

An analysis of the average waiting time during the patient discharge process at Kashani Hospital in Esfahan, Iran: a case study

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Abstract

Strategies for improving the patient discharge process have a beneficial effect on many hospital activities. The main objective of this research was to analyse the discharge process at Kashani Hospital in Esfahan, Iran in the fall of 2004. This study took the form of a case study in which data were collected by questionnaire, observation and checklist. SPSS and Operations Research (O.R.) methods were used to analyse data. The results showed that the average time for patients to complete the discharge process was 4.93 hours. The hospital personnel involved identified the main factors affecting average waiting time as patients' financial problems and distance between different wards. The longest hospital stay was 5.7 days in the Neurology ward. Findings showed there was a queue in completing medical records at the nursing and medical equipment stations.

Keywords (MeSH):

Iran; Hospitals; Patient Discharge; Process Assessment; Waiting Lists

Introduction

Nagaraju (2005) defines the *patient discharge process* as 'the final step of the treatment procedure during a patient's length of stay', and *timely discharge* as 'when the patient is discharged home or transferred to an appropriate level of care as soon as they are clinically stable and fit for discharge'. According to Bateni (1995), appropriate discharge processes enable the list of available beds for admission to be kept current and accurate, and '[i]n addition, we can obtain useful data by accurate registration of patients in the admission book ...' and calculating therefrom the admission and discharge dates for each patient (Bateni 1995: 138).

A study on the medical centres of Tehran University of Medical Sciences, Iran and Shahid Beheshti has shown that in most centres complications in the discharge process and unnecessary routines have caused discharge delay and patient dissatisfaction. Scattered information and non-integrated database systems had resulted in increased works loads and dissatisfaction among internal and external hospital clients (Derayah 2003).

The discharge process represents the final contact between the patient and the hospital health professionals, and the outcomes of all procedures undergone by the patient are recorded at this stage. Improving the quality of the discharge process should therefore lead to an increase in patient satisfaction. As a result patients are likely to return to a health centre where they have experienced an efficient discharge process when they next seek treatment. In turn, efficiency and productivity are increased at the hospital (Gholipor & Ghomry 2003).

Conversely, available beds are a hospital's most important resource and the length of stay in hospital is an important factor in its efficiency. The unnecessary occupation of hospital beds and rooms and consequent low hospital bed turnover rate represent a waste in health care resources, and result in heavy associated organisational costs (Porhasani 1995). A fast discharge process can ensure early availability of patient beds, which in turn, can reduce the waiting time of patient admissions or even reduce the incidence of patient rejection due to unavailability of beds (Nagaraju 2005).

Research in the Shahid Sadoghi Hospital of Yazd has shown that the average length of the discharge process in the morning shift for a patient leaving the hospital in the afternoon is about six hours. The average length of the discharge process in the afternoon shift for patients leaving the hospital in the same shift is about two hours. More than 90% of patients receive their discharge order and visit by physicians before 2pm (Janfaza 2001).

The delay in hospital processes can be explained by queuing models (Ketabi 2003). A queue is described as the place where customers wait for a server to be free. Since customers' arrival and service times are stochastic they sometimes experience different waiting times, and therefore the average waiting time can be used as a factor in the analysis of a system's performance. The average number of customers waiting in the queue, known as the *average length of queue*, and the percentage of busy periods for the server, known as the *utilisation rate*, are other performance factors in queuing systems. In a sequence of workstations, the station with the longest service time creates a bottleneck in the flow of the customers in the system.

The European Working Group on Operational Research Applied to Health Services (1999) describes Operation Research (O.R.) as

...the systematic and quantitative analysis in support of rational policy and decision making. This umbrella concept of operational research covers many analytic approaches and methods, such as simulation modeling, mathematical programming, decision analysis, cost effectiveness analysis, development of indicators, and methods for forecasting, monitoring and evaluation

Queuing theory is typically used to assess the relationship between the length of a queue and the time a person waits for the service. Using these principles it is possible to identify the bottlenecks, and determine the best policies to reduce waiting times

As the emergency hospital of Esfahan city, Kashani Hospital has five wards, 394 beds and an average length of stay of 5.69 days. In regard to the particular functions of the hospital, most of its clients are emergency patients and need to be admitted urgently; delay in discharging the

patients not only increases dissatisfaction with the health care rendered in hospital, but also causes delay in the admission of new patients. An interview with discharged patients in five wards of the hospital showed that 45% of patients were dissatisfied with the length of the discharge process. Patient dissatisfaction reflects upon the quality of health care provided by the hospital, thus it is necessary to study the cause of inefficiencies in the discharge process and locate bottlenecks in order to improve the discharge process in the hospital.

