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Family Health Program and ambulatory care-sensitive conditions in Southern Brazil

ABSTRACT

OBJECTIVE: Ambulatory care-sensitive conditions (ACSC) are health problems managed by actions at the first level of care. The need for hospitalization by these causes is avoidable through an effective and proper primary health care. The objective of the study was to estimate ACSC among patients hospitalized by the *Sistema Único de Saúde* (Brazilian Health System).

METHODS: Hospital-based cross-sectional study involving 1,200 inhabitants of Bagé (Southern Brazil) who were inpatients between September/2006 and January/2007. The patients answered a questionnaire applied by interviewers and were classified according to the model of attention utilized prior to hospitalization. ACSC were defined in a workshop promoted by the Ministry of Health. The variables analyzed included demographic and socioeconomic characteristics, health and health services utilized. Multivariate analysis was conducted by the Poisson model, according to a hierarchical conceptual framework, stratified by sex and model of care.

RESULTS: ACSC accounted for 42.6% of the hospitalizations. The probability that the main diagnosis for hospitalization is considered an ACSC is greater among women, children under five years of age, individuals with less than five years of schooling, hospitalization in the year prior to the interview, emergency room consultation, and being an inpatient at the university hospital. Among women, ACSC are associated with age, educational level, length of time the health center has been in existence, living in an area covered by the *Programa Saúde da Família* (Family Health Program), use of this service, emergency room consultation during the month prior to the interview and hospital to which patient was admitted. For men, it was associated with age, have undergone another hospitalization in the year prior to the interview and hospital to which patient was admitted.

CONCLUSIONS: Analysis of ACSC allows identifying groups with inadequate access to primary health care. Although we could not infer an effect on the risk of hospital admission, analysis by sex and model of care suggests that Family Health Program is more equitable than "traditional" primary health care.

DESCRIPTORS: Family Health Program. Primary Health Care. Health Services, utilization. Hospitalization. Socioeconomic Factors. Cross-Sectional Studies.

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INTRODUCTION

Primary health care is the model of care that receives most endorsement from the World Health Organization. Its goal is to improve health indicators, reduce

the gaps in morbi-mortality, and achieve a more rational consumption of biomedical technology, thus attaining greater efficiency in expenditure within this sector.³ In Brazil, the *Sistema Único de Saúde (SUS)* [Unified Health System] and the *Programa Saúde da Família (PSF)* [Family Health Program (FHP)] follow the same conceptual foundations, and primary health care is thus the point of departure in an attempt to redirect the model of assistance.

Evaluation and monitoring of actions and results are fundamental in adapting the policies and the actions implemented. The *Sistema de Informação da Atenção Básica* [Data System on Primary Care], the *Programa de Expansão e Consolidação da Saúde da Família* [Program of Expansion and Consolidation of Family Health],¹³ and the *Pacto dos Indicadores da Atenção Básica* [Pact of Primary Care Indicators]¹⁹ as well as the bills concerning financial aid to research are cited among the governmental efforts accomplished in this direction. However, instruments and studies evaluating the impact of primary care on the population's health are lacking.¹⁵ The Data System on Primary Care is useful in organizing the family health teams,¹ but it presents limitations insofar as evaluative research is concerned. Furthermore, it is not used to register data on "traditional" primary care (that is, not FHP), which impedes comparisons between the two models of attention. The evaluation of the Program of Expansion and Consolidation of Family Health is restricted to municipalities with over one hundred thousand inhabitants. The Pact of Primary Care Indicators lacks an aggregate measure that would permit a more integrated evaluation of primary care.

On the other hand, hospitalizations due to Ambulatory Care Sensitive Conditions (ACSC) have expanded as an indirect indicator of access to opportune and effective care at the primary level of health care. The idea is that the capacity of primary care to resolve health problems should be reflected in a decrease in hospitalizations for a specific group of causes.^{7,12,14,b,c} ACSC are health problems that are attended by actions characteristic of primary health care. Hospitalizations for ACSC are an indirect indicator of the effectiveness of the health system, at this level of care. It is presumed that individuals hospitalized for ACSC did not receive effective health care at an opportune moment, leading to an aggravation of their clinical condition, which then required hospitalization.^{9,10}

This indicator was created at the end of the 1980s in the United States to evaluate the impact of lack of access

to primary health care services.^{5,6,20} Afterwards, it was employed in countries with universal access, such as Spain, to compare the effectiveness of different models of primary health care.^{4,8} In Brazil, studies have been conducted with this indicator in the States of Ceara (Northeastern Brazil) and Minas Gerais (Southeastern Brazil).^b

According to the equity principle, the implementation of the Family Health Program is initiated in areas where poverty is greater, whose populations also suffer more occurrences of diseases and limitations with respect to access to services, including health care. Thus, the socioeconomic characteristics of the population must be taken into consideration when interpreting the effect of the model of attention on hospitalizations for ACSC, particularly when coverage by the FHP is not universal. When such variables are lacking, the aggregation of individuals' conditions may serve as a proxy.

