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PATIENT SHCEDULING IN THE IWK'S EYE CARE CENTRE

The IWK's division of Ophthalmology currently provides clinical service to over 8000 patients per year. Eye Care Centre patients were experiencing long waits between registration and their ophthalmologist appointment. This paper details the development of a patient scheduling methodology that utilizes "just-in-time" philosophy to reduce the wait time experienced by Eye Care Centre patients.

Introduction

The IWK Health Centre is located in Halifax, Nova Scotia and provides quality care to children, youth, women, and families in the Maritime Provinces and beyond. As a tertiary care health centre dedicated to education, research, family centered care and health promotion, the IWK promotes a mission of caring, learning and advocacy. First and foremost, staff, volunteers and partners are committed to helping children, youth and women in the Maritimes be the healthiest in the world [2].

Each year, approximately 5,000 babies are delivered at the IWK; Maritime children, women, youth and newborns spend approximately 260,000 days as inpatients or in clinics at the Health Centre. The IWK has 101 adult beds, 110 beds for babies and 121 beds for children. The Health Centre employs more than 2,400 staff and has over 750 volunteers. There are 173 active medical and dental staff who are experts in a wide range of specialties including pediatrics, surgery, psychiatry, dentistry, laboratory medicine, diagnostic imaging, anaesthesia, obstetrics, gynaecology and family medicine [2]. The IWK is also a world-class research facility studying disorders and disease affecting children and women, and services provided to mental health and addictions patients [2].
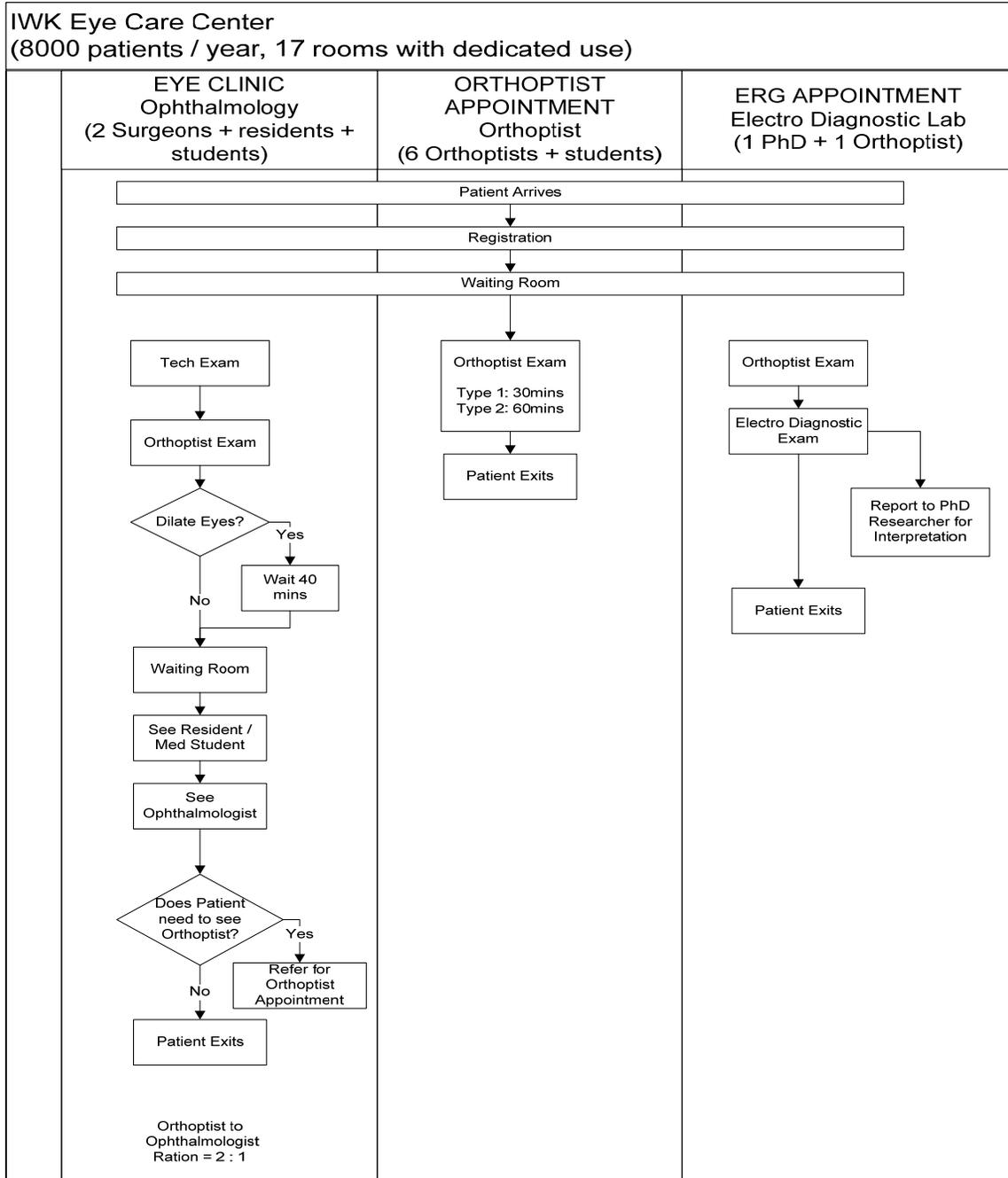
The IWK's division of Ophthalmology currently provides clinical service to over 8000 patients per year. In addition, another 5,500 active files have been referred to the IWK Eye Care Team as a result of the closure of a local, community-based pediatric ophthalmologist practice. These services are not offered elsewhere in the Maritime region. Patients are served by the following Eye Care Centre staff:

- Ophthalmologists (two surgeons as well as fellows and residents whose numbers vary with time);
- Orthoptists (six orthoptists as well as students whose numbers vary with time);
- Electro Diagnostic staff (one PhD, as well as one orthoptist); and
- Eye Care Centre clerical staff (booking and registration clerks).

Eye Care Centre Patient Flow

The flow diagram shown in Figure 1 shows the flow of patients through Eye Clinic in the IWK Eye Care Centre. Patients enter the clinic and will have one of three different types of appointment, depending on what type of clinic is being held.

Figure 1: Eye Care Centre Patient Flow

IWK Eye Care Center
(8000 patients / year, 17 rooms with dedicated use)

EYE CLINIC Ophthalmology (2 Surgeons + residents + students)	ORTHOPTIST APPOINTMENT Orthoptist (6 Orthoptists + students)	ERG APPOINTMENT Electro Diagnostic Lab (1 PhD + 1 Orthoptist)

Patient Arrives

Registration

Waiting Room

EYE CLINIC:
Tech Exam → Orthoptist Exam → Dilate Eyes?
- Yes → Wait 40 mins → Waiting Room
- No → Waiting Room
→ See Resident / Med Student → See Ophthalmologist → Does Patient need to see Orthoptist?
- Yes → Refer for Orthoptist Appointment
- No → Patient Exits

Orthoptist to Ophthalmologist Ration = 2 : 1

ORTHOPTIST APPOINTMENT:
Orthoptist Exam (Type 1: 30mins, Type 2: 60mins) → Patient Exits

ERG APPOINTMENT:
Orthoptist Exam → Electro Diagnostic Exam → Report to PhD Researcher for Interpretation → Patient Exits

Problem Statement

Waiting patients are not considered work-in-progress in most ambulatory clinics, and therefore their "cost" is not an active concern. The result is clinics are over booked in the morning and either under booked or late in the afternoon. Although scheduling patients in this fashion results in high physician utilization throughout the day, it can cause extensive waits for patients.

Patients of the Eye Care Centre clinics at the IWK Health Centre patients were experiencing long waits between registration and their ophthalmologist appointment. All Eye Clinic patients "checked in" by an orthoptist; some required a 40-minute wait while their eyes dilated. This information was not considered when scheduling patients, resulting in a situation where patients arrive in consistent increments but are ready for the ophthalmologist sporadically. As a result of patients being ready sporadically, the ophthalmologists learned to wait for a buffer of "ready" patients before starting their day. This buffer, in conjunction with the variation in preparation time, results in extensive waits for patients.

Patient Time in System Study

To reduce patient wait time between registration and specialist examination baseline measures, such as how long patients currently wait and the number of patients seen in a clinic, had to be determined. Thus, a patient time in system study was required.

To prepare for the study, memoranda and an example of the data collection form to be used were sent out to Eye Care Centre staff. The memorandum emphasized patient confidentiality and assured physicians that the study was for statistical purposes only. A pilot run was conducted on June 26, 2006 with positive results experienced in regards to data collection form fill rate. The actual study was conducted over a period of three clinic days during the first week of July 2006.

Execution

Data collection forms, or "passports," were issued with patient charts on the days the study was conducted. Progress checks were performed at various times throughout the day; however, the success of the study relied on the co-operation of the Eye Care Centre staff to ensure that the data collection forms were filled out correctly.

Results

Upon the study's completion, all data collected were input into spreadsheets from which the ratio of patient wait time to service time was determined. The results for one of the clinic days observed are shown in Table 1.

Table 1: Patient Time in System Study Results

	Time (Minutes)			
	Mean	**Median**	**Max.**	**Min.**
Registration	0:04	0:03	0:11	0:02
Wait for Orthoptist	0:04	0:01	0:30	0:00
Orthoptist Examination	0:24	0:25	1:10	0:00
Dilate	0:40	0:40	0:50	0:30
Wait for Resident	0:09	0:00	0:43	0:00
Resident Examination	0:07	0:05	0:30	0:00
Wait for Ophthalmologist	0:26	0:20	1:20	0:04
Ophthalmologist Examination	0:10	0:09	1:31	0:00
Min. Waiting for 10 Minutes with Specialist	6.46	6.17	15.93	1.14

As shown, the mean time a patient waits for 10 minutes of service time with a specialist was 6.46 minutes. This ratio was higher than the project sponsor and Eye Care Centre Core team desired. This ratio of wait time to service time results in significant patient waits and disruptions in patient flow. A visual display of patient flow through the clinic on the same day is shown in Figure 2.

