Patient Flow Analysis in a Children's Clinic

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Objective: The main objectives of the study were to determine the average waiting times of patients at each of the treatment stations in a large paediatric out-patient department, and to determine the average length of time for a patient visit with paediatricians and interns.

Design: Data were collected over the period of 1 month, from 1 to 31 October 1994, on patient waiting times and length of visit with paediatricians and interns.

Setting: The study was conducted in the 24-h out-patient clinic and the half-day speciality clinic at Qoods Children's Teaching Hospital, in Qazvin, Iran.

Study participants: All patients attended the paediatric out-patient clinic and the half-day speciality clinic during the 24-h period for one full month.

Main outcome measures: The following were measured: average waiting times and average length of visit for patients seeing interns and paediatricians.

Results: The average waiting time to see a paediatrician was found to be 77 minutes, and the average length of visit with a paediatrician was 3.4 minutes. Patients waiting to be seen by interns had an average waiting time of 7.8 minutes, and their average length of visit was 7.7 minutes. The average length of visit with an intern was higher during the morning (8.6 minutes) and highest during the afternoon (9.5 minutes) shifts.

Suggestions for improvements are made and for ways to take advantage of waiting periods to provide preventive and other health care information. © 1997 Elsevier Science Ltd. All rights reserved.

Key words: Flow analysis, children's clinic.

INTRODUCTION

Patient flow analysis (PFA) (The term 'Client Flow Analysis' (CFA) is similar to PFA, and is also used for analysing the flow of clients referred to health centres for preventive care [4]) is a managerial technique used to examine ways of minimizing waiting times and increasing the efficiency of health care services. The technique can help to identify gaps in the distribution and utilization of personnel, time and skills [1,2]. It allows clinic managers and workers to look at the way that clients and patients move through the clinic [4].

Patients may have to wait for long periods before obtaining individual services in health centres and outpatient departments, partly because of poor organization.

Improved management could lead to better coverage and acceptance of services by communities. Clinic schedules should suit the needs of the communities served rather than those of the health centre staff.

Some researchers have applied PFA to evaluate the efficiency of the ambulatory services in out-patient clinics as well as in health centres. As a result, they have succeeded in reducing patients' waiting times and increasing the efficiency of health care providers [1-7].

In this study, PFA is used to assess the waiting times of the clients referred to a large paediatric out-patient department connected to Qoods Teaching Hospital in Qazvin, Iran. As a hospital administration adviser, the author recommended that the clinic authorities should take steps to improve the patients' satisfaction as well as the efficiency of the services. Client flow analysis as a quantitative method was primarily used to calculate the waiting times and contact times in the centre. The main objectives of this survey are to determine the waiting times spent by clients in each station to receive the service, and to measure the length of visit times with interns and paediatricians.

MATERIAL AND METHODS

Qoods Children's Teaching Hospital is the only paediatric centre in the region and covers a total population of one million. The clients come from rural, periurban and urban areas. It has a 24-hour out-patient department and a half-day specialty clinic. The study was conducted from 1 to 31 October 1994. All patients referred to the paediatric clinic during a 24-hour period were followed. Interns received the patients 24-hourly, but the paediatricians only 3 hours a day (from 10 a.m. to 1 p.m.). A pilot study was also conducted. Patient flow analysis requires clinic staff to record entry and exit times for every patient presenting at their service station, so synchronization was used to measure the waiting times of the patients and record them in the checklist. This non-computerized data collection method is useful in the
setting of countries in development, because all staff at the site can participate in data collection and analysis [4]. Good monitoring and control by the research team supported the project.

The flow of patients in the clinic is shown in Fig. 1. The figure shows the possible services that may be received by the patient at each station. On his or her arrival, each client received a designated checklist on which the relevant times would be recorded. The client, with checklist in-hand, circulated in the clinic to contact the service provider. An example of checklist, translated into English, is shown in Fig. 2. In each station, the arrival and exit times were filled out by the staff. Then, both the waiting times and the length of the visit for any service

![Diagram](chart.png)  
**FIGURE 1.** Patient circulation in Qoods paediatric out-patient department. The numbers on the arrows indicate the average waiting times (minutes), and the numbers in the circles indicate the average length of time spent at each station, e.g. from entry to admission takes an average of 3 minutes, and from admission to meeting with an intern 7.8 minutes. The average length of contact time with the intern is 7.7 minutes.

