.56;241.36)
Šiauliai	201.36[*] (200.07;202.66)	207.22[*] (205.89;208.55)	244.01[*] (242.47;245.54)
Panevėžys	193.87[*] (192.49;195.25)	194.75[*] (193.36;196.15)	223.90 (222.31;225.48)
Alytus	191.86[*] (190.10;193.62)	185.27 (183.51;187.03)	**206.54**[*] (204.55;208.54)
Marijampolė	186.19[*] (184.47;187.90)	**177.87**[*] (176.17;179.57)	**197.69**[*] (195.81;199.57)
Tauragė	**178.44**[*] (176.41;180.47)	**175.27** (173.23;177.31)	**214.05** (211.63;216.46)
Telšiai	184.45 (182.68;186.23)	**182.93** (181.15;184.71)	**212.79** (210.77;214.80)
Utena	185.83[*] (184.07;187.59)	192.56[*] (190.77;194.36)	226.84[*] (224.74;228.93)
Lithuania	182.88 (182.48;183.27)	185.04 (184.64;185.44)	216.04 (215.59;216.49)

Values in bold indicate lower than the national level.
[*] $P < 0.05$, compare to the level of Lithuania in the accounting year.

Table 2 demonstrates general hospitalization rates of 10 administrative regions. In 2005, 7 regions had statistically significantly higher hospitalization compare to the level of Lithuania – namely Klaipėda, Šiauliai, Panevėžys, Alytus, Kaunas, Marijampolė and Utena regions. In Vilnius and Tauragė regions hospitalization was statistically significantly lower than the national level, and in Telšiai region it did not differ statistically significantly.

In 2008, general hospitalization rates were statistically significantly higher compare to the level of Lithuania in 4 regions: Klaipėda, Šiauliai, Panevėžys and Utena (Table 2). In Vilnius and Tauragė regions general hospitalization remained statistically significantly lower than the national level. Marijampolė region statistically significantly changed general hospitalization level position from being higher than the national level to lower than the national level. General hospitalization rates in Alytus, Kaunas and Telšiai regions did not differ from the Lithuanian rate ($P > 0.05$).

In 2011, 4 regions, having higher hospitalization rates than at the national level, remained to be the same: Šiauliai, Klaipėda, Utena and Panevėžys ($P < 0.05$). The hospitalization rate in Tauragė did not differ statistically significantly, while the rest regions (Marijampolė, Vilnius, Alytus, Kaunas, and Telšiai) had statistically significantly lower rates (Table 2).

The results of the study revealed that in every year most of regions had higher hospitalization rates than the nationally planned level of 180 per 1000 population. As the actual national hospitalization level increased in 2005–2011, one of the objectives was to summarize regional variation of hospitalization changes. Fig. 2 represents rate ratios of actual general hospitalization compare to the intended level in different regions. In context of overall increase of hospitalization, Šiauliai, Klaipėda, Panevėžys and Utena regions had considerably higher prevalence of hospital admissions compare to the national and other regions' average. In Tauragė and Telšiai regions, hospitalization remained close to the national level of the accounting year. Throughout the entire period of investigation, Vilnius had significantly lower than national average general hospitalization (in 2005 and 2008 hospitalization was even lower than 180 per 1000 population). In Marijampolė, Alytus and Kaunas regions, hospitalization was higher than national level in 2005; however, the situation became statistically significantly opposite in 2011 and hospital admissions were less prevalent compared to the Lithuanian average.

