Original article

Hospitalizations for primary care-sensitive conditions in a Southern Brazilian municipality☆

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ABSTRACT

Objective: To study the most frequent causes of hospitalizations for primary care-sensitive conditions (HPCSC) in the city of Juiz de Fora, Brazil, by age group and gender, over the periods of 2002 to 2005 and of 2006 to 2009.

Methods: This was a descriptive study, with data collected from the Hospital Information System of the Unified Health System (Sistema de Informação Hospitalar do Sistema Único de Saúde - SIH-SUS) and from population projections by the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística – IBGE). HPCSC rates were calculated for 1,000 inhabitants, and the most frequent causes were studied by gender and age group, comparing both periods.

Results: HPCSP showed rates of 7.74/1,000 between 2002 and 2005 and 8.81/1,000 between 2006 and 2009. The main causes were heart failure, cerebrovascular diseases, angina pectoris, pulmonary diseases, and kidney and urinary tract infections, which together represented 4.9/1,000 in the first period and 5.6/1,000 in the second period. The evolution of the rates between both periods occurred differently by age group and gender.

Conclusion: The study did not exhibit any remarkable differences in HPCSC rates between the periods. Regarding the most frequent causes, reduced hospitalization rates for gastroenteritis, asthma, high blood pressure, and cerebrovascular diseases were observed, as well as increased hospitalizations for heart failure, pulmonary diseases, epilepsies, and kidney and urinary tract infections; these hospitalizations occurred differently by gender and age group. The results showed that a deep reflection regarding the determinants of hospitalizations for avoidable causes is needed.

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Internações por condições sensíveis à atenção primária em município do sudeste do Brasil

R E S U M O

Palavras-chave:
Atenção primária à saúde
Internações por condições sensíveis
à atenção primária
Sistema de Informação Hospitalar
do Sistema Único de Saúde
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Objetivo: Analisar as causas mais frequentes de internações por condições sensíveis à atenção primária (ICSAP) em Juiz de Fora, MG, Brasil, por faixa etária e sexo, nos períodos de 2002 a 2005 e 2006 a 2009.

Métodos: Trata-se de um estudo descritivo a partir dos dados provenientes do Sistema de Informação Hospitalar do Sistema Único de Saúde (SIH-SUS) e das projeções populacionais do Instituto Brasileiro de Geografia e Estatística (IBGE). As taxas de ICSAP foram calculadas para mil habitantes e as causas mais frequentes analisadas por sexo e faixa etária, comparando-se os dois períodos.

Resultados: As internações por condições sensíveis à atenção primária em Juiz de Fora apresentaram taxas de 7,74/mil hab. no período entre 2002 e 2005 e 8,81/mil hab. entre 2006 e 2009. As principais causas foram insuficiência cardíaca, doenças cerebrovasculares, angina pectoris, doenças pulmonares e infecções de rins e trato urinário que, em conjunto, representaram 4,9/mil hab. no primeiro período e 5,6/mil hab. no segundo período. A evolução das taxas entre os dois períodos ocorreu de forma distinta por faixa etária e sexo.

Conclusão: O estudo não revelou diferença expressiva na taxa de ICSAP entre os dois períodos. Quanto às causas mais frequentes, foi verificada diminuição das taxas de internações por gastroenterites, asma, hipertensão e doenças cerebrovasculares e incremento das internações por insuficiência cardíaca, doenças pulmonares, epilepsias e infecções de rins e trato urinário que ocorreram de forma distinta por sexo e faixa etária. Os resultados evidenciam a necessidade de se aprofundar a reflexão sobre os determinantes das hospitalizações por causas evitáveis.

Introduction

In several countries, causes of hospitalization have been used as a measurement of primary health care (PHC) effectiveness. The concept of outpatient care-sensitive health conditions originated in the early 1990's in the United States,[1] and has been used as a marker of quality and availability of primary health care, as a tool to evaluate the impact of primary care services, and a method to compare the care received by users having health insurance or not. Canadian and European reports have also shown concern regarding the elaboration and validation of a health condition list for which effective measures at the primary care level would reduce hospitalization risks.[1-7]

Since 2001, the first lists of outpatient care-sensitive conditions have emerged in the literature in Brazil from the states of Ceará[8] and Minas Gerais,[9] as well as from the city of Curitiba;[10] these lists, along with international experience, supported the elaboration of the indicator "hospitalizations for primary care-sensitive conditions" (HPCSC), which represents a set of health conditions whose hospitalization could be prevented through a timely and effective primary care action.[11]

