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ORIGINAL ARTICLE

Cost comparison of gynecologic procedures between the US and a developing country: an observational study

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Abstract

The Unites States spends on healthcare, with women's health being included, more than what middle-to-low-income countries, such as Lebanon, do. Compared to the United States, Lebanon has negligible data on the amounts spent on healthcare including female health services. In this study, we try to assess the cost differences of common gynecologic procedures between Lebanon and the United States, trying to fill the gap of missing data in Lebanon and identifying potential factors that can lead to high healthcare cost in the United States. Retrospective chart review. Chart review in Lebanon and surgery cost estimate in the US. A total of 505 patients was included in Lebanon, where patients were divided into 3 classes of insurance depending on the services provided. Cost of common gynecologic procedures in US dollars. The data collected were stratified according to insurance statuses of the patients. Using the ANOVA test, a comparison was performed between different insurance categories of patients in the US and patients in Lebanon. Forty percent of Lebanese patients were covered by second-class insurance. Total abdominal hysterectomy with removal of corpus and cervix was the most common gynecologic procedure. In addition, there was a significant difference in the mean total bill between first-class and third-class insured patients. When comparing Lebanon to the United States, the mean total bill was significantly higher for insured and non-insured United States patients than patients in Lebanon, except for open myomectomy where the difference between the mean total bill in Lebanon and the United States was nonsignificant. There is a significant difference in the cost of Cesarean delivery, sub-classes of hysterectomy, and laparoscopic myomectomy between Lebanon and the United States, even when patients are classified according to their insurance status, which necessitates interventions in the United States to cut down costs.

Keywords Healthcare costs · Gynecologic procedures · Cost comparison

Introduction

The total spending on healthcare services in the United States (US) is the highest worldwide with an increasing pattern. Healthcare cost encompasses a progressively large share of the US economy. By the end of 2020, the healthcare expenditure is estimated to become 20% of the gross domestic product (GDP) after being 4.6% only in 1950 [1, 2]. The share of spending on healthcare is a major concern in the US. Currently, evidence on reforms that can decrease the cost of healthcare and improve its value is still lacking [3]. In Lebanon, the total healthcare spending of the GDP was 12.4% in 1998 and continued in decreasing to reach 7.1% in 2012. Currently, household share of the total healthcare expenditure is 53% [4].

As a part of the total healthcare, female spending in the US is $1231 billion, which is 56% of the total personal health care (PHC) spending, given that women account for more than 50% of the population [5]. The latest study from the Lebanese ministry of health in 2006 showed a total of 46,000 patients seeking obstetric and gynecologic care [4]. On the contrary, there is a current lack of data in Lebanon on the amount of women spending on PHC.

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The abundance of female spending could be partially explained by the cost of gynecologic procedures, which is affected by the characteristics and comorbidities of the patients [6]. Additionally, patient demographics have also an impact on the gynecologic procedure cost by affecting the duration and course of stay [6].

Three of the most common performed gynecologic procedures in practice are: Cesarean section, hysterectomy, and myomectomy [7]. Approximately for every four women in the US, one will have a cesarean section. This data have a huge contribution to the healthcare bill given the relatively high cost of cesarean section, which is estimated to range between $7439 and $14,528 depending on the state compared to a range between $5017 and $10,413 depending on the state for an uncomplicated vaginal delivery [8]. These bills are mostly covered by the insurance, but the patient has still to pay a part [9]. Besides, benign tumors of the smooth muscle cells of the human uterus form leiomyomas, which are uterine fibroids. The surgical treatment of uterine fibroids costs between $10,000 and $20,000 [10]. In addition, 600,000 cases of hysterectomy are performed in the US each year summing up for a cost of $5 billion thereby forming a huge share of the healthcare spending [11]. On the other hand, Lebanon has no published data on the cost of common gynecologic procedures.

