


# Adjacent Primary Care May Reduce Less Urgent Pediatric Emergency Department Visits

Journal of Primary Care & Community Health  
Volume 11: 1–6  
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DOI: 10.1177/2150132720926276  
journals.sagepub.com/home/jpc  


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## Abstract

**Aims:** Pediatric emergency department (ED) overcrowding is a challenge. This study was designed to evaluate if a hospital-integrated primary care unit (HPCU) reduces less urgent visits at a pediatric ED. **Methods:** This retrospective cross-sectional study was carried out at a university hospital in Sweden, where the HPCU, open outside office hours, had been integrated next to the ED. Children seeking ED care during 4-week high- and low-load study periods before (2012) and after (2015) implementation of the HPCU were included. Information on patient characteristics, ED management, and length of ED stay was obtained from hospital data registers. **Results:** In total, 3216 and 3074 ED patient visits were recorded in 2012 and 2015, respectively. During opening hours of the HPCU, the proportions of pediatric ED visits (28% lower;  $P < .001$ ), visits in the lowest triage group (36% lower;  $P < .001$ ), patients presenting with fever ( $P = .001$ ) or ear pain ( $P < .001$ ), and nonadmitted ED patients ( $P = .033$ ), were significantly lower in 2015 than in 2012, whereas the proportion of infants  $\leq 3$  months was higher in 2015 ( $P < .001$ ). **Conclusions:** By enabling adjacent management of less urgent pediatric patients at adequate lower levels of medical care, implementation of a HPCU outside office hours may contribute to fewer and more appropriate pediatric ED visits.

## Keywords

children, emergency medical service, pediatrics, primary care, triage, urgency

Dates received 24 January 2020; revised 21 April 2020; accepted 21 April 2020.

## Introduction

Emergency department (ED) overcrowding is a worldwide growing challenge,<sup>1</sup> reported to contribute to medical errors,<sup>2</sup> patient mortality,<sup>3</sup> higher costs in adults,<sup>4</sup> lower quality of care,<sup>5</sup> and delayed bedside management in children.<sup>6</sup>

Many parents seek pediatric ED care for less-urgent problems,<sup>7–9</sup> which could have been appropriately managed at lower levels of medical care. The use of less urgent pediatric ED care has been reported to be associated with overestimation of medical urgency,<sup>10,11</sup> dissatisfaction with primary care, need for medical reassurance, and higher availability and expected higher quality of ED care.<sup>10,12,13</sup>

Hospital-integrated primary care units (HPCU) have been shown to counteract adult ED overcrowding by facilitating triage and referral procedures of less urgent patients.<sup>14–17</sup> Similar studies have, to our knowledge, not been carried out at pediatric ED units.

This study was designed to evaluate if a HPCU, available outside office hours, reduces total and less urgent visits at a pediatric ED in a Scandinavian country providing health care free of charge for all children.

## Methods

### Study Setting

This retrospective register study was carried out at a large urban university hospital in Malmö—a city in southern Sweden with a catchment area of 400 000 inhabitants.

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Twenty percent of its inhabitants were children, and 41 percent represented first- or second-generation immigrants, at the time of the study.<sup>18</sup>

Between 2012 and 2015, PCUs were available daytime (08:00-17:00) all over the city on weekdays. National telephone health line services for medical advice were open day-, evening-, and nighttime 7 days a week. In 2012, a city PCU, located approximately 1.5 km away, was available outside office hours (Monday-Friday 17:00-22:00, Saturday-Sunday 10:00-22:00). From early 2014, this PCU was integrated next-door to the pediatric and adult hospital ED facilities.

### Study Patients

All patients, 0 to 17 years of age, visiting the pediatric ED during 1 month at high (March), and 1 month at low (September) seasonal load, before (2012) and after (2015) implementation in 2014 of the HPCU, were included to evaluate and compare pediatric ED visits before and after this implementation.

Pediatric patients visiting the HPCU during the same time periods in 2015 were also included, but no corresponding data were available on patient visits at non-HPCUs in 2012.

On arrival at the pediatric ED, each study patient was directed by a pediatric nurse—based on presenting symptoms, basic patient history, and general appearance—to the pediatric ED triage or the HPCU (in 2015) for further assessment.

Based on presenting symptoms, patient history, vital parameters, and clinical signs, each ED patient was then triaged by a pediatric nurse according to a 5-level urgency scale, based on the RETTS-P (Rapid Emergency Triage and Treatment System for Paediatric patients)<sup>19-21</sup> and ESS (Emergency Signs and Symptoms) systems. The lowest triage group (5) was defined as patients that could be treated at lower levels of care if available. After triage, each patient was to be assessed by a pediatric ED physician, redirected for primary or other specialist care, or sent home. Patients on scheduled revisits were not included.