Currently, several studies have studied the factors associated with avoidable risk of hospitalization, by evaluating the effects of the primary health care model and, in Brazil, the effects of the Family Health Care Strategy (Estratégia Saúde da Família – ESF).[12-14]

Recently, the number of articles demonstrates the increasing interest in using the HPCSC worldwide, even though denominations and condition lists may be different due to the individual characteristics of the current health policies in different countries.[15] As observed by Moura, in 2010, the researchers' efforts have mainly focused on studies using the group of primary care-sensitive conditions to evaluate the effectiveness, quality, and availability of health care services, but there is still a deficit of studies identifying the diagnoses most often recorded as causes of hospitalization.[16]

This study aims to identify the main causes of HPCSC in the municipality of Juiz de Fora by age group and gender over two periods: 2002 to 2005 and 2006 to 2009. It will contribute to deepen the analysis and reflection on the most frequent causes for potentially avoidable hospitalizations, and will guide the definition of priority interventions in primary care by controlling their determinants.

Methods

This was a descriptive study of the main causes for HPCSC, with the municipality of Juiz de Fora, MG, Brazil, as the study unit. Data regarding hospitalizations were collected from the Hospital Information System of the Unified Health System (Sistema de Informação Hospitalar do Sistema Único de Saúde – SIH-SUS); the basic tool was the hospitalization authorization form (autorização de internação hospitalar –

Table 1 – Most frequent causes of hospitalizations for primary care-sensitive conditions in the municipality of Juiz de Fora, MG, Brazil.

2002 to 2005		2006 to 2009	
HPCSC	Rates	HPCSC	Rates
Heart failure	1.38	Heart failure	1.93
Cerebrovascular diseases	1.20	Cerebrovascular diseases	1.11
Angina pectoris	1.06	Angina pectoris	1.06
Pulmonary diseases	0.73	Pulmonary diseases	0.81
Kidney or urinary tract infections	0.52	Kidney or urinary tract infections	0.69
Gastroenteritis	0.43	Epilepsies	0.51
Diabetes mellitus	0.36	Diabetes mellitus	0.49
Epilepsies	0.35	Gastroenteritis	0.37
Cutaneous tissue infection	0.29	Inflammatory diseases in female pelvic organs	0.30
Asthma	0.28	Cutaneous tissue infection	0.30
High blood pressure	0.25	Kwashiorkor and malnutrition	0.22
Inflammatory diseases in female pelvic organs	0.22	High blood pressure	0.20
Kwashiorkor and malnutrition	0.21	Asthma	0.19
Bacterial pneumonia	0.18	Bacterial pneumonia	0.19
Pulmonary tuberculosis	0.14	Pulmonary tuberculosis	0.19
Iron-deficiency anemia	0.05	Prenatal- or delivery-related disease	0.15
Prenatal- or delivery-related disease	0.04	Iron-deficiency anemia	0.05
Other	0.04	Other	0.04

HPCSC, hospitalizations for primary care-sensitive conditions.

AIH), demonstrating elevated rates of hospitalization coverage in Brazil.[17-19] Data were collected from the period of 2002 to 2009, which was subdivided into two periods, 2002-2005 and 2006-2009, to compare between both periods. The causes of HPCSC were defined based on the Brazilian list for classifying causes of hospitalization and conditions.[20] An algorithm using the STATA software was elaborated to identify HPCSC in the scope of research. The five most frequently observed conditions in hospitalizations were categorized by gender and age group (age 0 to 9 years, 10 to 24 years, 25 to 39 years, 40 to 59 years, and ≥ 60 years), in accordance with the study periods. AIHs with long hospitalizations and those regarding Chapter XV (prenatal care and delivery) of the International Classification of Diseases, 10th edition (ICD-10) were excluded.

Hospitalization rates were defined as the ratio between the number of hospitalizations for primary care-sensitive conditions and the population at risk, in accordance with the age group, gender, and period per 1,000 inhabitants, based on population projections of the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística – IBGE).[21]

This study is part of a project entitled "Integrated use of the database in health evaluation" by the Advisement, Training, and Health Study Nucleus of the Federal University of Juiz de Fora (NATES-UFJF), approved by the ethics committee under the opinion number 220/2008, and conducted with the funding support of FAPEMIG (CDS-APQ-01087-08).

Results

Overall, the hospitalizations through the Unified Health System (SUS) in Juiz de Fora were 101,423 from 2002 to 2005 and 126,775 from 2006 to 2009, indicating increased rates from 52.36 to 61.14/1,000. HPCSC rates corresponded to 7.74/1,000 in the first period and 8.81/1,000 in the second period.

