

ORIGINAL ARTICLE

THE BURDEN OF CHRONIC DISEASE IN ADOLESCENT'S HOSPITALIZATIONS

André Garrido¹, Francisca Costa¹, Maria de Lurdes Torre¹, Alexandra Dias².

¹Pediatric Department, Hospital Prof. Doutor Fernando Fonseca, E.P.E., Amadora, Portugal,

²Hospital de Dona Estefânia, Lisboa, Portugal.

ABSTRACT

The growing prevalence of chronic disease during adolescence urges health services to adapt. We did a retrospective characterization of adolescent's hospitalizations in a second-level hospital during five years. We examined adolescent's most relevant clinical information and the hospital resources used for their admission. We also explored how chronic disease influences data collection.

There were 1018 hospitalizations of adolescents in the pediatric ward during this period with longer length of stay and regular need of hospital resources. Chronic patients represented almost 60% of adolescents' hospitalizations and among these, more than two-thirds were related to their chronic disease. This emphasizes the urgency for policy making concerning control optimization of such diseases as well as improving facilities to become more youth-friendly.

Introduction

Chronic disease affects up to 31.5% adolescents.^{1,2,3,4,5} Its prevalence is rising due to advances in management and survival of diseases like cystic fibrosis, congenital heart disease, spina bifida, congenital anemias and cancer and to the increasing incidence of other diseases like obesity and diabetes, asthma, mental disorders and HIV infection.^{2,6,7,8} Although mortality decreased in this age group, morbidity and disability are a growing burden.⁹ The most represented chronic diseases in this age group are asthma and allergies, overweight and obesity, mental health and behavioral problems and heart disease.^{5,7,10}

The burden of these chronic diseases can affect adolescence development, disturb growth and pubertal maturation, social-emotional development and family issues.^{4,11} Global health policies are being settled, encouraging day care and home care instead of in-hospital treatment whenever possible and creating facilities that are more youth-friendly.⁴ The individuals between ten and 19 years of age represented 10.9% of the Portuguese population in 2011¹² and those between ten and 17 years of age were responsible for 24512 hospital discharges in Portugal in 2018, 2.2% of total national hospital discharges.¹³ The most prevalent hospital discharge diagnoses of this age group reported in the literature are: injury and mental disease between ten and 14 years old and complications of pregnancy, childbirth and puerperium and also mental disease between 15 and 18 years old.^{14,15,16}

We examined retrospectively the hospitalizations from our hospital to characterize the adolescent hospitalizations and to study the factors that may have contributed to prolonged hospitalizations, namely chronic disease.

Address for Correspondence: André Garrido, Hospital Prof. Doutor Fernando Fonseca, IC19, 2720-276 Amadora, Portugal.

Email: andre.garrido@hff.min-saude.pt

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ARTICLE HISTORY

Received 6 December 2021

Accepted 17 January 2022

KEYWORDS

Adolescence, Adolescent Health Services, Hospitalization, Chronic Disease

Methods & Materials

We studied adolescent admissions in the pediatric ward of our hospital: between 13 and 18 years old, since the 1st January of 2012 until the 31st December of 2016. We excluded hospitalizations with only surgical conditions (e.g., simple elective surgery, orthopedic trauma).

Our hospital is a Level II hospital that serves the Lisbon outskirts population with immigrants from Africa, South America and Eastern Europe.¹² Major pediatric trauma and oncology patients are rarely admitted in our hospital. Healthy pregnant adolescents are usually admitted to the obstetric ward.

The following data was collected: age, sex, length of hospital stay, reason for admission, previous medical history and underlying diseases, family and social work department support during admission, other specialists consulted during admission and discharge diagnosis.

Reasons for admission were divided in: acute disease, exacerbation of chronic disease, elective medical procedure (such as prophylactic or therapeutic administrations) and social reasons. The discharge diagnoses were categorized according to International Classification of Diseases, Tenth Revision, Clinical Modification (ICD10) coding and then grouped in broader items, following also ICD10 tabular index.

We reviewed the chronic diseases of each patient, limiting to the three more functionally significant. We used the broad definition of chronic disease proposed by Stein and colleagues.¹⁷

The authors performed a descriptive analysis of the data and studied possible correlations between two groups: patients with chronic diseases and patients without chronic diseases.

