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Case Study

Paediatric Orthopaedic Clinic at the Children's Hospital of Western Ontario

Dr. Kellie Leitch glanced at the data on wait times collected from the patients in one of her clinics. As Chief of Paediatric[1] Orthopaedic surgery at the Children's Hospital of Western Ontario (CHWO), she was very concerned by the long times that the young patients (and their parents) were experiencing in the daily clinic. Long wait times tended to aggravate the already pent-up distress and concern that they were feeling, and parents were understandably irritated at missing significant time at work. Currently, on an average, patients were spending roughly two hours in the clinic.

Patient health was not Dr. Leitch's only concern. Clinical staff had increasingly complained about being overextended, yet budgetary pressures to reduce the cost of service continued to mount. She was not convinced that all staff was being effectively utilized, and there was an unresolved request from the Radiology department for more advanced equipment. Dr. Leitch also served on several government task forces. From these, she knew that federal and provincial policymakers were increasingly concerned with the economic impact that health-care wait times had on national economic productivity.

In a moment of weakness, Dr. Leitch recently had volunteered her clinic to hospital management as a "test case" to demonstrate that patient care could be done in a more timely fashion, without increasing costs. An objective of reducing wait times by 20 per cent was established to show meaningful improvement that would be clearly evident to patients, staff and management. A monthly executive meeting was fast approaching, and expectations were starting to run high that Dr. Leitch would present preliminary recommendations that would offer significant reductions.

[1]Paediatric orthopaedics is the branch of medicine that deals with the treatment of injuries to or conditions involving the musculoskeletal system in children.

PAEDIATRIC ORTHOPAEDIC CLINIC

As part of London Health Sciences Centre, located in the city of London, Ontario, Canada, CHWO was a large, regional health-care centre that provided specialized paediatric services to children. The population of the 10 counties forming the primary catchment area for CHWO was 1.4 million, including approximately 400,000 children. Many of the CHWO's specialty services also attracted referrals from across Ontario, as well as from neighboring provinces and states in Canada and the United States.

The Paediatric Orthopaedic Clinic was one treatment centre of CHWO that was jointly managed with the Division of Surgery (see Exhibit 1). After experiencing a severe or complex bone trauma—and following emergency treatment elsewhere—a child might be referred to the Clinic for further examination and treatment. Family doctors, walk-in clinics and urgent care centres through the catchment area also sent their young patients needing specialized care to the clinic. Patients typically returned for ongoing treatment as healing progressed.

The Clinic was open for three half-day sessions per week, Monday through Wednesday, from 8:30 a.m. to 1:00 p.m. During the remainder of the week, the facilities were used by other sub-specialties of surgery. Staffed by a surgeon, two senior resident students, three clerks and four registered nurses, the Clinic examined about 80 patients during each half-day session, of which 60 per cent were returning for a follow-up appointment (and so termed follow-up patients). In addition to the staff noted above, other medical students might spend up to one month training in the Clinic.

PATIENT FLOW AT THE CLINIC

Front Desk: Registration & Verification of Documents

The Registration desk was the first point of contact for the patients at the clinic, with the first