Each HPCU patient was accordingly triaged by a primary care nurse to be assessed by a primary care physician, by a primary care nurse, or sent home.

### Data Sources

Data on pediatric ED and HPCU visits (age, gender, date, day of week, time of arrival and discharge, presenting symptoms, triage, urgency level, ED management, outcome) were obtained from the hospital database registers.

### Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) for Windows, version 24.0 (IBM Corp), was used to record, structure and analyze study data.

Nonparametric continuous data are reported as median with interquartile range and was compared between independent groups with the Mann-Whitney *U* test.

Proportions between groups were compared with 2-sided Fisher's exact test.

Probability (*P*) levels of <.05 were considered statistically significant.

### Ethics

The study was approved by the regional Research Ethical Review Board, Lund, Sweden (DNR 2016/710). Study information was obtained from de-identified hospital registers only, and hence not from individual patient records.

### Results

We included 3216 and 3074 pediatric ED visits in 2012 and 2015, respectively, and 2302 pediatric HPCU visits in 2015. Scheduled patient revisits at the ED (145 in 2012, and 155 in 2015) were considered noneligible for inclusion. Information on all study patients was available for statistical analysis with <1 % missing data on presenting symptoms and ED outcome.

Data on pediatric patient visits at the ED in 2012 and 2015, and at the HPCU in 2015, during out-of-office hours (except nighttime) is reported in Table 1. During opening hours of the HPCU, there was a higher proportion of young infants ( $P < .001$ ), and lower proportions of children with fever ( $P < .001$ ) or ear pain ( $P < .001$ ) at the pediatric ED compared with corresponding periods in 2012. Accordingly, the proportion of patients triaged to be assessed by a pediatric ED physician ( $P < .001$ ), not triaged in the lowest triage group ( $P < .001$ ), or admitted for hospital care ( $P = .033$ ), were all significantly higher in 2015 than in 2012 (Table 1).

The proportion of patients attending the pediatric ED during opening hours of the HPCU was 28% lower ( $P < 0.001$ ), and their length of ED stay was 25% longer ( $P < .001$ ) than in 2012. In contrast, the proportion of patients triaged in the lowest triage group, was 36 % lower ( $P < .001$ ) than in 2012, particularly during weekends (Table 2).

During office hours, when the HPCU was not available, the proportion of ED patients in the lowest triage group, was higher in 2015 than in 2012 ( $P < .001$ ) (Table 2).

The average length of stay in the HPCU was less than one-fourth of that in the ED ( $P < .001$ ) (Table 2).

### Discussion

We consider our main finding—that an adjacent HPCU available outside office hours reduced less urgent pediatric ED visits—to have largely resulted from facilitated rapid referral of patients between these 2 nearby facilities, as has previously also been found at adult EDs in Europe.<sup>14-17</sup>

**Table 1.** Patient Characteristics at a Swedish Pediatric Emergency Department (ED) During Out-of-Office Hours (Except Nighttime) Before (2012) and After (2015) the Implementation of a Hospital-Integrated Primary Care Unit (HPCU), Open Outside Office Hours (Not Nighttime), and at the HPCU in 2015.

