Factors affecting patients' waiting time at the Radiology Department

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Abstract

Aim of Study: To identify the extent and causes for prolonged patient waiting times and overcrowding at the Radiology Department (RD) in Aseer Central Hospital, Abha City, Saudi Arabia.

Methods: A cross-sectional observational study design was followed. It included 107 staff members at the RD in Aseer Central Hospital. A data collection tool was designed by the researchers and used for data collection.

Results: 51.4% of patients were referred to RD from the outpatient clinics, 27.3% were referred from the ED, while 21.3% were inpatients. Monday and Tuesday were the most overcrowded days at the RD (33.3% and 20.8%, respectively). Almost half of the patients (47%) stayed in the waiting area for 1-3 hours. Patient waiting times differed significantly according to their days of received radiologic services, with the longest waiting time being on Wednesday (44.4%, p=0.021), and according to patients provided radiologic services. The most frequently stated causes by the radiology staff for overcrowding at the RD were the "huge number of patients received directly from the community who did not go via a primary health care center"; "the large number of non-emergency patients" and the "socially recommended cases sent to RD via the ED" (45.8%, 32.7% and 29.9%, respectively).

Conclusions: Patient waiting times are unduly prolonged. It is mostly 1-3 hours. The main bulk of overcrowding comes from patients referred from the outpatient clinics. The main causes for overcrowding are the excessive number of non-emergency, unscheduled patients, and the socially recommended cases, in addition to the shortage of specialist radiology physicians.

Recommendations: There is a need to implement an elaborate system to organize unscheduled patients, who may crowd out other emergency patients and to allocate a special radiology section for patients referred from the ED. To increase the number of serving specialist radiologists at the RD of Aseer Central Hospital. To enforce provided radiology services at primary care centers in Aseer Region.

Key Words: Waiting time, Radiology Department, Patient referrals.

Introduction

More than a century ago, by the discovery of X-rays, radiology has grown to be a medical specialty. Since then, all hospitals became equipped with X-ray apparatus, evidencing the importance of radiodiagnosis. Nowadays, a radiology service can comprise several methods, including conventional radiology, fluoroscopy, nuclear medicine, computed tomography (CT), mammography, interventional radiology, bone densitometry, ultrasonography (US) and magnetic resonance imaging (MRI) (1).

At the radiology department, the diversity of input and the wide range of services make it a difficult system to be managed (2). Several common problems that are commonly encountered in the radiology department are mainly prolonged waiting times, and waiting area congestion. One of the principal features of a well-managed radiology department is the short average length of time that patients spend before accessing a radiology service (3-4).

Anderson et al. (5) demonstrated that the overall patient satisfaction with provided health care services is largely determined by the length of time spent to receive health care services. Lengthy patient waiting times have been emphasized as the major cause of dissatisfaction with health care services.

During the last year, there was a considerable increase in the beneficiaries of Aseer Central Hospital's services, both inside and outside Aseer Region, with 17,232 cases at outpatient clinics, 119,088 at the emergency department (ED), 39,405 at the dental center, and 35,702 patients at the rehabilitation department. Also, the hospital performed 274,551 laboratory tests, and 96,721 radiology examinations (6).

This huge number of performed radiology examinations reflects the greatly overbooked services and probably a heavily over-crowded radiology department, hence affecting the quality of the radiology services provided to clients. Therefore, it is a pressing necessity to identify the extent and the main factors associated with overcrowd at the Radiology Department in order to be able to put forward recommendations for overcoming this problem.

This study aimed to identify the extent and causes for prolonged patients' waiting time and overcrowding at the Radiology Department (RD) in Aseer Central Hospital, Abha City, Saudi Arabia.

Methodology

A cross-sectional observational study design was followed. Cross-sectional study design is a type of observational study design. In a cross-sectional study, the investigator measures the outcome and the exposures in the study participants at the same time (7).