Comparative data suggest that there is a substantial difference in the cost of gynecologic procedures between the US and several middle-to-high-income countries [12]. Since there are huge variations that exist in the prices, costs, and charges of several common medical procedures across countries [13], our primary aim was to assess the variation in the cost of myomectomy, hysterectomy, and cesarean section between medical centers in the US and Lebanon. The secondary aim was to fill the gap of missing data in Lebanon and identify potential factors that can lead to high healthcare cost in the US.

Materials and methods

Study design

This is a retrospective chart review study. Our data were extracted from the billing system of one medical center in Lebanon, from 2012 to 2018 and the bill in the US was estimated by Fair Health consumer [14], an online resource estimator, due to inability to obtain the data. Our study population consisted of adult patients between the mentioned time intervals. A total of 505 patients were included in Lebanon.

The cost of vaginal, abdominal, and laparoscopic hysterectomy, open and laparoscopic myomectomy, and Cesarean section was adjusted to US dollars. Besides, the age, insurance type, comorbidities, surgery cost, medication cost, anesthesia cost, imaging cost, laboratory cost, material cost, and materials used were abstracted from the medical records.

All patients who underwent the selected gynecological procedures performed by national board and American board gynecologists during the specified period were included. Participants were excluded if they had any complications during the operation or if their operation was performed by a gynecologist who is not certified by national board or if the operation was performed via robotic technology.

The study was approved by the institutional board review (IRB) of the medical center in Lebanon.

Statistical analysis

The SPSS software version 25 was used to analyze the database. The ANOVA test was used to compare the cost taken and variables that have three or more groups. A p value < 0.05 was considered significant.

Results

Hysterectomy and myomectomy were further divided into sub-classes of surgeries depending on the approach and the structures involved. For instance, hysterectomy was divided into seven sub-classes, whereas myomectomy was divided into either laparoscopic-assisted or open. Cesarean delivery was fitted into one class. All the classifications were based on the current procedural terminology code (CPT code) (Table 1).

The gynecologic procedure most commonly performed in Lebanon (20.4% of patients) was total abdominal hysterectomy (TAH) with removal of corpus and cervix followed by open myomectomy (19.6%). Cesarean delivery was performed on 16% of the patients (Table 2). Besides, the dominant proportion of patients in Lebanon had a second-class insurance (41.3%) followed by cash payers or first-class insurance (34.3%) (Table 2).

Insurance companies in Lebanon offer plans that differ in co-insurance. First-class insurance has the lowest co-insurance and highest premium. While third-class insurance would have relatively the highest co-insurance percentage and lowest premium; second-class insurance would be in between these two.

The mean total bill was the largest for first-class patients or cash payers among patients stratified into their insurance class status. The difference in the mean total bill was significant when comparing first-class to third-class insured patients (Table 3).

The average out-of-pocket amount for every surgery was calculated and classified according to the insurance class in Lebanon (Table 4). Class 3 insured gynecologic patients paid the highest out-of-pocket amount for surgeries 1, 3, 9,

Table 1 The surgeries discussed in this study with their corresponding CPTs in Lebanon and the US

Surgery number	Surgery type	CPT codes in Lebanon	CPT codes in the US
1	Laparoscopic assisted vaginal hysterectomy	56,308	58,552 and 58,554
2	Vaginal hysterectomy	58,262	58,262 and 58,291
3	Vaginal hysterectomy with repair of enterocele	58,270	58,270 and 58,292
4	Total abdominal hysterectomy with removal of corpus and cervix	58,150	58,150
5	Total abdominal hysterectomy with removal of corpus and cervix along with colpo-urethrocyst-opexy	58,152	58,152
6	Total abdominal hysterectomy, including partial vaginectomy including para-aortic and pelvic lymph node sampling	58,200	58,200
7	Supracervical abdominal hysterectomy	58,180	58,180
8	Laparoscopic assisted myomectomy	56,309	58,545 and 58,546
9	Myomectomy	58,140	58,140 and 58,146
10	Cesarean delivery including postpartum care	59,515	59,515

