The Effect of Time-to-Provider, Left-without-Treatment and Length-of-Stay on Patient Satisfaction in Training Hospitals' Emergency Department, Iran

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Abstract
Background: It is necessary to consider into hospital emergency services' quantity and quality in different aspects such as time-to-provider, left-without-treatment and length-of-stay. The aim of this research was to identify the effect of these factors on patient satisfaction in training hospitals.

Methods: In this descriptive-analytical and cross-sectional study, the sample size was calculated 768. The instrument included 54 questions and 8 sections. Three questions were in the field of following factors: 1) Time to provider was defined as the time from initial triage to initial provider evaluation. 2) Left-without-Treatment patients were defined as those who were initially triaged but were unable to be evaluated by a provider because they had left the ED. 3) Length-of-Stay was defined as time from initial triage to the time of final ED disposition, either discharge or admission. It was analyzed by descriptive statistics, simple logistic regression, multiple logistic regressions, simple linear regression and multiple linear regression.

Results: The time-to-provider lower than 15 minutes, LWOT and LOS lower than 6 hours were 92.8%, 3.9% and 90.3%, respectively. The mean of time-to-provider and the mean of LOS were 18.1 minutes and 202 minutes. Time-to-Provider affected satisfaction of admission, guardians, nursing care and managing proceedings \((P<0.001)\). LOS affected satisfaction of admission, guardians and diagnosis proceedings \((P<0.01)\). LWOT did not affect satisfaction and its domains \((P>0.05)\).

Conclusion: Decreasing time-to-provider and LOS has the effect on patient satisfaction in some domains. Furthermore, left-without-treatment rate is not a good proxy of patient satisfaction.

Keywords: Time-to-Provider, Left-without-Treatment, Length-of-Stay, Satisfaction

Introduction

Patient satisfaction in emergency departments (EDs) needs to be addressed according to health care reform (1). Improving satisfaction of emergency services represents an opportunity to reduce the occurrence of costly ED return visits and to increase continuity and satisfaction of care (2). Patients who are satisfied with ED care have greater intentions to return to the same ED, and are less likely to have complaints or to initiate lawsuits (3).
process to improve patient's satisfaction when they are identified (4).

The fundamental challenges of hospital emergencies' satisfaction are the high left-without-treatment, the prolonged time-to-provider and length-of-stay (5). Time-to-provider is defined as the time from initial triage to initial provider evaluation. LWOT patients are defined as those who are initially triaged but were unable to be evaluated by a provider because they have left the ED. LOS is defined as time from initial triage to the time of final ED disposition, either discharge or admission (6).

Patients who leave without treatment are at risk for worsening morbidity and mortality due to delay in diagnosis and treatment of their current conditions (7). In addition, high time-to-provider, LWOT and LOS negatively affect several domains of quality such as timeliness, safety, and patient centeredness (8). In addition to the impact on quality, they are directly associated with lost hospital revenues (9). The impact on quality and finances has led many emergency managers to pay increasing attention to this metrics (7).

Although the link between LOS, time-to-provider and other factors with satisfaction were separately published in many studies, none of them concurrently assesses the effect of time-to-provider, LWOT, LOS and other factors on satisfaction and its domains. It was not examined on satisfaction of staff ignore clinical services, separately. It does not clarify whether time-to-provider, LWOT and LOS affect satisfaction in addition to other factors or not.

The aim of this research was to identify the effect of time-to-provider, LWOT and LOS on patient satisfaction in training hospitals.

**Materials and Methods**

In this descriptive-analytical and cross-sectional study, the statistical population was patients of selected hospitals in Tehran and Shahid Beheshti University of Medical Sciences' ED, Tehran, Iran in 2014.