	Number (%) of pediatric visits			
	ED visits		Level of probability <sup>a</sup>	HPCU visits
	2012 (n = 1467), n (%)	2015 (n = 1014), n (%)		2015 (n = 2302), n (%)
Patient age				
0-3 months	230 (15.7)	255 (25.1)	<.001	14 (0.6)
4-6 months	108 (7.4)	67 (6.6)	>.300	92 (4.0)
7-12 months	202 (13.8)	98 (9.7)	.002	191 (8.3)
13-23 months	289 (19.7)	161 (15.9)	.017	390 (16.9)
2-3 years	253 (17.2)	154 (15.2)	.186	502 (21.8)
4-6 years	170 (11.6)	94 (9.3)	.074	410 (17.8)
7-12 years	126 (8.6)	94 (9.3)	>.300	411 (17.9)
13-17 years	89 (6.1)	91 (9.0)	.007	292 (12.7)
Patient gender (female)	689 (47.0)	499 (49.2)	.288	1097 (47.7)
Presenting symptoms <sup>b</sup>				
Fever	325 (22.7)	174 (17.3)	<.001	408 (17.9)
Breathing problem	172 (12.0)	133 (13.2)	>.300	48 (2.1)
Vomiting/diarrhea	181 (12.7)	138 (13.7)	>.300	123 (5.4)
Cold	142 (9.9)	106 (10.5)	>.300	338 (14.8)
Abdominal pain	92 (6.4)	55 (5.5)	>.300	116 (5.1)
Rash	74 (5.2)	42 (4.2)	.288	156 (6.8)
Ear pain	44 (3.1)	8 (0.8)	<.001	213 (9.4)
Neurological problem	34 (2.4)	34 (3.4)	.169	3 (0.1)
Urological problem	44 (3.0)	35 (3.5)	>.300	92 (4.0)
Injury	35 (2.4)	5 (0.5)	<.001	298 (13.1)
Chest pain	25 (1.7)	31 (3.1)	.039	9 (0.4)
Headache	25 (1.7)	16 (1.6)	>.300	19 (0.8)
Extremity pain	7 (0.5)	1 (0.1)	.151	93 (4.1)
Other	230 (16.1)	227 (22.3)	<.001	362 (15.9)
Triage <sup>c</sup>				
Levels 1-4	1137 (77.5)	867 (85.5)	<.001	
Level 5	330 (22.5)	147 (14.5)	<.001	
Assessed by a pediatric ED physician	1120 (76.3)	907 (89.4)	<.001	
Admitted to hospital	149 (10.2)	131 (12.9)	.033	

<sup>a</sup>P value indicating difference of proportion between ED visits in 2012 and 2015.

<sup>b</sup>Missing values; 37 (2.5%) in 2012 and 9 (0.9%) in 2015 at the ED, and 24 (1.0%) in 2015 at the HPCU.

<sup>c</sup>Triage according to the RETTS-P (Rapid Emergency Triage and Treatment System for Paediatric patients) and ESS (Emergency Signs and Symptoms) system.

The proportion of less urgent patient visits was more than one-third lower outside office hours after implementation of the HPCU. This conforms to previous findings in adults with fewer self-referrals and lower less urgent ED use.<sup>14,15,22,23</sup> Patients, particularly beyond infancy, presenting at the ED with clinical signs of fever or ear pain were more often managed in the HPCU. Considerably fewer ED visits when the HPCU was available probably reflect diversion of less urgent cases disengaging ED resources for more compromised patients. Our finding that pediatric ED patients were more often triaged to be assessed by ED

physicians during opening hours of the HPCU indicates that patients were more appropriately selected for ED care. This probably also accounted for their longer average ED stay during opening hours of the HPCU. Accordingly, shorter pediatric ED stay among patients triaged for lower levels of care have been reported in a European study.<sup>24</sup> HPCUs have also been reported to be associated with shorter time from arrival until physician's assessment of more urgent ED patients,<sup>25</sup> but we have no corresponding data.

The higher admission rates and proportions of young infants at the pediatric ED outside office hours in 2015 are

**Table 2.** Day-, Evening-, and Nighttime Patient Visits, Level of Urgency (1-5), and Median Length of Stay at a Swedish Pediatric Emergency Department (ED) Before (2012) and After (2015) the Implementation of a Hospital-Integrated Primary Care Unit (HPCU), Open Outside Office Hours (Not Nighttime), and at the HPCU in 2015.