Table 2 The percentage of the total patients belonging to each surgery type and insurance class in Lebanon

Surgery type	*N* (%)
1. Laparoscopic assisted vaginal hysterectomy	75 (14.9%)
2. Vaginal hysterectomy	24 (4.8%)
3. Vaginal hysterectomy with repair of enterocele	30 (5.9%)
4. Total abdominal hysterectomy with removal of corpus and cervix	103 (20.4%)
5. Total abdominal hysterectomy with removal of corpus and cervix along with colpo-urethrocystopexy	18 (3.6%)
6. Total abdominal hysterectomy, including partial vaginectomy including para-aortic and pelvic lymph node sampling	24 (4.8%)
7. Supracervical abdominal hysterectomy	4 (0.8%)
8. Laparoscopic assisted myomectomy	47 (9.3%)
9. Myomectomy	99 (19.6%)
10. Cesarean delivery including postpartum care	81 (16.0%)
Insurance class	
Cash payer or first class	173 (34.3%)
Second class	208 (41.3%)
Third class	123 (24.4%)

Table 3 The mean total bill corresponding to each insurance class in Lebanon

Insurance class	Mean total bill
Cash payer or first class	4720.83 ± 2378.98
Second class	2543.52 ± 1761.04
Third class	2991.17 ± 1717.45
p value	< 0.001

Post hoc analysis: classes 1 and 3: $p < 0.001$

and 10 whenever compared to other insurance classes. On the contrary, class 1 insurance patients paid the highest out-of-pocket amount for surgeries 4 and 6. Class 2 insurance patients paid the most for surgeries 2 and 8.

The averaged total bill for every type of gynecologic surgery in Lebanon was compared to the corresponding surgery

Table 4 Difference in the out-of-pocket paid according to the type of surgery and the insurance class

Type of surgery	Insurance class I	Insurance class II	Insurance class III
1	1029.62 ± 1902.93	564.84 ± 687.61	1561.97 ± 2055.83
2	151.40 ± 187.21	1075.89 ± 1919.86	150.78 ± 187.61
3	111.53 ± 102.83	230.24 ± 158.34	1084.49 ± 2307.10
4	657.03 ± 1275.96	258.24 ± 426.25	415.19 ± 1082.84
5	NA	NA	NA
6	2944.55 ± 3985.96	977.84 ± 1694.77	2202.06 ± 2595.45
7	589.09 ± 1349.52	NA	NA
8	169.47 ± 303.55	396.04 ± 227.31	311.59 ± 542.55
9	222.75 ± 471.68	387.84 ± 812.89	591.94 ± 921.21
10	556.44 ± 1314.06	179.24 ± 123.91	828.78 ± 1146.71

averaged total bill of insured and non-insured patients in the US (Table 5).

The averaged total bill for surgery 1 was significantly lower in Lebanon than the "in Network" and "out of Network" US patients for surgeries 1, 2, 3, and 8. For surgery 9, the mean total bill was significantly lower in Lebanon than the US "out of Network". However, it was similar to the "in Network" US patients. Interestingly, the mean total bill of insured patients was lower for insured patients than non-insured for all types of surgeries.

Discussion

Our results showed that the majority of gynecologic patients in Lebanon belong to the second-class insurance. These results are logical and reasonable for two main reasons. First, patients have a preference to pay for the average insurance type and receive a relatively good medical coverage. Second, the public sector and private companies tend to provide mostly a second-class type of insurance to their employees.

The mean total bill in Lebanon was lowest for second-class insurance patients and highest for first-class patients. While the highest mean total bill is expected to result from the accumulation of high cost rate of hospitalization, the mean total bill of third-class insurance was higher than that of second-class insurance that might be explained by the higher prevalence of patients covered by third-class insurance undergoing expensive surgeries.

