

Waiting time for pediatric patients to be admitted for elective surgery at a National Pediatric Health Institute in Mexico City

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Abstract

Background: Waiting times for elective surgery can be a physically and psychologically distressing experience for patients, affecting their satisfaction and perceptions of service quality. This study aimed to estimate the waiting time for pediatric patients admitted for elective surgery, identify events causing delays, and compare variations in the admission process.

Method: Three cohorts of pediatric patients scheduled for elective surgery were prospectively followed: (A) weekday general surgery admissions, (B) weekday admissions to other surgical specialties, and (C) weekend surgical admissions. The admission process was mapped, timescales of each stage were recorded, and delay incidents were identified through direct non-participant observation after obtaining informed consent or assent. **Results:** The mean waiting time was 6.9 h (95% confidence interval [CI]: 6.6-7.2 h) for all scheduled surgical admissions. Patients in cohort B experienced the longest waiting time at 8.1 h (95% CI: 7.7-8.5 h, $p < 0.0001$). Primary causes of delay included lengthy transfers to the admission area, bed management issues, and limited staff availability during shift changes. Avoidable delays resulted in a mean additional waiting time of 1.4 h. **Conclusions:** The findings suggest that hospital waiting times could be reduced through organizational interventions targeting the main causes of delay and simplifying administrative processes.

Keywords: Waiting times. Process assessment. Patient flow. Public hospital. Process improvement. Pediatric hospital.

Tiempo de espera para el ingreso hospitalario de pacientes pediátricos a cirugías electivas en un Instituto Nacional de Salud Pediátrico en la Ciudad de México

Resumen

Introducción: Los tiempos de espera para cirugías electivas pueden ser una experiencia física y psicológicamente angustiante para los pacientes, afectando su satisfacción y percepciones sobre la calidad del servicio. Este estudio tuvo como objetivo estimar el tiempo de espera para pacientes pediátricos admitidos para cirugía electiva, identificar eventos que causan retrasos y comparar variaciones en el proceso de admisión. **Método:** Se siguieron prospectivamente tres cohortes de pacientes pediátricos programados para cirugía electiva: (A) admisiones de cirugía general entre semana, (B) admisiones

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entre semana para otras especialidades quirúrgicas, y (C) admisiones quirúrgicas en fin de semana. Se mapeó el proceso de admisión, se registraron los plazos de cada etapa y se identificaron los incidentes de retraso mediante observación directa no participante después de obtener consentimiento informado o asentimiento. **Resultados:** El tiempo medio de espera fue de 6.9 horas (IC 95%: 6.6-7.2 horas) para todas las admisiones quirúrgicas programadas. Los pacientes en la cohorte B experimentaron el tiempo de espera más largo con 8.1 horas (IC 95%: 7.7-8.5 horas, $p < 0.0001$). Las causas principales de retraso incluyeron transferencias prolongadas al área de admisión, problemas en la gestión de camas y disponibilidad limitada de personal durante los cambios de turno. Los retrasos evitables resultaron en un tiempo adicional medio de espera de 1.4 horas. **Conclusiones:** Los hallazgos sugieren que los tiempos de espera hospitalarios podrían reducirse mediante intervenciones organizativas dirigidas a las principales causas de retraso y simplificando los procesos administrativos.

Palabras clave: Tiempos de espera. Evaluación de procesos. Flujo de pacientes. Hospital público. Mejora de procesos. Hospital pediátrico.

Introduction

Assessing waiting times for access to hospital services is relevant for public health systems seeking to expand their coverage¹⁻⁴. Lengthy waiting times influence the perception of quality of care, user satisfaction^{5,6}, and health service planning, often perceived as inadequate⁷. Consequently, waiting times serve as indicators of service delivery efficiency².

Theory suggests that waiting times increase when demand exceeds service capacity^{2,8,9}. However, organizational factors can affect waiting times independently of demand. In hospital bed management, up to 97% of incidents that increase waiting times involve clinical or administrative causes¹⁰⁻¹⁴. These delays lead to the loss of useful hospitalization days and create long queues for scheduled admissions¹⁴⁻¹⁶.

Hospital structures focused on specialized work may impede the coordination of patient flow through multiple internal processes^{5,10,17}. Health services commonly experience deficiencies in administrative processes, including unnecessary steps, avoidable delays, bottlenecks, and poor utilization of human and physical resources. These issues contribute to extended patient waiting times, even when care capacity is sufficient¹⁸. In addition, waiting times can induce anxiety in patients and their companions¹⁹.