The favorable perception of satisfaction, maximum deviation and confidence interval were respectively considered 50%, 5% and 95% for maximizing the sample size. It was calculated by following formula for each university:

$$n = \frac{Z^2 \times p \times (1 - p)}{d^2} = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2} = 384$$

It was calculated 768 for both universities. According to gather 65 samples from each hospital, 6 hospitals were selected from each university. It included 3 general and 3 specialized hospitals. Homogenous and symmetry were considered in selecting hospitals. The instrument was the questionnaire of Deputy of Curative Affairs of Tehran University of Medical Sciences (10) in 54 questions and 8 sections:

- Demographic Characteristics and Medical information (19 Questions);
- Domains of Satisfaction: Admission (3 Questions), Guardians (1 Question), Clinical Proceedings (5 Questions), Nursing Care (5 Questions), Diagnosis Proceedings (4 Questions), Environment (9 Questions) and Managing Proceedings (8 Questions).

The five-level Likert scale was employed for the responses: strongly disagree (1 score), disagree (2 score), neither (3 score), agree (4 score) and strongly agree (5 score). The demographic characteristics, medical information, time-to-provider, length-of-stay, left-without-treatment and phone numbers were retrospectively obtained from medical records of patients attending in EDs from April 2013 to January 2014. The records were randomly selected. Satisfaction survey was conducted by telephone contacts from July to December 2014. If there were not any of this information, the patient was excluded from study. The response rate was 97.66% (750 patients).

The questionnaire was handed to some experts in order to revise it. The reliability was tested on 50 patients. The Cronbach's alpha was calculated 0.87. We prepared the final questionnaire after altering some questions and eliminating irrelevant questions. It was analyzed by SPSS and descriptive statistics (Chicago, IL, USA), simple logistic regression, multiple logistic regression, simple linear regression and multiple linear regression.
The study was approved by Research Council of TUMS. Informed consent was obtained from participants. Participants were assured that their participation was voluntary and their responses would be treated with confidentiality.

Results

The attendants' demographic characteristics were as follows: 57.3% women, 56.8% older than 45, 63.1% covered by social insurance, 92.7% urban, 56% married, 58.7% lower than high school and 68.4% covered by coinsurance. The payment was higher at Shahid Beheshti University. The most of payments was the mixture of out-of-pocket and insurance. The satisfaction was higher in all domains at Tehran University with the exception of managing proceedings.

The mean of time to provider was 18.1 minutes (SD=0.12). The proportion of time-to-provider lower than 15 minutes was 92.8%. The proportion of LWOT was 3.9%. The mean of length-of-stay was 202 minutes (SD=10). The proportion of LOS lower than 360 minutes was 90.3%. The contributory factors of them were:
- Time-to-Provider: university (OR=1.95, P<0.01), age (OR=0.52, P<0.01), gender (OR=0.39, P<0.001), marital status (OR=0.48, P<0.01), co-insurance (OR=0.52, P<0.05), presence of emergency specialist (OR=0.45, P<0.01), type of payment (OR=1.6, P<0.05), shift (OR=0.21, P<0.001);
- LWOT: gender (OR=2.36, P<0.05), shift (OR=0.41, P<0.05);
- LOS: disease/percussion severity (OR=6.48, P<0.001).

The Time-to-provider, LWOT, LOS and other significant contributory factors were imported in the final multiple linear regression model for adjusting possible problematical factors and achieving final independent factors by backward method. The results are summarized in Table 1 and 2. Time-to-provider affected satisfaction of these domains: admission (β=0.174, P<0.001), guardians (β=0.169, P=0.001), nursing care(β=0.098, P=0.008) and managing proceedings (β=0.129, P<0.001). LWOT did not affect patient satisfaction and its domains (P>0.05).LOS affected the satisfaction of these domains: admission (β=-0.118, P=0.001), guardians (β=-0.110, P=0.002) and diagnosis proceedings (β=0.095, P=0.009). They did not affect total satisfaction (P>0.05).