The lower bill paid by insured US patients than non-insured US patients might be explained by the power of negotiation and transparency's effect on reducing prices. The insurers or payers have a huge power of negotiation and can bargain to reach a much cheaper contract.

Comparing total bills between Lebanon and the US, bill components were taken into consideration. Two potential variables that definitely could potentially have an impact on billing are instrument sets and operating room staffing. The set of instruments used in each of the surgeries described in the study is identical in the US and Lebanon and this even includes suture types and laparoscopic devices. The Lebanese American University Medical Center being American affiliated and having American and international accreditation follows the universal standards followed in the US. In regard to staffing, operating room staffing in LAU Medical center is almost the same as in the US. The staff present in operating rooms in the US and Lebanon are the surgeon, resident physician, assistant surgeon if any intervention needed like a urologist for a bladder or ureter injury, surgical tech or scrub nurse, student, anesthesiologist, nurse anesthesiologist and a pediatric resident in case of a cesarean section.

Another variable that could impact the total cost is the length of stay for which hospitals usually add proportional charges. In our study, the length of stay for the surgeries studied in Lebanon and the US was similar. The overall trend in both was to discharge home in the same or next day postoperatively.

After accounting for these variables, the difference in cost is mainly attributed to the relatively elevated workforce and services' costs. These comprise workforce compensation for surgeons, anesthesiologists, nurses, assistants, techs, pharmacists and the costs of medical services as operating room time, laboratory work, imaging studies, prosthesis, medications and equipment. Also worth mentioning, is the standard monetary compensation of healthcare workers in the US that is relatively higher than their Lebanese counterparts in occupation stratification, respectively.

Given the huge gap in the total bill between both the "out of network" bill and the "in network" bill and total bill in

Table 5 Mean total bill for each surgery among patients in Lebanon, insured patients in the US, and non-insured patients in the US along with the statistical difference between patients in Lebanon and insured and non-insured, respectively

Variable	Lebanon	USA		Significance	
Surgery type	Mean total bill	Mean total bill of insured patients (in Network)	Mean total bill of non-insured patients (out of network)	P1	P2
1	3949.71 ± 1783.99	16,329.00 ± 2858.12	30,612.00 ± 6491.24	< 0.001	< 0.001
2	4021.64 ± 2104.92	7868.50 ± 2291.73	22,837.50 ± 10,963.69	0.02	< 0.001
3	3027.72 ± 1635.16	9179.00 ± 684.48	17,283.50 ± 1351.28	< 0.001	< 0.001
4	3972.29 ± 2914.54	2898	34,411	NA	NA
5	3621.58 ± 2099.20	3555	7417	NA	NA
6	5108.68 ± 2842.97	4770	9634	NA	NA
7	5832.03 ± 6284.28	2643	26,874	NA	NA
8	2926.58 ± 1059.48	9027.00 ± 1040.86	24,728.00 ± 6817.92	< 0.001	< 0.001
9	2638.77 ± 1864.48	2588.00 ± 72.12	26,878.50 ± 5878.17	0.969	< 0.001
10	2637.90 ± 1224.24	6213	12,587	NA	NA

P1 = *p* value between Lebanon and USA in coverage; P2 = *p* value between Lebanon and USA out coverage

Lebanon, and given that a decent percentage of the surgeries performed in the university medical center in Lebanon is operated by gynecologists trained in the US, it is necessary to shed the light and manage the cost components in the US to set strategies to cut costs and reduce bills.

There are certain limitations regarding our manuscript. We only could get the total bill from the US. No bill stratifications or components were allowed for privacy issues.

Conclusions

There is a significant difference in the cost of gynecologic surgical services between Lebanon and the US, especially when the bill is computed as out of Network. Studied gynecologic procedures in the US have a much higher bill total when they are out of coverage than in coverage. The presence of an insurance program reduces the billing gap. There is a real and solid potential to cut the surgical bill in the US by expanding the population covered by insurance and improving negotiations between insurers and hospital centers.

