

## Hospital Cost Associated with Pediatrics Urinary Tract Infection: Before and After Health Sector Evolution Program in the West of Iran

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### Abstract

#### Introduction

Urinary tract infections (UTIs) are one of the most important bacterial infections among children throughout the world. The study aimed to assess the cost of hospitalization associated with pediatrics UTIs in Kermanshah province between 20 April 2013 and 20 February 2015.

#### Materials and Methods

This survey was a cross sectional and descriptive study. The study subjects included all those aged 20 years and younger who were admitted to the Imam Reza hospital, a referral hospital in Kermanshah, with the diagnosis primary of the UTI in the studied period. The data on age, gender, Length of stay (LOS), and cost of hospitalization were collected from the medical records. The data analysis was performed by Stata V.12.

#### Results

Overall average of age and length of stay was  $2.7 \pm 3.9$  years and  $6.2 \pm 4.4$  days, respectively. The study showed the average cost per patient and per one day hospitalization was 9,206,699 and 1,484,951 Iranian Rials (IRR), respectively. Patient's share of total cost of hospitalization in before and after Health Sector Evolution Program (HSEP) was 1,565,710 and 982,619 IRR, respectively. In addition, there are a significant positive relationship between age, being boy and length of stay with total cost of hospitalization.

#### Conclusion

Our finding implies that the total cost of pediatric UTIs is substantial; at about 877,719,440 IRR before HSEP and 1,734,770,576 IRR after HSEP. The study also indicates that Health Sector evolution program causes considerable decrease the patient's share of total cost of hospitalization (8.7 % vs. 23.4 %).

**Keywords:** Children, Cost of hospitalization, Length of stay, Urinary tract infections.

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## Introduction

Urinary tract infections (UTIs) are very common and one of the most important bacterial infections among pediatrics developed as well as developing countries (1, 2). Although prevalence UTIs varies by countries but usually they occur in 1% of boys and 3-5% of girls (3).

In a study in the USA have been demonstrated that an about 2 to 3 % of pediatrics with urinary tract infections are required to inpatient care (4). In addition, an estimated approximately 0.7 of physician visits and 5- 14 of emergency department visits in each year among children are belonged to the Pediatric urinary tract infections (4, 5).

Medical and financial implications associated with UTIs are substantial. Inpatient care of pediatric UTIs and its management places a considerable cost on health system and society as a whole. Spencer et al. found that the cost of hospital per UTIs hospitalization in the USA was 2,858 dollar US in 2000, and it increased to 3,838 dollar US by 2006 (2). Or in a study conducted by Foxman in the USA, annual cost of community-acquired UTIs among the total population was estimated at approximately \$1.6 billion (6). There were few studies about cost of urinary tract infections among pediatric in other countries (2, 6) and at the time of this study, there was not any study published associated with the costs of pediatric UTIs in the Iran. Therefore, this study was carried out to measure the cost of hospitalization and length of stay associated with pediatric UTIs in the Kermanshah province, west of Iran, between 20 April 2013 and 20 February 2015.

## Materials and Methods

This survey was cross sectional, descriptive and retrospective study which

is carry out in the Imam Reza hospital in Kermanshah province, West of Iran, from 20 April 2013 to 20 February 2015. In the study, from 20 April 2013, to 22 March 2014 was considered as time A (before Health Sector Evolution program) and from 21 March to 20 February 2015 was considered as time B (after Health Sector Evolution program).

The study subjects included all those aged 20 years and under who admitted to the hospital with the diagnosis primary of the UTIs in the studied period.

The data on age, gender, length of stay, types of insurance, total cost of hospitalization and its subtotal (cost of visits, drug, nursing care, diagnosis test, hotelling, items consumables and other costs) were obtained from the medical records.

A regression liner model was used to identifying the main factors affecting on total cost of hospitalization. Also, the statistical analysis was performed by Stata software, Version12 and a P value<0.05 was considered statistically significant. During the studied period, 1 US dollar in time A and time B was equal to 31,838 and 32,510 Iranian Rials (IRR), respectively.

## Results

130 and 154 patients were admitted in Imam Reza hospital due to urinary tract infections in time A and time B, respectively. The study showed the mean age of patients in time A was 2.3 years with standard deviation 3.6 (raged from 1 to 18 years); while in time B, it was 3.5 years with standard deviation 3.8 (ranged from 1 to 19 years). The descriptive characteristics and subtotal cost of study population in time A and time B are shown in Table.1.