ACSC make it possible to identify, in an objective and comparable manner, parts of the population that lack adequate primary care, which is presumed to be convenient for the Unified Health System in Brazil. Thus, this study seeks to answer the following question: compared to other models utilized in organizing care, the FHP is associated to a smaller proportion of ACSC among the hospitalized population? The objective of the present study was to estimate the probability of the diagnosis of ACSC among residents of a municipality, hospitalized by *SUS*, according to the model of care utilized in the consultations prior to hospital admission.

METHODS

The population of the municipality of Bage (Southern Brazil) was estimated in 122,461 inhabitants in 2006, 82% of which were living in the urban zone. It has three hospitals (one of which is an army hospital that has no covenant with *SUS*), 470 hospital beds in covenant with *SUS* (one hospital bed for each 3.8 thousand inhabitants) and 21 *unidades básicas de saúde (UBS)* [primary health care centers (PHCC)], 13 of which are Family Health Centers that attend 52% of the population.^d

All admissions to hospitals in covenant with *SUS* of residents of the municipality between the 16th of September 2006 and the 15th of January, 2007 were analyzed. The patients (or their guardians, when they were children) were interviewed during the period of hospitalization, by trained interviewers, during all days of the week.

^a Starfield B. *Atenção primária: equilíbrio entre necessidades de saúde, serviços e tecnologia*. Brasília: Unesco/Ministério da Saúde; 2002.

^b Mendes EV. *A atenção primária à saúde no SUS*. Fortaleza: Escola de Saúde Pública do Ceará; 2002.

^c Fundação João Pinheiro. Centro de Estudos Econômicos e Sociais. *Atenção básica à saúde em Minas Gerais: desigualdades na distribuição de recursos financeiros e na prestação de serviços básicos após a introdução do Piso da Atenção Básica (PAB)* [internet]. Belo Horizonte [cited 2004 Nov 21]. Available at: http://www.fjp.gov.br/produtos/cees/Atencao_Basica_em_Minhas_Gerais.pdf

^d Ministério da Saúde. DATASUS. *Informações de saúde* [internet]. Brasília; 2007 [cited 2007 Feb 20]. Available at: <http://tabnet.datasus.gov.br>

The questionnaire included demographic and socioeconomic data as well as information concerning the use of health services. The diagnosis justifying admission and discharge from the hospital were collected in hospital records, after the patient was discharged.

Obstetrical admissions, admissions that terminated in death, patients transferred to the Intensive Care Unit (ICU) of other hospitals and people who were not capable of answering the questionnaire, according to the interviewer's evaluation, as well as those who refused to reply, were excluded. Patients admitted to the ICU were interviewed after being transferred to a room. No age limit was established for inclusion in the study.

The minimum number of hospitalizations necessary in order to detect a difference of at least 10% of the probability of an ACSC diagnostic among the hospitalized patients, according to whether he or she resided in an area covered by the Family Health Program was 868 individuals, taking the arcseno approximation¹⁷ with parameters $\alpha=5\%$, $\beta=20\%$, $\text{losses}=10\%$, global proportion of ACSC estimated in 46%, FHP: not – FHP of 1:1. Another 30% was added in order to confer greater stability to the adjustment for confusion factors, and the resulting sample was calculated in at least 1.129 subjects.

Data was digitalized and partially processed through the EpiData Entry program.

Evaluation of the PHCC was undertaken in a discussion group with the Director of the Health Department and the team coordinating the municipality's primary health care. The criteria utilized in this evaluation were: commitment with the individuals utilizing health services, team work, intersectionality, integrality, equity, communitarian work and the organization of care. At the end of the discussion, each PHCC received a score from zero to ten with respect to each of the criteria.

The outcome being studied is the proportion of ACSC among the hospitalizations analyzed. The list of codes of the 10th revision of the International Classification of Diseases (ICD-10) considered ACSC was defined in a workshop promoted by the Ministry of Health, in December, 2005^a (Table 1). During this process, inspired by Caminal et al's study,¹¹ a group of experts answered questions with respect to the frequency, transcendence, sensitivity to primary health care actions, ease of diagnosis, need for hospitalization in response to disease development, and the influence of financial incentives on the codes registered, among a list of pre-selected causes. The outcome variable, created with the aid of the EpiData *Analysis* program, considered the ICD recorded at diagnosis upon discharge from the hospital. A

person was considered FHP user if he/she was a resident of the region covered by the Family Health Program and if he/she had been attended at a consultation at this unit during the previous month (whether or not the motive of this consultation was related to the cause that led to hospital admission).

After describing the data and conducting bivariate analysis, a multivariate analysis was conducted through the Poisson model according to a hierarchical theoretical framework for determining hospitalization for ACSC (Table 2). Within this model, determinants of health conditions and use of the health services may be found in its most distal level, at the intermediate level, descriptors of health conditions and use of the services prior to hospital admission can be found and, at the proximal level, are the hospital services utilized as well as the performance of the municipality's primary health care services.