Manpreet Hora wrote this case under the supervision of Professor Robert D. Klassen and Dr. Kellie Leitch solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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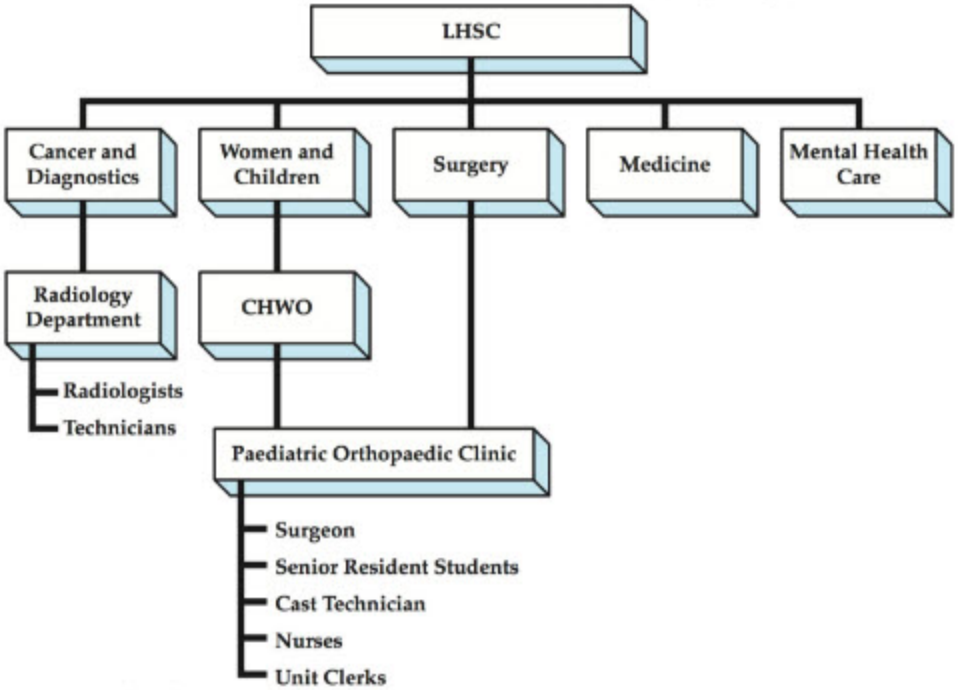
EXHIBIT 1 Functional areas in london health sciences centre (LHSC).



Source: Internal records.

appointment being scheduled for 8:30 a.m. Although the patients rarely were scheduled for an appointment after 11:30 a.m., the last patient frequently went for examination by the scheduled surgeon or senior resident student at about 12:45 p.m. Three clerks managed the Registration desk. As each patient arrived, a clerk noted the arrival against the master schedule, checked the status of the patient's insurance health card and accepted any referral documents the patient brought along. The patient then returned to the main Waiting Area while a nurse verified the status of his or her medical file.

After a patient registered, three nurses were available to verify any medical documents submitted by the patient. For example, for new patients, a nurse checked the doctor's referral and made any necessary notes on a generic form that was given to the patient. This document served as an "internal referral" form that identified which X-rays or examinations needed to be done. All patients were then sent immediately to the nearby Radiology department, located about 25 metres away from the Clinic in another part of the hospital, for an X-ray of the area undergoing treatment.

Radiology Department: Taking and Developing an X-Ray Image

Upon arrival in the Radiology department, the patients submitted the internal referral form at the front desk. This form reported specific information about which part of the body required an X-ray. Patients were required to wait in the Reception area of the Radiology department until an X-ray machine was available. When the patient's name was called, a technician escorted the patient into one of six imaging rooms. Because parental (or guardian) consent was needed for an X-ray, the technician briefly explained the procedure to the parent and child.

At this point, the X-ray machine often needed major adjustment—depending on the type of X-ray image taken of the previous patient. There were two generic types of X-rays: upper extremity, from the shoulder to the finger (to obtain images of the elbow, lower arm, upper arm, wrist, hand

and fingers); and lower extremity, from the knee to the toe (to obtain images of the knee, lower leg, upper leg, ankle, foot and toes). On average, to adjust the machine from one extremity to the other took several minutes. If the previous patient had had the same type of X-ray, the machine needed no major adjustment. The technician then helped the patient to adopt the required posture for the X-ray.

After the X-ray image was taken, the patient returned to the reception area to wait to collect the X-ray image on film. While the patient waited, two activities occurred: first, the X-ray film was developed, and second, a radiologist reviewed and annotated the image to assist later examination of the patient by a surgeon. The development of the film was an automated process, and the X-ray equipment could simultaneously take new images and develop previous images. Following review by the radiologist, the X-ray film was given to the patient, who then made the return journey to the Clinic.

In total, the Radiology department had one clerk at the front desk and three radiologists. In addition, six technicians operated six X-ray machines. The department was a shared resource in the hospital. In addition to serving the needs of the patients from the Clinic, it provided X-rays for patients from the Emergency department, the Urology clinic and the Chest clinic. Only about two-thirds of the time between 8:30 a.m. and 12:30 p.m. was allocated to the Paediatric Orthopaedic Clinic. Although patients were generally served on a first-come, first-served basis, exceptions were frequently made for some patients from Emergency who required an X-ray immediately.

Return to Clinic

After returning to the Waiting area in the Clinic, patients handed the X-ray film (including the radiologist's accompanying comments) to the Registration desk. A fourth nurse was responsible for placing the X-ray film in the patient's file. This nurse also was responsible for calling patients into particular examination rooms as rooms became available, and for preparing the rooms between patients.

