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The incidence of acute pancreatitis in children hospitalized with abdominal pain in Pediatric Surgery Clinic in Bydgoszcz

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Abstract

Introduction

The condition most frequently reported by children is abdominal pain, posing a substantial diagnostic problem. In paediatric population, acute pancreatitis occurs much less frequently than in adults.

Aim of the study

The aim of the study was to assess rate of acute pancreatitis in children accepted to hospital for abdominal pains.

Material and methods

The study was of a retrospective nature. 629 medical histories of children hospitalized in University Hospital No. 1 in Bydgoszcz for abdominal pains and/or acute pancreatitis were analyzed. Demographic data (sex, age, residence) and season of patients' admission were included in the study.

Results

The study reveals, that hospital admissions for abdominal pain more frequently regarded boys -352 (55.96%) than girls -277 (44.04%). Children of urban background formed 57.39% and those of rural background -42.61%. In the studied group, acute pancreatitis concerned girls more frequently than boys (8.7% vs 3.7%). No statistical relationship was proven between the age and the acute pancreatitis occurrence. The average age of children with acute pancreatitis amounted to 11.02 years. Every third instance of acute pancreatitis was diagnosed in spring (32.4%), and every fifth (18.9%) in winter.

Conclusions

1. An increase is observed in the number of children's hospital admissions for abdominal pains. Admissions for abdominal pains formed an average of one fifth of all admissions.

2. A decrease in acute pancreatitis occurrence is observed in hospitalized children.

3. Acute pancreatitis occurred twice as often in girls than in boys.

Keywords: children, pain, abdominal pain, pain evaluation, pancreas, pancreatitis, acute pancreatitis.

Introduction

The appearance of an unpleasant and disagreeable sensory experience is referred to as the occurrence of pain. Pain is experienced, when the intensity of stimuli exceeds the body's physiological limits. Its strength depends on each human being's individual predispositions and experiences. According to the definition, pain is an "unpleasant sensual and emotional experience related to a presently occurring or potential damage to tissues/organs, or described in the categories of such damage" [1,2]. Pain is a type of sensory experience, indispensable to human life. When dealing with pain-related conditions in children, in the aspect of the rate and type of its occurrence, one needs to take into consideration the specificity of child's stage of development [2].

In paediatric practice, pain is regarded as the most frequently reported medical condition. This common symptom may reveal itself during many diseases. This causes pain to be a diagnostic problem, as the cause for its occurrence is usually hard to establish [3]. Differentiation is made based on the cause, location and the nature of the condition.

Pain may have an impact on a human being's general development and functioning. It also impacts greatly on shaping the immature, fragile psychology of a child [1]. The reaction to the pain experienced, is composed of different factors. The evaluation of pain in children is not easy, because of its subjective nature, as well as of the increased difficulty in the contact with a small, suffering child. In order to facilitate the process of condition evaluation, many scaling systems were developed to be used in paediatrics.

As soon as the child develops such symptoms as: pain in the epigastrium, nausea, vomiting, the diagnosing physician must take into consideration the possibility of acute pancreatitis [4].

Pancreatitis occurs relatively rarely in child patients. In child population, acute pancreatitis occurs much less frequently than in adults [5-8]. The literature contains data showing it to apply to 10-15:100000 children and youth [7], while the general occurrence of paediatric pancreatitis amounts to 1:7000 [9]. The problem of the aforementioned disease tends to gain in epidemiologic significance in paediatrics. This is probably due to the increased disease occurrence in children, as well to the increased clinical alertness [5].

Aim of the study

The aim of the study was to assess rate of acute pancreatitis in children accepted to hospital for abdominal pains.

Material and methods of study

The research was of a retrospective nature. 629 medical histories of children hospitalized in Paediatric Surgical Ward in University Hospital No. 1 in Bydgoszcz in 2008-2012 for abdominal pains and/or acute pancreatitis were analyzed. Demographic data (gender, age, residency) and season of patients' admission were included in the study.

Authorisation for conducting the research was granted by the Bioethics Committee at L. Rydygier Collegium Medicum in Bydgoszcz, Nicolaus Copernicus University in Torun; request no. KB 306/2013.