The most frequent causes of HPCSC in Juiz de Fora were heart failure, followed by cerebrovascular diseases and angina pectoris. By comparing the periods, hospitalization rates for cerebrovascular diseases (7.5%), gastroenteritis (14%), high blood pressure (20%), and asthma (32%) were found to be slightly reduced; however, other respiratory diseases (pulmonary diseases, bacterial pneumonias, and pulmonary tuberculosis) increased 13.3% in hospitalization rates. Hospitalizations due to heart failure (39.9%), kidney and urinary tract infections (32.7%), and diabetes mellitus (36.1%) also increased (Table 1).

Gastroenteritis, epilepsies, and diseases affecting the respiratory system were among the five most frequent causes for hospitalization in the age group of 0 to 9 years in both genders and periods. Gastroenteritis was the most frequent cause of hospitalization between 2002 and 2005 (2.1/1,000), and second most frequent between 2006 and 2009 (1.95/1,000) (Table 1), presenting the same pattern in both genders (Tables 2 and 3). The rate of hospitalization for asthma in this age group was reduced between the study periods, the same occurring in the analysis by gender (Tables 2 and 3).

In age groups of 10 to 24 years and 25 to 39 years in females, the main causes for hospitalization were kidney and urinary tract infections, with an increase of 0.16/1,000 to 0.19/1,000, respectively, between both periods (Table 2). For males, noteworthy is the prevalence and increase in hospitalization rate for epilepsies in the age group of 10 to 24 years as the first cause of hospitalization between 2006 and 2009. Pulmonary tuberculosis, shown among the five most prevalent hospitalization rates between 2002 and 2005, is not included among the top five in the period between 2006 and 2009 (Table 3).

Table 2 – Most frequent causes of hospitalizations for primary care-sensitive conditions in females by age group in the municipality of Juiz de Fora, MG, Brazil.

Age group		2002-2005			2006-2009	
		HPCSC	Rates		HPCSC	Rates
0 to 9 years	1st	Gastroenteritis	2.00	1st	Pulmonary diseases	1.76
	2nd	Pulmonary diseases	1.13	2nd	Gastroenteritis	1.61
	3rd	Asthma	1.06	3rd	Epilepsies	1.17
	4th	Epilepsies	0.84	4th	Asthma	0.76
	5th	Bacterial pneumonia	0.77	5th	Kidney or urinary tract infections	0.73
10 to 24 years	1st	Kidney or urinary tract infections	0.78	1st	Kidney or urinary tract infections	0.94
	2nd	Inflammatory diseases in female pelvic organs	0.37	2nd	Prenatal- or delivery-related disease	0.57
	3rd	Epilepsies	0.18	3rd	Inflammatory diseases in female pelvic organs	0.53
	4th	Diabetes mellitus	0.12	4th	Epilepsies	0.23
	5th	Prenatal- or delivery-related disease	0.10	5th	Diabetes mellitus	0.17
25 to 39 years	1st	Inflammatory diseases in female pelvic organs	0.89	1st	Prenatal- or delivery-related disease	1.12
	2nd	Kidney or urinary tract infections	0.76	2nd	Kidney or urinary tract infections	0.97
	3rd	Cerebrovascular diseases	0.25	3rd	Prenatal- or delivery-related disease	0.31
	4th	Heart failure	0.23	4th	Heart failure	0.30
	5th	Diabetes mellitus	0.14	5th	Cerebrovascular diseases	0.23
40 to 59 years	1st	Cerebrovascular diseases	1.48	1st	Heart failure	2.21
	2nd	Angina pectoris	1.43	2nd	Angina pectoris	1.62
	3rd	Heart failure	1.06	3rd	Cerebrovascular diseases	1.38
	4th	High blood pressure	0.59	4th	Kidney or urinary tract infections	0.87
	5th	Diabetes mellitus	0.56	5th	Inflammatory diseases in female pelvic organs	0.81
≥ 60 years	1st	Heart failure	7.50	1st	Heart failure	6.50
	2nd	Cerebrovascular diseases	5.42	2nd	Cerebrovascular diseases	3.52
	3rd	Angina pectoris	3.53	3rd	Angina pectoris	2.42
	4th	Pulmonary diseases	2.41	4th	Pulmonary diseases	1.30
	5th	Diabetes mellitus	1.15	5th	Diabetes mellitus	1.23

HPCSC, hospitalizations for primary care-sensitive conditions.
HPCSC rates per 1,000 population.
Source: Hospital Information System of the Unified Health System (Sistema de Informação Hospitalar do Sistema Único de Saúde – SIH-SUS) and IT Department of SUS (Departamento de Informática do SUS – DATASUS).