	Pediatric ED			HPCU
	2012 (n = 3216)	2015 (n = 3074)	Level of probability <sup>a</sup>	2015 (n = 2302)
<i>Monday-Friday</i>				
<b>08:00-16:59</b>				
Patient visits, n (%) <sup>b</sup>	1029 (32.0)	1146 (37.3)	<.001	
Length of stay, <sup>c</sup> hours	2.4 (1.5-3.6)	2.0 (1.0-3.2)	<.001	
Triage <sup>d</sup>				
Levels 1-4, n (%)	905 (87.9)	780 (68.1)		
Level 5, n (%)	124 (12.1)	366 (31.9)	<.001	
<b>17:00-21:59</b>				
Patient visits, n (%) <sup>b</sup>	683 (21.2)	503 (16.4)	<0.001	1141 (50.0)
Length of stay, <sup>c</sup> hours	1.9 (0.9-2.9)	2.4 (1.3-3.4)	<.001	0.5 (0.2-0.9)
Triage <sup>d</sup>				
Levels 1-4, n (%)	535 (78.3)	422 (83.9)		
Level 5, n (%)	148 (21.7)	81 (16.1)	.017	
<b>22:00-07:59</b>				
Patient visits, n (%) <sup>b</sup>	450 (14.0)	642 (20.9)	<.001	
Length of stay, <sup>c</sup> hours	1.1 (0.5-2.1)	1.4 (0.5-2.3)	.005	
Triage <sup>d</sup>				
Levels 1-4, n (%)	285 (63.3)	437 (68.1)		
Level 5, n (%)	165 (36.7)	205 (31.9)	.105	
<i>Saturday-Sunday</i>				
<b>08:00-21:59</b>				
Patient visits, n (%) <sup>b</sup>	784 (24.4)	511 (16.6)	<.001	1161 (50.0)
Length of stay, <sup>c</sup> hours	1.8 (1.0-2.9)	2.4 (1.4-3.4)	<.001	0.7 (0.1-1.1)
Triage <sup>d</sup>				
Levels 1-4, n (%)	602 (76.8)	445 (87.1)		
Level 5, n (%)	182 (23.2)	66 (12.9)	<.001	
<b>22:00-07:59</b>				
Patient visits, n (%) <sup>b</sup>	270 (8.4)	272 (8.8)	>.300	
Length of stay, <sup>c</sup> hours	1.4 (0.5-2.4)	1.6 (0.5-2.6)	>.300	
Triage <sup>d</sup>				
Levels 1-4, n (%)	175 (64.8)	206 (75.7)		
Level 5, n (%)	95 (35.2)	66 (24.3)	.006	

<sup>a</sup>Proportions of patient visits and assessments in 2012 versus 2015 compared by 2-sided Fisher's exact test. Length of stay in 2012 versus 2015 compared by Mann-Whitney *U* test.

<sup>b</sup>Proportion of total number.

<sup>c</sup>Median (interquartile range).

<sup>d</sup>Triage according to the RETTS-P (Rapid Emergency Triage and Treatment System for Paediatric patients) and ESS (Emergency Signs and Symptoms) system.

in agreement with findings in adults.<sup>14</sup> This indicates that implementation of the HPCU contributed to more appropriate initial selection of pediatric ED patients.

The significantly shorter length of stay at the HPCU than at the pediatric ED, indicates that an HPCU contributes to rapid and more appropriate management of children with less urgent problems, as found in a Swiss study.<sup>26</sup> HPCU facilities have also been reported to reduce self-referred adult ED visits,<sup>15</sup> and health care costs.<sup>27</sup>

That the total number of patients seeking ED care day-time increased between 2012 and 2015 might reflect the corresponding 9% increase in the total number of children in Malmö.<sup>28</sup> Since there was also an increase in the proportion of nonurgent ED visits during office hours, we cannot exclude that some parents preferred the ED walk-in service to day-time primary care, as proposed by others.<sup>29</sup> By improving access to nearby primary care, HPCU facilities have been reported to result in fewer total and self-referred

day- and evening-time adult ED visits.<sup>15</sup> The reduction in pediatric ED visits when the HPCU was available, emphasizes that this nearby unit did unburden the pediatric ED and improve the appropriateness of care for both more and less urgent medical conditions.

A previous study by us has shown associations between direct pediatric ED seeking without previous medical consultation, and having parents both born outside the Nordic countries.<sup>30</sup> Considering that parental care seeking is strongly influenced by cultural habits, linguistic abilities, and actual knowledge of the medical system, it is reasonable to believe that an HPCU might be particularly useful to those parents by guiding them to appropriate levels of pediatric emergency care.

A major strength of this study is that medical information was obtained in all eligible pediatric ED and HPCU patients. In addition, we compensated for seasonal variations in ED load by including patient visits under both high- and low-load conditions. Furthermore, all pediatric patients within a large urban catchment area were managed at the same single hospital. We consider our main findings to reflect also other larger urban hospitals in Sweden. We know of no other organizational change of the local or regional health care systems that might have influenced our main findings except the implementation of the HPCU.

A limitation of the study is its retrospective design. Another limitation is that information recorded outside office hours at the non-HPCU in 2012, as well as data from medical visits or consultations from other PCUs during daytime, were irretrievable. This might have added valuable information on shifts in care seeking before and after implementation of the HPCU.

## Conclusions

The implementation of an HPCU close to a large urban pediatric ED outside office hours was associated with more efficient management of less urgent pediatric patients at more adequate levels of medical care. The HPCU was found to enable appropriate pediatric emergency care in due time for the individual patient.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was supported by PhD grants from the Scania Region, Malmö, and by research funds administered by Lund University Faculty of Medicine, Lund, Sweden.

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