The criterion for including a medical history into the analysis was the medical diagnosis at the moment of a child's acceptance into the hospital: abdominal pain and/or pancreatitis. The criterion for excluding a medical history from the study were medical diagnoses of children hospitalized on other grounds than abdominal pain.

Statistical analysis was conducted using Microsoft Excel 2007, employing standard functions of the spreadsheet, as well as the statistical software STATISTICA.

In the study, while testing null hypothesis of the lack of dependence between the analized features, the χ^2 test for factors' independence was employed. The significance level of p<0.05 was implemented.

Characteristics of the studied group

The number of children hospitalised for acute abdominal pain and acute pancreatitis in comparison to all children accepted into the Paediatric Surgical Ward at the given time, is presented in Table I.

Feature	All children	Children	Children
	hospitalized in	hospitalized for	hospitalized for
	Paediatric	stomaches	acute pancreatitis
	Surgical Ward		
2008	1214	124 (10.21%)	12 (0.99%)
2009	1233	106 (8.6%)	9 (0.73%)
2010	942	108 (11.46%)	9 (0.97%)
2011	1237	128 (10.35%)	6 (0.49%)
2012	1478	163 (11.03%)	3 (0.2%)
Total	6374	629 (9.89%)	39 (0.6%)
Annual on	1275	126 (9.88%)	8 (0.63%)
average			

Table I. Studied group according to the number of hospitalizations

Over 5 years, 6374 children were hospitalized in the Paediatric Surgical Ward, with an average of 1275 patients accepted annually. The group of abdominal pain patients under study amounted to 629 children between 2008 and 2012, including 39 children hospitalized for acute pancreatitis. Of these, the annual average for patients with abdominal pain was 126 children, 8 with acute pancreatitis. Hospital admissions for abdominal pain amount to 9.89% of all hospital admissions on average, and hospitalizations for acute pancreatitis form 0.6% of all hospital admissions. An increase in the number of Ward admissions for abdominal pain is observed, while the number of admissions for acute pancreatitis shows a tendency to decrease. The number of hospitalized children was the lowest in 2010, after which it gradually rose, to reach the highest level in 5 years, in 2012.

The group under study was sociodemographically evaluated, as presented in Table II.

Feature		2008 N (%)	2009 N (%)	2010 N (%)	2011 N (%)	2012 N (%)	Total
	boys	80 (64.52%)	66 (62.26%)	54 (50%)	66 (51.56%)	86 (52.76%)	352 (55.96%)
Gender	girls	44 (35.48%)	40 (37.74%)	54 (50%)	62 (48.44%)	77 (47.24%)	277 (44.04%)
	total	124 (100%)	106 (100%)	108 (100%)	128 (100%)	163 (100%)	629 (100%)
	0-3 years	10 (8.06%)	12 (11.32%)	7 (6.48%)	16 (12.5%)	21 (12.88%)	66 (10.49%)
Age group	4-6 years 7-14	14 (11.29%)	18 (16.98%)	12 (11.11%)	17 (13.28%)	11 (6.75%)	72 (11.45%)

Table II. Characteristics of the group under study

	years 15-18	67 (54.03%)	59 (55.66%)	68 (62.96%)	73 (57.03%)	82 (50.31%)	349 (55.48%)
	years total	33 (26.61%)	17 (16.04%)	21 (19.44%)	22 (17.19%)	49 (30.06%)	142 (22.58%)
		124 (100%)	106 (100%)	108 (100%)	128 (100%)	163 (100%)	629 (100%)
	urban	78	62 (58,400()	65	66	90 (55.210()	268
Area of residence	rural	(62.,9%) 46 (37.1%)	(58.49%) 44 (41.51%)	(60.19%) 43 (39.81%)	(51.56%) 62 (48.44%)	(55.21%) 73 (44.78%)	(42.61%) 361 (57.39%)
	total	124 (100%)	106 (100%)	108 (100%)	128 (100%)	163 (100%)	629 (100%)

The studied group consisted of 629 children hospitalized for abdominal pain, of which 55.96% were boys, and 44.04% were girls. Of all children hospitalized for abdominal pain, 55.39% came from urban areas, and 42.61% from rural areas. The youngest child in the study was a 2 month old infant, while the oldest was 18 years old. The most patients suffering from abdominal pains placed in the range of 10-12 years of age. The lowest number of children hospitalized for this reason was in the age group of 2-4 years (Fig. 1).