All the variables at each level of determination being analyzed, starting from the most distal level to the outcome, were included in the equation and those with $p \geq 0.2$ were eliminated step-by-step. Each subsequent level incorporates the variables previously maintained; the measures of effect and the p-value reported for each variable are those found in its level of analysis. Multivariate analysis was conducted for the entire set of individuals and for each sex strata as well as for each model of care. Except when indicated, the p-values presented were obtained by means of Fisher's exact test or, when comparing averages, by Student's t-test or ANOVA; the Stata 9.0 program was utilized in analysis.

Participants signed a Term of Informed Consent before responding to the questionnaire. The study was approved by the Committee on Ethics in Research of the *UFPel* [Universidade Federal de Pelotas, Rio Grande do Sul State].

RESULTS

Between 16/Sept/2006 and 15/Jan/2007 1,446 non-obstetric admissions of municipal residents that qualified for reimbursement by *SUS* were recorded in the hospitals of Bage. These individuals were approached by the study team and the proportion of refusals to participate in the research was 6.6% (96 cases), the average age of the latter was 19.8 years older than those interviewed ($p < 0.001$), with no significant difference with respect to their sex. In 47 cases, (3.5%) the interviewee informed that he/she resided in another municipality, being excluded from the study; these cases did not differ from those of participants according to hospital of admission, age or sex. Among the 1,303 subjects that agreed to

^a Ministério da Saúde. Departamento de Atenção Básica. Oficina de trabalho para elaboração de uma Lista Brasileira de Hospitalização por Condições Sensíveis à Atenção Primária. [Workshop for the elaboration of a Brazilian List of Ambulatory Care-Sensitive Conditions] Belo Horizonte, MG, 9/12/2005. (unpublished data)

Table 1. Brazilian List of Ambulatory Care-Sensitive Conditions.

Group of causes	Code
1. Diseases preventable by means of immunization and avoidable conditions	A33 – A35, B05, G00.0, A37, A36, A50, A51 A53, A15.0-A15.3, A16.0-A16.2, A17.0, A15.4 - A15.9, A16.3 - A16.9, A17.1-A17.9, A18, A19, A95, B50-B54, B16
2. Infectious gastroenteritis and complications	A00-A09, E86
3. Iron deficiency anemia	D50
4. Nutritional deficiencies	E40-E46, E50-E64
5. Ear, nose and throat infections	H66, J00-J03, J06, J31, I00-I02
6. Bacterial pneumonias	J13,J14, J15.2-J15.4, J15.8, J15.9, J17, J18
7. Asthma	J45, J46
8. Chronic obstructive pulmonary disease	J20, J21, J40-J44, J47
9. Hypertension	I10, I11
10. Angina pectoris	I20, I24
11. Cardiac insufficiency	I50, J81
12. Cerebrovascular diseases	I60-I69
13. Diabetes mellitus	E10-E14
14. Epilepsy	G40, G41
15. Kidney and urinary tract infections	N00, N10-N12, N15.9, N39.0, N30, N34
16. Skin and subcutaneous tissue infections	A46, L01-L04, L08
17. Pelvic inflammatory disease	N70-N73, N75, N76
18. Gastrointestinal ulcer with hemorrhage and/or perforation	K25.0-K25.2, K25.4-K25.6, K26.0-K26.2, K26.4-K26.6, K27.0-K27.2, K27.4-K27.6, K28.0-K28.2, K28.4-K28.6
19. Malignant uterine neoplasm	C53, C55
20. Pregnancy and birth related diseases	O23, P00, P35.0, P70.0, P70.1, B20-B24

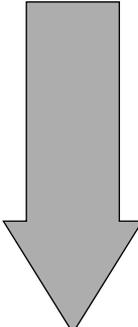
Source: Ministry of Health. Department of Primary Care. Workshop for the elaboration of a Brazilian List of Hospitalization for Ambulatory Care-Sensitive Conditions. Belo Horizonte, MG, Dec/9/2005.

participate in the study, 103 (7.9%) were hospitalized more than once, thus a total of 1,200 cases of single hospital admissions were analyzed. The variables with the greatest proportion of missing data were: diagnosis at discharge (6.0%), family income (7.4%), another hospitalization during the previous year (8.4%) and health

plan’s consultation as the source of recommendation for hospital admission (5.4%).

The interviewees had an average of 5.7 (SD=4.0) years of schooling and lived in the urban zone (96.2%), with a mean family income (during the month prior to the

Table 2. Hierarchical model of analysis of the study variables.

