

Hospital costs of renal colic diagnosis and management in a Brazilian private emergency service*

Custos hospitalares do diagnóstico e tratamento da cólica renal em um serviço de emergência privado brasileiro

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ABSTRACT

BACKGROUND AND OBJECTIVES: The incidence of renal colic is increasing in developing countries due to several factors, and takes people to the emergency service to relieve the acute and severe pain it induces. The economic impact of emergency diagnosis and management is not known in Brazil. This study aimed at evaluating the cost of renal colic diagnosis and management in a private emergency service and the variables influencing such cost.

METHOD: This is a retrospective study evaluating the medical records of renal colic patients seen between August and September 2010 by a private emergency service of the city of São Paulo.

RESULTS: We have evaluated 136 medical records of patients of both genders, with mean age of 39 years, 52% with history of stones and 30% with other comorbidities. WHO's analgesic scale was used in 48% of cases. Mean total cost was R\$ 453.62 and the impact of patients' length of stay on cost was significant.

CONCLUSION: Cost has widely varied since the study was carried out in a private institution with different paying sources. Length of stay in the emergency service was the only variable with statistical significance with regard to increased costs. Effective management and quality of assistance strategies, which decrease length of stay of patients in the emergency service, may contribute to decrease assistance costs.

Keywords: Costs and cost analysis, Emergency service, Pain, Renal colic.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A incidência de cólica renal tem aumentado nos países em desenvolvimento por diversos fatores e leva o indivíduo ao serviço de emergência em função da necessidade de alívio da dor aguda e intensa que esta provoca. O impacto econômico do diagnóstico e tratamento em caráter emergencial é desconhecido em nosso meio. O objetivo deste estudo foi avaliar o custo do diagnóstico e tratamento da cólica renal em serviço de emergência privado e as variáveis que influenciam neste custo.

MÉTODO: Trata-se de um estudo retrospectivo em que foram analisados os prontuários de pacientes atendidos com cólica renal entre agosto e setembro de 2010 em um serviço de emergência privado de São Paulo.

RESULTADOS: Foram avaliados 136 prontuários de pacientes de ambos os sexos, com idade média de 39 anos, 52% com antecedente de cálculo e 30% com outras comorbidades. A escala analgésica da Organização Mundial da Saúde (OMS) foi utilizada em 48% dos casos. O custo total foi em média R\$453,62 e a influência do tempo de permanência do paciente no custo foi significativa.

CONCLUSÃO: O custo foi bastante variado, tendo em vista o estudo ter sido realizado em uma instituição privada, com fontes pagadoras diversas. O tempo de permanência do paciente no serviço de emergência foi a única variável com significância estatística em relação ao aumento dos custos. Estratégias eficazes de tratamento e qualidade assistencial, que reduzam o tempo de permanência do paciente no serviço de emergência poderão refletir na redução dos custos do atendimento.

Descritores: Cólica renal, Custos e análise de custo, Dor, Serviço hospitalar de emergência.

INTRODUCTION

The need for acute or chronic exacerbated pain management is one of the reasons for looking for emergency services, situation which is often lived by patients and assistance teams in a disastrous way from the viewpoint of current Brazilian public and private hospitals' structure^{1,2}.

Studies on managing pain in emergency services show that its under-treatment is still a reality, especially for visceral pain²⁻⁶. Clinically, acute pain management is an opportunity to improve in terms of assistance processes, which could be worked on to reach

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gains for patients and structures in terms of quality, costs and treatment duration.

Renal colic pain is acute and severe and often leads patients to look for emergency assistance. The incidence of renal stones has increased in developing countries due to social changes and consequent change in eating habits, in addition to climate factors with warm temperatures in some geographic areas. The cost of the disease involves diagnosis, management, prevention and potential complications, in addition to medical leaves⁷.

With regard to pain management Guidelines, the World Health Organization (WHO) emphasizes analgesic therapy in a very didactic way, called WHO's Analgesic Ladder. Non-steroid anti-inflammatory drugs (NSAIDs) and opioids have been mentioned as recommendation level "A", to manage renal colic, that is, directly applicable to the target population with consistency of general results. Several studies⁸⁻¹⁰ have been carried out to compare the effectiveness of drugs used to treat acute renal colic pain, however studies have not comparatively evaluated the costs of this treatment.