Author contributions BAZ and KJ conceived the idea for the study, participated in its design and coordination, and provided the final approval of the version to be published. GEH and JAZ reviewed literature, participated in reviewing and analyzing the charts and wrote parts of the manuscripts. SH undertook data management and computation of statistical outcomes.

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Declarations

Conflict of interest Bassel Abouzeid, George Elhasbany, Jawad Abouzeid, Souheil Halleit and Karl Jallad declare that they have no conflict of interest.

Ethics approval The study was approved by the institutional board review (IRB) of the medical center in Lebanon. Date of issue: 22 March 2019, IRB number: LAUMCRH.KJ1.22/mar/2019, IRB registration number: IRB 00006954 LAUIRB#1. This article does not contain any studies with human participants performed by any of the authors.

Informed consent Informed consent was not required for this study.

Consent statement All the authors approve the final version of the manuscript.

References

1. Fuchs VR (2013) The gross domestic product and health care spending. N Engl J Med. https://doi.org/10.1056/NEJMp1305298
2. Cuckler GA, Sisko AM, Keehan SP et al (2013) National health expenditure projections, 2012–22: slow growth until coverage expands and economy improves. Health Aff (Millwood). https://doi.org/10.1377/hlthaff.2013.0721
3. Papanicolas I, Woskie LR, Jha AK (2018) Health care spending in the United States and other high-income countries. JAMA J Am Med Assoc. https://doi.org/10.1001/jama.2018.1150
4. WHO (2006) Health system profile Lebanon. WHO, Cairo. https://doi.org/10.1017/CBO9781107415324.004
5. Lassman D, Hartman M, Washington B, Andrews K, Catlin A (2014) US health spending trends by age and gender: selected years 2002–10. Health Aff (Millwood). https://doi.org/10.1377/hlthaff.2013.1224
6. Hustedt MM, Mattox JH, Hustedt J, Wood CP (2016) Effects of patient comorbidities on cost of hysterectomy for benign indications in the United States [2J]. Obstet Gynecol 127:81S. https://doi.org/10.1097/01.AOG.0000483736.11845.ee
7. Oliphant SS, Jones KA, Wang L, Bunker CH, Lowder JL (2010) Trends over time with commonly performed obstetric and gynecologic inpatient procedures. Obstet Gynecol. https://doi.org/10.1097/AOG.0b013e3181f38599
8. FAIR health state-by-state analytics make news. http://www.fairhealth.org/article/fair-health-state-by-state-analytics-make-news. Accessed 23 Feb 2019
9. Gibbons L, Belizan JM, Lauer JA, Betran AP, Merialdi M, Althabe F (2012) Inequities in the use of cesarean section deliveries in the world. Am J Obstet Gynecol. https://doi.org/10.1016/j.ajog.2012.02.026
10. Zimmermann A, Bernuit D, Gerlinger C, Schaefers M, Geppert K (2012) Prevalence, symptoms and management of uterine fibroids: an international internet-based survey of 21,746 women. BMC Womens Health. https://doi.org/10.1186/1472-6874-12-6
11. Jones HW (2008) Inpatient hysterectomy surveillance in the United States, 2000–2004: commentary. Obstet Gynecol Surv. https://doi.org/10.1097/01.ogx.0000312151.61642.80
12. Augusto KL, Brilhante AVM, Modesto GCD et al (2018) Costs and mortality rates of surgical approaches to hysterectomy in Brazil. Rev Saude Publica. https://doi.org/10.11606/S1518-8787.2018052000129
13. International Federation of Health Plans (2015) 2015 Comparative price report variation in medical and hospital prices by country. Health Care Cost Inst Collab Int Fed Health Plans
14. Welcome to FAIR Health. http://www.fairhealthconsumer.org. Accessed 4 June 2020

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