This paper describes a study of the waiting times for stages within the discharge process (as a queuing system) at Kashani Hospital, Esfahan, Iran, which is a medium-sized general hospital in an urban area. In this study, the current patient discharge process is examined in order to determine average waiting times and locate bottlenecks in the process. Factors which will reduce delays are investigated. Finally, several recommendations are proposed to improve the efficiency of the discharge process.

Method

This research involved a case study that was carried out in the Autumn of 2004 in Esfahan, Iran. The statistical population consisted of two groups: 448 patients and 40 hospital staff. Hospital staff included physicians, nurses, secretaries and personnel who worked in the accounting section, the social centre, the cashier's office, and Para clinical wards in the hospital. Of the participants, there were 47.5% females and 42.5 % males, and most of them had Bachelor degrees.

All staff selected worked in areas related to the discharge process. To perform this study, the researchers designed two questionnaires and checklists. The questionnaires identified the viewpoints and attitudes of the hospital personnel regarding factors effective in the discharge process, as well as their ideas on how to improve the quality of the discharge process in Kashani Hospital and reduce the discharge process time. In the first phase of data collection, a test – retest method was used to validate the reliability of the questionnaires; their Cronbach's alphas were 74% and 85%. The validity of checklists and questionnaires was also confirmed. The sample size of

patients was based on the number of patients who were discharged in the same period during the previous year in Kashani Hospital.

Researchers obtained permission from the hospital administrator, who requested that personnel cooperate with the researchers. Staff were then interviewed in relation to their viewpoints and attitudes. For time measurement, a data-gathering team observed different wards and areas which dealt with the discharge process over a three-month period in the Autumn of 2004. Patients were tracked by patient number and were selected after physicians had ordered their discharge. The research group followed them throughout the process to measure their waiting time in each station.

Data collected included:

- current discharge process
- viewpoints and attitudes of hospital personnel about causes of delay in discharge process
- patient's medical record numbers
- names of stations and duration of rendered service
- time of arrival at and departure from stations
- hospital ward
- sex
- length of stay in Kashani Hospital.

The average waiting time was calculated for each ward in the whole of the discharge process. Wards included ENT (Ear, Nose and Throat), Orthopaedic, Surgery, Neurology and Private (which renders special individual facilities and services for each patient). The phases of the

discharge process were determined by interviewing the staff and eventually a flow chart showing the current process was drawn. SPSS and O.R. methods were used to analyse the data.

Results

The findings showed that the physicians visited most of their patients at 10-11 a.m. and they issued the discharge order during this period; thus any delay in the physicians' visits caused delays in the discharge of their patients. In this hospital the discharge process began with the issue of the discharge order by the physician. As shown in Figure 1, after discharge has been recommended by the physician, other staff check insurance conditions, write up the medical record form, edit the medical records, pay the pharmacy, medical equipment and blood bank, prepare bills, and receive money, after which the patient can leave the hospital. For the purposes of this research, each of these phases is called a 'workstation', which provides a service to the discharged patients (known as 'customers').

The personnel's opinion about factors affecting waiting time in the discharge process, based on their importance from most to least, is as follows:

- physicians do not visit patients on time
- delay by interns in completing the documentation summary sheet (Discharge Summary) in the medical record
- absence of networked Hospital Information Systems
- absence of guidelines for personnel involved in the discharge process

Table 1: Utilisation, length of queue and average waiting time in the Kashani Hospital discharge process in 2004

	COMPLETION OF MR			TAKE COPY			ISSUE OF INSURANCE			EDIT MR			MEDICAL EQUIPMENT		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
WARD															
ENT	9.39	0	0.28	14.75	0	0.42	13.21	0	0.38	5.7	0	0.16	0	0	0
Orthopedic	24.17	0.18	0.15	99.93	8.08	6.72	16.08	0	0	7.62	0	0	99.64	30.7	25.39
Surgery	9.27	0	0.17	10.22	0	0.19	0	0	0	5.46	0	0.1	23.66	0	0.44
Private	31.22	0.3	0.24	18.07	0	0	25.58	0.11	0.09	5.55	0	0	0	0	0
Neurology	88.18	6.54	2.8	52.75	0.06	0.03	19.65	0	0	38.88	0.02	0.01	0	0	0

1) Percentage 'utilisation' in hours (i.e. the percentage length of busy periods for the 'server'/provider of the discharge-related service)
 2) Length of queue in numbers of patients
 3) Average waiting time in hours

- lack of patients' financial ability to pay their bills.