Various strategies have been implemented to improve hospital management processes⁹. Evidence supports enhancing existing service capacity or modifying local organizational behavior at the local level⁷. In this context, process re-engineering may facilitate improvements in both productivity and quality of care^{20,21}.

While waiting lists for elective surgery have been extensively studied, the hospital admission process itself is often excluded from common definitions and monitoring points^{1-3,8,9}. Studies typically describe time

to initial consultation, time to diagnosis, and time to procedure scheduling^{9,20,22}. However, waiting times for hospital admission have not been as thoroughly investigated as those for emergency admissions¹.

This study aimed to estimate and compare waiting times and delay-causing events during the hospitalization of pediatric patients undergoing elective surgery in three different modalities over a week. The investigation spans from the patient and caregiver's arrival at the hospital until the patient occupies the assigned hospital bed.

Method

Study setting

The Hospital Infantil de México Federico Gómez is a tertiary care National Health Institute located in Mexico City that provides medical services to a very low-income population. The hospital also conducts research and teaching activities. It has 220 beds and nine operating theaters. Before the severe acute respiratory syndrome coronavirus 2 pandemic, the number of surgical interventions was 3,697, and the occupancy rate for surgical assistance was 64.8%, corresponding to 41.3% of hospital discharges. The Department of Surgery is divided into 11 specialties. General Surgery performs the most operations (39.2%), receiving patients from several services without surgical consultation (Endocrinology, Diabetes Clinic, Infectious Diseases, and anorectal oncological surgery). The remaining operations correspond to specialties with their own surgical consultation: Orthopedics, Oncology, Ophthalmology, Otolaryngology, Urology, Plastic Surgery, Cardiovascular Surgery, Thoracic Surgery, Stomatology, and Neurosurgery. In these specialties, 90.7% of elective surgical procedures involve a hospital stay of more than 24 h²³.

Admission for elective surgery

The scheduling of elective procedures is the responsibility of the attending physicians of each surgical specialty, who are assigned to each specialty during working days and morning shifts. Hospital admission involves three general stages: medical and surgical assessment, hospital admission procedures, and transfer to the inpatient service.

Study design

A prospective comparative cohort study was designed, comprising three cohorts: (A) weekday admissions, primarily general surgery, and oncology, (B) weekday admissions of specialties with their own surgical consultation, and (C) surgical specialties with weekend admissions.

Ethical approval

This study was reviewed and approved by the Hospital Research, Biosafety, and Research Ethics Committees under protocol number HIM-2022-073. Informed consent was obtained from accompanying parents, and assent was obtained before direct non-participant observation for children older than 7 years. Patient and caregiver privacy was protected by avoiding the dissemination of sensitive and identifiable information.

Participants

The study included patients scheduled for elective surgical procedures in any surgical specialty service of the hospital during 4 months of 2022 who were ≤ 18 years of age and had provided signed informed consent and assent. Patients whose scheduled surgeries were converted to emergency procedures due to changes in their health status were not included. Exclusion criteria were voluntary withdrawal under the terms of the informed consent/assent or rescheduling of the surgical admission.

Sample design

To estimate the waiting time for admission, a sample of 14 follow-ups per cohort was calculated based on a finite population of 3,697 annual surgeries²³, a variance of 0.92 h² from an initial pilot study, and an absolute precision of 0.5 h with 95% confidence. In addition, the sample size required for a hypothesis test of mean

difference among three groups was calculated as 22 follow-ups per cohort, assuming a minimum difference of 1 h between groups, with 80% power and 95% confidence.

Non-probabilistic quota sampling was employed for each specialty, as the dynamics of the scheduling lists precluded the probabilistic selection of scheduled admissions.

Variables studied

Waiting time was defined as the time between the patient's arrival at the surgical admission consultation and their placement in the assigned hospital bed.

A delay incident was defined as any circumstance that, directly or indirectly, negatively affects the sequence of the planned admission process and results in increased hospital waiting time. This variable included both the frequency and duration (hours or minutes) of observed delay incidents within the admission process.

Additional demographic variables collected were age, sex, diagnosis, comorbidities, admitting surgical specialty service, need for mobility assistance (wheelchair, stretcher, other assistive devices), communication barriers (related to health problems), and history of surgery in the hospital.

Method of observation and monitoring

A multidisciplinary group of observers (eight members) was formed, with one researcher serving as lead trainer in the non-participant direct observation method. This method involves placing the observer in contact with the hospital admission process while collecting information externally, without intervention in the social group or process under study^{24,25}. A three-week pilot study was conducted to standardize the recording method, identify appropriate spaces for follow-up, and delineate the segments of the admission process in each surgical specialty. Three distinct groups were identified in the admission process.