In addition to symptoms relief, adequate pain management decreases patients' length of stay in the emergency department, decreases treatment costs and, consequently, increases patients' satisfaction with the quality of the assistance. This study is justified by the almost inexistence of Brazilian publications related to hospital costs of renal colic diagnosis and management, as well as it may be useful to propose reflections about the importance of institutional protocols, of adequately managing pain, as well as of associated characteristics which may help managing assistance and services.

This study aimed at evaluating the costs of renal colic diagnosis and treatment in a private emergency service and the variables affecting such cost.

METHOD

This was a retrospective, descriptive, exploratory and quantitative study of patients with renal colic seen by the adult emergency service (AES) of a private, charity and middle-sized hospital of the city of São Paulo.

For data collection, and after documents analysis, the electronic medical record system Tasy was used to access medical records, as well as to select the sample according to the International Code of Diseases (ICD) of patients with acute pain as a consequence of urinary tract stones.

Participated in this study patients seen by the AES from August to September, 2010 with diagnostic hypothesis of ICD N20 – kidney and ureter calculus, N21 – urinary tract calculus or N23 – renal colic.

Exclusion criteria were patients with any ICD different from those previously described; patients needing hospitalization after AES assistance, since time spent in the sector waiting for hospital vacancy could significantly change hospital invoice amounts, as well as patients who had ICD N20, N21 or N23, however did not report pain as their major complaint.

Studied variables were: diagnostic exams costs, mean AES stay, age, presence of comorbidities and therapeutic resources used.

To determine renal colic assistance costs (from the perspective of the paying source) the cost per disease system was used and hospital invoice composition was individually checked. The invoice is

presented to the paying source divided in three parts, as follows: materials and medications (Mat/Med), room and services fees, and diagnostic exams, so it was possible to separate costs to determine diagnosis and treatment costs. All costs were presented according to the amounts paid by different Paying Sources for each item. To establish the match of amounts, which depend on each patient's agreement with his health insurance company, results will be presented as cost amounts by mean, median and standard deviation.

Patients' length of stay to treat renal colic was considered the interval between admission and discharge.

According to the use or not of the WHO's Analgesic Ladder, in compliance with the indication for referred pain intensity, patients were divided, respectively, in groups A and B. Scale used to evaluate pain intensity by nurses was the Verbal Numeric Scale (VNS)¹¹.

Demographic and clinical data, and already mentioned variables of interest were collected by in Excel program.

The Data Research and Analysis Software Sphinx version 5.1 was used for data analysis. Data descriptive analysis was performed by means of percentage indices for quantitative variables frequency, and for continuous quantitative variables, mean, standard deviation, maximum/minimum amounts and median were calculated. Student's *t* test was used to evaluate quantitative variables with sample mean. Chi-square test was used for qualitative variables. Significance level of 5% was used for all analyses. Pearson's correlation coefficient was used to evaluate costs and length of stay variables.

This study was approved by the Research Ethics Committee of the institution, opinion 42/2010.

RESULTS

From 13692 medical records of patients seen by the AES during the study period, 180 medical records had diagnostic hypothesis of ICD N20 – kidney and ureter calculus, N21 – urinary tract calculus or N23 – renal colic, that is, 1.31% of total AES assistances. From 180 medical records, 136 met inclusion criteria and 44 were excluded for not having pain complaint, for characterizing outpatient assistance, for not being adults, for having been seen by the obstetric emergency service, or even for needing hospitalization. Mean age was 39.7 years, that is, adults in productive age. Table 1 shows demographic and clinical data of groups separately, and then grouped.

All patients were included in the study due to pain complaint and from those seen by nursing screening, 54.5% had pain score as the fifth vital sign and 45.5% had pain only at nurse evolution.

With regard to analgesic treatment, 48.5% have received analgesic regiment according to WHO standardized ladder (group A) for acute pain management, being that remaining patients (group B) had other analgesic regimens (51.5%).

With regard to additional exams for renal colic diagnosis, 71.8% of patients had at least three laboratory tests. Mean of exams was 2.37, median was 1, with variation from zero to 15 laboratory tests, from a total of 124 tests performed. Fifteen X-rays were taken for 11% of patients and ultrasound was performed for 75.7% of patients. CT was performed for 33.8% of patients.