Examination Room

Either the surgeon or one of the two senior residents performed the medical examination of the patient. The surgeon examined all new patients and about 30 per cent of the follow-up patients with greater complexity or complications. A senior resident examined the remaining follow-up patients. (The other senior resident accompanied the surgeon as she or he examined patients. The two residents alternated duties every other day.) Finally, if adjustments or alterations to or removal of a patient's cast were necessary, the cast technician was asked to come to the patient's examination room.

After the completion of the examination, the patient was formally discharged. Depending on the surgeon's analysis and consultation, the patient might return to the Clinic's Registration desk to schedule a future appointment. Alternatively, the patient might visit the pharmacy or the café in the hospital.

DATA COLLECTION

Although Dr. Leitch had heard of some complaints from patients of long waiting times, it was not clear to her how long patients were spending at each activity in the process. Patients were asked to help with the data collection during six half-day sessions over a two-month period. As patients arrived at the Registration desk, their parents or guardians were given a questionnaire to complete during the visit (see Exhibit 2). As each patient moved through the Clinic, the parent recorded the timing, along with her or his impressions of the process. Later, after the treatment was completed for that appointment, the patient returned the questionnaire to the Registration desk. The survey was strictly voluntary, and a total of 218 completed surveys were returned. Given the daytime hours of the Clinic, many parents were forced to take time off work to bring the patient for examination and treatment (the average annual earnings for full-time workers in London were about $44,000[2]). Aggregate data reported by the patients are tabulated in Exhibit 3, and a sample of their comments is summarized in Exhibit 4. Finally, staff was asked to estimate activity times based on their years of experience and observation (see Exhibit 5).

MOVING FORWARD

While wait times could not be eliminated altogether, Dr. Leitch believed that it was possible to signifi-

[2]Statistics Canada, 2001 Community Profiles, London, Ontario (city), Earnings and Income, available online at www12.statcan.ca/english/profil01/CP01/Index.cfm?Lang=E, accessed January 7, 2007.

EXHIBIT 2 Patient questionnaire about wait times.

Hi there! Thank you for taking the time to fill out this brief survey. The reason that we are asking you to answer these questions is that we are trying to **reduce waiting times** for our patients and need to collect some data. This will enable us to work to reduce backlogs in any areas that are currently facing them.

What is your hospital ID number? _____

1. Front Desk

a. What time did you register in the Ortho Clinic? _____

2. Radiology Department

a. What time did you go to X-ray department? _____

b. What time did you have your X-ray done? _____

c. What time did you receive your X-ray film? _____

3. Return to Clinic

a. What time did you hand in your X-ray into the Ortho Clinic? _____

4. Examination Room

a. What time did you get called into the Exam Room? _____

b. Did you see a Surgeon, Resident or Cast Technician? *(please circle all that apply.)* **Surgeon / Resident / Cast Tech**

Other Questions

a. What are we seeing you for? *(please circle one for each item)*
a. New *or* Follow-Up
b. Upper Extremity *or* Lower Extremity

b. Any other issues? _____

c. How satisfied are you with your care at the Children's Hospital? *(please circle)*

not at all satisfied				**extremely satisfied**
1	2	3	4	5

d. Do you have any comments or suggestions? _____

Source: *Internal records.*

cantly reduce the total time that patients and their parents spent in the Clinic. Staff and patients had offered a number of suggestions, which had been narrowed to three options. First, both patients and nursing staff had observed that patients in the Radiology department were all too often made to wait when Emergency patients had to be X-rayed on short notice. If four X-ray machines (and the required technicians) could be dedicated to the Clinic when it was open, these interruptions could be avoided.

The Radiology department presented a second option: the purchase of an additional X-ray machine. It was difficult to precisely calculate the reduction in waiting time this extra machine would effect, but one estimate was that patients' wait time in Radiology's Reception area would be cut by 25 per cent. The capital cost for a new machine was about $30,000, and typically a machine required about $5,000 in annual maintenance costs. The Radiology department would also need another qualified technician to operate the machine, at an annual cost of about $75,000.