Table 1: The results of multiple linear regression analyses of contributory factors of satisfaction of staffing services

| Domains of Satisfaction | Variable                                | B     | SE   | β    | T    | CI                | P-Value |
|-------------------------|-----------------------------------------|-------|------|------|------|-------------------|---------|
| Admission               | Constant                                | 8.242 | 0.318| 7.98 | (7.788-8.878) | <0.001 |
|                         | Type of Payment                         | 0.574 | 0.108| 0.182| 5.3  | (0.361-0.787)   | <0.001 |
|                         | Hometown                                | 1.594 | 0.362| 0.151| 4.402| (0.883-2.306)   | <0.001 |
|                         | LOS                                     | -0.009| 0.003| -0.118| -3.428| (- --0.004)    | 0.001  |
|                         | Presence of Emergency Specialist        | 0.936 | 0.187| 0.174| 5.002| (0.569-1.304)   | <0.001 |
|                         | Time-to-Provider                        | 0.018 | 0.004| 0.174| 4.896| (0.011-0.026)   | <0.001 |
|                         | University                              | -0.623| 0.184| -0.116| -3.395| (- --0.263)    | 0.001  |
|                         | Marital Status                          | 0.649 | 0.186| 0.120| 3.487| (0.283-1.014)   | 0.001  |
|                         | Coverage of Insurance                   | -0.562| 0.284| -0.068| -1.982| (- -0.005)     | 0.048  |

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### Table 1: Cond...

| Model                        | $R=0.663$, $R^2=0.439$, $\Delta R^2=0.432$, $SE_E=8.894$, $F=60.646$, $P<0.05$     |
|------------------------------|-------------------------------------------------------------------------------------|
| Guardians                    |                                                                                      |
| Constant                     | 2.434 0.037 3.861 (2.360-2.508) $<0.001$                                               |
| Hometown                     | 0.578 0.127 0.158 4.562 (0.329-0.827) $<0.001$                                         |
| Age                          | 0.007 0.001 0.153 4.418 (0.004-0.010) $<0.001$                                         |
| Time-to-Provider             | 0.006 0.001 0.169 4.712 (0.004-0.009) $<0.001$                                         |
| Presence of Emergency Specialist | 0.297 0.068 0.155 4.378 (0.163-0.429) $<0.001$                                         |
| University                   | -0.227 0.066 -0.119 -3.432 (-0.097) 0.001                                             |
| LOS                          | -0.003 0.001 -0.110 -3.141 (-0.001) 0.002                                             |
| Type of Payment              | 0.095 0.039 0.084 2.420 (0.018-0.171) 0.016                                             |
| Environment                  | $R=0.361$, $R^2=0.131$, $\Delta R^2=0.124$, $SE_E=19.565$, $F=18.458$, $P<0.05$    |
| Constant                     | 22.703 1.507 3.748 (19.689-25.717) $<0.001$                                            |
| Gender                       | -3.267 0.525 -0.213 -6.236 (-2.244) (-4.306) $<0.001$                                  |
| Severity and Acute of Disease or Percussion | -1.684 0.331 -0.180 -5.089 (-1.035) 2.344 $<0.001$                                 |
| Type of Referral             | 2.390 0.649 0.133 3.685 (1.177-3.664) $<0.001$                                         |
| University                   | -2.130 0.512 -0.140 -4.158 (-1.124) 0.001                                             |
| Education                    | -0.665 0.202 -0.117 -3.298 (-0.269) 0.001                                             |
| Hometown                     | 3.207 1.023 0.107 3.135 (1.199-5.216) 0.002                                            |
| Marital Status               | 1.193 0.534 0.078 2.232 (0.144-2.242) 0.026                                            |
| Shift                        | 0.690 0.346 0.070 1.994s (0.011-1.368) 0.046                                           |
| Managing Proceedings         | $R=0.908$, $R^2=0.825$, $\Delta R^2=0.808$, $SE_E=2.636$, $F=47.238$, $P<0.05$     |
| Constant                     | 9.629 0.512 2.549 (8.605-10.653) $<0.001$                                              |
| Presence of Emergency Specialist | 1.249 0.256 0.173 4.878 (0.747-1.752) $<0.001$                                       |
| Coverage of Co-Insurance     | 1.137 0.271 0.147 4.193 (0.605-1.670) $<0.001$                                         |
| Education                    | -0.309 0.094 -0.115 -3.287 (-0.121) 0.001                                             |
| Time-to-Provider             | -0.018 0.005 -0.129 -3.568 (-0.008) 0.001                                             |
| Gender                       | -0.824 0.252 -0.113 -3.276 (-0.330) 0.001                                             |
| University                   | 0.683 0.682 0.095 2.736 (0.193-1.174) 0.006                                            |
| Model                        | $R=0.353$, $R^2=0.125$, $\Delta R^2=0.118$, $SE_E=3.391$, $F=17.521$, $P<0.01$   |