The personnel's suggestions on how to reduce the length of the discharge process are based on importance, from most to least, as follows:

- punctual attendance by physicians
- formulation of guidelines for personnel involved in the discharge process
- opening of all wards 24 hours per day
- determining a specific discharge time
- implementing Hospital Information System networks,
- in-service training for personnel,
- timely documentation by interns of the summary sheet (Discharge Summary) of the medical record.

The average waiting time in the discharge process in Kashani Hospital was 4.93 hours. Table 1 denotes the average length of queue, average waiting time and utilisation factor in ENT, Orthopaedic, Surgery, Neurology and Private wards throughout the Khashani Hospital discharge process. For instance, it can be seen that completion of medical records by interns in the Neurology ward had the highest 'utilisation' (i.e. the busy period for the provider of the discharge-related service) at 88.18% of the time of the discharge process, and the highest average waiting time of 2.8 hours. Copying medical record forms in the Orthopaedics ward engendered a maximum average waiting time average of 6.72 hours. Checking and controlling the insurance situation and carrying out the related functions in the ENT ward also involved lengthy waits, as did organising and editing of the forms in the medical records, by ward clerks in the ENT ward. At one extreme, paying for medical equipment in the Orthopaedics ward required a mean waiting time of 25.39 hours.

The longest average waiting times for discharge in Private, Neurology, ENT, Surgery and Orthopaedic wards were for completion of medical records (0.24 hours), completion of medical records (2.8 hours), copying of medical records forms (0.42 hours), paying off for medical equipment (0.44 hours) paying for medical equipment (25.39 hours) stations respectively.

Bottlenecks were found in completing medical records (in Private and Neurology wards), medical equipments stations (in Surgery and

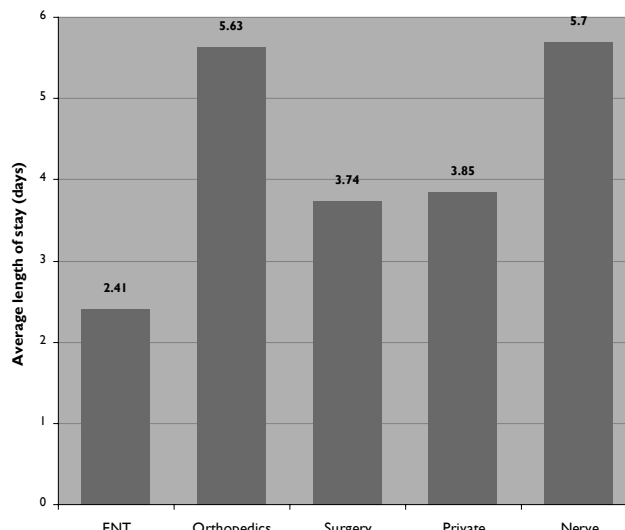


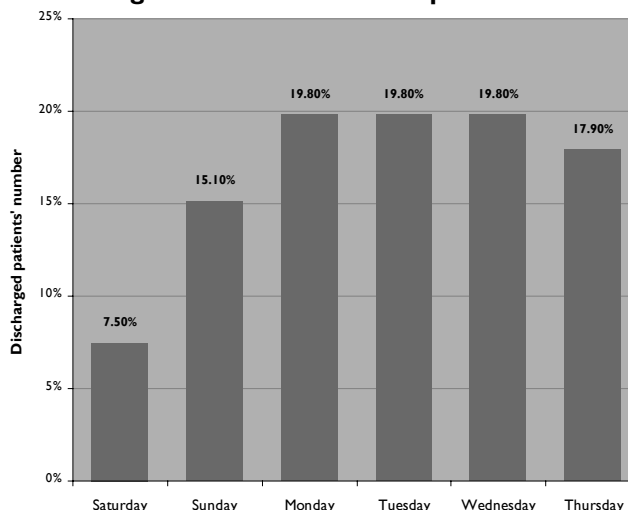
Figure 1: Average length of stay in different wards for Kashani Hospital in 2004

Orthopaedic wards) and copying of medical records forms (in the ENT ward). There were a number of factors corresponding to these delays, but the most significant were inaccessibility of interns, lack of efficient communication between different wards and inability of uninsured patients to pay costs.