Table 3 represents regional differences in hospital morbidity of CVD. Comparing regional hospital morbidity to the national CVD hospital morbidity level, the regions could be divided into 3 groups: statistically significantly higher, statistically significantly lower and statistically significantly indifferent or variable. Statistically significantly higher CVD hospital morbidity rates compared to the national level were reported in Utena, Marijampolė, Panevėžys and Kaunas regions; statistically significantly lower – in Telšiai, Tauragė and Vilnius regions. Other regions (Klaipėda, Šiauliai and Alytus) were either not statistically significantly different or unstable in the trend.
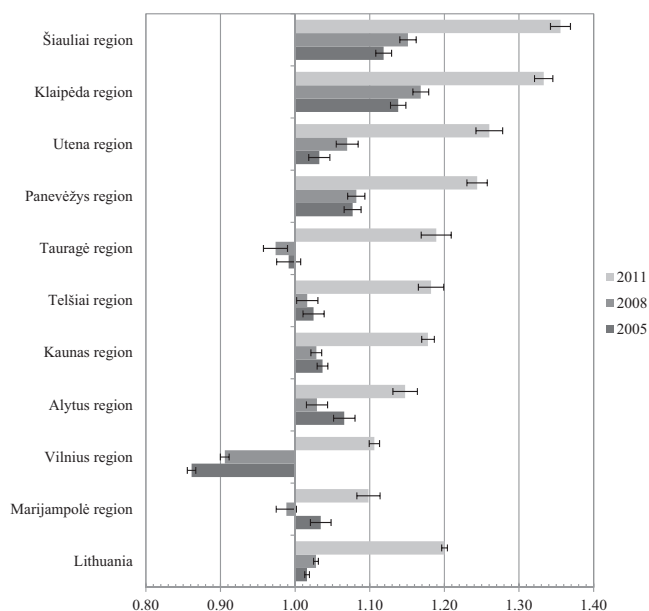

Fig. 2 – Rate ratios (with 95% confidence intervals) of actual general hospitalization in the accounting year compare to the nationally planned level (planned hospitalization of 180/1000 population = 1).

Table 3 – Hospital morbidity of cardiovascular diseases (1000 population) with 95% confidence interval (CI) and impact to the general hospitalization rate in Lithuanian regions.

Region	Rate (95% CI)			Impact to general hospitalization rate, %		
	Year			Year		
	2005	2008	2011	2005	2008	2011
Vilnius	**33.11**[*] (32.76;33.46)	**33.15**[*] (32.81;33.49)	**40.24**[*] (39.88;40.60)	21.36	20.33	20.21
Kaunas	37.71[*] (37.30;38.12)	37.18[*] (36.78;37.57)	42.23 (41.81;42.66)	20.21	20.09	19.92
Klaipėda	**36.22** (35.68;36.76)	36.50 (35.97;37.03)	41.25 (40.70;41.80)	**17.68**	**17.36**	**17.19**
Šiauliai	**36.20** (35.65;36.75)	**35.97** (35.43;36.52)	39.05[*] (38.48;39.61)	**17.98**	**17.36**	**16.00**
Panevėžys	40.39[*] (39.77;41.02)	39.01[*] (38.40;39.61)	43.60[*] (42.97;44.23)	20.83	20.03	19.47
Alytus	41.06[*] (40.25;41.87)	38.95[*] (38.17;39.73)	**40.63**[*] (39.84;41.42)	21.40	21.02	19.67
Marijampolė	41.67[*] (40.85;42.48)	40.90[*] (40.10;41.70)	45.58[*] (44.76;46.41)	22.38	22.99	23.06
Tauragė	**31.82**[*] (30.95;32.69)	**30.75**[*] (29.90;31.60)	**38.14**[*] (37.21;39.08)	**17.83**	**17.54**	**17.82**
Telšiai	**30.29**[*] (29.55;31.04)	**30.28**[*] (29.54;31.01)	37.82[*] (37.01;38.62)	**16.42**	**16.55**	**17.77**
Utena	41.06[*] (40.27;41.85)	45.10[*] (44.28;45.91)	50.92[*] (50.07;51.77)	22.10	23.42	22.45
Lithuania	36.57 (36.39;36.75)	36.32 (36.15;36.50)	41.67 (41.48;41.85)	20.00	19.63	19.29

Values in bold indicate lower than the national level.
[*] P < 0.05, compare to the level of Lithuania in the accounting year.