Fig. 1. Distribution for the variable of age.



The studied group was evaluated also for clinical factors (Tables III, IV).

	1 1					
Tractmont	2008	2009	2010	2011	2012	total
Heatiment	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Conservative	74	65	50	58	60	315
	(59.68%)	(61.32%)	(46.3%)	(45.31%)	(36.8%)	(50.07%)
Operativa	50	41	58	70	103	314
Operative	(40.32%)	(38.68%)	(53.7%)	(54.68%)	(63.2%)	(49.92%)
Total	124	106	108	128	163	629
	(100%)	(100%)	(100%)	(100%)	(100%)	(100%)

Table III Treatment employed for abdominal pains

Table IV. Hospitalization time

	Minimum	Maximum	М	SD
Days of hospitalization	1,000000	63,00000	7,187599	6,217382

Over half (50.07%) the children accepted into the Ward for abdominal pain, were treated conservatively, while 314 of all patients under the study, 49.92%, required the employment of operative treatment. An increasing tendency to treat operatively can be observed. Over the 5 years, both treatment methods were used with equal rate. Operative and conservative treatment are in more or less proportionate values: 48.6% / 51.4%, with prevalence of the latter.

Hospital treatment of children admitted for abdominal pains most frequently took 1-5 days (Fig. 2).





The shortest stay in the Ward was 1 day, and the longest exceeded 2 months (63 days). The average length of stay at the Ward for hospital treatment of abdominal pain amounted to 7 days.

The average length of hospital treatment in case of acute pancreatitis was 18.19 days, while in case of other diseases it amounted to as short as 6.5 days.

T-test confirmed (Table V), that in children suffering from acute pancreatitis, hospitalization length is substantially higher than it is in the case of other children (p<0.05).

t-test							
	Average - other	Average – acute pancreatitis	t	Df	Р	SD - 0	SD - 1
Hospitalizati on in days	6,50000	18,18919	- 12,3 635	627	0,000000	4,840956	12,54733

Table V. Hospitalization time in cases of acute pancreatitis and other abdominal pains

Study results

Epidemiologic tendencies in abdominal pains occurrence in children

Data on numbers in all types diagnosed in children examined in 2008-2012 were evaluated. These are presented in Table VI.

Table VI. Epidemiologic tendencies in abdominal pains occurence in children.

DIAGNOSIS /	2008	%	20	%	2010	%	2011	%	2012	%
number*			09							
abdominal pains	18	12.24	17	15.32	6	5.17	10	7.41	7	4.19
abdominal injury	9	6.12	9	8.11	8	6.9	16	11.85	16	9.58
acute pancreatitis	12	8.16	9	8.11	9	7.76	6	4.44	3	1.8
observation for acute appendicitis	28	19.05	24	21.62	20	17.24	11	8.15	20	11.98
acute appendicitis – all types	30	20.4	21	18.93	28	24.14	49	36.3	69	41.32
cholelithiasis	7	4.76	2	1.8	14	12.07	10	7.41	16	9.58
suspection (observation for) intussusception	3	2.04	0	0	0	0	0	0	0	0
intussusception	9	6.12	11	9.91	8	6.9	10	7.41	11	6.59
observationforobstructionofalimentary canal	8	5.44	2	1.8	2	1.72	4	2.96	4	2.4
obstruction of alimentary canal	2	1.36	3	2.7	6	5.17	5	3.7	5	2.99
ovarian tumour/twisted tumour	0	0	2	1.8	3	2.59	1	0.74	4	2.4
Ovarian torsion and/or Fallopian tube torsion (incl. torsion of ovarian cyst)	0	0	3	2.7	2	1.72	3	2.22	0	0
Ovarian cyst	1	0.68	0	0	3	2.59	2	1.48	1	0.6
Other	20	13.61	8	7.21	7	6.03	8	5.93	11	6.59
Total*	147	100%	11 1	100%	116	100%	135	100%	167	100%

* numbers here refer not to the number of patients, but to the number of all diagnoses; therefore, percentage values may differ from those presented on previous diagrams.

