Inappropriateness of Hospital Admission, Hospital Stay and Bed Utilization at Monufia University Hospitals, Egypt

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Abstract:

Background: Worldwide, inappropriate hospital admission and stay is one of the most important challenges facing all health systems. **Objectives:** The current study aimed to estimate frequency of inappropriate admission and stay, determine risk factors associated with inappropriateness and study the bed utilization patterns in 2016 at Monufia University Hospitals. **Methods:** A total number of 350 patients (1637 days) admitted to various departments of Monufia University Hospitals were included in this cross-sectional study. Patients were interviewed, their hospitalization days were assessed by Appropriateness Evaluation Protocol (AEP) and their records were analyzed.

Results: Percentages of inappropriate hospital admission and stay were 18.3% and 18.6% respectively. General surgery department had the highest rate of inappropriateness (32.8%). Admission to avoid the waiting time for an outpatient investigation was the most common reason of inappropriate admission (48.4%),while waiting for surgical procedure was the most common reason of inappropriate pre-procedure hospital stay (64.2%) and conservative practice was the most common reason of inappropriate post-procedure hospital stay (58.4%). Overall bed occupancy rate was 76.39% and average hospital stay was 4.12 days. Inappropriate admission was related to rural residency and to patients living >10 km away from the hospital, while inappropriate stay was related to older age >50 y and long hospital stay.

Conclusion: The most common reason of inappropriate hospitalization was unorganized hospital schedules of treatment and discharge of patients. Proper monitoring of length of stay (LOS) and bed utilization rates can early detect any hospitalization defect and thus improve hospital efficiency.

Key words: AEP, Bed occupancy rate, Inappropriate hospitalization, LOS.

Introduction:

Hospital services are the most expensive part of modern health care systems.[1] Egyptian Ministry of Health and Population (MOHP) facilities receive only 19% of total financial resources in the health sector. Out of this 19%, University hospitals are spending 8% of this small budget, so they must cope with challenges of limited resources.[1,2] Inappropriate use of hospital services not only represents an inefficient use of limited resources, but also causes an additional cost burden and healthcare associated infections (HCAI). HCAI appear in a patient under medical care in the hospital or other health care facility which was absent at the time of admission.[3,4]

Appropriateness means that "people get the care they need in the right way and right time".[5] The inappropriate use of hospital resources was assessed by measuring two main processes; inappropriate hospital admission and unnecessary hospital stay.[1] Inappropriate hospital admission refers to the

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admission of patients having other options with lower level of technology rather than the hospital services. In other words, there is no necessity to admit them in hospital at that time.[4] Appropriate hospital stay refers to those stays during which the patient requires medical attention, nursing care and drug therapy that cannot be provided outside the hospital; otherwise it is inappropriate.[6]

Hospital bed-occupancy rates and LOS have been proposed as a measure of the ability of a hospital to function safely and effectively. High bed-occupancy rates are associated with greater risks of HCAI and have a negative impact on staff health. Also, a prolonged hospital stay can increase the risk of complications, worsen the patient's quality of life and use valuable resources.[7] Relative shortages in hospitals, specialized medical services, medical equipment and trained health care workers[8,9] have necessitated the study of hospital admission and LOS to recognize the most important factors affecting them and thus limit inappropriate hospitalization and help proper use of hospital resources.

The current study aimed to estimate frequency of inappropriate admission and stay, determine risk factors associated with inappropriateness and study the bed utilization patterns in 2016 at Monufia University Hospitals (occupancy rate, bed turnover rate and average hospital stay).

Methods:

A cross-sectional study was conducted in Monufia University Hospitals, Egypt from the 1st of July 2017 to the end of March 2018. Out of 8834 adult patients admitted to Monufia University Hospitals, a sample size of 350 participants (calculated using Epi-Info 7 program) was randomly chosen relying upon a study power of 80%, alpha error of 5%, a level of significance of 95% and a least significant difference of 5% after exclusion of patients discharged on the same day of admission or stayed for only one day, co-morbidity of psychiatric illness (inconsistency of their speech) and patients staying in special services units (such as intensive care units, coronary care, endoscope, and dialysis center) because of their different needs of care.

Data collection was divided into two phases:

First phase: A detailed study of the main major departments in Monufia University Hospitals: general surgery and internal medicine departments. In addition to two randomly selected ones: chest and urology departments as representatives to medical and surgical departments, respectively.