The strongest impact of CVD on general hospitalization rates was detected in Marijampolė (22.38%–23.06%) and Utena (22.10%–23.42%) regions; the weakest impact, in Telšiai, Šiauliai, Klaipėda and Tauragė regions.

As the same grouping was applied in classifying regions by their hospital morbidity due to malignant neoplasms, the highest rates were noted in Klaipėda and Panevėžys regions; the lowest, in Vilnius region (Table 4). The rest had no statistically significant or constant variation pattern.

Of 10 regions of Lithuania, the weakest impact of malignant neoplasms was found to be in Utena region, as well in Kaunas and Šiauliai regions; the strongest impact, in Panevėžys region.

In cases of external causes, Šiauliai and Utena regions had the highest hospital morbidity, the lowest was reported in Vilnius, Kaunas and Marijampolė regions (Table 5). Klaipėda, Panevėžys, Alytus, Tauragė and Telšiai had no statistically significant or constant variation pattern.

Marijampolė, Klaipėda and Kaunas regions were the ones, having the weakest impact of external causes in the structure of hospitalization causes. Tauragė and Telšiai were noted by their evident decline in impact of external causes.

When looking for possible explanations of regional hospitalization variability, it was hypothesized that lower or higher hospitalization might be associated with better or worse population health in those regions. We decided to prove this hypothesis by associating hospitalization (or hospital morbidity) and the adequate mortality (as an indicator of population health) of the accounting year. Correlation coefficients of general hospitalization or disease-specific hospital morbidity and adequate mortality indicators are presented in Table 6.

Table 4 – Hospital morbidity of malignant neoplasms (1000 population) with 95% confidence interval (CI) and impact to the general hospitalization rate in Lithuanian regions.

Region	Rate (95% CI)			Impact to general hospitalization rate, %		
	Year			Year		
	2005	2008	2011	2005	2008	2011
Vilnius	**7.95**[*] (7.77;8.13)	**10.44**[*] (10.24;10.65)	**12.06**[*] (11.84;12.28)	**5.13**	6.40	6.06
Kaunas	10.97[*] (10.73;11.20)	10.73[*] (10.50;10.96)	10.94[*] (10.70;11.17)	5.88	**5.80**	**5.16**
Klaipėda	11.21[*] (10.89;11.53)	14.16[*] (13.80;14.52)	15.58[*] (15.21;15.96)	**5.47**	6.73	6.49
Šiauliai	12.10[*] (11.76;12.44)	12.25[*] (11.90;12.60)	12.73 (12.37;13.09)	6.01	**5.91**	**5.22**
Panevėžys	13.53[*] (13.13;13.92)	14.37[*] (13.96;14.78)	15.15[*] (14.72;15.57)	6.98	7.38	6.77
Alytus	11.31[*] (10.85;11.76)	11.72 (11.25;12.19)	12.73 (12.24;13.23)	5.89	6.33	6.16
Marijampolė	10.90 (10.45;11.36)	**11.21** (10.74;11.68)	**11.30**[*] (10.83;11.77)	5.85	6.30	**5.72**
Tauragė	11.07 (10.52;11.62)	**11.42** (10.86;11.98)	12.66 (12.05;13.27)	6.20	6.52	5.91
Telšiai	11.22[*] (10.73;11.70)	**11.38** (10.89;11.86)	12.82 (12.30;13.34)	6.08	**6.22**	6.02
Utena	**9.40**[*] (8.98;9.81)	**11.24** (10.78;11.70)	**12.40** (11.91;12.89)	**5.06**	**5.84**	**5.47**
Lithuania	10.53 (10.43;10.63)	11.66 (11.55;11.77)	12.66 (12.54;12.77)	5.76	6.30	5.86

Values in bold indicate lower than the national level.
[*] P < 0.05, compare to the level of Lithuania in the accounting year.

Table 5 – Hospital morbidity of external causes (1000 population) with 95% confidence interval (CI) and impact to the general hospitalization rate in Lithuanian regions.