The Radiology Department is in Aseer Central Hospital, Abha City, which is a governmental tertiary care central hospital that received during 2018 a total of 366,516,000 patients (6). There are about 120 staff in the Radiology Department, including radiologists, technicians, nurses and other medical service providers. The Radiology Department in Aseer Central Hospital has 9 divisions that serve all diagnoses and interventions needed for the whole southern region of the Kingdom of Saudi Arabia.

All adult patients seen or waiting to be seen in the Radiology Department in Aseer Central Hospital were observed during the whole day starting at 08:00 am (Sunday-Thursday) for a three-month period (i.e., April to June 2019).

Since the total population of staff at the Radiology Department in Aseer Central Hospital is limited (N=120), all Radiology staff were invited to participate in this study, i.e., no specific sampling technique was followed. Only 107 agreed to participate in this study (i.e., 89% response rate).

Based on relevant review of literature, the researcher designed a data collection tool. The study variables were included in the following:
1. Personal and demographic characteristics of staff at the Radiology Department: This part included the following variables: Age, gender, nationality, day, time, type of provided radiology services to patients.
2. Variables related to the possible causes for overcrowded Radiology Department in Aseer Central Hospital, e.g., average patient waiting times for each provided type of radiology service, type of patient referrals, possible causes for overcrowding.

The validity of the designed study questionnaire was assessed by a Professor of Hospital & Health administration, King Abdul-Aziz University, and a Professor of Community Medicine, King Khalid University. Moreover, the test-retest reliability of the study tool was assessed by its twice application on ten Radiology staff in Abha Private Hospital and comparing the responses which revealed an 80% agreement.

Staff responses were coded and entered for statistical analysis using the Statistical Package for Social Sciences (SPSS, version 25.0). Descriptive statistics (i.e., frequency and percentages) were calculated. Chi square test was applied to test the significance of differences between different study variables according to patient waiting times. P-values less than 0.05 were considered as statistically significant.

Results

Table (1) shows that more than half of participant radiology staff (59.8%) were aged 25-45 years, while 18.7% were less than 25 years old and 21.5% were more than 45 years old. Almost half of participants (51.4%) were males, while most participants (72.9%) were Saudi. Most participants were at the MRI department (30.3%), Ultrasonography Department (20.2%), CT Department (18.2%), or plain X-ray Department (17.2%). A few participants were at the Fluoroscopy or Interventional departments (5.1% each), and the Dual-Energy X-ray Absorptiometry (DEXA) or mammography departments (2% each).

Figure (1) shows that more than half of patients (51.4%) were referred to Radiology department from the outpatient clinics, 27.3% were referred from the ED, while 21.3% were inpatients.

Table (2) shows that Monday and Tuesday are the most overcrowded days at the Radiology Department (33.3% and 20.8%, respectively), followed by Sunday (16.4%) then Wednesday and Thursday (14.8% each). About one third of patients (32.2%) had to stay in the waiting area of the Radiology Department for less than one hour, while 47% stayed for 1-3 hours and 20.8% stayed for more than 3 hours.

Table (3) shows that patient waiting times differed significantly according to their days of received radiologic services, with the longest waiting time (>60 minutes) being on Wednesday (44.4%, p=0.021). Waiting times differed significantly according to patient provided radiologic services, with patients receiving fluoroscopy, CT and interventional radiology having the highest percentage of >3 hours' waiting time (100%, 48% and 42.9%, respectively, p<0.001). Moreover, inpatients had a significantly higher percentage of >3 hours' waiting time than outpatients and ED patients (33.3, 14.9% and 22%, respectively, p=0.009). However, patients' waiting time did not differ significantly according to their age groups, gender, nationality, or scheduled time of service.

Table (4) describes the most frequently stated causes by the radiology staff for overcrowding at the Radiology Department. These causes were the "huge number of patients received directly from the community who did not go via a primary health care center"; "the large number of non-emergency patients" and the "socially recommended cases sent to Radiology Department via the ED" (45.8%, 32.7% and 29.9%, respectively). Other frequent causes for overcrowding at the Radiology Department were the "Lack of specialist radiology physicians to provide service at the community level"; and "Expensive radiology services at private clinics" (20.6%, and 18.7%). Less frequent causes included "Increasing complexity of cases referred from EDs"; "variability of service times and appointment schedules"; and "limited access to radiology services at primary care centers" (15.9%; 14%; and 6.5%, respectively).