The enrolled patients were subjected to a pre-designed questionnaire that consisted of three parts: socio-demographic data, admission and discharge data and appropriateness evaluation protocol (AEP).The AEP is the tool most widely tested and validated in various countries for measuring the appropriateness of hospitalizations and hospital stays.[10] It was used and validated for the first time in America in 1970 and included twenty-seven objective criteria items.[11]

Researchers in European countries made multiple modifications to the United States AEP (US-AEP) to develop a common list of reasons for inappropriate admissions and days of stay, this included several steps from translation of US-AEP till validation of European AEP.[12] The authors applied the modified European version that is divided into two parts.[11,12] First part; assessment of appropriate and inappropriate admission by using 15 admission criteria.

This assessment was done once after patient admission to the hospital. Second part; assessment of appropriate and inappropriate days of care by using 24 criteria divided into three groups: (1) medical services, (2) nursing/life support services and (3) patient condition factors. Evaluation of hospital stay was done randomly twice pre and post-operative. If any one of the criteria was met, the day was deemed "appropriate," and if not, the day was deemed "inappropriate". Finally, causes of inappropriate admission and days of care were enlisted, evaluated and analyzed accordingly.

Second phase: A record analysis was used to assess the pattern of bed utilization in Monufia University Hospitals during 2016. Medical records from Hospital Statistics Unit were reviewed to highlight the following indicators:-

- Average hospital stay (days)= total inpatient days/ no of admissions
- Bed turnover rate (person/ bed)= no of discharges/ no of beds
- Bed occupancy rate (%) = no of bed days used/ no of available bed days

Data management: Data were tabulated and statistically analyzed using an IBM personal computer with Statistical Package for Social Sciences (SPSS) version 23. Data were expressed in: Number (No), percentage (%), mean (X^-) and standard deviation (SD). Logistic regression was performed to ascertain the effects of risk factors for inappropriate hospital admission and stay. P- value of > 0.05 was considered statistically non-significant, P-value of <0.05 was considered statistically significant and

P-value of < 0.001 was considered statistically highly significant.

Ethical consideration:

Every participant was informed about the objectives of our study and asked to provide an oral consent for interviewing and relevant data collection. Instructions of medical ethics committee at Monufia Faculty of Medicine were followed strictly and its approval was obtained on May 2017.

Results:

The percentages of inappropriate admission and stay are 18.3% and 18.6% respectively .General surgery has an equal percentage of inappropriate admission and stay (32.8%), surprisingly; it is the highest one. On the other hands, all admissions and stay to chest department are appropriate, so it is excluded from statistical analysis. All patients admitted to internal medicine department had appropriate hospital admission and pre-procedure hospital stay, so this department was excluded from analysis of inappropriate admission and inappropriate pre-procedure hospital stay.

The majority of participants are females. The average age of participants is 49.4 (SD= 15.668). The average hospitalization period is 4.68 (SD= 5.138). Inappropriate hospital stay was significantly higher among married,

elderly and patients admitted to the hospital for the first time through outpatient clinic or referral.

This study finds that admission to avoid waiting time for investigations is the most common reason of inappropriate admission in different departments. Detailed study of each department separately shows that admission required by the GP or specialist is the most common reason in internal medicine department (100%)**,** admission to avoid waiting time for investigations is the most common one in general surgery department (57.1%) and premature admission is the most common one in urology department (47.6%).

Waiting for surgical procedure is the most common reason of inappropriate pre-procedure hospital stay in different departments (64.2%). 52.8% of patients didn't get their surgical procedure on time because they were waiting investigation results. Internal medicine department is excluded from pre-procedure hospital stay statistical analysis as it is appropriate.

On the other hand, the most common reason of inappropriate post-procedure hospital stay in different departments is conservative practice (58.4%). 50% of patients need outpatient care instead of hospital stay for conservation. Regarding

logistic regression model of risk factors associated with inappropriate admission and stay; rural residence, living far from hospital ≥10 km, admission for surgical treatment and being admitted for the first time were the only significant predictors of inappropriate admission.

Admission for surgical treatment was 7.15 times associated with inappropriate admission more than admission for medical treatment. While, female patients, age ≥50, illiteracy, prolonged LOS and admission for surgical procedure were the only significant predictors of inappropriate hospital stay. Illiterate patients were 9.37 times associated with inappropriate stay more than literate ones. It is evident that from record analysis of year 2016 as addressed in Table-4 there is a great variability in bed occupancy according to specialty.