Data collection

Three forms were developed to record timing during the admission process, considering the operational characteristics of surgical specialties and any observed delays. Mobile phones with synchronized clocks were used for the measurements.

Patient contact and follow-up

The list of scheduled surgical patients was obtained at least 24 h before their admission appointment. Parents were contacted by telephone to confirm their hospital appointment attendance, explain the general nature of the study, and arrange a meeting time and location with the investigators before their admission appointment. At the hospital, the study's nature was explained in detail to the patient and caregiver, and the required informed consent or assent was obtained. Follow-up began when the patient and family member reported their arrival at the outpatient consultation area. The start and end times (in hours and minutes) of each hospital admission process stage were recorded. Monitoring concluded when the nurse in charge of the service instructed the patient and caregiver to occupy the designated bed.

Process mapping

Process mapping methodology was used to represent the existing admission process, following basic principles: process identification, data collection, map generation, process analysis, and action planning. A flowchart was used as the modeling tool for mapping the programmed admission process, developed through presentation and discussion of various sketches among the researchers^{26,27}.

Statistical analysis

Qualitative variables (gender, age group, comorbidity, mobility assistance, communication barriers, and previous surgery) were summarized as relative frequencies and percentages (%). The age group was determined by categorizing the patient's age, which was calculated using the patient's date of birth and admission follow-up date. The categories were: newborn (< 29 days), infant (29 days-23 months), pre-school (24 months-71 months), school (72 months-143 months), and adolescent (≥ 144 months). The percentage of admissions per hour was also determined for each cohort.

Continuous quantitative variables (age [years], waiting time [h], cumulative delay time [h], and delay-free waiting time [h]) were summarized using estimates of central tendency and dispersion appropriate to the type of distribution.

The point estimate and 95% confidence interval (95% CI) were calculated for waiting time in the whole sample, in the cohorts, and for each surgical specialty service. Using the estimated waiting times, we calculated

the percentage of follow-ups that adhered to the World Health Organization (WHO) recommendations of ≤ 4 h for hospital admission²⁸.

The delay-free waiting time was calculated for each follow-up by subtracting the time spent on delay incidents from the total waiting time. This calculation was performed for each stage of the admission process: medical and surgical assessment, admission procedure, and transfer to the inpatient ward.

The distribution of variables (sex, age group, comorbidity, mobility aid, communication barrier, and previous surgery) was compared among cohorts A, B, and C. χ^2 test was used, or Fisher's exact test when sample sizes were small.

When distribution and homoscedasticity criteria between groups were met, waiting times between cohorts and their segments were compared using Kruskal-Wallis tests or one-way analysis of variance with Tukey's *post hoc* test. For independent pairs with normal distribution, Student's t-test was used; for non-normally distributed independent pairs, the Mann-Whitney U test was applied.

The paired t-test was used to compare the delay-free waiting time with the original waiting time for the entire group. Comparisons between each cohort's waiting time and its adjusted counterpart were performed according to the parametric distribution type of the pairs: Wilcoxon test for cohort A and paired t-test for cohorts B and C. All statistical analyses were performed using SPSS software version 25, with statistical significance set at 95% ($\alpha = 0.05$).

Results

The study included sixty-seven follow-ups across 11 surgical specialties. Sampling quotas were balanced, except for neurosurgery and otolaryngology. General surgery represented the highest scheduling volume (35.8%), followed by orthopedics (10.4%) ([Table 1](#)).

The baseline patient characteristics are presented in [table 2](#). Cohort B showed a higher proportion of patients requiring in-hospital mobility assistance, including wheelchairs, stretchers, oxygen tanks, and strollers, among others.

Mapping the hospital admission process

The admission process was illustrated using a general flow chart ([Fig. 1](#)). Three main differences were identified between cohort A and cohort B.

Table 1. Composition of the sample by surgical specialty

Surgical specialty	Follow-ups carried out, n (%)	Expected sample, n (%)	Admission group*
General surgery	24 (35.8)	21 (32.5)	A, C
Oncology	5 (7.7)	5 (7.2)	A
Orthopedics	7 (10.4)	5 (7.7)	B
Ophthalmology	6 (9.0)	4 (5.5)	B
Otorhinolaryngology	6 (9.0)	3 (4.9)	B
Urology	5 (7.5)	5 (8.1)	B, C
Plastic surgery	5 (7.5)	4 (6.7)	B, C
Cardiovascular surgery	3 (4.5)	4 (6.5)	B, C
Thoracic surgery	3 (4.5)	2 (2.8)	B, C
Stomatology	2 (3.0)	5 (7.2)	B
Neurosurgery	1 (1.5)	7 (10.9)	B, C
Total	67	66	

*Admission group: **A:** general surgery admission on weekdays. **B:** other specialties admission on weekdays. **C:** weekend specialties admission.