Table 1: Personal characteristics of participant radiology staff (n=107)

Personal characteristics	No.	%
Age		
<25 years	20	18.7
25-45 years	64	59.8
> 45 years	23	21.5
Gender		
Male	55	51.4
Female	52	48.6
Nationality		
Saudi	78	72.9
Non-Saudi	29	27.1
Department		
Computerized tomography	18	18.2
Magnetic Resonance Imaging	30	30.3
Ultrasonography	20	20.2
Mammography	2	2.0
Plain X-ray	17	17.2
Fluoroscopy	5	5.1
Dual-Energy X-ray Absorptiometry (DEXA)	2	2.0
Interventional	5	5.1

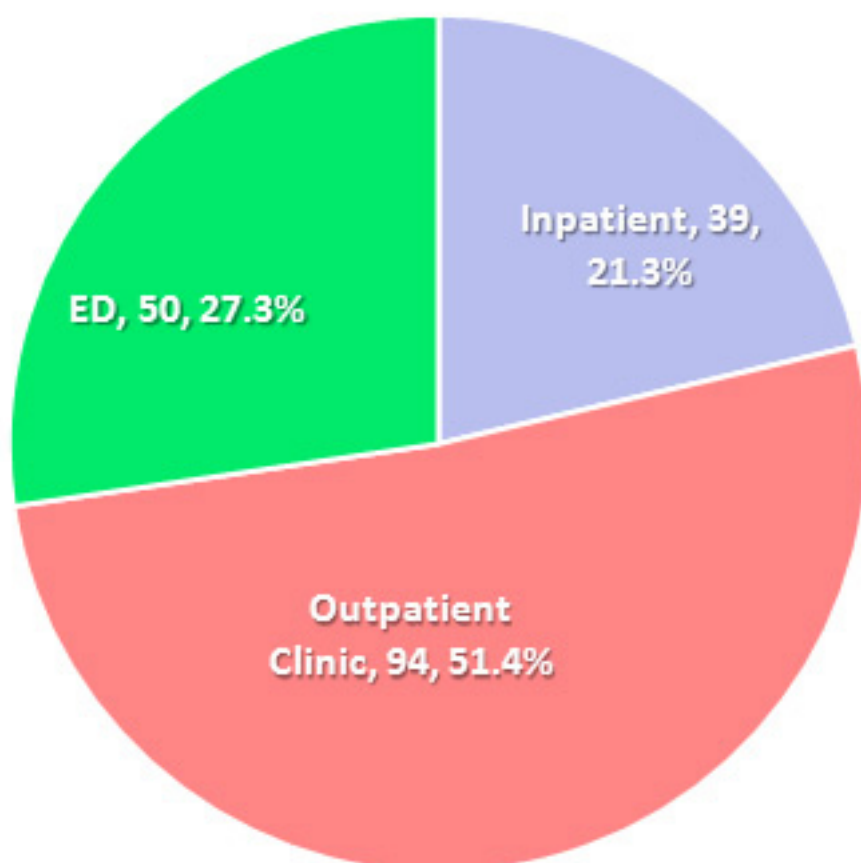**Figure 1: Source of patient referrals to Radiology Department**

Table 2: Characteristics of radiologic services provided to patients at Aseer Central Hospital

Radiologic service characteristics	No.	%
No. of patients according to days of radiologic services		
Sunday	30	16.4
Monday	61	33.3
Tuesday	38	20.8
Wednesday	27	14.8
Thursday	27	14.8
Time of service		
08:00 -12:00	55	30.1
13:00-18:00 pm	82	44.8
19:00-24:00	46	25.1
Waiting time at the radiology center waiting area		
< 1 hour	59	32.2
1-3 hours	86	47.0
> 3 hours	38	20.8

Table 3: Patient waiting times at the radiology center waiting area according to their personal characteristics and provided radiologic service