Inflammatory diseases of pelvic organs among females aged 10 to 24 years increased from 0.37 to 0.57/1,000 between both periods, and were the most frequent cause of HPCSC among women aged 25 to 39 years, increasing from 0.89 to 1.12/1,000 (Table 2).

Diseases related to the prenatal period and to birth (congenital syphilis and congenital rubella syndrome), in the age group of 10 to 24 years, were the second most frequent cause of hospitalization for females in the period from 2006 to 2009, with a rate of 0.57/1,000 (Table 2).

Diabetes mellitus presented a distinct behavior by gender in the age group of 10 to 24 years. In males, it appeared as the most frequent cause for HPCSC in the first period, and as the second cause in the second period, decreasing to 0.06/1,000. In females, it demonstrated a minor increment between periods (+0.03/1,000) (Tables 2 and 3).

Cardiovascular system diseases (heart failure, angina pectoris, and cerebrovascular diseases), not found among the most frequent causes of HPCSC in younger age groups, emerge in the 25 to 39 years age group for both genders. In males, hospitalizations for heart failure were reduced by 0.28/1,000, in contrast with females, whose rate of 0.23 increased to 0.30/1,000 between the study periods (Tables 2 and 3).

Between 40 and 59 years, cardiovascular diseases reached 5.76 and 5.78/1,000, respectively, in each period. Diabetes mellitus also appears among the most frequent causes of HPCSC in both genders and periods (Tables 2 and 3).

In the age group of 60 years and older, there was a reduction in hospitalizations for cardiovascular and pulmonary diseases (–1.0/1,000 in hospitalizations for heart failures, –1.9/1,000 for cerebrovascular diseases, –1.11/1,000 for angina pectoris, and –1.11/1,000 for pulmonary diseases), and there was a minor increment of hospitalizations for diabetes mellitus (+0.08/1,000). This trend has also occurred in females. However, there was an increased hospitalization rate for heart failure (+2.48/1,000) and kidney and urinary tract infections (+0.71/1,000) in males (Tables 2 and 3).

Discussion

The results of the current study showed that the HPCSC rates within the study periods were lower in Juiz de Fora than the 14.96/1,000 rate nationally described in 2006.[11] These results may reflect a better socioeconomic status in the municipality of Juiz de Fora, when compared with Brazilian indicators. Considering the human development index (HDI) as an example, Juiz de Fora had, in 2000, a HDI of 0.828, which is considered high (HDI > 0.800); Brazil only reached this level in 2006.[22]

Table 3 – Most frequent causes of hospitalizations for primary care-sensitive conditions in males by age group in the municipality of Juiz de Fora, MG, Brazil.

Age group		2002-2005			2006-2009	
		HPCSC	Rates		HPCSC	Rates
0 to 9 years	1st	Gastroenteritis	2.20	1st	Pulmonary diseases	2.66
	2nd	Pulmonary diseases	1.54	2nd	Gastroenteritis	2.28
	3rd	Asthma	1.47	3rd	Epilepsies	1.04
	4th	Epilepsies	1.27	4th	Asthma	0.91
	5th	Bacterial pneumonia	0.97	5th	Cutaneous tissue infection	0.61
10 to 24 years	1st	Diabetes mellitus	0.30	1st	Epilepsies	0.33
	2nd	Epilepsies	0.19	2nd	Diabetes mellitus	0.24
	3rd	Cutaneous tissue infection	0.12	3rd	Cutaneous tissue infection	0.17
	4th	Pulmonary tuberculosis	0.09	4th	Kidney or urinary tract infections	0.11
	5th	Gastroenteritis	0.08	5th	Gastroenteritis	0.10
25 to 39 years	1st	Heart failure	0.38	1st	Pulmonary tuberculosis	0.12
	2nd	Pulmonary tuberculosis	0.33	2nd	Epilepsies	0.12
	3rd	Cutaneous tissue infection	0.30	3rd	Heart failure	0.11
	4th	Angina pectoris	0.30	4th	Kidney or urinary tract infections	0.07
	5th	Cerebrovascular diseases	0.24	5th	Angina pectoris	0.07
40 to 59 years	1st	Angina pectoris	3.00	1st	Heart failure	3.23
	2nd	Cerebrovascular diseases	2.50	2nd	Angina pectoris	2.71
	3rd	Heart failure	2.38	3rd	Cerebrovascular diseases	1.71
	4th	Pulmonary diseases	0.63	4th	Epilepsies	0.83
	5th	Diabetes mellitus	0.61	5th	Diabetes mellitus	0.80
≥60 years	1st	Heart failure	10.04	1st	Heart failure	12.52
	2nd	Cerebrovascular diseases	8.03	2nd	Cerebrovascular diseases	7.49
	3rd	Angina pectoris	6.86	3rd	Angina pectoris	6.17
	4th	Pulmonary diseases	5.35	4th	Pulmonary diseases	4.17
	5th	Kidney or urinary tract infections	1.17	5th	Kidney or urinary tract infections	1.88