Table 2. Patient characteristics included in the study

Characteristics	Total (n = 67)	Cohort A (n = 27)	Cohort B (n = 22)	Cohort C (n = 18)
Sex, n (%)				
Male	33 (49.3)	20 (74.1)	11 (50.0)	3 (16.7)
Female	34 (50.7)	7 (25.9)	11 (50.0)	15 (83.3)
Age group, n (%)				
Neonates	1 (1.5)	1 (3.7)	0	0
Infants	10 (14.9)	3 (11.1)	3 (13.6)	4 (22.2)
Children	38 (56.7)	16 (59.3)	16 (72.7)	6 (33.3)
Adolescents	18 (26.9)	7 (25.9)	3 (13.6)	8 (44.4)
Comorbidities, n (%)				
Yes	22 (32.8)	10 (37.0)	8 (36.4)	4 (22.2)
No	45 (67.2)	17 (63.0)	14 (63.6)	14 (77.8)
Mobility assistance, n (%)				
Yes	13 (19.4)	2 (7.4)	9 (40.9)	2 (11.1)
No	54 (80.6)	25 (92.6)	13 (59.1)	16 (88.9)
Communication barriers, n (%)				
Yes	14 (20.9)	4 (14.8)	8 (36.4)	2 (11.1)
No	53 (79.1)	23 (85.2)	14 (63.6)	16 (88.9)
Prior surgeries, n (%)				
Yes	37 (55.2)	16 (59.3)	15 (68.2)	6 (33.3)
No	30 (44.8)	11 (40.7)	7 (31.8)	12 (66.7)

Admission cohort. **A:** general surgery admission on weekdays. **B:** other specialties admission on weekdays. **C:** weekend specialties admission.

Time and order of consultation

In cohort A, 89% of consultations were scheduled between 11:00 and 12:00, followed by medical assessment between 12:00 and 15:00. In cohort B, 78% of consultations were scheduled between 09:00 and 11:00, with care provided on a first-come, first-served basis between 09:00 and 15:00.

Consultation dynamics

In cohort A, a pediatrician and surgeon performed the assessment simultaneously. In cohort B, the pediatrician and surgeon conducted assessments at different times, resulting in an additional 0.5-h wait.

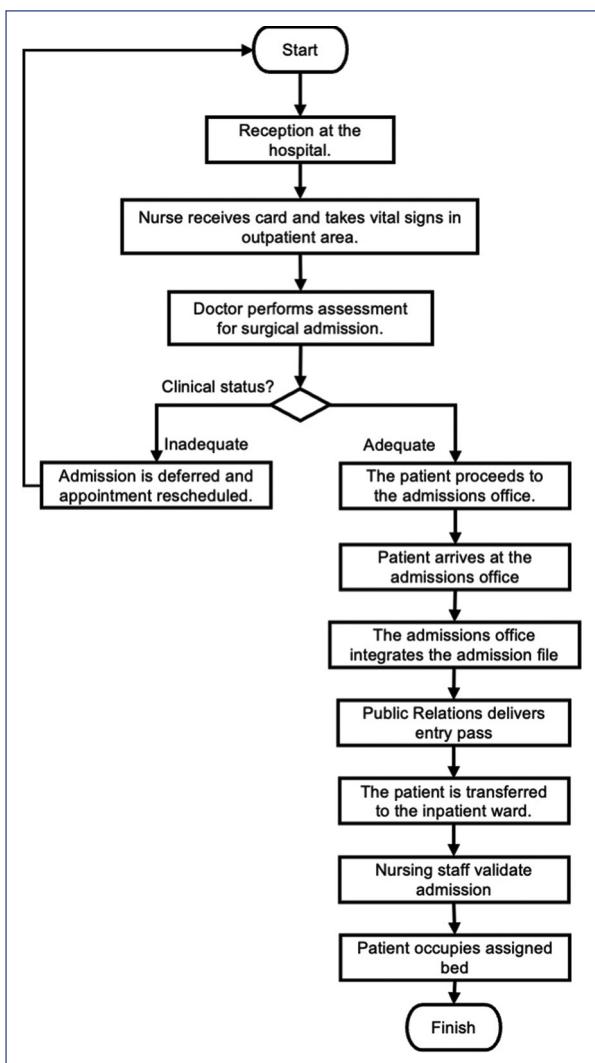


Figure 1. Simplified flowchart of the elective surgery admission process.