Statistical analysis was performed using SPSS (version 23.0) software. We used T-test to compare: (a) the mean length of stay of those who were accompanied by a relative with those who were not, (b) those who needed social work department or other medical

specialties support with those who did not and, (c) chronic versus non-chronic patients. The Chi-squared test was used to compare: (a) the need for psychiatric/psychological support among those who needed social work department support versus those who did not; (b) compare the need of social work department support between those that had been accompanied by a relative versus those who had not; (c) compare chronic versus non-chronic patients concerning the need for specialties support and transfer to intensive care. Pearson's chi-squared test was used to compare the different adolescent's companions of chronic versus non-chronic patients. The significance level was set to 0.05 for all tests and they were all double-sided. This analysis was approved by the ethics committee of our hospital.

Results

All Hospitalizations

There were 1018 adolescent hospitalizations in our ward during the study period, representing 13.6% of the total admissions (7507 hospitalizations), with female predominance (61.3%). The median age was 15.8 years (P25:14.4; P75:17.0). The percentage of hospitalizations by age is represented in Table 1.

The median length of stay was four days comparing to a median length of stay of the total hospitalizations in our ward of three days. The median length of stay by age group can be found in Table 1.

The main reasons for admission were acute disease and acute exacerbation of chronic disease as can be seen in Table 1.

The main discharge diagnosis / assemble of symptoms are grouped by ICD10 coding in Table 2.

Professionals from other departments were consulted in 60.7% of the hospitalizations: psychology (14.5%); otolaryngology (12.0%); physical medicine and

rehabilitation (11.4%); ophthalmology (10.0%); pediatric surgery (8.5%); pediatric cardiology (8.0%); child and adolescent psychiatry (6.1%); gynecology (5.5%); orthopedics (5.0%); pain management multidisciplinary team (0.9%). Professionals from more than one department were consulted in 20.6% of hospitalizations. The mean length of hospital stay in which the support of other specialists was needed was significantly longer, 9.6±18.3 days, compared to 3.7±3.3 days when no support was asked (p<0.001). The adolescents were transferred to the intensive care unit of our hospital in 4.6% of the hospitalizations and in 1.3% of cases to other hospitals.

Analyzing the relative support during hospitalization, in 23.0% of the hospitalizations, patients were most of the time alone. 71.5% were accompanied by one of their parents, 1.1% by a grandparent, 0.9% by their boyfriend/girlfriend and 3.5% by other family members or friends. The mean length of hospital stay was significantly longer for hospitalizations in which patients were most of the time alone (11.2±20.6 days versus 6.1±12.2 days, p<0.001).

The social work department intervened in 14.2% of the admissions. The mean length of hospital stay in this setting was significantly longer: 17.3±35.4 days, contrasting with 5.6±5.1 days in which patients did not required social work department support (p<0.001). In the group of patients that needed social work department support, psychological (33.1% versus 11.5%) and child and adolescent psychiatry (14.5% versus 4.7%) were also significantly more requested (p<0.001). Adolescents with no family support during admission were also the group that needed significantly more support from the social work department (28.6% compared with 9.9%, p<0.001).

In nine cases a maltreatment protocol was reported (0.9% of total hospitalizations): one case of neglect, one case of emotional and physical abuse, one case

Table 1. Percentage of hospitalizations and median length of stay by age. Reasons for admission of total hospitalizations and of the hospitalizations of adolescents with chronic disease.

Age (years old)	All hospitalizations		Hospitalizations of adolescents with chronic disease	
	%	Median length of stay (days)	%	Median length of stay (days)
13	17.5	3 (min=1; max=71)	17.1	3 (min=1; max=54)
14	16.6	3 (min=1; max=147)	19.6	3 (min=1; max=147)
15	19.2	4 (min=1; max=98)	15.3	4 (min=1; max=98)
16	21.1	4 (min=1; max=283)	22.5	4 (min=1; max=98)
17	21.8	4 (min=1; max=100)	20.6	4 (min=1; max=59)
18	3.8	5 (min=1; max=231)	4.9	6 (min=1; max=231)

Reasons for admission	% of all hospitalizations	% of hospitalizations of adolescents with chronic disease
Acute disease	65.3	43.8
Acute exacerbation of chronic disease	27.8	47.5
Elective procedure	4.9	8.1
Social issues	1.2	0.7

Table 2. Frequency of ICD10 group diagnoses of hospital discharge of all adolescent hospitalizations and of hospitalizations of adolescents with chronic disease.