HPCSC, hospitalizations for primary care-sensitive conditions.
HPCSC rates per 1,000 population.
Source: Hospital Information System of the Unified Health System (Sistema de Informação Hospitalar do Sistema Único de Saúde – SIH-SUS) and IT Department of SUS (Departamento de Informática do SUS – DATASUS).

A few studies showed an association between ESF expansion and reduced HPCSC.[13,14,23,24] In Juiz de Fora, although a small mean increase in ESF coverage has been observed in the last years (43.6% to 48.1%),[21] an increase in HPCSC rates was observed. This result points to problems in PHC prioritization in the municipality, a fact observed, for example, in the difficulties to reach the goal of 80.6% coverage proposed by the Program of Family Health Expansion (Programa de Expansão da Saúde da Família – PROESF) within the study period.[25] It is important to note that in 2005 and 2009 the number of beds was, respectively, 3.7 and 3.6 per 1,000 inhabitants, thus showing stability and discarding the possibility that the rise found resulted from a higher supply of hospital beds in the municipality.[21]

It is difficult to compare the results of the present study with other studies in the literature due to the various methods used, which, in turn, depend on the age groups studied, the sociodemographic variables selected, and the variability of descriptors used. In Europe, in the United States, and in Canada, studies employ different lists of primary health care-sensitive diseases, and use them based on the International Classification of Diseases, ninth edition (ICD-9), whereas Brazilian lists use the tenth edition (ICD-10), which could create difficulties for international comparisons. Nevertheless, the pattern of diagnosis groups in preventable hospitalizations is concurrent among within studies.[26-29]

The most frequent causes of HPCSC in Juiz de Fora (heart failure, cerebrovascular diseases, angina pectoris, pulmonary diseases, kidney and urinary tract infections, and gastroenteritis) are in agreement with the studies in scientific literature.[11,16] By comparing both periods, the trend rate is observed to occur differently by age group and gender.

In children, gastroenteritis, pulmonary diseases, and asthma were among the main causes of HPCSC; an increase in pulmonary diseases was observed between both periods studied, whereas hospitalizations for asthma and gastroenteritis presented a tendency to decrease. Similar results were found in Brazil for patients under 20 years of age.[16]

As a result of the expansion of ESF as a model of primary care, and the 65% improvement in sanitation in areas of the municipality covered by ESF,[21] reduced hospitalization rates for these three conditions would be expected. The study of the morbidity and mortality profile of the Brazilian population has shown that, over the last years, hospitalizations for gastroenteritis have been more prominent in populations living in areas where poverty concentration is greater and socioeconomic status is poor, thus raising diarrhea risk, mainly when associated with lack of sanitation and poor life conditions.[30,31] Despite the tendency towards reduced

hospitalization and mortality rates from gastroenteritis, and the availability of effective and low-complexity therapeutic measures (oral fluid therapy and associated antibiotic therapy), gastroenteritis still has a high prominence in the morbidity profile of the Brazilian population, especially in older age groups. The progress in care, and increased environmental sanitation has caused gastroenteritis to give way to acute respiratory infections,[31] consistent with this study's results.