Level of determination	Variable
	Demographic, socioeconomic
	1 Sex, age group, schooling, per capita family income, possession of consumer goods (CCEB-ABEP), residential zone (rural or urban), length of time residing in the current address. Health condition, use of services
	2 Other hospitalization(s) in the 12 months prior to the interview; other consultation(s) in the 30 days prior to the interview; length of time the FHP has been functioning; the individual utilizes the FHP; model of care in the consultations in the 30 days prior to the interview for the problem that generated the hospitalization; recommendation of hospitalization, in these consultations. Use of the services, service performance
3 hospital to which the patient was admitted; specialty of the physician responsible for admission; evaluation of the services by the administrator.	
Outcome: Hospitalization for Ambulatory Care – Sensitive Conditions	

CCEB-ABEP: Criteria of Economic Classification Brazil, of the Associação Brasileira de Empresas de Pesquisa [Brazilian Association of Business Research]

interview) of R\$ 730.46 (SD=564.60) and mean per capita family income of R\$ 226.65 (SD=198.59), belonging to the C and D categories (83,4%) of the Criteria for Economic Classification of the *Associação Brasileira de Empresas de Pesquisas* [Brazilian Association of Business Research]. The age quartiles were: 4, 35.5 and 58 years. The proportion of sexes and age groups were different according to each hospital: in the philanthropic hospital, the majority of the patients were males (54.4%) and the distribution, according to age groups was more homogeneous, whereas at the university hospital, more women were admitted (56.9%) as well as adults and elderly patients whose mean age was 9.7 years older (values of $p < 0.001$).

The hospitals also differed with respect to the specialties of the physicians responsible for admissions (according to the patients' account): at the university hospital, there was a lower proportion of admissions by pediatricians (26.0%, versus 33.3% at the philanthropic hospital) and general surgeons (1.2%, versus 13.6%) and a greater proportion of admissions were carried out by other specialists (39.5% versus 20.3%); general practitioners admitted 29% of the cases and gynecologists 4%, in both hospitals.

According to the diagnosis upon discharge from the hospital, 480 admissions for ACSC were recorded during the study period (42.6%; 95% CI [39.7;45.4]), which is similar to the 43.0% which resulted from

Table 3. Hospital prevalence of Ambulatory Care – Sensitive Conditions and the use of health services. Bage, Southern Brazil, 2006-2007.

Population / Variable	n (%)	Prevalence ACSC	PR (95% CI)*
All individuals	1,200		
Model of care of the service of reference		Missing 6.0%	
FHP	624 (52.0)	43.1	1
Traditional Primary Care	386 (32.2)	42.4	0.98 (0.84;1.15)
Other	190 (15.8)	41.1	0.95 (0.78;1.16)
Consulted exclusively in the primary health care unit		Missing 6.0%	
No	1084 (90.3)	41.8	1
Yes	116 (9.7)	49.1	1.17 (0.96;1.44)
That had consultations in the primary health care unit of reference	324		
Model of care of the primary health care unit of reference		Missing 7.1%	
FHP	194 (59.9)	48.3	1
Other	130 (40.1)	45.5	0.94 (0.74;1.20)
That had consultations exclusively at the primary health care unit of reference	110		
Model of care of the primary health care unit of reference		Missing 5.4%	
FHP	48 (43.6)	54.6	1
Other	62 (56.4)	46.7	0.86 (0.58;1.25)
Residents in a Family Health Area	623		
Individual utilizes FHP (1 missing)		Missing 5.9%	
No	400 (64.2)	40.9	1
Yes	223 (35.8)	47.3	1.16 (0.96;1.40)
Excludes patients without information concerning the primary health care unit of reference			
Consultation at the primary health care center of reference	953	Missing 6.6%	
No	652 (68.4)	40.8	1
Yes	301 (31.6)	47.2	1.15 (0.99;1.34)
Consultation exclusively at the primary health care unit of reference	953	Missing 6.6%	
No	849 (89.1)	41.9	1
Yes	104 (10.9)	50.0	1.19 (0.97;1.47)

* Poisson Model with robust variance

FHP: Family Health Program

ACSC: Ambulatory Care – Sensitive Conditions

Table 4. Hospitalizations for Ambulatory Care – Sensitive Conditions, by sex according to the main study variables. Description and multivariate analysis by levels of determination. Bage, Southern Brazil, 2006-2007.