![Checklist](checklist.png)  
**FIGURE 2.** Qoods Children's Clinic. Waiting time checklist.
TABLE 1. Age groups referred to the out-patient department by shift

<table>
<thead>
<tr>
<th>Age</th>
<th>Morning</th>
<th>Afternoon</th>
<th>Night</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 28 days</td>
<td>98</td>
<td>35</td>
<td>36</td>
<td>167</td>
<td>8.9</td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>245</td>
<td>112</td>
<td>198</td>
<td>555</td>
<td>29.2</td>
</tr>
<tr>
<td>1-2</td>
<td>94</td>
<td>36</td>
<td>80</td>
<td>211</td>
<td>11.1</td>
</tr>
<tr>
<td>2-5</td>
<td>186</td>
<td>61</td>
<td>200</td>
<td>447</td>
<td>23.6</td>
</tr>
<tr>
<td>5-12</td>
<td>244</td>
<td>103</td>
<td>169</td>
<td>516</td>
<td>27.2</td>
</tr>
<tr>
<td>Total</td>
<td>867</td>
<td>347</td>
<td>683</td>
<td>1896</td>
<td>100</td>
</tr>
<tr>
<td>Percentage</td>
<td>45.7</td>
<td>18.3</td>
<td>36.0</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Mean of ages = 3.45 years, SD = 3.519.

were calculated by subtracting successive entry and exit times. This procedure was done by computer, after all data for analysis had been collected (see Fig. 3).

FINDINGS

During the period of the study, 1896 patients arrived at the clinic. Of these patients, 8.9% were neonatal (under 28 days), 29.2% under 1 year and the rest between 1 and 12 years old (see Table 1). 45.7% were referred during morning shifts (7:30 a.m.-1:30 p.m.), 18.3% arrived during afternoon shifts (1:31 p.m.-7:30 p.m.) and 36% arrived during night shifts (7:31 p.m.-7:29 a.m. the next day). As shown in Fig. 2, the highest patient load is between 8 a.m. and 9 a.m. Of these patients, 25% were referred between 12 midnight and 8 a.m., 25% between 8 and 10 a.m., 25% between 10 a.m. and 4 p.m. and the last 25% between 6 p.m. and 12 midnight.

The average waiting time from arrival to admission was 3 minutes: 95% of the clients waited 0-4 minutes, 5% waited 5-15 minutes and 5% waited more than 15 minutes. During the survey, 1564 cases visited the interns, and 234 cases visited the paediatricians; 98 clients left the clinic without getting any service (of this number, 66 clients refused to visit interns, 23 complained of waiting too long to visit paediatricians and nine wanted to visit certain doctors). The waiting times to visit the paediatrician ranged from 1 minute (minimum) to 232 minutes (maximum); 25% of patients waited between 1 and 34 minutes, 25% between 34 and 70 minutes, 25% between 71 and 113 minutes and 25% between 113 and 232 minutes; (mean = 77 minutes, SD = 52.5, mode = 114). The length of the visit with the paediatrician ranged from 1 to 26 minutes (mean = 3.4, SD = 3, mode = 2.5); for 66.7% of the clients, 1-3 minutes were spent (Table 2). It was observed that, on average, a client waits 77 minutes to receive 3.4 minutes of the paediatrician's time.

The waiting time for a visit with an intern ranged from 1 to 100 minutes (mean = 7.8, SD = 11.8, mode = 1). Ninety per cent of 1564 clients visiting the interns waited 0-20 minutes and 10% waited 21-100 minutes. The length of the visit with the interns ranged from 1 to 78 minutes (mean = 7.7, SD = 8.2, mode = 5). For 85% of patients, 1-10 minutes were spent on the visit. On average, each patient waited 7.8 minutes to receive 7.7 minutes of the intern's time. The average waiting time for a visit with an intern during the morning shift was 8.6 minutes, during the afternoon shift it was 9.5 minutes and during the night shift it was 6.5 minutes. For 7% of patients during the morning shift, 7.3% in the afternoon and 9.4% at night, only one minute was spent on each visit by the interns.