Region	Rate (95% CI)			Impact to general hospitalization rate, %		
	Year			Year		
	2005	2008	2011	2005	2008	2011
Vilnius	**14.68**[*] (14.42;14.94)	**14.45**[*] (14.20;14.71)	**16.55**[*] (16.27;16.83)	9.47	8.86	8.31
Kaunas	**14.73**[*] (14.44;15.01)	**15.39**[*] (15.10;15.68)	**16.00**[*] (15.69;16.31)	7.89	8.31	7.55
Klaipėda	17.54[*] (17.12;17.96)	**14.63**[*] (14.24;15.02)	17.31 (16.87;17.75)	8.56	6.96	7.21
Šiauliai	22.78[*] (22.28;23.27)	22.30 (21.80;22.80)	24.54 (23.98;25.11)	11.31	10.76	10.06
Panevėžys	17.35 (16.88;17.83)	16.48[*] (16.01;16.95)	18.08[*] (17.55;18.60)	8.95	8.46	8.08
Alytus	**16.64** (16.04;17.24)	**14.69**[*] (14.12;15.26)	**16.50** (15.86;17.14)	8.67	7.93	7.99
Marijampolė	**13.63**[*] (13.10;14.17)	**12.55**[*] (12.03;13.06)	**12.51**[*] (11.97;13.05)	7.32	7.06	6.33
Tauragė	20.80[*] (20.01;21.58)	16.22 (15.52;16.93)	**15.30**[*] (14.57;16.02)	11.66	9.25	7.15
Telšiai	21.00[*] (20.32;21.67)	16.73[*] (16.12;17.33)	**16.89** (16.25;17.54)	11.39	9.15	7.94
Utena	20.17[*] (19.51;20.83)	18.37[*] (17.73;19.01)	18.43[*] (17.74;19.12)	10.85	9.54	8.12
Lithuania	16.93 (16.80;17.07)	15.87 (15.73;16.00)	17.27 (17.13;17.42)	9.26	8.58	7.99

Values in bold indicate lower than the national level.
[*] $P < 0.05$, compare to the level of Lithuania in the accounting year.

Moderately strong correlation was observed between general hospitalization and mortality. In 2005, this association was indirect and in 2011 it became direct. In other words, at the beginning of healthcare restructuring program higher hospitalization was correlated with lower mortality, while at the end of the program higher hospitalization was correlated with higher mortality. This result allows us to assume that in the process of hospital restructuring, regional differences of hospitalization became reasoned more by community health needs. However, no reasonable trends were found in correlating disease-specific hospitalization and mortality rates. Also, it is noteworthy that no statistical significance of correlation was found, possibly due to minimal amount of measurements (only 10 regions were taken into account).

4. Discussion

One of the main purposes of the healthcare restructuring program was to reduce hospitalization to the average European level. Hospitalization and hospital morbidity in Lithuania remained higher than the EU average, Baltic and other neighboring states. In 2011, the Lithuanian acute care hospital discharge rate (per 1000 population) was 224.6, while the EU average rate was 158.5, 154 in Latvia, 158.1 in Estonia, 158.6 in Poland, 170.5 in Finland, 155.1 in Sweden [8]. Despite the national efforts to decrease hospital care, our study

Table 6 – Correlation coefficients of regional hospitalization and mortality rates.

Year	Spearman correlation coefficient			
	General	Cardiovascular diseases	Malignant neoplasms	External causes
2005	−0.41	0.01	0.45	−0.01
2008	−0.19	0.30	−0.12	0.24
2011	0.50	−0.12	0.02	−0.21

confirmed the failure of hospitalization reduction and even revealed an increase of hospitalization in Lithuania.

Differences in hospitalization and hospital morbidity exist among the administrative regions of Lithuania. In 2005, 8 out of 10 Lithuanian regions had higher general hospitalization as compared to the national level. In the process of healthcare restructuring, the situation had changed. Despite the overall increase in hospitalization, hospitalization was reduced to the level lower than the national average in several regions (Marijampolė, Alytus and Kaunas). Šiauliai and Utena regions brought great concern – having hospitalization considerably higher compared to the national average, general hospitalization was found to be increasing throughout the period of investigation. Klaipėda and Panevėžys regions, having an unfavorable situation at the beginning, achieved the decline in hospitalization.