Level of analysis / Variable	Both sexes				Male sex				Female sex			
	Description		Analysis		Descrição		Analysis		Description		Analysis	
	n %	% ACSC	PR	95% CI	n %	% ACSC	PR	95% CI	n %	% CSAP	PR	95% CI
Distal level	N = 1115				n = 548				n = 572			
Sex	1200	-	-	-	-	-	-	-	-	-	-	-
Male	49.7	37.8	1	-	-	-	-	-	-	-	-	-
Female	50.3	47.1	1.28	1.12;1.46	-	-	-	-	-	-	-	-
Age group (yrs)	1200	596			604							
0 – 4	26.1	57.6	1		28.0	61.8	1		24.2	52.9	1	
5 – 14	11.2	38.1	0.68	0.53;0.86	13.4	28.4	0.48	0.32;0.70	8.9	51.9	1.01	0.75;1.30
15 – 49	28.3	31.6	0.54	0.44;0.65	25.2	22.0	0.38	0.27;0.53	31.5	39.1	0.74	0.58;0.95
50 or +	34.4	41.6	0.65	0.55;0.77	33.4	33.3	0.55	0.43;0.70	35.4	49.0	0.82	0.65;1.03
Schooling (years of study)	1199	596			603							
0-4	36.5	46.2	1		36.6	38.0	-		36.5	53.8	1	
5-8	41.1	41.2	0.84	0.71;0.98	41.1	36.8	-		41.1	45.5	0.82	0.67;1.00
9-11	19.5	41.3	0.84	0.69;1.02	19.5	42.0	-		19.6	40.7	0.73	0.55;0.95
12 or +	2.8	24.2	0.52	0.28;0.95	2.8	23.5	-		2.8	25.0	0.46	0.19;1.08
Economic classification	1188	589			599							
A and B	9.3	32.4	-		10.5	24.2	1		8.2	43.5	-	
C, D and E	90.7	43.2	-		89.5	38.9	1.35	0.86;2.13	91.8	47.3	-	
Intermediary level	n = 862				n = 513				n = 441			
Other hospitalization in the past year	1099	559			540							
None	48.4	38.7	1		51.5	32.6	1		45.2	45.5	1	
1 to 2	43.4	47.5	1.12	0.94;1.34	41.1	45.1	1.36	1.07;1.72	45.9	49.8	1.06	0.84;1.34
3 or +	8.2	54.6	1.29	1.07;1.55	7.5	47.5	1.54	1.17;2.02	8.9	60.9	1.22	0.97;1.53
Length of time the health care center is functioning	1010	489			521							
1° thid	41.0	39.9	1		38.4	36.6	-		43.4	42.6	1	
2° third	55.5	45.6	1.17	0.99;1.38	57.9	38.7	-		53.4	52.4	1.35	1.07;1.69
3° third	3.5	32.3	0.97	0.59;1.61	3.7	26.7	-		3.3	37.5	0.94	0.52;1.73

To be continued

Continuation Table 4

Level of analysis / Variable	Both sexes						Male sex			Female sex					
	n %	% ACSC	PR	95% CI	n %	% ACSC	Description	n %	% ACSC	PR	95% CI	n %	% CSAP	PR	95% CI
Health service of reference is FHP	1007				487			520							
No	38.0	42.7	1		36.1	34.2		39.8	49.7	1					
Yes	62.0	43.1	0.85	0.71;1.02	63.9	39.4		60.2	46.6	0.67	0.52;0.85				
Individual utilizes FHP *	623				310			313							
No	64.2	40.9	1		62.9	40.0		65.5	41.8	1					
Yes	35.8	47.3	1.15	0.95;1.39	37.1	38.8		34.5	55.8	1.32	1.03;1.68				
Consultation in emergency room	1199				595			604							
None	52.4	40.7	1		50.9	38.7		53.8	42.5	1					
1 to 2	44.2	44.4	1.16	1.00;1.35	45.0	36.6		43.4	52.2	1.23	1.02;1.49				
3 or +	3.4	48.6	1.25	0.87;1.80	4.0	42.9		2.8	56.2	1.36	0.87;2.13				
Proximal Level**				n = 841							n = 403				n = 433
Hospital of admission	1200				596			604							
Philanthropic	58.2	33.7	1		63.8	29.3		52.8	38.8	1					
University Hospital	41.8	54.8	1.68	1.43;1.97	36.2	52.4		47.2	56.5	1.58	1.28;1.94				
Performance of the Health Team (score above the median)***	1010				489			521							
Team work	37.2	39.8	0.81	0.65;1.09	32.9	32.9	0.77	0.59;1.00	44.8	-	-				
Organization of care	43.6	39.9	-	-	40.1	35.0	-	-	43.7	0.83	0.63;1.09				
Average of all the criteria****	48.8	45.1	0.89	0.75;1.06	47.2	33.8	0.79	0.63;1.00	46.2	-	-				

Poisson Regression with robust variance; variables that attained p<0.05 are in **bold** letters

- Does not apply or was not included in the model (p ≥0.2)

* The denominator is composed of the patients that have a FHP health care center as their reference

** Includes the specialty of the physician responsible for hospitalization, according to the patient's account. The variable enters the model only to control this condition, without an interest in estimating its effect.

*** Score given by the Department of Health and the municipality's coordinators of primary health care. Dichotomous comparison, with the median of the scores as the cutting point. PR<1 indicates less probability of ACSC.

**** The variable was entered into the model without the isolated criteria of evaluation, so as to avoid the effect of collinearity.

the analysis of the diagnosis reported at the time of admission to the hospital. The mean family income was R\$ 69.82 lower for those individuals hospitalized for ACSC than those admitted to the hospital for other causes ($p=0.007$); the mean level of education for both groups was similar (there was a difference of 0.3 years; $p=0.2$).