Personal characteristics	<1 hour		1-3 hours		>3 hours		p Value
	No.	%	No.	%	No.	%	
Age							
<25 years	15	37.5	12	30.0	13	32.5	
25-45 years	23	26.4	47	54.0	17	19.5	0.062
> 45 years	21	37.5	27	48.2	8	14.3	
Gender							
Male	21	25.3	45	54.2	17	20.5	
Female	38	38.0	41	41.0	21	21.0	0.138
Nationality							
Saudi	43	30.1	71	49.7	29	20.3	
Non-Saudi	16	40.0	15	37.5	9	22.5	0.366
Day							
Sunday	12	40.0	12	40.0	6	20.0	
Monday	16	26.2	38	62.3	7	11.5	
Tuesday	11	28.9	21	55.3	6	15.8	0.021†
Wednesday	5	18.5	10	37.0	12	44.4	
Thursday	6	22.2	17	63.0	4	14.8	
Radiographic service							
CT	3	12.0	10	40.0	12	48.0	
MRI	3	37.5	2	25.0	3	37.5	
Ultrasonography	8	17.8	29	64.4	8	17.8	
Mammography	7	28.0	14	56.0	4	16.0	
Plain X-ray	36	55.4	25	38.5	4	6.2	<0.001†
Fluoroscopy	0	0.0	0	0.0	2	100.0	
DEXA	2	33.3	2	33.3	2	33.3	
Interventional	0	0.0	4	57.1	3	42.9	
Referred as							
Inpatient	7	17.9	19	48.7	13	33.3	
Outpatient clinic	29	30.9	51	54.3	14	14.9	0.009†
ED	23	46.0	16	32.0	11	22.0	
Time of service							
08:00 -12:00	15	27.3	29	52.7	11	20.0	
13:00-18:00 pm	22	26.8	43	52.4	17	20.7	0.960
19:00-24:00	13	28.3	26	56.5	7	15.2	

†Statistically significant

Table 4: Causes of overcrowded Radiology Department as stated by ACH radiology staff

Causes of overcrowding at the Radiology Department	No.	%
Huge number of patients received directly from the community who did not go via a primary care center	49	45.8
Large number of non-emergency patients	35	32.7
Socially recommended cases sent for radiology from EDs	32	29.9
Lack of specialist radiology physicians providing service at the community level	22	20.6
Expensive radiology services at private clinics	20	18.7
Increasing complexity of cases referred from EDs	17	15.9
Variability of service times and appointment schedules	15	14.0
Limited radiology services at primary care centers compared with many types of services provided by the Radiology Department at ACH	7	6.5

Discussion

Imaging has become an important part of patients' physical examinations. Moreover, the utilization of imaging markedly increased for screening and follow-up of patients. During the last decade, radiologists endured a heavy workload (8).

Results of this study indicated that there is excessive crowding at the Radiology Department in Aseer Central Hospital, and the time patients spend at the waiting area is very long, being 1-3 hours for almost half of patients, and more than 3 hours for 21% of patients.

These findings are in accordance with those reported by Onwuzu et al. (2) in Nigeria, who reported that patients spend 1-3 hours at the waiting area of the Radiology Department. Patients usually spend almost an hour after arrival getting their request cards ready for typing. Once their request is taken into the diagnostic room, it takes about an hour and a quarter to be called in, and attended to by the radiographer.

Shakoor (9) stated that Radiology departments are experiencing increasing rates of patient demands and hence, becoming unable to accommodate these increasing demands. These increased demands will inevitably lead to considerably prolonged patient waiting times and will negatively affect their satisfaction toward provided services.

Van Nynatten and Gershon (10) added that the expanding indications for imaging combined with inappropriate ordering, and delays in reporting, have led to unnecessarily long wait times, and consequently, overcrowding of patients at radiology departments.

Sciacchitano et al. (11) stressed that when the number of patients that present to the radiology department becomes large without a corresponding increase in staff population, the waiting time is bound to be longer as the number of radiology staff will be unable to cope with the daily provided service. Consequently, prolonged patient waiting times will cause deterioration in their condition and in some cases; the effectiveness of the proposed treatment may be reduced.