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Table 2: The Results of Multiple Linear Regression Analyses of Contributory Factors of Satisfaction of Clinical Services and Total Satisfaction

| Domains of Satisfaction        | Variable                          | B       | SE     | β     | T      | CI                | P-Value |
|-------------------------------|-----------------------------------|---------|--------|-------|--------|-------------------|---------|
| **Clinical Procedings**       | Constant                          | 17.576  | 1.024  | 13.845| 15.528 | (19.624)         | <0.001  |
|                               | University                        | -1.867  | 0.272  | -2.373| -6.830 | (-2.390, -1.323) | <0.001  |
|                               | Presence of Emergency Specialist  | 0.954   | 0.274  | 0.122 | 3.478  | (0.416, 1.493)   | 0.001   |
|                               | Gender                            | -0.938  | 0.276  | -0.119| -3.398 | (-0.396, 1.480)  | 0.001   |
|                               | Coverage of Co-Insurance          | 0.988   | 0.295  | 0.117 | 3.352  | (0.409, 1.566)   | 0.001   |
|                               | Coverage of Insurance             | -0.929  | 0.420  | -0.077| -2.214 | (-1.753, -0.105) | 0.027   |
| **Model**                     | R=0.681, R²=0.463, ΔR²=0.458, SE_E=1.979, F=93.964, P<0.05 |         |        |       |        |                  |         |
| **Nursing Care**              | Constant                          | 15.635  | 0.980  | 7.709 | (13.675,17.595) | <0.001  |
|                               | Presence of Emergency Specialist  | 2.096   | 0.517  | 0.146 | 4.053  | (1.081, 3.111)   | <0.001  |
|                               | University                        | -1.788  | 0.508  | -0.125| -3.522 | (-0.791, 2.784)  | <0.001  |
|                               | **Time-to-Provider**              | -0.027  | 0.010  | -0.098| -2.668 | (-0.007, 0.048)  | 0.008   |
|                               | Type of Referral                  | 1.540   | 0.610  | 0.091 | 2.526  | (0.343, 2.737)   | 0.012   |
|                               | Age                               | 0.027   | 0.011  | 0.082 | 2.314  | (0.004, 0.049)   | 0.021   |
|                               | Coverage of Insurance             | -1.566  | 0.781  | -0.070| -1.992 | (-3.089, -0.011) | 0.047   |
| **Model**                     | R=0.778, R²=0.606, ΔR²=0.593, SE_E=12.877, F=46.193, P<0.05 |         |        |       |        |                  |         |
| **Diagnosis Proceedings**     | Constant                          | 12.354  | 1.054  | 3.522 | (10.246,14.462) | <0.001  |
|                               | Presence of Emergency Specialist  | 1.097   | 0.362  | 0.110 | 3.030  | (0.386, 1.808)   | 0.003   |
|                               | LOS                               | 0.014   | 0.005  | 0.095 | 2.631  | (0.004, 0.024)   | 0.009   |
|                               | Gender                            | -0.859  | 0.366  | -0.085| -2.349 | (-0.127, 0.1577) | 0.019   |
| **Model**                     | R=0.693, R²=0.479, ΔR²=0.472, SE_E=17.021, F=71.231, P<0.05 |         |        |       |        |                  |         |
| **Total Satisfaction**        | Constant                          | 82.996  | 2.176  | 13.11 | (78.644,87.348)  | <0.001  |
|                               | Presence of Emergency Specialist  | 8.734   | 1.446  | 0.209 | 6.038  | (5.894,11.574)   | <0.001  |
|                               | Gender                            | -7.486  | 1.464  | -0.177| -5.113 | (-4.612, 10.361) | <0.001  |
|                               | University                        | -5.116  | 1.436  | -0.122| -3.563 | (-2.297, 7.935)  | <0.001  |
|                               | Age                               | 0.106   | 0.032  | 0.113 | 3.273  | (0.043, 0.170)   | 0.001   |
|                               | Hometown                          | 8.085   | 2.836  | 0.099 | 2.851  | (2.518, 13.653)  | 0.004   |
|                               | Type of Referral                  | 3.587   | 1.720  | 0.037 | 2.086  | (0.211, 6.963)   | 0.037   |
| **Model**                     | R=0.603, R²=0.363, ΔR²=0.358, SE_E=7.940, F=62.120, P<0.05 |         |        |       |        |                  |         |