Table 3 presents the relation between the model of care and ACSC diagnosis upon admission to the hospital. There was no significant difference according to the model of care or use of the health care center of reference. However, independently of the population being analyzed, the proportion of ACSC was greater among individuals who indicated a FHP Centre as his/her

Table 5. Multivariate analysis of hospitalizations due to ambulatory care-sensitive conditions by levels of determination, according to the model of care. Bage, Southern Brazil, 2006-2007.*

Level of analysis / Variable	Model of care					
	Family Health Program (n=624)		Traditional primary care (n=386)		Other (n=190)	
	PR	95% CI	PR	95% CI	PR	95% CI
Distal level		n = 586		n = 356		n = 184
Female sex	1.22	1.02;1.47	1.53	1.19;1.96	-	-
Age group (yrs)						
5 – 14	0.74	0.55;0.99	0.32	0.15;0.67	1.20	0.76;1.89
15 – 49	0.53	0.42;0.69	0.54	0.39;0.76	0.53	0.32;0.87
50 or +	0.65	0.51;0.83	0.60	0.45;0.81	0.72	0.48;1.07
Schooling (yrs)						
5-8	0.91	0.73;1.13	0.73	0.55;0.97	-	-
9-11	0.84	0.63;1.12	0.74	0.52;1.04	-	-
12 or +	0.53	0.15;1.88	0.44	0.16;1.25	-	-
Classes C, D and E	-	-	-	-	2.19	1.05;4.59
Intermediary level		n = 585		n = 331		n = 166
Other consultation in the past month	-	-	-	-	1.47	1.07;2.03
Hospitalization in the last 12 months						
1 to 2	-	-	1.14	0.85;1.52	1.72	1.11;2.65
3 or +	-	-	1.52	1.14;2.04	2.03	1.35;3.03
Utilizes FHP**	1.20	1.00;1.45	-	-	-	-
Consultation in the emergency room						
1 to 2	1.29	1.07;1.57	-	-	-	-
3 or +	1.34	0.82;2.19	-	-	-	-
Consultation covered by the health plan or private physician						
1 to 2	-	-	1.16	0.84;1.61	1.26	0.80;1.96
3 or +	-	-	1.87	0.72;4.82	2.19	0.96;5.02
Proximal level***		n = 571		n = 331		n = 166
Admitted as an inpatient in the university hospital	1.64	1.37;1.96	1.83	1.37;2.44	1.3	0.88;1.91
Performance of the Health Team (Evaluation by the administrator)						
Team work	0.84	0.66;1.08	-	-	-	-
Organization of care	-	-	0.69	0.52;0.92	-	-
Average of all the criteria****	0.88	0.72;1.07	0.77	0.61;0.98	-	-

- Does not apply or was not included in the model ($p \geq 0.2$)

* Variables that compose the model in any of the strata of analysis are presented; the categories of reference are omitted; the variables which reached $p < 0.05$ are in **bold** letters

** Reference: residents in the Family Health Area that did not have consultations in the FHP in the month prior to the interview

*** Level 3 (proximal) includes the specialty of the physician responsible for admitting the patient to the hospital, according to the patient's account, only to control this information, without an interest in estimating its effect. Presented $p=0.02$ for the FHP, $p=0.12$ for Traditional Primary Care (A.B.), and $p=0.8$ for "Other", which is not included in the analysis of this strata.

**** Variable entered without the other criteria of evaluation, so as to avoid collinearity

service of reference or when the patient had consulted with a physician at his primary health care center during the previous month.

Bivariate analysis indicated a greater probability that diagnosis at admission to the hospital would be ACSC among: women, children under 5 yrs of age, people who had less schooling, those who were poorer, those who had been hospitalized at least one other time in the year prior to the interview, and among those who had been to a consultation, during the month before the interview, for a reason other than the one that led to hospitalization. The hospital in which the patient was admitted as well as the specialty of the admitting physician, were also associated with the outcome. Admission was recommended in 42.8% of the cases being attended by FHP, versus 61.3% of the cases being attended, by any other model of care (RP=0.70; 95% CI [0.57;0.86]).

Although referrals from health plan consultations recommending that patients be admitted to the hospital reached $p=0.2$, there was a small number of observations of this type ($n=37$) and the variable was not included in the multivariate model.

Table 4 presents the description and bivariate analysis of the variables that entered the adjustment model, as well as the multivariate analysis, involving all study subjects and according to sex strata. It may be observed that receiving primary health care within the FHP, the length of time the primary health care center (PHCC) has been in existence and, principally, the period of time it has been functioning as FHP were variables, close to the limits of statistical significance. Among the performance criteria evaluated by the Director of the Health Department and the team coordinating the municipality's primary health care, the one which was closest to an association with ACSC as a cause of hospitalization was "organization of care" ($p=0,1$).

As it may be observed on Table 4, the proportion of ACSC among women was 28% greater than among men. The age group with the greatest risk of finding an ACSC among the patients admitted to the hospitals through SUS was composed of children under five years of age and this risk increased once again among adults aged 50 or older. The proportion of ACSC decreased with increasing educational level ($p<0.001$). The same table indicates that when the FHP was the service of reference, the probability of a diagnosis of ACSC was 15% lower ($p=0.08$). The hospital was the main associated factor. Patients whose PHCC of reference received an above average score for the criteria "team work" presented a probability 19% lower than others that the cause of admission to the hospital was an ACSC ($p=0.06$). The probability of ACSC diagnosis increased for: the female sex, age under 5 years, less than five years of schooling, hospitalization in the previous year, consultation at the emergency room, admission at the university hospital.