ICD10 Groups	All hospitalizations		Adolescents with chronic disease	
	N	%	n	%
J00-J99 Diseases of the respiratory system	154	15.1	92	15.4
R00-R99 Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	126	12.3	76	12.7
A00-B99 Certain infectious and parasitic diseases	120	11.8	41	6.9
D50-D89 Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	100	9.8	88	14.8
G00-G99 Diseases of the nervous system	77	7.6	56	9.4
E00-E89 Endocrine, nutritional and metabolic diseases	69	6.8	54	9.1
N00-N99 Diseases of the genitourinary system	68	6.7	31	5.2
L00-L99 Diseases of the skin and subcutaneous tissue	57	5.6	16	2.7
(ICD-10-PCS Codesa) 0 Medical and Surgical	50	4.9	17	2.9
S00-T88 Injury, poisoning and certain other consequences of external causes	36	3.5	16	2.7
K00-K95 Diseases of the digestive system	35	3.4	27	4.5
F01-F99 Mental, Behavioral and Neurodevelopmental disorders	32	3.1	21	3.5
Z00-Z99 Factors influencing health status and contact with health services	28	2.5	26	4.4
I00-I99 Diseases of the circulatory system	24	2.4	12	2.0
M00-M99 Diseases of the musculoskeletal system and connective tissue	23	2.3	12	2.0
F Physical Rehabilitation and Diagnostic Audiology	7	0.7	7	1.1
C00-D49 Neoplasms	6	0.6	2	0.3
O00-O9A Pregnancy, childbirth and the puerperium	3	0.3	1	0.2
Q00-Q99 Congenital malformations, deformations and chromosomal abnormalities	2	0.2	1	0.2
V00-Y99 External causes of morbidity	1	0.1	0	0

^a ICD-10 Procedures Codes

of physical and sexual abuse and six cases of physical abuse. The adolescents were most of the time alone in 66.7% of these hospitalizations.

Chronic Patients Hospitalizations

Out of 1018 hospitalizations, 596 (58.5%) were of chronic patients, with a female predominance of 64.1%. The median age was 15.9 years (P25: 14.4; P75: 17.0). The mean length of hospital stay for these hospitalizations was 7.8 ± 17.7 days (max=283; min=1) comparing to 6.6 ± 8.8 days (max=100; min=1) in non-chronic adolescents ($p=0.183$), although not statistically significant. The patient with the longest length of hospital stay is a chronic patient with quadriplegic cerebral palsy and epilepsy who was hospitalized for multiple illness complications.

In 68.6% of the cases, the cause of admission was related to a chronic disease. The main reasons for admission can be found in Table 1. The main chronic disease found was sickle-cell disease. Table 3

presents the most common chronic disease diagnosis encountered. The main discharge diagnosis / assemble of symptoms are grouped by ICD10 coding in Table 2.

Compared with the non-chronic patients group, the group of adolescents with chronic disease required more support from other specialists, namely psychology (17.6% versus 10.2%, $p=0.001$), physical medicine and rehabilitation (15.1% versus 6.2%, $p<0.001$), child and adolescent psychiatry (7.6% versus 4.0%, $p=0.023$), pediatric cardiology (8.2% versus 7.6%, $p=0.72$) and pediatric pain management team (1.4% versus 0.2%, $p=0.089$). All these differences were statistically significant except for pediatric cardiology and for pediatric pain management team. In 5.9% of the chronic patient hospitalizations, the adolescent needed intensive care as opposed to 2.8% of the non-chronic ($p=0.103$).

In the chronic disease group, 24.5% of the adolescents were alone during the admission, when compared with

Table 3. The top forty most represented chronic diseases.

Chronic disease		n	% of hospits.
D57	Sickle-cell disorders	111	18.6
J45	Asthma	72	12.1
E10	Type 1 diabetes mellitus	55	9.2
J30	Vasomotor and allergic rhinitis	36	6.0
E66	Overweight and obesity	34	5.7
G40	Epilepsy and recurrent seizures	30	5.0
C96	Other and unspecified malignant neoplasms of lymphoid, hematopoietic and related tissue	29	4.9
K51	Ulcerative colitis	28	4.7
D83	Common variable immunodeficiency	28	4.7
G43	Migraine	25	4.2
J47	Bronchiectasis	24	4.0
F33	Major depressive disorder, recurrent	23	3.9
F41	Other anxiety disorders	19	3.2
G80	Cerebral palsy	15	2.5
F79	Unspecified intellectual disabilities	13	2.2
F91	Conduct disorders	13	2.2
G90	Disorders of autonomic nervous system	13	2.2
M86	Osteomyelitis	12	2.0
D64	Other anemias	11	1.8
K29	Gastritis and duodenitis	11	1.8
J35	Chronic diseases of tonsils and adenoids	9	1.5
G91	Hydrocephalus	9	1.5
M32	Systemic lupus erythematosus	8	1.3
D86	Sarcoidosis	8	1.3
F90	Attention-deficit hyperactivity disorders	8	1.3
E03	Other hypothyroidism	8	1.3
K59	Other functional intestinal disorders	7	1.2
R11	Nausea and vomiting	7	1.2
D68	Other coagulation defects	6	1.0
N28	Other disorders of kidney and ureter, not elsewhere classified	6	1.0
I10	Essential (primary) hypertension	6	1.0
I51	Complications and ill-defined descriptions of heart disease	6	1.0
K50	Crohn's disease	5	0.8
G93	Other disorders of brain	5	0.8
K90	Intestinal malabsorption	5	0.8
I63	Cerebral infarction	5	0.8
E27	Other disorders of adrenal gland	5	0.8
Z21	Asymptomatic human immunodeficiency virus [HIV] infection status	4	0.7
B69	Cysticercosis	4	0.7
N04	Nephrotic syndrome	4	0.7