**Table 1:** Descriptive characteristics and subtotal cost of study population in 2013 and 2014

Variables	Time A		Time B		Total	
	Mean	SD	Mean	SD	Mean	SD
Gender	Number		Number		Number	
Boy	43		52		95	
girl	87		102		189	
Age (year)	2.3	3.6	3.5	3.8	2.7	3.9
Length of stay (day)	6.2	5.1	6.3	2.7	6.2	4.4
Cost items (Iranian Rials)						
Visit	870,201	728,005	2,056,375	2,195,183	1,513,408	1,788,098
Nursing care	194,233	494,947	277,613	262,681	563,783	1,312,470
Medication	857,975	1,522,284	959,348	1,656,195	816,895	1,721,540
Diagnosis tests	555,332	484,803	1,005,240	695,977	602,301	811,736
Hoteling	3,229,981	8,293,707	5,519,159	9,497,356	4,471,296	9,023,587
Consumerable materials	744,167	1,207,598	871,335	2,186,235	939,801	1,272,312
Others	313,886	313,949	578,145	1,000,230	299,213	288,891
Total cost	6,765,777	10,652,051	11,264,744	9,497,356	9,206,699	1,142,456
Patient's share	1,565,710	2,841,482	982,619	2,899,451	1,254,770	2,893,710

The average cost of hospitalization per patients in time A and time B was 6,765,777 and 11,264,744 IRR, respectively. The study also showed that the average patient's share of total cost in time A and time B was 1,565,710 and 982,619 IRR, respectively. However, overall, the average hospitalization per patients in the studied period was

9,206,699 IRR. Our finding showed that the cost of hospitalization per day in time A and time B was 1,191,254 and 1,788,055 IRR, respectively. Patient's share of total cost of hospitalization in time A and time B was 1,565,710 and 982,619 IRR, respectively. The characteristics of variables used in the study by sex are shown in Table. 2.

**Table 2:** characteristics of variables used in the study among study population by gender

Variables	Boys		Girls	
	Mean	SD	Mean	SD
Age (year)	2.43	4.1	2.9	3.8
Length of stay (day)	6.6	6.2	6	3
Cost items (Iranian Rials)				
Visit	1,584,899	1,907,836	1,477,473	1,728,915
Nursing care	576,543	978,900	557,370	1,453,886
Medication	1,050,027	2,171,245	699,712	1,436,277
Diagnosis tests	750,661	1,131,282	527,728	579,021
Hoteling	5,129,225	6,734,521	4,140,591	8,196,629
Consumerable materials	907,970	1,087,772	955,800	1,358,081
Others	277,619	281,210	310,067	292,809
Total cost	10,276,944	10,643,212	8,668,744	9,885,213
Patient's share	1480431	3168493	1141343	2747095

The study showed the average cost of hospitalization among boys and girls was 10,276,944 and 8,668,744 IRR, respectively. Also, the patient's share of total cost among boys and girls was

1,480,431 and 1,141,343 IRR, respectively. The distribution of cost drivers in study population by gender in the studied period is shown in Figures 1, 2.