Regarding asthma, a tendency for increased incidence has been described in the last three decades, with elevated prevalence rates in the United States, Brazil, Canada, Australia, New Zealand, and other countries.[32,33] In this study, although asthma is among the most frequent causes of hospitalization, mainly within theage group of 0 to 9 years, a reduction in hospitalizations was observed between both periods in both genders. In addition, asthma is not included in the five most frequent causes in other age groups. Several risk factors are discussed in the literature as related to asthma, but the key immunologic, genetic, and environmental mechanisms underlying the disease development are still unclear.[34] The decrease in hospitalizations for asthma in children in Juiz de Fora found in this study can be attributed to the "Projeto Ação SUSpirar", initiated in November 2006 by the Department of Health of the Municipality of Juiz de Fora, whose main objective was to encourage asthma-specific prevention actions in local children.[35] According to Leal et al.,[36] there is a limitation for asthma management in public health, which, given the care flow based on exacerbations and the lack of functionality of the facilities, contributes to standardization of seasonal care and prevalence of exacerbations. Even though assistance is provided and consensuses for asthma management in public health are disseminated, practitioners' commitment to and understanding of the disease concepts and the proposal of the Ministry of Health for primary care have not been successfully achieved. According to the author, the implantation of continuing education programs is needed in view of a health system characterized by large staff turnover rates.[36]

Kidney infections and urinary tract infections (UTIs) are noteworthy for their high prevalence in this study and increased rates between study periods. A review conducted by Heilberg and Schor[37] concluded that understanding the different clinical and laboratory aspects in managing and preventing recurrence in patients with UTI maximizes therapeutic benefits, as well as lowers cost and adverse effect incidences. Currently, no active or passive immunization as prevention is available for urinary infections caused by *Escherichia coli*, responsible for 85% to 90% of kidney infections and UTIs. However, a decrease in hospitalizations can be achieved through early diagnosis, appropriate treatment and, in case of disease recurrence, through extended prophylaxis with urinary tract antiseptic drugs[38] aiming to reduce the possibility of pyelonephritis, whose outpatient management is less feasible.[37]

It is important to highlight the prevalence of epilepsy among the main causes of HPCSC in this study, and the importance of early diagnosis and treatment in primary care. Epilepsy is the most prevalent chronic neurologic disease among children and elderly, and the high prevalence of endemic infections (neurocysticercosis and malaria) in developing countries are considered major risk factors for contracting the disease.[39] Some studies have demonstrated that, under the influence of central nervous system diseases, such as epilepsy, cardiac functional changes with elevated heart rate increase the probability sudden death occurrence by two or three-fold, compared with nonepileptic individuals, which reinforces the importance of appropriate epilepsy management in primary care.[40]

Comparing elderly (> 60 years) and adult (25-59 years) populations regarding the most frequent hospitalization causes, adults present variability as a function of gender, whereas the elderly population has a higher degree of homogeneity.

The higher rates among the elderly observed in this study are consistent with those found in other studies conducted in Brazil,[41,42] and are similar to those found for the population of the United States in 2000.[43] More frequent use of hospital services by the elderly reflects the higher occurrence of chronic diseases and conditions at this stage of life, which are frequently more severe.

The present study shows some of the common limitations for studies that use secondary data, such as SIH-SUS. Over the last decades, progress in the availability and improvement in the quality of information generated by national health information systems in Brazil have been observed. Depending on the health policy prevailing at any given time in the study periods, an increase in hospitalization rates resulting from an improvement in recording certain conditions can be observed, which may have occurred differently among age groups and genders. Moreover, the calculation of the hospitalization rate per inhabitant depends on population data that derived from projections and estimates for the study period.

The aspects related to limitations in the use of information system databases in Brazil do not invalidate the importance of the information generated, especially considering that its release has a great potential to promote improvement both in the quality of information provided in the future and in the proposals to evaluate health policies, given that the objective of returning them to the managers of the Unified Health System and professionals directly involved in producing, registering and managing health care information is met.

Conclusion

Upon comparing the two periods evaluated, favorable changes in the course of hospitalization rates for some diseases, such as gastroenteritis, asthma, and cerebrovascular diseases were observed, but an increment in hospitalizations for heart failure, pulmonary diseases, epilepsies, and kidney and urinary tract infections, occurring differently for gender and age group, was also observed. In several aspects, the results of the present study are consistent with those observed in other Brazilian studies. The information presented can be used by primary care practitioners to development epidemiologic surveillance actions and hygienic and sanitary guidance, as well as to stimulate collaboration among professionals, managers, and

the community, aiming to improve the specific approach of health conditions responsible for a great contingent of hospitalizations.

Conflict of interest

All authors declare to have no conflict of interest.