Some departments are under-utilized as cardiothoracic surgery and forensic& toxicology departments. Overall bed occupancy rate is 76.39%. There is no significant difference between medical and surgical departments regarding bed utilization rates.

Discussion:

Concerning the rate of inappropriate admission, it was 18.3%. An Egyptian study was in concordance with this result [4], it reported a rate of 19%. A wide range of results were published regarding inappropriate admission.[1,6,13-16] A Chinese study reported (26.5%), a Spanish one found (7.4%), a French one showed (7.7%) and Iranian ones reported a range (7.4%-16.2%). The different results could be attributed to the fact that different study designs, versions of AEP, population and settings were used.[17,18]

The rate of inappropriate hospital stay was estimated to be 18.6%. In Egypt: it was 50.5% in Ismailia and 59% in Zagazig.[14,19] Other studies revealed that Belgium, Italy, France and Iran 24.61, 44.6%, 32.4% and 22.1-39.4% respectively [1, 4, 17, 20, 21].

Different rates of inappropriate stay could be explained by different length of hospital stay. Majeed et al. (2012) reported that a prolonged hospital stay increased the risk of complications, use valuable resources and rate of inappropriate hospital stay. The results of this work showed that female patients had a higher rate of inappropriate hospital stay than males. These results were in line with many published work and could be explained by increased probability of females to have chronic diseases especially after the age of menopause. Some studies agree with the current study. Robbins and Webb (2006)

disagree; they explained their finding by the fact that males exposure to higher levels of psychosocial and environmental stressors is significantly higher than females.[22,23]

Elderly patients had a significant higher rate than younger ones; this could be attributed to their higher clinical and social problems.[14,24] As long as they live, they develop multiple, complex and chronic debilitating diseases requiring prolonged hospital stay.[25] Evaluation protocol enlisted only medical reasons for hospitalization related to acute care and disregarded the subjective criteria of physical, mental or social suffering which were often prominent in non-acute care settings. Contrary to Soria-Aledo et al. (2009) who found that age itself was not a major risk for inappropriate stay, other studies proved findings of the current study.[19, 24, 25-27]

Patients lived away from hospital (> 10 km) had a higher rate of inappropriate hospital stay, this could be explained by the difficulty of reaching hospital on time, so they need a prolonged hospital stay. Soria-Aledo et al. (2009) had another hypothesis that hospital doctors had used to visit the area patients used to see nearby patients first, this may lead to a significant delay in examination, tests, and then consequently discharge. Many published work showed that long distance from hospital had a significant association with inappropriate hospitalization.[14, 17, 24].

The average LOS is 4.68 days. Salem and Mahmoud (2008) reported the same result in Benha university hospital (4.02days). Whereas Jeddian et al. (2017) and Ghods et al. (2015) reported a lower LOS (3.6 days in surgical wards and 3.02 days respectively). Other studies reported a higher rate from 6 to 9.4 days. Admission to avoid waiting time for investigations is the most common reason of inappropriate admission. The same result was obtained in a study conducted by Al-Tehewy et al. (2009). On the other hand, waiting for surgical procedure is the most common reason of inappropriate pre-procedure hospital stay, while conservative practice is the most common one of post-procedure inappropriateness. Wassif et al. (2013), Ghods et al. (2015) and Tavakoli et al. (2015) totally agree with our results, but Fontaine et al. (2011) reported that delayed discharge (ineffective discharge planning) was the most common reason. [19,6,4,28]

Rural residence, living far from hospital ≥10 km and being admitted for the first time were significant predictors of inappropriate admission showed in logistic regression model, long distance that leads to difficulty of

reaching hospitals and fear of patients from disease and its complications in contrast to previously admitted patients might explain our findings. Other studies reported same risk factors. Whereas patients aged ≥50 and admission for surgical procedure that leads to prolonged LOS were the significant predictors of inappropriate hospital stay, Barisonzo et al. (2013) reported that inappropriateness was significantly more frequent among elderly in the presence of co-morbidities. [4, 29].

In year 2016,Monufia university hospitals had a total occupancy rate 76.39% with average hospital stay 4.12 days. Cardiothoracic surgery department showed the lowest bed occupancy and bed turnover rates (44.32% and 18.25 person ∕ bed respectively) and the highest average hospital stay (8.86 days). Low number of patient admissions (364), discharge (365), total patient days (3236) and high number of beds (20) to this department may give a reason behind this.