Finally, Dr. Leitch wondered if better scheduling of patients' appointments and assignment of staff in the Clinic might offer benefits. She was unsure if grouping certain types of patients would reduce the waiting times at various activities in the Clinic. As

EXHIBIT 3 Patients' reported times spent in the clinic[1].

Steps[2]	New Patients[3]	Follow-up Patients	
	average (minutes)	average (minutes)	standard deviation[4] (minutes)
1. Front Desk	30	25	4
2. Radiology department	58	58	22
3. Return to Clinic	3	3	2
4. Examination room	38	33	19

Notes:
1. Statistics are based on 218 patients over six Clinic sessions.
2. All steps reported by patients include wait and activity time.
3. On average, 40% of total appointments are new patients.
4. Standard deviations were similar for new and follow-up patient times.

Source: *Internal records.*

EXHIBIT 4 Sample of comments from questionnaire respondents.

The "Good"
1. "You offer excellent service with pleasant demeanor. Thank you!!"
2. "Thank you—excellent care! Worth the wait for the expertise and interest in patient & kindness shown"
3. "Excellent Care!!!"
4. "Staff are friendly and quite helpful"
5. "Staff are informative + friendly for the most part—wait was a bit long, but not unreasonable given the high volume of patients to be seen"

The "Mixed"
1. "Professional staff but too long waiting periods. Where the patient is admitted create a schedule (e.g., 920 X-ray, 945 consultation) to avoid long waiting times and full waiting rooms, frustration and confusion"
2. "Understand reasons for wait times but difficult for a 3-yr-old to understand"
3. "Have patients from out of town get X-rays taken locally and bring them when they come"
4. "Previous visits to this clinic we have waited up to 6 hrs. Coming here (to the 'ortho clinic') is definitely a bad experience. We were satisfied with the Doctor though!"
5. "If we did not have to wait so long with each visit I would have circled 5. The nurses and doctors are friendly and informative and have done an excellent job on our son's arm. The staff are also very helpful. The waiting time is ridiculous"

The "Not So Good"
1. "Try to make the waiting time less and parking not expensive"
2. "People from long distance. I question the need for the frequency of appointments when children are missing school and parents are losing wages"
3. "Need your own X-ray area; 5 waiting periods!"
4. "I'm losing one day of work for 15 min consultation, and I'm losing money. Can you guys look somewhere where health care works? USA for ex, Germany? I won't mind to pay because I'm paying anyway twice: taxes and what I don't make when I'm working"

Source: *Internal records.*

EXHIBIT 5 Staff estimates of processing time per activity.

Activity	Staff	Availability	Average Processing Time (*minutes per patient*) New Patient	Follow-up Patient
1. Front Desk				
a. Registration	3 clerks	8:30 a.m. to 11:30 a.m.	5	5
b. Verification	3 nurses	8:30 a.m. to 12:45 p.m.	11	5
2. Radiology Department[1]				
a. X-ray imaging	6 technicians	8:30 a.m. to 12:30 p.m.	11	9
b. Development of X-ray	—	8:30 a.m. to 12:30 p.m.	7	7
c. Diagnostic reading and comments	3 radiologists	8:30 a.m. to 12:30 p.m.	5	4
3. Return to Clinic				
Direct patients/filing/ exam room prep	1 nurse	8:45 a.m. to 1:00 p.m.	2	2
4. Examination Room	1 surgeon[2]	8:45 a.m. to 1:00 p.m.	7	4
	2 senior residents[3]	8:45 a.m. to 1:00 p.m.	—	7

Notes:
1. Two-thirds of the Radiology department's time is available for the Clinic.
2. The Surgeon examines all the new patients and 30% of the follow-up patients.
3. A Senior Resident examines the follow-up patients not seen by the Surgeon. Only one Senior Resident is available each day to see patients.

Source: *Internal records.*

she contemplated her next steps, Dr. Leitch knew that any actions she proposed would come under close scrutiny. And, in the event her recommendations improved wait times in this "test case" at her own Clinic, could they be applied elsewhere in the hospital?

Discussion Questions

1. What is the activity utilization rate at each step in the process of providing care? What is the direct labor utilization?
2. How is variability affecting capacity at the clinic? Can the sources of variability be controlled or eliminated? How?
3. Where is the bottleneck in the process? What other capacity constraints are there in the clinic?
4. What is the economic cost of wait times?
5. What improvements can be considered? Why?