Mean patients' stay in the AES was 4h49' (standard deviation =

Table 1 Patients distribution in groups A and B.

Variables	Group A		Group B		Groups A and B	
	n	%	n	%	n	%
Distribution by group	66	48.5	70	51.51	36	100
Males	42	63.6	28	40	70	51.5
With other comorbidities	20	30.3	21	30	41	30.2
With history of renal stones	36	54.6	35	50	71	52.2
Seen in AES with renal colic in the 6 months previous to data collection	10	15.1	10	14.3	20	14.7

p > 0.005 for all variables between groups A and B (there has been no statistical significance). AES = adult emergency service.

3h59'), median of 3h59' with variation of 31' to 23h27'. Renal colic costs have varied from minimum of R\$ 42.44 to maximum of R\$1936.98, with mean of R\$ 453.62. Total costs for groups A and B are shown in table 2.

Table 2 Distribution of total costs per groups.

Total Costs Variation (R\$)	Group A	Group B	Groups A and B
Minimum amount	R\$ 42.44	R\$ 117.31	R\$ 42.44
Maximum amount	R\$ 1733.71	R\$ 1936.98	R\$ 1936.98
Median	R\$ 259.11	R\$ 285.99	R\$ 269.38

p > 0.005 for total costs variation between groups A and B.

There has been no statistically significant difference of total costs between groups A and B (p = 0.26).

Age and presence of comorbidities were variables not interfering with costs (p = 0.49). The presence (or not) of comorbidities has not influenced the number of requested exams (p = 0.85) or total costs (p = 0.15). Similarly, there has been no influence of history of stones on total costs (p = 0.79).

Diagnostic exams were responsible for 57% of total costs and are shown in table 3.

Table 3 Distribution of mean diagnostic exams.

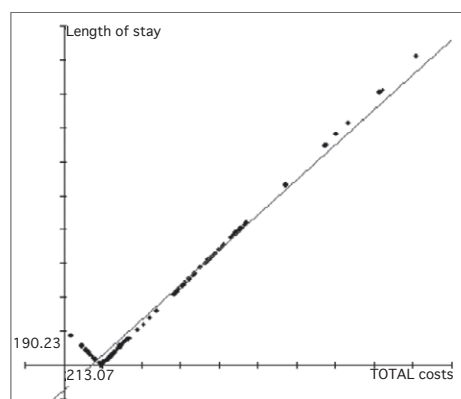
Cost variations of diagnostic exams (R\$)	Laboratory Tests	X-Rays	Ultrasound	Tomography
Mean amount	R\$ 22.80	R\$ 31.51	R\$ 84.98	R\$ 509.74
Standard deviation	R\$ 25.09	R\$ 13.10	R\$ 30.58	R\$ 209.46

Pearson's correlation coefficient is shown in graph 1 where r = +0.99 represents direct positive correlation among variables: length of stay and total costs. So, length of stay was the only variable with statistical significance in our study.

DISCUSSION

Several studies have proven the effectiveness of the WHO program to relieve cancer pain. This proposal has gone beyond the initial recommendation to control cancer pain and became the guideline to control pain in general¹².

WHO's analgesic ladder is composed of three steps and associates



Graph 1 Correlation between length of stay and total costs of the 136 followed cases.

Pearson's correlation coefficient r = +0.99

the therapeutic approach to pain intensity referred by patients. The first step is related to mild pain management and recommends the use of simple analgesics and NSAIDs; the second step relates to moderate pain and associates simple analgesics and NSAIDs to weak opioids; the third step considers the management of severe

pain and replaces weak opioids by strong opioids¹³. Multimodal analgesia is also recommended to manage acute pain and combines drug classes with different action mechanisms and follows the proposition of the analgesic ladder, so as to match drug needs to pain intensity¹⁴.

In a Turkish study with 574 patients seen by an emergency service, also due to renal colic, NSAIDs were used by 86.8% of patients and only 4% received analgesia with opioids¹⁵, showing that the use of opioids in combination with NSAIDs, according to suggested recommendation, is still not a consolidated practice not only in Brazil.

Analgesics and opioids have the function of decreasing pain dura-

tion, although our research has not observed any relationship between costs and length of stay with different analgesic regimens, that is, the use or not of WHO's therapeutic regimen does not make the treatment more effective or less expensive.