Results of the present study revealed that the main bulk of overcrowding at the Radiology Department comes from patients referred from the outpatient clinics, followed by those referred from the Emergency Department, and finally inpatients. There is an observed fluctuation in patient crowding, with the highest on Mondays and Tuesdays, and a reported peak during the afternoon. Patient waiting times differed significantly according to their days of received radiologic services, with the longest waiting time being on Wednesdays. Moreover, waiting times differed significantly according to provided radiologic services and type of patient referral. This confirms the first and second hypotheses. However, patient waiting times did not differ significantly according to their scheduled time of service.

The observed fluctuation has been reported by several studies. In Nigeria, Onwuzu et al. (2) noted that most patients arrive to the Radiology Department before 11:00 am, while 40.5% arrive between 11:00 am and 2:00 pm. They explained this fluctuation by the fact that patient waiting times depend on their time of arrival, type of requested radiologic service, and their source of referral, as patients from Emergency Department should be immediately attended to.

In Holland, Hofman (12) noted that peaks of busy hours at the Department of Radiology are around 9:00 – 11:00 am, and at 2:00 pm. These peaks can be attributed to the visits of specialists to the patients at the wards, generating peaks of unscheduled arrivals.

Results of this study established that the main causes for overcrowding at the Radiology Department, as reported by the Radiology Department staff, were the huge number of non-emergency, unscheduled patients who did not go via a primary health care center; and the socially recommended cases, in addition to the shortage of specialist radiology physicians and the expensive radiology services at private hospitals. Less frequent causes were the limited access to radiology services at primary care centers.

Hofman (12) also stated that the inflow of patients to the Radiology Department is either elective (e.g., referred from Outpatient Clinics) or non-elective (e.g., referred from the Emergency Department). Scheduled patients include outpatients, while inpatients can be regarded as unscheduled patients since most of them require a scan on the same day. Different degrees of urgency are associated with patients' characteristics.

Several maneuvers were suggested to overcome overcrowding peaks at Radiology departments. Off-peak scheduling was recommended by scheduling more appointments during the times of low walk-in demands and filling off-peak hours with elective requests. Elective patients may be scheduled well in advance since direct examination is not necessary, while for emergency patients time is critical to the patients' potential recovery. Therefore, a dedicated emergency room was advised for emergency scheduling (13). Heng & Wright (14) noted that a dedicated emergency room decreases overcrowding, and increases the probability for referred emergency patients being served as soon as possible.

This study had some limitations. Collected data within the present study were based on service providers (i.e., staff of Radiology Department) only, and did not include service receivers (i.e., patients). Moreover, it was limited to assessment of time spent at the waiting area of the Radiology Department and did not cover the duration between patient examination and time scheduled for receiving the necessary radiologic services.

In conclusion, patient waiting times at the Radiology Department in Aseer Central Hospital till performance of the necessary radiologic service is unduly prolonged, mostly ranging from one to three hours. The main bulk of overcrowding comes from patients referred from the inpatients, ED and outpatient clinics. The highest peak occurs during the afternoon, especially on Mondays and Tuesdays. Wednesdays are the most crowded days at the Radiology Department. Fluoroscopy and CT are associated with the most prolonged hours of waiting times. The main causes for overcrowding at the Radiology Department are the excessive number of non-emergency, unscheduled patients, and the socially recommended cases, in addition to the shortage of specialist radiology physicians.

Therefore, there is a pressing necessity to improve patient waiting times, and to reduce overcrowding and workload at the Radiology Department. Moreover, there is a need to implement an elaborate system to block the referral of socially recommended patients and to organize unscheduled patients, who may crowd out other emergency patients.

It is recommended to allocate a special radiology section for patients referred from the Emergency Department; to increase the number of serving specialist radiologists at the Radiology Department of Aseer Central Hospital; and to enforce provided radiology services at primary care centers in Aseer Region.

More radiology equipment is needed to serve more patients at the Radiology Department. Appointment schedules should be reorganized to avoid overcrowded days, e.g., Mondays and Tuesdays.

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