Transfer to admission

Following medical and surgical assessment, the children and their companions proceeded to the admission office. In cohort A, a resident pediatrician accompanied the patient and caregiver to the admission area. In cohort B, other specialties directed patients to the admission office, typically at 15:00, resulting in extended waiting times. In cohort C, patients were discharged and completed admission procedures over the weekend.

No significant differences were observed in admission procedures. Public relations staff provided information about admission and hospital rules to all scheduled admissions gathered in the admission area between 15:00 and 17:00, regardless of arrival time.

Waiting time for hospital admission

The estimated waiting time in the elective admission process was 6.9 h (± 1.3 h). The 95% CI for this parameter was between 6.6 and 7.2 h (Table 3). Significant differences were observed among the waiting times of cohorts A, B, and C ($p < 0.0001$). The comparison between cohorts B and A showed a significant difference of 1.8 h ($p < 0.0001$), while cohorts B and C differed by 1.9 h ($p < 0.0001$). Direct comparison between waiting times of cohorts A and C revealed no difference (mean difference 0.08 h, $p = 0.956$). Only 6% of total admissions met the WHO recommendation of waiting time ≤ 4 h, while 7.5% of admissions exceeded 9 hours. Most admissions (70.1%) were completed between 16:00 and 18:00.

Stages of the admission process

The two longest stages of the admission process were medical-surgical assessment (3.3 ± 0.9 h) and admission formalities (3.6 ± 1.3 h). No significant difference was found among the three cohorts in the first phase ($p = 0.305$). In the second stage, cohorts A (3.3 ± 0.9 h) and C (2.7 ± 0.9 h) differed significantly from cohort B (4.6 ± 0.9 h) ($p < 0.0001$).

Delay incidents

One hundred delay incidents were identified in the scheduled admission process, including 16 external to the admission process. External incidents comprised leaving care areas ($n = 4$), arriving hours before scheduled appointments ($n = 4$), and essential medical procedures during assessment ($n = 8$) such as cast removal, electrocardiograms, and blood sampling. The remaining 84 delay incidents occurred across 52 follow-ups, with varying distribution per follow-up. Fifteen follow-ups (22.4%) experienced no delays during the admission process.

The most significant delays in terms of duration and frequency occurred during transfer to the admission procedure area (average delay 98 min), unavailability of beds (average delay 88 min), and lack of admission staff due to shift changes (average delay 46 min). These three delay types accounted for 63.9% of total delay time (Table 4).

Delays resulted in three major periods of inactivity: waiting time for surgical consultation (mean 102 min, maximum 238 min), transfer to the admission area for cohort B patients (mean 51 min, maximum 242 min),

Table 3. Waiting times for scheduled surgical admission

Surgical admission process	Waiting time (h)	
	\bar{x} (\pm SD)	95%CI
Global estimate	6.9 (\pm 1.3)	6.6-7.2
Cohort A	6.4 (\pm 0.7)	6.1-6.6
Cohort B	8.1 (\pm 0.9)	7.7-8.5
Cohort C	6.3 (\pm 1.5)	5.6-7.0

SD: sample standard deviation; 95%CI: confidence interval with 95% confidence; \bar{x} : arithmetic mean.

Admission cohort. A: general surgery admission on weekdays. B: other specialties admission on weekdays. C: weekend specialties admission.

and waiting time for admission to the inpatient service (mean 79 min, maximum 166 min).

Delay-free waiting time

The estimated delay-free waiting time was 5.5 h (\pm 1.5 h), representing a reduction of 1.4 h compared to the actual waiting time ($p < 0.0001$). Some cases with waiting times exceeding 9 h showed no reductions due to non-preventable delay incidents. Delay-free waiting times by cohort were: cohort A, 5.3 ± 1.5 h ($p < 0.0001$); cohort B, 5.9 ± 1.7 h ($p < 0.0001$); and cohort C, 5.3 ± 1.2 h (paired t, $p = 0.004$). Cohort B demonstrated the largest reduction in waiting time, averaging 2.2 h. No significant difference was found in delay-free waiting time among cohorts ($p = 0.336$).