The table above contains data on the numbers of each of the diagnoses made on child patients examined in 2008-2012. It needs to be noted, that one patient could have multiple diseases diagnosed simultaneously. The largest number of patients hospitalized for abdominal pain had

acute appendicitis diagnosed, and the second most numerous group were children in which this disease was being suspected.

In 2008, acute pancreatitis formed 8.16% of all diagnoses, and placed 5th regarding the rate of occurrence. Most frequently (in one in five patients), acute appendicitis was diagnosed, and in case of 19.05% the disease was being suspected.

In 2009, acute pancreatitis was less numerous than in 2008, 8.11% of all diagnoses, and again placed 5th regarding the rate of occurrence.

Observation for acute appendicitis regarded again over one fifth of patients, while 18.92% were faced with a complete diagnosis of acute appendicitis.

In 2010, acute pancreatitis formed less than in former years, 7.76% of all diagnoses. However, it placed higher (4th) in the rank of occurrence rate. The most frequent was again the diagnosis of acute appendicitis, found in one fourth of examined patients, while the disease was suspected in 17.24% patients.

In 2011, acute pancreatitis amounted to less than in former years, 4.44% of all diagnoses. It descended to 8^{th} in the rank of rate of occurrence. Meanwhile, acute appendicitis was diagnosed in 36.3% of the hospital patients. A large number, 11.85%, suffered from abdominal injuries.

In 2012, acute pancreatitis amounted to less than in former years, only 1.8% of all diagnoses, placing as far as 11th regarding rate of occurrence. Again, the most numerous was acute appendicitis, diagnosed in every fourth patient, and marking the highest number of this disease's occurrence of all the years of study.

The number of acute pancreatitis occurrence over the five years of study between 2008 and 2012, gradually diminishes in value, taking a decreasing tendency.

In 2008, acute pancreatitis formed 9.68% when compared to other abdominal pains, in 2009 it was 8.49%, 8.33% in 2010, 4.69% in 2011, and only 1.84% in 2012.

Relationship between time of year and abdominal pain occurrence in children

In 2008, every third hospitalized child was admitted during spring (31.45%), while the lowest number of hospital admissions were in autumn, 19.25%. In 2009, these proportions reversed. The highest number of child patients with abdominal pains were admitted during autumn: almost every fourth child; the lowest number were admitted in spring, 17.92%. 2010 brought another overturn. In spring, the highest number of abdominal pains occurred: one third of all hospitalizations, while in autumn the number was the lowest: 15.74%. In 2011 a change was noted when compared with previous tendencies. The largest number of children with abdominal pains, 28.13%, arrived in summer and autumn, while the smallest, 19.53%, arrived in winter.

In 2012 again the highest number of calls regarding abdominal pain, one thirds, came in autumn; while in spring this number was the lowest, 14.72%.

In general, over the five years of study, the largest number of children with abdominal pains were admitted to the ward in the summer months, 27.34%, while the lowest number came in winter, 22.42%. The largest number of acute pancreatitis cases were diagnosed in children during spring, forming one third of all acute pancreatitis diagnoses.

 χ 2 test (Chi2=1.688; df=3; p=0.640) proved none of the previously described differences to be statistically significant; therefore season of the year has no significant impact on the occurrence of abdominal pain (Table VII).

Feature		2008 N (%)	2009 N (%)	2010 N (%)	2011 N (%)	2012 N (%)	Total
	spring	39 (31.45%)	19 (17.92%)	36 (33.33%)	31 (24.22%)	24 (14.72%)	149 (23.69%)
	summer	32 (25.81%)	28 (26.42%)	32 (29.63%)	36 (28.13%)	44 (27%)	172 (27.34%)
Season	autumn	24 (19.35%)	39 (36.79%)	17 (15.74%)	36 (28.13%)	51 (31.29%)	167 (26.55%)
	winter	29 (23.39%)	20 (18.87%)	23 (21.3%)	25 (19.53%)	44 (27%)	141 (22.42%)
	total	124 (100%)	106 (100%)	108 (100%)	128 (100%)	163 (100%)	629 (100%)

Table VII Relationship between time of year and abdominal pain occurrence in children

Epidemiologic tendencies in acute pancreatitis occurrence in children

As can be read from the chart, the number of children, in which acute pancreatitis was diagnosed, decreased by half over three years, and decreased four times over four years, since 2008. At the same time, the number of children hospitalized for abdominal pains, gradually increased, reaching the highest level in 2012. (The group of children hospitalized for abdominal pains included also the ones with diagnosed acute pancreatitis).