![Arrival time vs Exit time](image)

**FIGURE 3.** Sample distribution according to arrival and exit time of the clients in OPD. The figure shows that the discharges follow the pattern of the arrivals. Whereas the peak of arrivals is 9 a.m., the peak of discharges is 1 hour later (10 a.m.). Thus, the accumulation of clients takes place in a short interval (9-10 a.m.).

<table>
<thead>
<tr>
<th>Length of visit (minutes)</th>
<th>Number of patients</th>
<th>Percentage</th>
<th>Cumulative percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td>2</td>
<td>74</td>
<td>31.6</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>74</td>
<td>31.6</td>
<td>66.7</td>
</tr>
<tr>
<td>4</td>
<td>48</td>
<td>20.5</td>
<td>87.2</td>
</tr>
<tr>
<td>5</td>
<td>18</td>
<td>7.7</td>
<td>94.9</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>3.4</td>
<td>98.3</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>0.4</td>
<td>98.7</td>
</tr>
<tr>
<td>24</td>
<td>2</td>
<td>0.8</td>
<td>99.5</td>
</tr>
<tr>
<td>26</td>
<td>1</td>
<td>0.4</td>
<td>100</td>
</tr>
<tr>
<td>234</td>
<td>100</td>
<td></td>
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</tr>
</tbody>
</table>
achieving this end [6]. This technique can show the important skill of personnel at their disposal. Opti-

CONCLUSION

Clinic managers have space, equipment and, most importantly, skilled personnel at their disposal. Opti-

maximally combined, these elements should provide a good service. Patient flow analysis offers an approach of achieving this end [6]. This technique can show the workload of the departments at certain times or during certain intervals, the bottle-necks in patient circulation or the critical paths of care. It is a technique that is simple, quickly performed, cost-effective, easy to learn and easily transferable [4]. This study shows that, on average, patients wait 77 minutes to receive only 3.4 minutes’ service from the paediatrician. This is the case where paediatricians attend the clinic at 10 a.m. and their patients, who are mostly from peri-urban, suburbs and rural areas, are referred to the clinic from 7 a.m. onwards. If the doctors attend at 9 a.m., the average waiting time drops at least to 17 minutes (10 — 9 = 1 hour = 60 minutes, and 77 — 60 = 17). However, health managers can also take advantage of such opportunities to improve the health education of the people. For instance, in this case, where clients are waiting for an average of 77 minutes, it is suggested that a video projection unit be installed in the waiting hall and health education films be presented. The films regarding preventive care are most suitable for transmission to the parents who are waiting. Health educators can also give parents health messages concerning primary health care for the children as well as family planning information. The latter is an urgent need in Iranian society. Following the author’s suggestion, the video-taped health education system was installed and is now in operation in the waiting hall of the clinic.

The length of visits with paediatricians—who also have the role of teachers in the system—is short: only 12.8% of paediatricians spent more than 4 minutes per visit. This may indicate perfunctoriness or other causes.

The study also revealed that, for about 10% of patients, the duration of visits with interns is less than 1 minute, which is extremely short. This is a matter that teachers at the clinic should investigate. However, teaching interns good communication and interviewing skills, improving the supervision rounds by the attending physicians, especially during afternoon and night shifts, will improve the quality of services provided by interns, who are, tomorrow’s doctors. It was observed that interns had some difficulties in interviewing clients, especially those from rural or peri-urban areas, those with less education, or speakers of dialect.)

These results indicate that, in a teaching clinic claiming a community orientation, better services with higher quality can be delivered to patients if continuous assessment of current activities is carried out and fed back to the system for improvement of services. Clearly, flow analysis at the clinic level can lead to a more integrated approach to service delivery and a more patient-oriented scheduling of services.

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REFERENCES

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