There might be several reasons for this situation. The extent of hospital care was intended to be regulated by developing ambulatory healthcare services and social sector. As the healthcare restructuring continued, the alternative sector did not develop adequately in parallel [9–11]. Possibly the problems of ambulatory healthcare accessibility or weakness of social sector development might have been solved by admitting socially disadvantaged patients to the hospital. Although this kind of situation is highly discussed in Lithuania, no solid evidence is made available. Managerial and organizational issues of hospital admission process might play an important role too. However, further research should be undertaken in order to relate these possible explanations to regional hospitalization variation.

Our hypothesis that higher or lower hospitalization might be explained by health status of the population in the regions was not proved. Regarding general hospitalization, correlation changed from indirect in 2005 to direct in 2011, demonstrating that greater general hospitalization was recorded in those regions with a higher mortality level in 2011. This could allow to assume that in the process of healthcare restructuring, hospital admission became based more on the healthcare demand. No statistical significance was detected though. We

also have not succeeded to find associations between hospital morbidity and adequate disease-specific mortality rates. Similar outcomes were found in several studies, performed in the United States [12], the Netherlands [13] and Austria [14], which state that variations of small-area population-based hospitalization rates for specific diagnoses is best explained by clinical decision making and non-health factors such as supply of in-patient resources (i.e. hospital beds, in-patient departments) rather than morbidity or other healthcare demand indicating factors. These studies have shown that when relatively more in-patient care resources are available, physicians tend to admit proportionately more highly variable conditions – those conditions for which hospitalization rates are substantially uncorrelated with morbidity [12]. Other authors associate regional variability of hospital morbidity with an income level [15–17] and access to primary care [15,17]. Hospitalization tends to be higher in the regions with lower income or poorer accessibility to primary health care (in terms of primary care physicians or centers prevalence). These explanations could be valid in Utena region, as general hospitalization in this region was found to be higher than the national average and increasing throughout the period of investigation, particularly having in notion that the acute care hospital bed rate in Utena region is higher compare to other similar regions. Also, the highest unemployment 23.8% was in Utena region, followed by 20.6% in Panevėžys and 19.3% in Telšiai regions in 2011 [18]. However, further research is needed in order to avoid speculations and check if these patterns are valid in Lithuania.

Several limitations might be relevant to the results of this study. Hospital discharge data of SVEIDRA are collected for administrative purposes rather than explicitly for epidemiological studies and is dependent on the accuracy of reporting and coding. In 2011, a new hospital discharge recording system was implemented in Lithuania [19]. The quality of coding was not assessed and taken into account in this study. Also, some cases of discharge lacked information about the patient's age or region of residence. Those cases were excluded in the process of standardization. Moreover, in Lithuania day cases are accounted as in-patient cases and included into the hospital discharge register. Throughout the period of healthcare restructuring program, day care development was encouraged and the proportion of day cases in the overall structure of hospital discharge cases increased from 3.15% in 2005 to 8.68% in 2011 [7]. This fact might have been significant in increase of hospitalization.

5.   Conclusions

With this study we intended to assess if hospitalization was reduced in the process of healthcare restructuring program. The results revealed that the objective of hospitalization reduction was not achieved. On the contrary, an increase in hospitalization with significant inequalities within the country was detected. The variation of hospitalization or hospital morbidity did not correlate with the variation of mortality in population. Possibly other factors could be influential to the exiting regional inequalities. Further research is needed in finding explainable patterns of those

differences. However, we expect that this snapshot of hospitalization inequalities in the regions will be helpful for healthcare professionals in tailoring future healthcare restructuring actions. Hopefully, inequalities of hospitalization will level off in the process of further development of hospital care reforms in the country.

Conflict of interest

The authors state no conflict of interest.

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