Discussion

This study found that the average time for the elective surgery admission process was 6.9 h, including 1.4 h of cumulative delays. Few studies in Mexico examine the operational attributes of health services, leading to a lack of defined standards or criteria for assessing their appropriateness for users, particularly in pediatric services²⁰.

Following the WHO recommendation for non-urgent care, only 6% of admissions were completed within the expected 4-h window²⁸. Other national estimates indicate that the average waiting time for hospital admission is 7 h, with a maximum of 10 hours. Furthermore, up to 60% of hospital admissions require 5-8 h for completion¹⁰. This aligns with our findings (68.7% between 5 and 7 h); however, these challenges and their causes are common across international health systems^{8,9}.

Two aspects encompass the multiple deficiencies and excessive complexity in care processes that result in increased queues and low utilization of resources (human and physical)^{10,29,30}, even when capacity may be sufficient^{7,18}. The first aspect is the organization's functional structure, where clinical and administrative services lack control over patient trajectory beyond their departments. This negatively impacts the adoption of coordination mechanisms between care departments^{11,12}. One indicator of this issue is that 77.6% of patients experience delays due to operational deficiencies in the admission process. In addition, patients in the third quartile (Q3) lose an average of 2.3 h during admission. These operational failures result in extended periods of inactivity¹⁷. Improving patient flow requires adopting a patient-centered process approach^{11,12}.

The second issue affecting waiting times relates to inefficiencies in hospital bed management. This impacts the hospital's ability to admit new patients, increases non-medical discharges, and results in significant loss of hospitalization days^{10,14,16}. Delays in the discharge process indicate poor communication and information mechanisms within the hospital¹⁰, which become more pronounced during high-demand periods³⁰. In our study, 14% of incidents were related to bed management, representing the second most common cause of delay and prolonged waiting. Previous studies have identified bed management delays in up to 98% of hospital admissions¹⁰. The primary issue is bed availability, either due to delayed vacating of beds or extended maintenance procedures (cleaning, disinfection, among others)¹⁰. Administrative procedures constitute another significant cause of discharge delays. Studies show that clinical causes account for only one-third of delayed discharges, while administrative causes comprise the remaining two-thirds¹³.

Additional research is needed to identify factors impeding smooth and timely discharge, particularly those affecting bed availability and admission start times. This includes examining the behavioral patterns of staff involved in these processes, which may be challenging to modify over time. Extended waiting times and negative interactions with staff can adversely affect the relationship between patients, healthcare institutions, and workers⁶.

Other relevant aspects include the economic, physical, emotional, and social discomfort experienced by patients and caregivers^{10,13}. Long waiting times for medical care are a significant source of dissatisfaction with health services²⁰ and show a proportional correlation with service saturation and quality of care²⁹⁻³¹. In

Table 4. Category of delay in the surgical admission process

Category	n = 84 (%)	Cumulated delay (min)	Average delay (min) [†]
Delayed arrival at the admission office.	17 (20.2)	1658	98
Bed unavailable due to multiple causes.	12 (14.3)	1050	88
Shortage of hospital admissions staff.	20 (23.8)	916	46
Downtime between consultations	13 (15.5)	735	57
Delayed processing at the admissions office	13 (15.5)	665	10
Communication issues between medical and administrative staff.	3 (3.5)	322	107
Administrative delay before surgical assessment	3 (3.6)	258	86
Delays before admission to the inpatient ward	3 (3.5)	60	20

[†]The delay average was calculated based on the total number of patients studied. This information was then used to estimate the type of delay in each cohort.

addition, other factors influencing hospital delays, such as health status, comorbidities, and socioeconomic factors, need to be studied^{20,21}.

In recent decades, research has been used to enhance service capacity by redesigning systems and processes to increase service delivery^{3,32,33}. This study applied process mapping to identify potential areas of workflow failures²⁷. This approach identified appointment scheduling for admissions as a significant issue in the admission process design, as it caused unnecessary waiting between the completion of admission assessment and transfer to the hospital admission area. The mechanism that promotes efficient patient and caregiver flow during the consultation process is appointment scheduling at specific times, separate from outpatient consultations. Furthermore, the patient and caregiver are accompanied to the admission area with their file upon completing the admission assessment. In contrast, a first-come, first-served approach to outpatient consultations and surgical admissions lengthen waiting times and is the least efficient method. This improvement action has the potential to reduce waiting times and initiate hospital admission procedures earlier.

Finally, the central message is to simplify processes and prioritize patient care. However, this work only addressed the operational aspect, leaving strategic and tactical interventions pending⁴. Various options are available, including mathematical models, Markov chains, and artificial intelligence³. Another important consideration is the limitation that the quantitative rationality of process optimization in healthcare places on patient preferences and the flexibility required for equity. This paper's scope does not allow for a detailed exploration of these issues.