Renal colic pain is induced by urinary flow obstruction and consequent increase in urinary tract wall tension. There is prostaglandin synthesis and release, stimulating vasodilatation and intra-renal pressure increase, in addition to a direct action inducing ureter spasm. NSAIDs are indicated because they act on the primary cause of pain inhibiting prostaglandin release, excretory pathways and spasm; however, these drugs have a slower and less potent action mechanism as compared to opioids and their use is recommended in combination⁸, being exactly this the diverging point among different therapeutic approaches. The development of assistance guidelines and protocols aims at making easier the access to best published scientific evidences, however, the compliance with the protocol by health professionals in their clinical practice and the ongoing analysis of actions performance are still a challenge. Although not being their primary objective, protocols are also useful to prevent unnecessary costs with redundant or expensive procedures.

Indirect benefits of pain management may also be obtained, as evidenced by a study observing the increase in costs with the use of drugs as from the implementation of an acute pain management service in post-anesthetic care unit (PACU); however, symptoms have improved in a shorter period and there has been further optimization of PACU beds, with fewer surgery cancellations due to lack of vacancy in this sector¹⁶.

Length of stay was the only variable able to influence renal colic assistance costs, and findings suggest that it might have been longer due to the need of diagnostic exams. Other operational factors were not analyzed by this study.

Additional exams have significantly influenced total costs, which is in line with other authors who point renal stone diagnostic investigation as the major component of assistance costs¹⁵.

Stone size and location were reported in a study as variables directly interfering with diagnostic investigation costs. Stones larger than 5 mm or located more distally in the ureter were associated to higher costs, which in this case have reached 55.77 Euros, that is, approximately US\$ 8015. Stone features were not investigated by our study.

Renal colic costs were evaluated in our study under the perspective of the paying source, which explains the wide variability found between minimum amount of R\$ 42.44 and maximum amount of R\$ 1936.98, with mean of R\$ 453.62. This may impair the comparison with studies with amounts defined in a single table, such as those of the Single Health System (SUS). On the other hand, a wide variation of costs, from US\$ 80 to US\$ 750, has also been observed in studies carried out in European and American hospitals¹⁶, which are similar to costs observed in our study, which translated into dollars at 09/22/2011 rate, have varied from US\$ 73 to US\$ 1119.

Based on SUS IT Department data (DATASUS), we have observed SUS costs for renal lithiasis hospitalizations in 2010 and mean amount found was R\$ 423.42. We have also observed the

progressive increase (69%) in the number of hospitalizations in the last 15 years, representing 0.61% of SUS hospitalizations in 2010. Outpatient assistance and diagnostic investigation costs for this level are not part of the disclosed amount, suggesting even higher unknown costs and opening an opportunity for investment in prevention to avoid hospitalizations¹⁷.

Other non measurable costs as from our proposed methodological design, considered as limitations to our study, may be considered in prospective studies, such as: operational costs of patients' revaluations by the health team as a function of pain persistence, the subjective "symptom costs" for patients, which may be related to the evaluation of the assistance received, since the longer patients remain with pain, the less happy they are with the assistance, in addition to bed costs in a service of en working with maximum occupation capacity.

One may infer that renal lithiasis treatment costs are the sum of several situations, be it in outpatient, emergency or hospitalization sphere. In addition, direct costs of patients' decreased productivity and intangible costs represented by pain and distress are also to be added.

Once population risks, limitations of structure and of access to health services and evidences of progressive hospitalization increase in recent years are known, we understand that total costs may differ in different countries as a function of these features and that the comparison of such amounts should take such aspects into consideration. The emphasis on cost reduction and better efficiency of health services has created the explicit need to quantify and justify costs and benefits associated to specific therapies in order to have more rational therapeutic decisions¹⁸.

CONCLUSION

Costs have widely varied because the study was carried out in a private institution with different paying sources. Patients' length of stay in the emergency service was the only variable with statistical significance in costs increase.

Effective treatment and assistance quality strategies allowing patients' shorter length of stay in the emergency service may reflect on assistance costs decrease.

There are few studies in the literature relating acute pain and costs. So, our study has contributed to reflections about pain assistance management with regard to quality versus costs, and may shape other investigations in other types of pain treated in emergency services of public or private hospitals.

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