Furthermore, Table 4 indicates that the major differences between the sexes refer to the model of attention. The proportion of ACSC was 33% lower among women residing in a FHP region, but 32% higher among those that had had a FHP consultation in the month prior to the interview. Among men, no association was observed between the model of attention and ACSC. Among women, ACSC prevalence was also associated to: age group, schooling, length of time the PHCC was functioning, having a Family Health Center as the center of reference, being a person who utilizes the FHP services, having consulted at the emergency room of a hospital during the month prior to the interview, and hospital to which she was admitted. For men, ACSC prevalence was associated to age group, having been hospitalized at least one other time the previous year and hospital to which he was admitted.

By analyzing separately the model of care of reference (Table 5), certain singularities are perceived: sex is only associated to one ACSC in the FHP and in traditional primary care; in the other models of care (consultation by specialist, at the hospital ambulatory, at the business or union, through a health plan, private physician, among others), the variable that had the strongest effect and statistical significance was ownership of consumer goods. Among these models of care, no association was found with the hospital or physician responsible for admission. The same table indicates that the tendency to decrease the proportion of ACSC as years of schooling increases loses significance among the group that is covered by the FHP. Compared to all other patients residing in Family Health Areas, those that had a consultation at the PHCC in the month prior to the interview had a 20% higher probability that the cause of admission to the hospital was an ACSC ($p=0.05$). A consultation at the emergency room and the physician's specialty were only associated with the outcome among patients residing in Family Health Areas. On the other hand, criteria for evaluating the performance of the health teams were only associated to the outcomes of "traditional" primary care.

DISCUSSION

This study is a hospital survey, which investigated the measure of the effect of the proportion of ACSC among hospital admissions. Inferences may not be made concerning the risk of hospitalization for these causes. A larger population covered by a particular model of care could result in a greater proportion of ACSC among hospitalized patients who use this model of care, even if the rate of hospitalizations among them was lower.

The associations found can only be interpreted as an effect of the model of care when referred to analysis within each model (as exemplified by the proportion of ACSC according to the levels of education in each

model of care), or when the analysis refers to the entire study population (such as the proportion of ACSC according to the hospital to which patients were admitted). This may be an explanation for the apparently paradoxical relation between the lower probability of ACSC among patients residing in a Family Health Area and FHP users.

Thus, whenever the factor of analysis requires the residing population as a denominator, or the population that consulted for an ACSC and was not admitted to the hospital (such as the proportion of ACSC according to the model of care), its effect could be estimated only if the hospitalized population was compared to the population which was not hospitalized. Given an incidence of hospitalization for ACSC of approximately 2% per year, a population sample with this objective would have a very high budget. Identification of adequate denominators would be possible if a variable of the PHCC of reference to the hospitalized patient were included in the *Sistema de Informações Hospitalares/SUS* [System of Hospital Information of the Unified Health System] and if a record of the population residing in each health care area were available, as occurs in the FHP.

It is expected that there will be, among the study population, an over-representation of people exposed to greater risks and in worse health conditions than the general population. The variable FHP user, is useful in identifying the portion of the population covered by the FHP who did not use the system in the month prior to the interview, but perhaps incorporates aspects of the subject's health status, such as the gravity of the problem that led to the hospitalization, more than regular use of the FHP. This possibility is reinforced by the findings of the *Programa de Expansão e Consolidação da Saúde da Família-UFPEl*¹³ [Program of Expansion and Consolidation of Family Health – Federal University of Pelotas] that indicate that the poorest among the poor utilized the PHCC to which they were assigned according to their residential zone.

Selection biases are not expected (beyond those that are due to seasonal and temporal variation), since all patients admitted to the hospitals during this period were interviewed, with only a small proportion of refusals, despite the fact that average age of this group was higher. It is not possible to dismiss eventual classification errors, particularly when the diagnosis upon admission to the hospital is influenced by the systems of reimbursement. However, advances in auditing within SUS are notorious and the few studies that discuss the trustworthiness of diagnosis recorded on the *Autorização de Internação Hospitalar (AIH)* [Hospital Admission Authorization] form conclude that it is useful in epidemiological studies.¹⁸ Such a bias, if it occurs, should be non-directional since there is no reason to expect any difference due to the patient's PHCC of reference.

Hospitalization for ACSC may occur, among other reasons, due to the lack of use or a delay in the use of resources offered by the primary health care center as well as to inadequate clinical management. However, it should be considered that people seek solutions to their health problems and health professionals seek to work in an appropriate manner. As indicators of the effectiveness of the health system, under any circumstances, the interpretation of these hospitalizations should be directed towards the conditions of the organization of the system that generate them and not to the patients or the health workers. For example, the lack of knowledge concerning the supply of services and other “invisible” barriers to the established services perceived by the citizens or, on the other hand, the inadequate training of health professionals.