Conclusions

The waiting time for pediatric patients in the scheduled surgical admission process is 6.9 h (95% CI: 6.6-7.2 h), measured from arrival in the surgical consultation area until occupying the assigned hospital bed. The main issue identified in the process design is the allocation of appointments and surgical assessment schedules. Delays are primarily attributed to patient transfers to the hospital admission area, bed management, and staff availability during shift changes in the admission service. The findings suggest that simplifying the admission process and reducing delays could result in a decrease in waiting times by approximately 1.4 h.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical disclosures

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from patients, and received approval from the Ethics Committee. The SAGER guidelines were followed according to the nature of the study.

Declaration on the use of artificial intelligence.

The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

References

- McIntyre D, Chow CK. Waiting time as an indicator for health services under strain: a narrative review. *Inquiry*. 2020;57:1-15.
- OECD. Waiting Times for Health Services: Next in Line. OECD Health Policy Studies. Paris: OECD Publishing; 2020.
- Ala A, Chen F. Appointment scheduling problem in complexity systems of the healthcare services: a comprehensive review. *J Healthc Eng*. 2022;2022:5819813.
- Abdalkareem ZA, Amir A, Al-Betar MA, Ekhan P, Hammouri Al. Healthcare scheduling in optimization context: a review. *Health Technol (Berl)*. 2021;11:445-69.
- Xie Z, Or C. Associations between waiting times, service times, and patient satisfaction in an endocrinology outpatient department: a time study and questionnaire survey. *Inquiry*. 2017;54:1-10.
- Gutierrez A, Mendoza P. Tiempo de espera y calidad de atención en pacientes de odontostomatología intervenidos en sala de operaciones. *An Fac Med*. 2019;80:183-7.
- Kreindler SA. Policy strategies to reduce waits for elective care: a synthesis of international evidence. *Br Med Bull*. 2010;95:7-32.
- Ballini L, Negro A, Maltoni S, Vignatelli L, Flodgren G, Simera I, et al. Interventions to reduce waiting times for elective procedures. *Cochrane Database Syst Rev*. 2015;23:CD005610.
- Siciliani L, Borowitz M, Moran V, editors. Waiting Time Policies in the Health Sector: What Works? OECD Health Policy Studies. Paris: OECD Publishing; 2013.
- García TG. Análisis de Incidencias Asociadas al Tiempo de Demora Intrahospitalaria en Relación a la Gestión de Camas en un Hospital de Referencia. Mexico City: 25 Congreso Internacional de Ciencias Administrativas; 2021. Available from: <https://investigacion.fca.unam.mx/docs/memorias/2021/15.01.pdf> [Last accessed on 2024 Feb 26].
- Vos L, Chalmers SE, Dückers ML, Groenewegen PP, Wagner C, Van Merode GG. Towards an organisation-wide process-oriented organisation of care: a literature review. *Implement Sci*. 2011;6:8.
- Dimakou S, Dimakou O, Basso HS. Waiting time distribution in public health care: empirics and theory. *Health Econ Rev*. 2015;5:61.
- Zapata Gómez LJ, Restrepo Hernández Y. Factores Asociados a las Estancias Hospitalarias Prolongadas no Justificadas de Pacientes Mayores de 18 Años, en Una Institución de III Nivel de Complejidad en el Municipio de Rionegro. [Tesis de Maestría en Administración en Salud, Thesis for a Master's degree in Health Administration]. Medellín: Facultad de Medicina, Universidad Ces; 2019. Available from: <https://hdl.handle.net/10946/4692>
- Mendoza Giraldo D, Navarro A, Sánchez-Quijano A, Villegas A, Asencio R, Lissen E. Retraso del alta hospitalaria por motivos no médicos [Impact of delayed discharge for nonmedical reasons in a tertiary hospital internal medicine department]. *Rev Clin Esp*. 2012;212:229-34.
- Manzano-Santaella A. From bed-blocking to delayed discharges: precursors and interpretations of a contested concept. *Health Serv Manage Res*. 2010;23:121-7.