Similar bed occupancy rates were reported 67.9% and 70.16%. Wassif and colleagues (2013) found that neuropsychiatry department was underutilized. They explained their findings by the presence of stigma leading to preference of ambulatory treatment in psychiatry department, while in neurology;

patients paid for their stay, departments that provided private service and the economic treatment hospital were seen by the public as not prestigious and were not utilized properly.[14,31]

Study limitations: Multidisciplinary co-ordination between different clinical and administrative departments inside the hospital was limited. Getting access to the patients' data was a complicated process. Some medical records were incomplete also during assessment of preoperative hospital stay; some patients had an exit permission and left the hospital for a period which made assessment very difficult.

Conclusion: There are many factors that potentially affect hospitalization and lead to inappropriate admission and prolonged LOS of patients in Menofia University Hospitals. Unorganized hospital schedules of treatment, discharge and improper monitoring of LOS, to name a few were the most common reasons.

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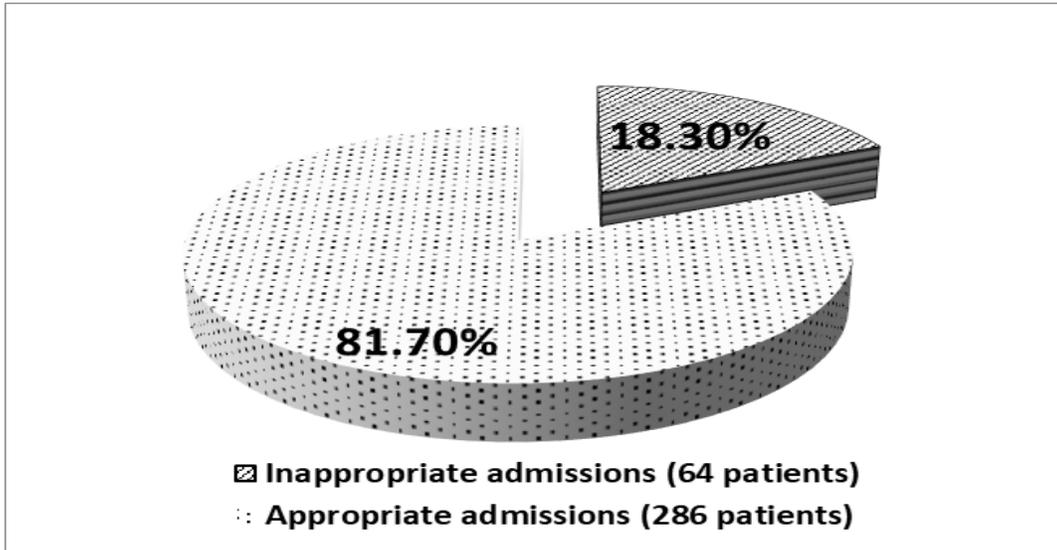
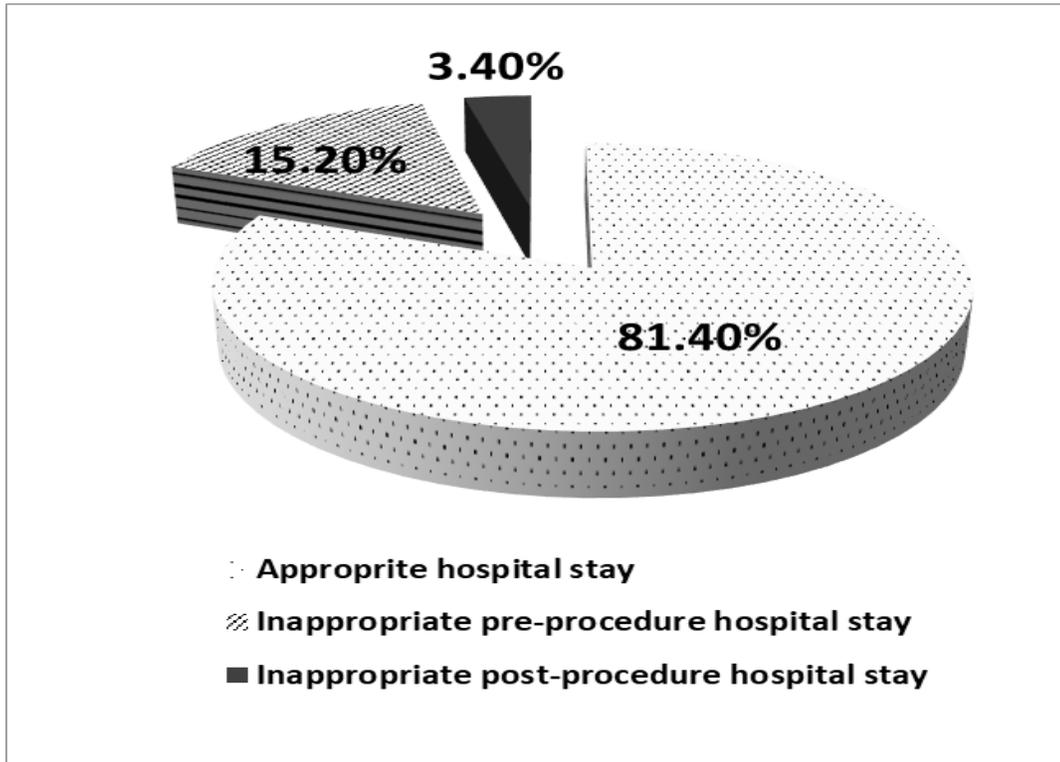**Figure (1): Inappropriate admissions at Monufia University Hospitals (18.3%)**