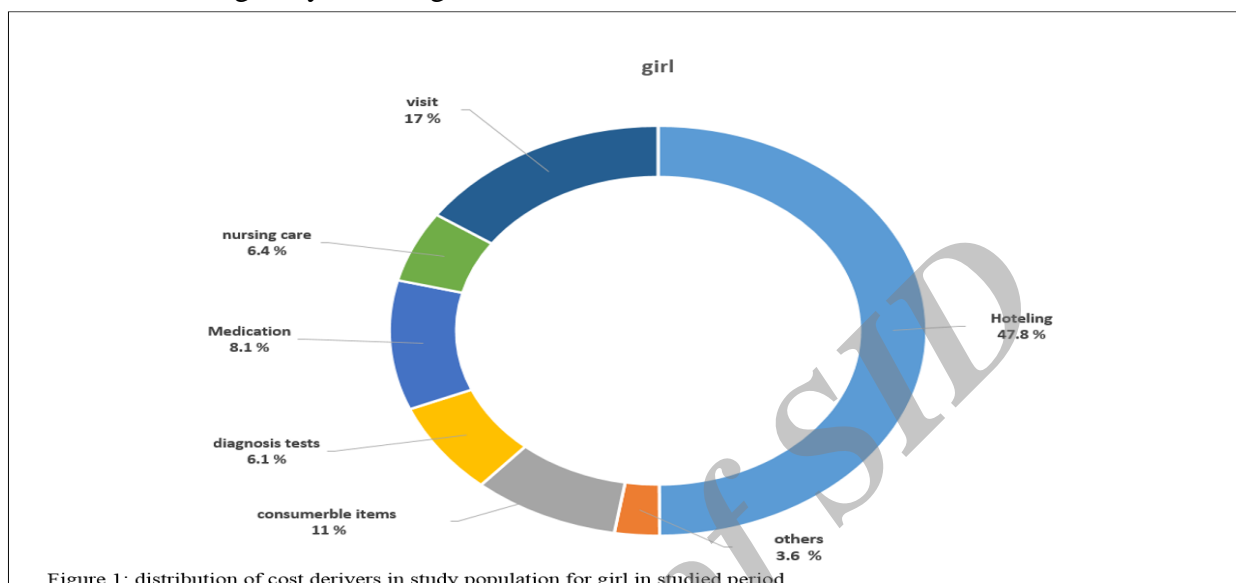


Figure 1: distribution of cost drivers in study population for girl in studied period

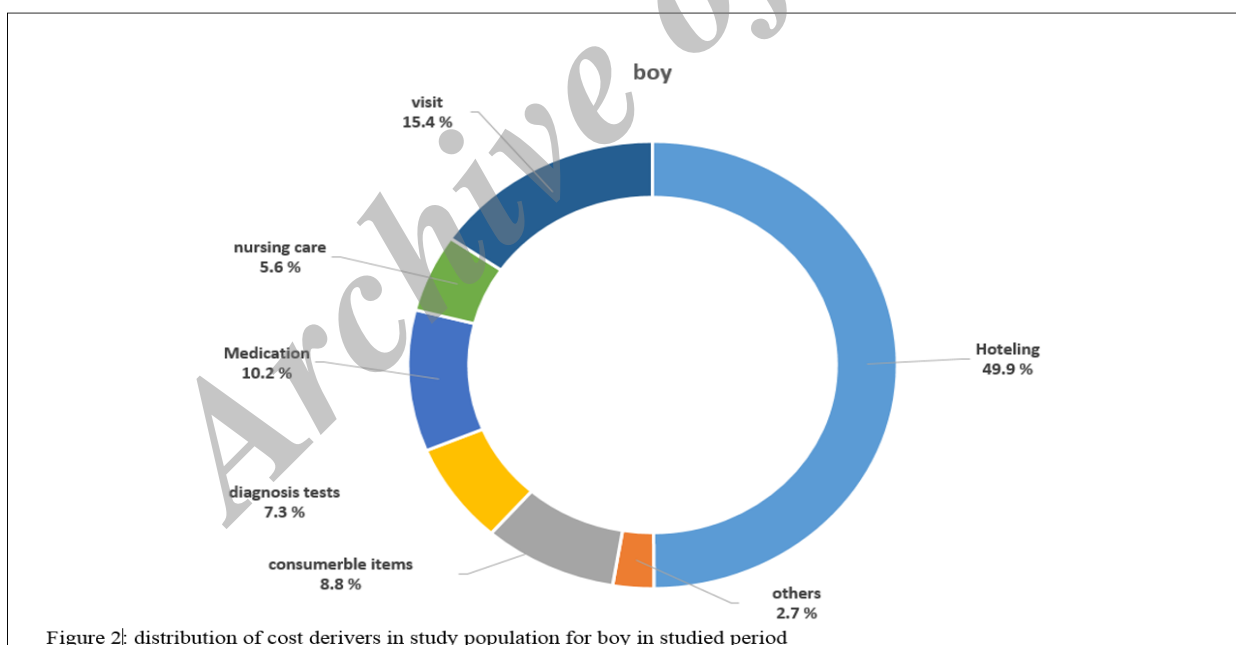


Figure 2: distribution of cost drivers in study population for boy in studied period

Our analysis indicate that the main cost drivers among pediatrics UTIs in the studied period were the hotelling cost, followed by visit, medication and consumables items, respectively. The results of regression model about main determinants of total cost of pediatrics UTIs among study population in time A

and time B are shown in Table 3. Our results showed length of stay, age and being boy have a significant positive impact on total cost of hospitalization during studied period. Also, our finding indicated that A 10 % increase in length of stay leads to increase in total cost of hospitalization by 9% (Table. 3).