The ACSC do not evaluate personal determinants of the patient's clinical condition or the quality of the medical act that lead to hospitalization, but the result of policies and actions executed in the face of such health problems. As in this study, individual's variables may be used to identify compliance with the principles of equity of a particular model of care, or its inclusion in models of analysis of variables relative to the health system (as *proxy* of the living conditions of the population being cared for), but should not be utilized to infer the individual's responsibility concerning his need for hospitalization.

The lower probability of ACSC among the women that reported they lived in areas covered by the FHP did not occur among the men, a difference which may be due to the fact that women utilize primary health care services much more than men. The apparently paradoxical associations observed among the residents in areas of family health and among those that effectively attended consultations in the FHP during the month prior to the interview, besides expressing the lack of a populational indicator, may be due to the possible incorporation of clinical gravity in the variable FHP user.

It is plausible that the service where the individual made his/her consultation prior to hospital admission is the one with which he/she has the closest bond. However, the lack of knowledge concerning previous service utilization makes it impossible to state that this occurs in all cases, and this should be taken into consideration when interpreting the results. On the other hand, asking individuals to report on health care during a broader period of time could increase the memory bias.

When the model of care is SUS's primary care, the main characteristics of the person associated to avoidable hospitalization were sex, age and educational level of the patient. In the private sector and other forms of organization of care, the main variable associated was the possession of consumer goods, which indicated a probability twice as great, among subjects with worse

economic conditions, that the cause of hospitalization would be an ACSC. This characteristic, which suggests a compensating effect of the Unified Health System on social inequity, is even more evident in the FHP, where the association with educational level loses statistical significance. The FHP attends more and recommends hospitalization less often than all other models of care.

In Brazil, accompanying the avoidable hospitalizations in order to evaluate and monitor primary health care was proposed by the State of Ceara; studies promoted by institutions associated to the State Health Departments were conducted in Bahia and Minas Gerais.^{a,b} The Ministry of Health has also been studying this indicator (this resulted in the list of ACSC codes^c utilized in this study), but no Brazilian study on the theme was found in scientific journals. To the authors' knowledge, this is also the first Brazilian study in which the indicator is integrated, and which uses primary and not aggregated data.

The proportion of ACSC found (43%) is much greater than that reported in other studies, even among the Spanish and Australian (who have universal access and extensive lists of ACSC), that varied from 7% to 13% of total hospital admissions,^{2-4,8,10,12} although there is little comparison possible between the populations and the health systems studied. In the Spanish example, with a system that is effectively universal, only municipalities with a single "Primary Health Care Area" were studied, which might explain such a low proportion of these cases.⁸

On the other hand, the proportion found in this study is similar to that found in Minas Gerais (where ACSC represented 33% of the total discharges, which included deliveries and abortions (20% of discharges), excluded in our study).^a The other results of this study are consistent with those found in the literature, that indicate greater rates of hospitalization among populations with worse socioeconomic conditions, among age groups at both extremes of the spectrum and varying according to the organization and supply of services, without a great deal of consistency according to sex.^{4,6,7,16,b} The lack of association to the residential zone (rural or urban) suggests that there are no barriers with respect to access to primary health care or hospitalization for these different populations of the municipality.³

Despite an incipient effect in the population studied, the FHP in Bage already presents signals of favorable impact. Socioeconomic discrimination was not observed among the individuals hospitalized, thus approaching the objective of the equity principle. The results observed among women and in the analysis by strata of the model of care suggest that even though it has been in activity for a short period of time, the FHP presents better results than traditional primary health care. However, the more immediate solutions for reducing the proportion of ACSC among hospital admissions in the municipality seem to be related to the organization of care in the university hospital.

Criteria for evaluation elaborated with the administrative team seem appropriate for traditional primary care, but need to be improved for FHP. However, this study represents only the perspective of this group and not of others, such as the patients and the health workers of the system.

This indicator is still new and its concept is being developed,⁹ as may be attested by the large variety of lists of codes considered ACSC as well as the different spheres of its application. The effect of the hospital on the determination of ACSC may signify that there is a need to render this measure appropriate theoretically. In this sense, the complexity that results from the multiplicity of health problems accounted for within this indicator, with different probabilities of expression according to sex, age group and its relations to the health services, indicate a broad space for research, both theoretical and in the field, involving the entire population, or specific age groups, sexes and causes, both on the ecological and the individual level of data analysis.

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^a Mendes EV. A atenção primária à saúde no SUS. Fortaleza: Escola de Saúde Pública do Ceará; 2002.

^b Fundação João Pinheiro. Centro de Estudos Econômicos e Sociais. Atenção básica à saúde em Minas Gerais: desigualdades na distribuição de recursos financeiros e na prestação de serviços básicos após a introdução do Piso da Atenção Básica (PAB) [internet]. Belo Horizonte [cited 2004 Nov 21]. Available at: http://www.fjp.gov.br/produtos/cees/Atencao_Basica_em_Minas_Gerais.pdf

^c Ministério da Saúde. Departamento de Atenção Básica. Oficina de trabalho para elaboração de uma Lista Brasileira de Hospitalização por Condições Sensíveis à Atenção Primária. Belo Horizonte, MG, 9/12/2005. (unpublished data)

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