R E F E R E N C E S

1. Billings J, Zeitel L, Lukomnic J, Carey TS, Blank AE, Newman L. Impact of socioeconomic status on hospital use in New York City. Health Affairs. 1993;12:162-73.
2. Bindman AB, Chattopadhyay A, Auerback GM. Interruptions in Medicaid coverage and risk for hospitalization for ambulatory care-sensitive conditions. Ann Intern Med. 2008;149:854-60.
3. Probst JC, Laditka JN, Laditka SB. Association between community health center and rural health clinic presence and county-level hospitalization rates for ambulatory care sensitive conditions: an analysis across eight US states. BMC Health Serv Res. 2009;9:134.
4. Hossain MM, Laditka JN. Using hospitalization for ambulatory care sensitive conditions to measure access to primary health care: an application of spatial structural equation modeling. Int J Health Geogr. 2009;8:51.
5. Caminal HJ, Morales EM, Sanchez RE, Cubells LMJ, Bustins PM. Hospitalizations preventable by timely and effective primary health care. Aten Primaria. 2003;31:6-14.
6. Caminal J, Starfield B, Sanchez E, Casanova C, Morales M. The role of primary care in preventing ambulatory care sensitive conditions. Eur J Public Health. 2004;14:246-51.
7. Purdy S, Griffin ST, Salisbury C, Sharp D. Ambulatory care sensitive conditions: terminology and disease coding need to be more specific to aid policy makers and clinicians. Public Health. 2009;123:169-73.
8. Secretaria de Estado da Saúde do Ceará. Lista de diagnósticos sensíveis à atenção ambulatorial da Secretaria de Estado da Saúde do Ceará. Fortaleza: Secretaria de Estado da Saúde do Ceará; 2001.
9. Resolução SES/MG Nº 1093, 29 de Dezembro de 2006. Secretaria de Estado da Saúde de Minas Gerais [cited May 2012]. Available from: http://www.saude.mg.gov.br
10. Centro de Epidemiologia, Coordenação de Diagnóstico em Saúde. Avaliação das internações por condições sensíveis à atenção ambulatorial. Curitiba: Secretaria Municipal de Saúde de Curitiba; 2006.
11. Alfradique ME, Bonolo PF, Dourado I, Lima-Costa MF, Macinko J, Mendonça CS, et al. Lista brasileira de internações por condições sensíveis à atenção primária: uma nova ferramenta para medir o desempenho do serviço de saúde. Cad Saúde Pública. 2009;25:1337-49.
12. Kilsztajn S. Programa de saúde da família. Rev Assoc Med Bras. 2001;47:285-6.
13. Nedel Fb, Facchini La, Martín-Mateo M, Vieira La, Thumé E. Family health program and ambulatory care-sensitive conditions in Southern Brazil. Rev Saúde Pública. 2008;42: 1041-52.
14. Fernandes VBL, Caldeira AP, Faria AA, Rodrigues Neto JF. Internações sensíveis na atenção primária como indicador de avaliação da Estratégia Saúde da Família. Rev Saúde Pública. 2009;43:928-36.