In 2008-2012 diagnoses of acute pancreatitis formed an average of 5.91% in the context of all hospitalizations for abdominal pain.

Relationship between sex and acute pancreatitis

The studied group consisted of 629 children. 39 definitions regarded acute pancreatitis, and 590 were other diagnoses. The data concerned hospitalizations in 2008-2012. Table VIII presents data regarding the sex of studied children.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2		
	Value	df	Asymptotic significance (2- tailed)
on's Chi-squared	1.688a	3	0.64
Likelihood ratio	1.582	3	0.66
		-	
N important observations	629		

Table VIII. Test  $\chi 2$  – time of year

	Value	df	Asymptotic significance (2- tailed)
on's Chi-squared	1.688a	3	0.64
Likelihood ratio	1.582	3	0.66
N important observations	629		

a. .0% cells (0) have expected size lower than 5. Lowest expected size amounts to 8.29.

Acute pancreatitis was diagnosed in 8.7% girls and 3.7% boys. Therefore, acute pancreatitis occurs more frequently in girls. Abdominal pain is more frequent in boys, while acute pancreatitis is more frequently diagnosed in girls (fig. 4).

Fig. 4. Type of diagnosis and children's sex



 $\chi$ 2 test (Chi2=6.919, df=1, p=0.009) confirmed statistical significance of the discussed intersexual differences. Acute pancreatitis is diagnosed with significantly higher rate in girls (Table IX).

			Diagnosis		
				acute	
			Other	pancreatitis	
			diagnoses		Total
Sex	Boy	Number	339	13	352
		% from Sex	96.30%	3.70%	100.00
					%
	Girl	Number	253	26	277
		% from Sex	91.30%	8.70%	100.00
					%
Total		Number	590	39	629
			94.10%	5.90%	100.00
					%

Table IX. Diagnosis type (acute pancreatitis vs other) and child patients' sex.

#### Dependence between age and acute pancreatitis occurrence

Acute pancreatitis is diagnosed in children of an average age of 11.02 years, while other abdominal pains are diagnosed in children in an average age of 10.24 years, as presented in figure 5.



box plot: age

Fig. 5. Diagnosis type (acute pancratitis vs others) and age

0 - other abdominal pains,

1 - acute pancreatitis

Acute pancreatitis comprises a broader age range than other abdominal pains, and is diagnosed in slightly older children than other abdominal pains. T-test did not confirm this age difference to be statistically significant (p>0.05) (Table XII).

Table	XII.	$\gamma 2$	tests –	diagr	nosis	and	sex
raute	<b>ZXII</b> .	14		ulugi	10313	ana	SUA

			Asymptotic	Exact	Exact
			significance	significance (2-	significance (1-
	Value	Df	(2-tailed)	tailed)	tailed)
on's Chi-squared test	6.919a	1	.009		
B continuity correction	6.050	1	.014		
Likelihood ratio	6.894	1	.009		
Fisher's exact test				.010	.007
N important	629				
observations					

a. .0% cells (0) have expected size lower than 5. Lowest expected size amounts to 16.29.

b. Calculated for 2x2 table only.

*Relationship between residence and the occurrence of acute pancreatitis* Acute pancreatitis is diagnosed in 5% patients from urban areas and 7.1% patients from rural areas (Table XIII).

Table XIII. Average age of acute pancreatitis occurrence

T-test			-				
	Mean - 0 other	Mean – 1 acute pancreati tis	Т	Df	р	SD - 0	SD - 1
Age	10.24520	11.02703	-1.0039	627	0.315796	4.584014	4.78125

Table XIV. Type of diagnosis (acute pancreatitis vs others) and place of residence

			Diagnos	Diagnosis	
				acute	Π
			Other	pancreatitis	Total
Area of residence	urban	N size	343	19	361
		N%	95.0%	5.0%	100.0%
	rural	N size	247	20	268
		N%	92.9%	7.1%	100.0%
Total		N size	590	39	629
		N%	94.1%	5.9%	100.0%

			Asymptotic	Exact	Exact
			significance	significance	significance (1-
	Value	Df	(2-tailed)	(2-tailed)	tailed)
Pearson's chi-squared test	1.229a	1	.268		
B continuity correction	.879	1	.349		
Likelihood ratio	1.215	1	.270		
Fisher's exact test				.305	.174
N Important observations	629				

Table XV.  $\chi 2$  tests: Type of diagnosis (acute pancreatitis vs others) and area of residence

0% cells (0) have expected size lower than 5. Lowest expected size amounts to 15,76.