20.9% in the non-chronic disease group ($p=0.199$). 70.1% were accompanied by one of their parents (versus 73.5% in the non-chronic group), 1.2% by a grandparent (versus 0.9% in the non-chronic), 0.8% by their boyfriend/girlfriend (versus 0.9% in the non-chronic group) and 3.4% by other family member or friend (versus 3.8% in the non-chronic group) ($p=0.719$).

Social work department intervened in 16.3% of the admissions compared with 11.4% in the non-chronic group ($p=0.029$). Four of these hospitalizations required a maltreatment protocol.

Discussion

There were more female than male adolescent hospitalizations, contrasting with the evidence that

chronic disease is more prevalent in males.^{1,4,7,10} This may be due to the absence of trauma hospitalizations in our ward, although admissions for mental disease and obstetric motives were also rare.

We confirmed longer median length of stay of one day when comparing the adolescent's hospitalizations with the total hospitalizations of the pediatric ward. As reviewed in the literature¹⁴, this analysis also confirms a rise in the number of adolescent's hospitalizations with age. The median length of hospital stay increased with age too, which is also supported by international health statistical reports.¹⁸ The mean length of stay was significantly longer in hospitalizations of unaccompanied patients and when other specialties and social work department support were needed.

The top groups of discharge diagnoses were substantially different from the McManus et al. survey.¹⁴ This can be explained by local protocols as adolescents admitted with poisoning are commonly hospitalized in our observation room and then transferred for observation in a child and adolescent psychiatric emergency service. Major trauma is usually diverted to other local hospitals and complications of pregnancy, childbirth and the puerperium are hospitalized in the obstetric ward.

However, more importantly, above two thirds of hospitalizations were from adolescents with chronic diseases and more than two thirds of these were related to their chronic disease. Exacerbations of chronic diseases were responsible for more than one fourth of the total hospitalizations and almost half of the chronic patients' admissions. These results are in line with the most recent analysis that reflect the burden of chronic disease in pediatric hospitalizations.¹⁹ The chronic disease group required significantly more support from other specialists. Capacitation of caregivers with technical knowledge and skills, facilitation of communication with clinical staff and the improvement of transitions between hospital and home are fundamental aspects to reduce hospitalizations of adolescents with chronic disease.^{20,21,22}

Family and friends support is of utmost importance in hospitalizations as is reflected by our data. Adolescents with chronic diseases are more frequently unaccompanied and require social work department support more often, thus resulting in significantly longer hospitalizations. Interestingly, they were more regularly accompanied by a grandparent than the non-chronic adolescents which reflects the known importance of these relatives in chronic disease, namely in sickle cell disease.²³

Limitations of this analysis include the retrospective nature of the study and are related to the sample selection, since the pediatric department of our hospital does not admit trauma patients or pregnant teenagers. Both groups, we believe, are highly represented in adolescence hospitalizations. This is a level II hospital therefore a central hospital may have different results than ours.

Conclusion

The hospitalizations of adolescents represent a significant burden in the pediatric ward with longer length of stay and regular need of other specialties and social work department support. They are

frequently unaccompanied which urges for creative measures that promote the adolescents' well-being in these circumstances. Chronic diseases contribute to an additional pressure in these hospitalizations and constitute a huge burden in these patients' lives. It is urgent to empower caregivers and community health services with skills to optimize the control of chronic diseases and to improve the accessibility for day care and home care instead of in-hospital treatment whenever possible.

Compliance with Ethical Standards

Funding None

Conflict of Interest None

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