15. Nedel FB, Facchini LA, Martín M, Navarro A. Características da atenção básica associadas ao risco de internar por condições sensíveis à atenção primária: revisão sistemática da literatura. Epidemiol Serv Saúde. 2010;19:51-60.
16. Moura BLA, Cunha RC, Aquino R, Medina MG, Mota ELA, Macinko J, et al. Principais causas de internação por condições sensíveis à atenção primária no Brasil: uma análise por faixa etária e região. Rev Bras Saúde Matern Infant. 2010;10:83-91.
17. Carvalho DM. Grandes sistemas nacionais de informação em saúde: revisão e discussão da situação atual. Informe Epidemiológico SUS. 1997;6:7-46.
18. Meneghell SN, Armani TB, Rosa RS, Carvalho L, Alunos do XX CESP. Internações hospitalares no Rio Grande do Sul. Informe Epidemiológico SUS. 1997;6:49-59.
19. Bahia L, Costa AJL, Fernandes C, Luiz RR, Cavalcanti MLT. Segmentação da demanda dos planos e seguros privados de saúde: uma análise das informações da PNAD/98. Ciência Saúde Coletiva. 2002;7:671-86.
20. Brasil. Ministério da Saúde, Portaria 221 de 17 de abril de 2008.
21. Brasil. Ministério da Saúde. Departamento de Informática do Sistema Único de Saúde. Brasília (DF): Ministério da Saúde; 2011 [cited may 2012]. Available from: http://www.datsus.gov.br
22. Boletim Regional do Banco Central do Brasil. Evolução do IDH das Grandes Regiões e Unidades da Federação; 2009, p.91-4.
23. Veloso RC, Araújo MRN. Avaliação da resolutividade do Programa de Saúde da Família em municípios de pequeno porte estado de Minas Gerais. Rev APS. 2009;3:238-43.
24. Dias-da-Costa JS, Büttenbender DC, Ana Lucia Hoefel AL, Souza LL. Hospitalizações por condições sensíveis à atenção primária nos municípios em gestão plena do sistema no Estado do Rio Grande do Sul, Brasil. Rev Saúde Pública. 2010;44:923-33.
25. Campos EMS, Bustamante-Teixeira MT, Bonin HB, Oliveira LZ, Cruzeiro CNL, Mauad NM, et al. Tecnologias ativas de integralidade em saúde na atenção básica: a experiência do município de Juiz de Fora. In: Atenção básica e integralidade: contribuições para estudos e práticas avaliativas em saúde. Rio de Janeiro; 2008. p. 129-52.
26. Bermúdez-Tamayo C, Márquez-Calderón S, Rodríguez del Águila MM, Perea-Milla López E, Ortiz Espinosa J. Características organizativas de la atención primaria y hospitalización por los principales ambulatory care sensitive conditions. Aten Primaria. 2004;33:305-11.
27. Caminal Homar J, Starfield B, Sánchez Ruiz E, Hermosilla Pérez E, Martín Mateo M. La atención primaria de salud y las hospitalizaciones por ambulatory care sensitive conditions en Cataluña. Rev Clin Esp. 2001;201:501-7.
28. Marquez-Calderon S, Rodriguez del Aguila MM, Perea-Milla E, Ortiz J, Bermudez-Tamayo C. Factors associated with hospitalization for ambulatory care sensitive conditions in municipalities. Gac Sanit. 2003;17 360-7.
29. Roos LL, Walld R, Uhanova J, Bond R. Physician visits, hospitalizations and socioeconomic status: ambulatory care sensitive conditions in a Canadian setting. Health Serv Res. 2005;40:1167-85.
30. Vanderlei Lcm, Silva Gap. Diarréia aguda: o conhecimento materno sobre a doença reduz o número de hospitalizações nos menores de dois anos? Rev Assoc Med Bras. 2004;50:267-81.
31. Genser B, Strina A, Santos LA, Teles CA, Prado MS, Cairncross S, et al. Impact of a city-wide sanitation intervention in a large urban centre on social, environmental and behavioural determinants of childhood diarrhoea: analysis of two cohort studies. Int J Epidemiol. 2008;37:831-40.
32. Nascimento LFC, Marcitelli R, Agostinho FS, Gimenes CS. Análise hierarquizada dos fatores de risco para pneumonia em crianças/ Hierarchical approach to determining risk factors for pneumonia in children. J Bras Pneumol. 2004;30:445-51.

33. ISAAC (International Study of Asthma and Allergies in Childhood), Steering Committee. Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema: ISAAC. Lancet. 1998;351:1225-32.

34. Padmaja S, Piush JM, Malcolm RS. Asthma: epidemiology, etiology and risk factors. Can Med Assoc J. 2009;181:181-9.

35. Projeto Ação Suspirar. Secretaria de Saúde lança projeto Ação SUSpirar para crianças asmáticas [cited May 2012]. Available from: http://www.pjf.mg.gov.br/noticias

36. Leal Rcac, Braile Dm, Souza Drs, Batigália F. Modelo assistencial para pacientes com asma na atenção primária. Rev Assoc Med Bras. 2011;57:697-01.

37. Heilberg Ip, Schor N. Abordagem diagnóstica e terapêutica na infecção do trato urinário – Itu. Rev Assoc Med Bras. 2003; 49:109-16.

38. Moura LB, Fernandes MG. A incidência de infecções urinárias causadas por *Escherichia coli*. Olhar Científico. 2010;1:411-26.

39. Duncan JS, Sander JW, Sisodiya SM, Walker MC. Adult epilepsy. Lancet. 2006;367:1087-100.

40. Scorza FA, Arida RM, Albuquerque M, Cavalheiro EA. Morte súbita na epilepsia: todos os caminhos levam ao coração. Rev Assoc Med Bras. 2008;54:199-200.

41. Lima-Costa MFF, Guerra HL, Barreto SM, Guimarães RM. Diagnóstico da situação de saúde da população idosa brasileira: um estudo da mortalidade e das internações hospitalares públicas. Informe Epidemiológico SUS. 2000;9:23-41.

42. Castro MSM, Travassos C, Carvalho MS. Fatores associados às internações no Brasil. Ciência Saúde Coletiva. 2002;7:795-811.

43. Hall MJ, Owings MF. 2000 National Hospital Discharge Survey. Adv Data. 2002;329:1-18.