Table XVI. Occurrence of abdominal pain and acute pancreatitis in the context of season of the year

	acute	Other	Total
	pancreatitis	diagnoses	N%
	N%	N%	
Spring	13	137	149
	(33.33%)	(23.22%)	(23.69%)
Summer	10	162	172
	(25.64%)	(27.45%)	(27.34%)
Autumn	9	158	167
	(23.08%)	(26.78%)	(26.55%)
Winter	7	134	141
	(17.95%)	(22.71%)	(22.42%)
Total	39	590	629
	(100%)	(100%)	(100%)

 $\chi$ 2 test (Chi2= 1.229; df=1; p=0.268) did not confirm significance of the differences (Table XV).

Acute pancreatitis occurs with equal rate in rural dwellers and in urban inhabitants.

Relationship between time of year and paediatric acute pancreatitis diagnosis

The number of acute pancreatitis diagnoses with consideration of seasons of the year is presented in Table XVI. The data refers to hospitalizations of children in 2008-2012.

The highest tendency in abdominal pain's occurrence was in the months of summer. Every third child suffering from abdominal pains was hospitalized in summer, while the lowest number, 22.42% felt pains to the abdomen during winter.

Acute pancreatitis was diagnosed with the highest rate in spring, one third (33.33%). The lowest number of acute pancreatitis diagnoses were made in winter, 17.95%.

# Discussion

It is estimated, that the pancreatitis occurrence rate amounts to 1:7000 children [9]. However, it is hard to estimate incidence proportion and prevalence rate in children, as most data in the literature considers small groups of patients, or even single cases [4].

The gathered own results considering manners of acute pancreatitis treatment, find their reflection in data cited by other authors. In own study, of 39 cases of acute pancreatitis, 20 required no more than conservative treatment, of which it should be noted, that it also serves as introductory to operative treatment. Similar observations are shared by A. Stawarski, who notes that in most cases, conservative treatment is used [10]. Thus, it is confirmed to be the most frequent method of treatment.

Medical procedures in acute pancreatitis depends on patient's general state, the severity and

stage of the disease, and they are of a multi-directional nature [9,11]. During the therapeutic process a distinction can be made between conservative, endoscopic and surgical, as well as dietetic treatment.

Early diagnosis and a proper handling of a child suffering from pancreatitis can prevent earlier and later complications of the disease [12].

In own study, over the 5 years, 39 children were hospitalized, in the age of 11.02 on average. These data are in concord with the results of a study by M. Uścinowicz et al. in 3rd Paediatric Ward of the Medical University in Białystok, and in Gastrological Clinic of the Paediatric Clinical Hospital. Study showed that over the 7 years of the research, acute pancreatitis occurred in 40 children, aged 11.4 years on average. The feature differentiating acute pancreatitis occurrence in children is sex. In own study, girls suffered the disease twice as frequently as boys, and in the study by M. Uścinowicz et al., boys formed the majority [8]. A retrospective study by Savu A. et al., aimed at establishing the etiology and epidemiology of acute pancreatitis in children over a period of 29 years, reveals that the disease occurs more often in boys (70%) than girls (30%) [13].

# Conclusions

1. An increase in the number of paediatric hospitalizations for abdominal pain was observed. Hospital admissions for abdominal pain formed one tenth of all hospital admissions on average.

2. Boys were hospitalized for abdominal pain more frequently than girls.

3. The largest number of abdominal pain cases occurred in summer, and the smallest in winter.

4. A decreasing tendency in acute pancreatitis occurrence is observed among hospitalized children: the number of children with diagnosed acute pancreatitis decreased by half over 3 years, and it decreased four times over 4 years, since 2008.

5. Acute pancreatitis occurred with twice a higher rate in girls than in boys.

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