**Discussion**

Patient satisfaction has long been a challenge in ED. The aim of this research was to identify the effect of time-to-provider, left-without-treatment and length-of-stay on patient satisfaction in training hospitals. The mean of time-to-provider was 18.1 minutes. The proportion of time-to-provider lower than 15 minutes was 92.8%. Time-to-provider affects satisfaction of these domains: admission, guardians, nursing care and managing proceedings. Despite an 11% increase in daily patient volume in 2010, analysis of time-to-provider pre-ED redesign and post-ED redesign implementation revealed a mean of 126.7 minutes in 2009 vs. a mean of 26.3 minutes in 2010 (11). Time-to-provider was 14 minutes (12). Arli et al. implied increasing period before first emergency intervention leads to dissatisfaction. The characteristic need of an ED patient is receive service within a short period. Managers must create policies and practices that allow emergency interventions to occur as soon as possible upon patient arrival (13).

The proportion of LWOT was 3.9%. LWOT does not affect patient satisfaction and its domains. The proportion of patients who left without treatment decreased. The proportion of LWOT during the 2009 study period was 8.7%, compared to 0.2% in the 2010 study period (11). More patients choose to leave ED without medical treatment (14). Left-without treatment rate was 5% during the study (12).

The mean of LOS was 202 minutes. The proportion of LOS lower than 6 hours was 90.3%. LOS affects satisfaction of these domains: diagnosis proceedings, admission and guardians. ALOS in 2009 was 5.5 hours and 3.6 hours in 2010, reflecting a mean reduction in ALOS of 1.9 hour (11). Colligan et al. reported length-of-stay was 238 minutes (12). The proportion of patients seen and treated within 4 hours improved from 83.9% to 96.3% (15). Adjusted total length-of-stay from 2003 to 2006 increased by 8.6 minutes for all patients. The introduction of a time target reduced the proportion of patients staying greater than 6 hours (15). Increased LOS has been associated with negative outcomes such as decreased satisfaction (16).

This single study was initiated in response to specific issues concerning patient health care delivery such as time-to-provider, LWOT and LOS. The results must be cautiously generalized to other institutions.

**Conclusion**

Increasing time-to-provider and length-of-stay sometimes lead into dissatisfaction. But it doesn't often occur. Patients, who refer into ED of training hospitals, will to pay lower direct costs such as out-of-pocket or receive free services. They are aware that realizing this willingness requires undergoing prolonged waiting times. Because they are enforced to pay more indirect costs such as waiting time. Therefore, this awareness could decrease patient dissatisfaction in some performance domains. On the other hand, Time-to-provider and LOS aren't exclusive contributory factors that could affect satisfaction of these domains. On the other hand, it is fault to exclusively considering to time factor in order to increase satisfaction. It is necessary to consider to other contributory factors, concurrently. Achieving patient satisfaction in various domains isn't only provided with decreasing LWOT, time-to-provider and LOS.

**Ethical considerations**

Ethical issues (including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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