**Table 3:** Main determinants of total cost of hospitalization among pediatrics UTIs in Kermanshah, West of Iran

Variables	Time A				Time B			
	Coefficients	P_value	95% CI		Coefficients	P_value	95% CI	
			Lower	Upper			Lower	Upper
Being boy	0.1778	0.040	0.3469	0.0086	0.1132	0.002	0.673	0.1327
*LAge	0.0389	0.000	0.0168	0.0610	0.041	0.003	0.0992	0.011
*LLOS	0.9041	0.000	0.7772	1.030	1.029	0.000	0.8692	1.188
Adj R-squared = 0.6091					Adj R-squared = 0.5143			
F(3, 126) = 67.99; P_value= 0.000					F(3, 150) = 55.00; P_value = 0.000			

\*CI= Confidence interval, LAge: Logarithm of age; LLOS: Logarithm of length of stay.

## Discussion

Pediatric urinary tract infections (UTIs) are a common problem and one of the most infections in children (7-10). The impact pediatric UTIs on health system and society as a whole is significant; at approximately for 0.7 % and 5-14% of physician visits and emergency visits by children annually, respectively. Most of pediatric UTIs are uncomplicated. Freedman found the 2-3 % of all them require inpatient care (4) and Spencer et al. concluded that pediatric UTIs account for 1.8 % of all pediatrics hospitalizations (2). However, the current study aimed to evaluate the cost of hospitalization associated with pediatric UTIs were admitted in Imam Reza hospital in Kermanshah, west of Iran, from 20 April 2013 and 20 February 2015.

The average of age and length of stay in the study period was  $2.7 \pm 3.9$  years and  $6.2 \pm 4.4$  days. The hospitalization due to UTIs is more common in girls (66.5 % of total study population) and younger (70 % less than 4 years) which is consistence with other study (2, 5).

Also, the study showed that the children with age of less than one year accounted for 40.7 % of total hospitalization and this

findings indicate the children with age of 1 year and under more likely to be admitted with UTIs than older children (2, 11, 12). Our results indicate that the average total cost of hospitalization per patients in the study period was 9,206,699 IRR. Our finding indicated the patient's share of total cost was 1,254,770 IRR which accounted for 13.6 of the total cost. Based on the study finding, the patient's share of total cost of hospitalization in time B compared to time A was decreased. Patient's share accounted for 23.4 % and 8.7 % of total cost before (time A) and after (time B) HSEP in Iran, respectively. Spencer (2) estimated the mean hospital cost for UTIs per hospitalization in 2003 and 2006 was 2,858 and 3,838 US dollar, respectively.

The study indicated the being boy, length of stay and age have a significant positive effect on cost of hospitalization. As mean a 10 % increase in age will lead to increase in cost of hospitalization by 0.3 and 0.4 % in time A and time B. Also, according to our results, for 1 % increase in the length of stay, the cost of hospitalization goes up by 0.9 and 1.02 % in 2013 and 2014, respectively. These finding are similar to a study by Spencer et al. (2). In addition, the average cost of hospitalization per boy patients was higher than the girl patients; 10,276,944 vs. 8,668,744 IRR,

respectively. Similar to this finding, Schoen et al. (13) found the mean total cost of managing UTIs in boys was 2 times higher than girls ones ( 1,111 vs. 542 US dollar). Also in both gender, the hoteling and physician visit were identified as the main cost drivers among study population during the study period.

### Conclusion

The study evaluates the cost of hospitalization among pediatrics UTIs who were admitted in Imam Reza hospital in Kermanshah province in time A (before Health Sector Evolution program) and time B (before Health Sector Evolution program). The study indicates the total cost of hospitalization for pediatrics UTI is large; at approximately 2,614,702,516 IRR. Our finding implies that the patient's share of total cost of hospitalization in time B compared to time A decreased (8.7 % of total cost vs. 23.4 % of total cost). Also, the study indicated that age, length of stay and being boy were the main factors affecting on the total cost of hospitalization.

**Conflict of Interest:** None.

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