- Bastero NM, Martínez GL, Olivé CM. La Optimización de los Circuitos Hospitalarios en la Gestión de Camas. [Tesis de Maestría en Administración y Gestión en Cuidados de Enfermería, Thesis for a Master's Degree in Nursing Care Administration and Management]. Barcelona: Universidad de Barcelona; 2009. Available from: <https://hdl.handle.net/2445/21568>
- Sánchez HJ. Diseño de Indicadores del uso Eficiente del Quirófano en un Hospital de Segundo Nivel. [Tesis de Maestría en Salud Pública, Thesis of Master's Degree in Public Health]. Mexico City: Instituto Nacional de Salud Pública, Escuela de Salud Pública de México; 2018. Available from: <https://catalogoinsp.mx/files/tes/55576.pdf>
- Kreindler SA. Watching your wait: evidence-informed strategies for reducing health care wait times. *Qual Manag Health Care*. 2008;17:128-35.
- Lizaur-Utrilla A, Martínez-Mendez D, Miralles-Muñoz FA, Marco-Gómez L, López-Prats FA. Negative impact of waiting time for primary total knee arthroplasty on satisfaction and patient-reported outcome. *Int Orthop*. 2016;40:2303-7.
- Centro de Investigación en Sistemas de Salud. Tiempos de Espera y Productividad en Rastreadores Clínicos Seleccionados en Hospitales del Sector Público. Morelos, Mexico: Instituto Nacional de Salud Pública; 2011. Available From: https://www.dged.salud.gob.mx/contenidos/dged/descargas/estudios/if_te_11.pdf [Last accessed on 2024 Feb 26].
- Díaz-Koo CJ, Fernández-Mogollón J, Hirakata NC. Características de los pacientes con estancia prolongada en el servicio de cirugía general del Hospital Nacional Almanzor Aguinaga Asenjo. *Rev Cuerpo Med HNAAA*. 2020;13:251-6.
- NHS England. Consultant-led Referral to Treatment Waiting Times Rules and Guidance. Consultant-led Referral to Treatment Waiting Times; 2021. Available from: <https://www.england.nhs.uk/statistics/statistical-work-areas/rtt-waiting-times/rtt-guidance> [Last accessed on 2024 Feb 26].
- Anuario Estadístico del HIMFG 2019. Mexico City: Hospital Infantil de México Federico Gómez; c2024. Available From: <https://www.himfg.edu.mx/interior/bioestadistica.html> [Last accessed on 2024 Feb 26].
- Eldh AC, Rycroft-Malone J, Van der Zijpp T, McMullan C, Hawkes C. Using nonparticipant observation as a method to understand implementation context in evidence-based practice. *Worldviews Evid Based Nurs*. 2020;17:185-92.
- Busetto L, Wick W, Gumbinger C. How to use and assess qualitative research methods. *Neurol Res Pract*. 2020;2:14.
- Ruiz F, García F, Calahorra L, Llorente C, Gonçalves L, Daniel C, et al. Business process modeling in healthcare. *Stud Health Technol Inform*. 2012;179:75-87.
- Antonacci G, Lennox L, Barlow J, Evans L, Reed J. Process mapping in healthcare: a systematic review. *BMC Health Serv Res*. 2021;21:342.
- Manual Para la Implementación de un Sistema de Triage Para los Cuartos de Urgencias. Washington DC: Pan American Health Organization; 2011. Catalog Number: OPS/HSS/HP/2010/007. Available from: https://www3.paho.org/hq/index.php?option=com_content&view=article&id=5259:2011-manual-un-sistema-triage-cuartos-urgencias&Itemid=0&lang=es#gsc.tab=0 [Last accessed on 2024 Feb 26].
- Hoot NR, Aronsky D. Systematic review of emergency department crowding: causes, effects, and solutions. *Ann Emerg Med*. 2008;52:126-36.
- Izco LA. Propuesta de Mejora: Tiempo de Espera Para Ingresar del Paciente a Urgencias [Tesis de Maestría en Administración en Salud, Thesis for a Master's Degree in Health Administration]. Navarra: Universidad Pública de Navarra; 2014. Available from: <https://academica-e.unavarra.es/bitstream/handle/2454/14005/ana%20izco.pdf?sequence=4&isallowed=y>
- Flores C. La saturación de los servicios de urgencias: una llamada a la unidad. *Emergencias*. 2011;23:59-64.
- Le DX, Do HT, Bui KT, Hoang TQ, Nguyen GH, Nguyen AV, et al. Lean management for improving hospital waiting times-Case study of a Vietnamese public/general hospital emergency department. *Int J Health Plann Manage*. 2022;37:156-70.
- Marín-García JA, Vidal-Carreras PI, García-Sabater JJ. The role of value stream mapping in healthcare services: A scoping review. *Int J Environ Res Public Health*. 2021;18:951.