Figure (2): Inappropriate hospital stay at Monufia University Hospitals (18.6%)

Table (1): Socio-demographic and hospitalization characteristics associated with inappropriate admission& stay:

Variable	Inappropriate admission (64)		Z test (P value)	Inappropriate stay (65)		Z test (P value)
	N	(%)		N	(%)	
Gender:						
▪ Male	32	50	0.25	31	47.7	0.12
▪ Female	32	50	(0.8)	34	52.3	(0.9)
Age:						
▪ < 50 y	24	37.5	1.68	23	35.4	2
▪ ≥ 50 y	40	62.5	(0.09)	42	64.6	(0.04)*
Marital status:						
▪ Married	51	79.7	3.75	52	80.0	3.82
▪ Unmarried	13	20.3	(<0.001)*	13	20.0	(<0.001)*
Distance from hospital:						
▪ < 10 km	29	45.3	0.5	29	44.6	0.62
▪ ≥ 10 km	35	54.7	(0.6)	36	55.4	(0.5)
Admission process:						
▪ Emergency	0	0	____	1	1.5	2.69
▪ Outpatient clinic &Referral	64	100		64	98.5	(0.007)*
Frequency of previous admissions:						
▪ < 1	53	82.8	4.02	52	80.0	3.82
▪ ≥ 1	11	17.2	(<0.001)*	13	20.0	(<0.001)*

* P value <0.05 is significant, <0.001 is highly significant

Table (2): Most common reasons of inappropriate admission and stay (pre-procedure and post-procedure) in different departments

Reasons	Departments			X^2 (P value)
	General surgery N (%)	**Internal medicine** N (%)	**Urology** N (%)	
Most common reasons of inappropriate admission: 1. Admission to avoid waiting time for investigations 2. Premature admission 3. Admission of patient living far from hospital.	24 57.1 9 21.4 11 26.2	_____ _____ _____	7 33.3 10 47.6 2 9.5	6.75 (0.03)*
Most common reasons of inappropriate Pre-procedure hospital stay: 1.Waiting for surgical procedure 2.Waiting for diagnostic test	23 60.5 15 39.5	_____ _____	11 73.3 4 26.7	0.78 (0.4)
Most common reasons of inappropriate Post-procedure hospital stay: 1. Conservative practice 2. Ineffective discharge planning	3 75 1 25	1 25 2 50	3 75 1 25	1.64 (0.4)

X^2: Chi square test   *significant.

Table (3): Logistic regression of risk factors associated with inappropriate admission and stay

Independent factors	β	Sig.	Exp (β)	95% CI	
				Lower	Upper
Inappropriate admission:					
1. Residence: Rural	.610	**0.044**	.543	.300	.983
2. Distance from hospital: ≥ 10 km	.149	**0.021**	1.160	.644	2.090
3. Day of arrival: Emergency day	.394	0.476	1.483	.502	4.382
4. Frequency of previous admissions	.809	**0.02**	2.245	1.133	4.445
5. Surgical treatment	4.468	**0.0001**	7.15	1.921	17.146
Inappropriate stay:					
1. Gender: Female	0.831	**0.02**	2.296	1.139	4.628
2. Age: ≥ 50 years	1.416	**0.004**	4.121	1.593	10.662
3. Educational level: Illiterate	2.238	**0.023**	9.378	1.356	64.839
4. LOS	0.074	**0.005**	1.076	1.022	1.134
5. Payment method: Unpaid	0.237	0.811	0.789	0.114	5.464
6. Surgical treatment	2.984	**< 0.001**	0.051	0.017	0.149