Figure 1 denotes average lengths of stay at Kashani Hospital in ENT, Orthopaedic, Surgery, Neurology and Private wards that were 2.41, 5.63, 3.74, 5.7 and 3.85 days respectively in 2004. The longest mean length of stay was 5.7 days in the Neurology ward.

Figure 2 shows that the longest patient waiting times for discharge in a week in Khashani Hospital in 2004 were on Mondays, Tuesdays and Wednesdays.

Figure 2: Frequency percentage of discharge during a week in Kashani Hospital in 2004



Discussion

The discharge process in Kashani Hospital starts with the physician's discharge order and finishes with the issue of the exit sheet by the cashier's office. This can be compared with the process in the University of Tennessee Medical Center:

In the Tennessee hospital, the discharge process begins with a written order from your doctor. After this order is written and given to the nurse, discharge arrangements will be made. Discharge arrangements may include obtaining written prescriptions, arranging for continued care at home and talking with other physicians involved in patient care to ensure that everything is in order before leaving. Sometimes this can take several hours from the time patient's primary doctor writes the discharge order. It may be necessary for a family member to visit the Cashier's Office on the first floor if financial information is not complete. When all necessary steps are taken, the nurse will provide discharge instructions and assist patient by arranging transportation to patient car. Before leaving, remember to check room carefully for any personal belongings (The University of Tennessee Medical Center n.d.).

The discharge processes in both hospitals have the same starting and finishing phases. The main difference is that in Kashani Hospital there is weak communication between the departments that produce the final documentation following issue of the discharge order. In addition, there is no follow-up of the patient's situation after discharge at Kashani Hospital.

There is little information about waiting time during discharge processes in other hospitals, especially in Iran. In other research in the Iranian city of Yazd in 2001, the average waiting time was found to be 4.5 hours for patients who left hospital in the evening shift, but in the morning shift it was 2.0 hours (Janfaza 2001).

The longest waiting times for discharge throughout a week was on Mondays, Tuesdays and Wednesdays (midweek days). It was found in a hospital in the United Kingdom that the longest waiting times for patient discharge were on Wednesdays and Fridays (Department of Health 2004). In Kashani Hospital, the wards with the

longest length of stay have longer discharge process waiting times.

There are many different components to a strategy to reduce waiting times. Research in Dallas, USA, showed that the discharge lead time can be reduced by 81% (Alzheimer's Society Information Sheet 2005). The average waiting time is reported to be 5.8 hours in hospitals in the USA with overcrowded Emergency Departments (Lewin Group for the American Hospital Association 2002). This can be compared with the average waiting time of 4.93 hours for all wards in Khashani Hospital in 2004.

In another survey in the United Kingdom key factors for reducing delay through the complete patient journey were that an expected date of discharge should be set within 24 hours of arrival or, in many cases of elective patients, before admission, and this should be made known to the patient and all staff concerned with the patient. The expected date of discharge should be proactively managed against the treatment plan (usually by ward staff) on a daily basis and changes communicated to the patient (Department of Health 2004). This proposes using predictions and O.R. methods to plan patients' admission, length of stay and discharge.

Two trials reported that patients with continuing medical conditions who were allocated to discharge planning reported increased satisfaction compared with those who underwent the routine discharge process (Shepherd et al. 2004).

Conclusion

O.R. analysis has provided a powerful insight into patients' issues regarding the discharge process in Kashani Hospital.

The following are recommendations arising from this study for changes to improve the discharge process in Kashani Hospital:

- Patients should know their expected date of discharge within 24 hours of arrival or, in the case of elective patients, before their admission to hospital.
- The expected date of discharge should be proactively managed against the treatment plan (usually by ward staff) on a daily basis and changes communicated to the patient.

- Ward rounds should be scheduled in a way that allows, at least daily, for a senior clinician to review all patients.
- Patient education must occur throughout the hospitalisation, not only at the time of discharge.
- Information should be captured throughout the hospital stay, not just at the time of discharge or after the discharge order has been issued by the physician.
- There must be explicit delineation of roles and responsibilities. Every discharge must have a written discharge plan (i.e. a Discharge Summary) that is comprehensive in scope and that addresses medications, therapies, dietary and other lifestyle modifications, follow-up care, patient education, and instructions about what to do if the condition worsens.
- This comprehensive discharge plan should be completed before the patient leaves the hospital.
- The person in charge of insurance organisations should approve insured patients within 24 hours of admission. As shown in Figure 4 this allows the omission of one stage in the process.
- A hospital information system network should exist at least between wards, Para clinical departments, accounting and cashier stations. This would result in the avoidance of many stages in patients' discharge process.

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