Table (4): **Bed utilization rates in some non-emergency departments in Menofia university hospitals 2016**

Department	Bed occupancy rate (%)	Bed turnover rate(person⁄ bed)	Average hospital stay (days)
General surgery	57.6	47.43	4.43
Plastic surgery	62.79	51.5	4.45
Orthopedic surgery	78.98	44.6	6.46
Ophthalmology	53.78	78.83	2.49
ENT	94.73	110.15	3.13
Urology	91.88	81.67	4.54
Obstetrics& Gynecology	89.72	98.52	3.32
Neurosurgery	91.22	49.24	6.76
Cardiothoracic surgery	44.32	18.25	8.86
Internal medicine	88.25	62	5.2
Chest	83.43	37.68	4.05
Tropical	94.7	75.11	4.6
Cardiology	96.8	149.4	2.36
Neuropsychiatry	70.75	47.91	5.85
Pediatric	90.35	81.95	4.02
Forensic& toxicology	53.34	100.24	2.09
Surgical departments	73.89	64.47	4.94
Medical departments	87.38	75.68	4.35
Total hospitals	76.39	67.03	4.12

الملخص العربى

عدم ملاءمة الدخول والإقامة واستخدام الأسرة فى مستشفيات جامعة المنوفية-مصر

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الخلفية: تمثل المستشفيات أعلى نسبة من الإنفاق على الرعاية الصحية، لذا فإن الاستخدام الفعال لخدمات الرعاية الصحية هو مصدر اهتمام كبير في جميع أنحاء العالم. إن الاستخدام غير الملائم لخدمات الرعاية الصحية لا يمثل فقط عدم كفاءة استخدام موارد الرعاية الصحية المحدودة، بل يؤدي أيضا إلى ارتفاع معدل إشغال الأسرة بشكل غير ضروري ويرتبط بسوء جودة الرعاية بسبب زيادة عبء المستشفى. **الهدف** من هذه الدراسة هو تقدير عدد مرات الدخول والإقامة غير الملائمة في مستشفيات جامعة المنوفية، وتحديد أسبابها، ودراسة نمط استخدام الفراش في مستشفيات جامعة المنوفية عام ٢٠١٦ م.**الطريقة**: أجريت دراسة مقطعية مستعرضة على المرضى البالغين الذين تم حجزهم فى الاقسام الآتية: الجراحة العامة، الباطنة، المسالك البولية، الصدر بمستشفيات جامعة المنوفية. وتم اختيار ٣٥٠ مريضاً عشوائياً (وتم إخضاعهم لاستبيان المقابلات وخصائص الدخول والاقامة فى المستشفى). **النتائج**: كانت النسبة المئوية للدخول والاقامة الغير ملائمين فى المستشفى ٣.١٨٪ ، ١٨.٦٪ على التوالي. وكان قسم الجراحة العامة أعلى معدل لعدم الملاءمة (٣٢.٨٪). وأوضحت الدراسة ان القبول لتجنب وقت الانتظار لإجراء الفحوصات الطبية في العيادات الخارجية هو السبب الأكثر شيوعًا للقبول الغير ملائم (٤٨.٤٪)، بينما كان الانتظار لإجراء عملية جراحية هو السبب الأكثر شيوعًا للإقامة غير المناسبة في المستشفى قبل العملية (٢.٦٤٪)، وكان وضع المريض تحت الملاحظة اثناء العلاج وهو لايحتاج الى ذلك بدلا من العلاج فى المنزل هو السبب الأكثر شيوعًا للإقامة غير المناسبة في المستشفى بعد العملية (٤.٥٨٪). بلغ معدل إشغال الأسرة الإجمالي ٣٩.٧٦٪ ومعدل الإقامة في المستشفى ١٢.٤ يومًا. **الخلاصة:** كان السبب الأكثر شيوعًا للاقامة غير الملائمة هو عدم تنظيم مواعيد المستشفى لمعالجة المرضى واجراء العمليات الجراحية وخروج المريض. وبالتالى يمكن بالمتابعة والرصد السليم لمدة الاقامة فى المستشفى ومعدلات الاستفادة من الأسرة أن يكشف عن أي عيب في المستشفى في وقت مبكر وبالتالي يتم تحسين كفاءة المستشفى.