Figure 2: Patient Time in System Visual Result
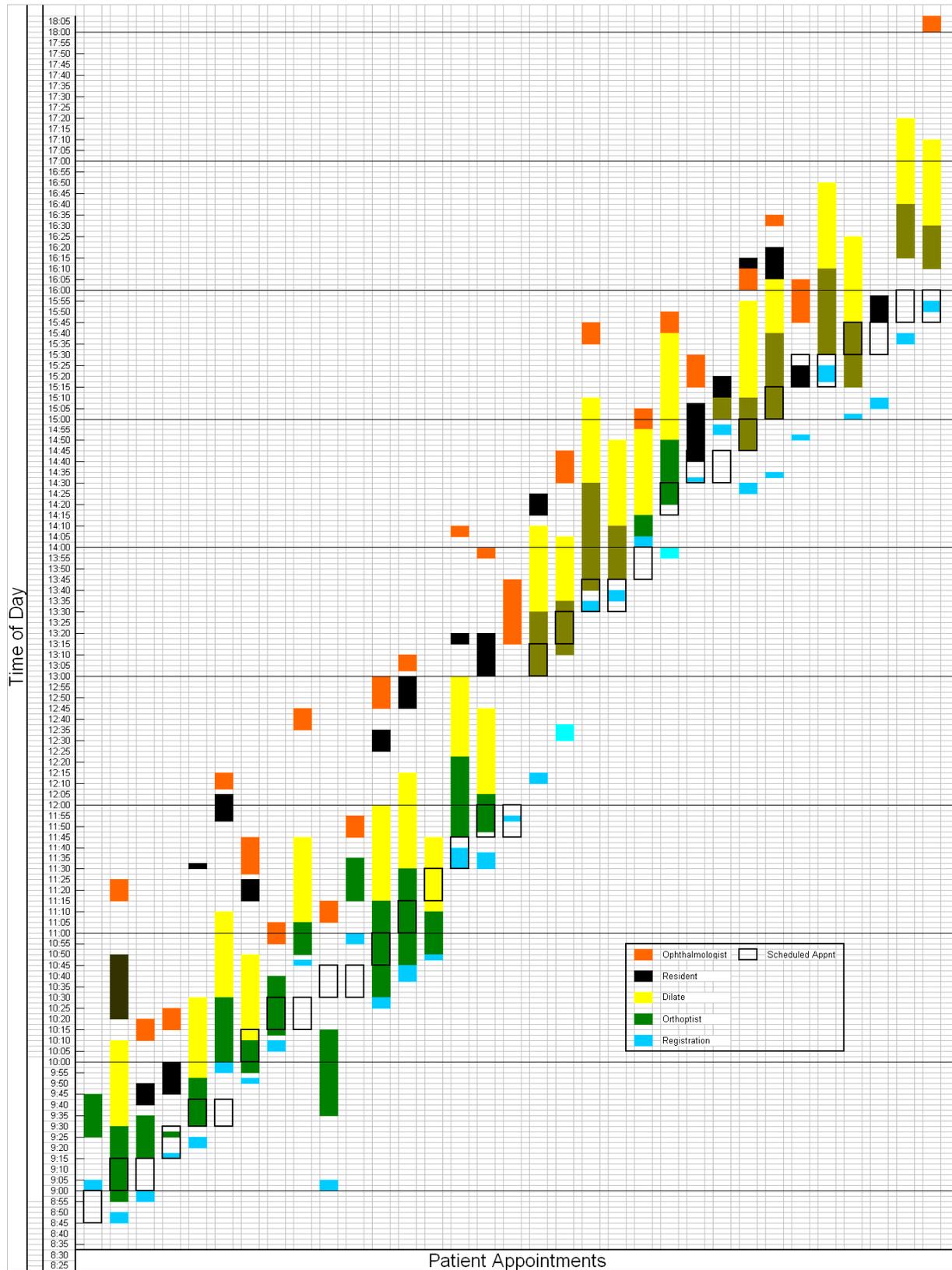
From Figure 2 it can be seen that even though patients are scheduled to be examined by the ophthalmologist every 15 minutes, patients are ready for their examinations at sporadic times. This is due to the fact that the time required to prepare the patient for the ophthalmologist (e.g. registration, orthoptist examination, and possible dilation) is not considered when scheduling.

Solution Methodology

The patient time in system study indicated that a new patient scheduling methodology was required for the Eye Care Centre. The current scheduling method did not consider the time required for preparing patient. This resulted in patients being ready to see the ophthalmologist at sporadic times, instead of the 15-minute intervals that are scheduled. To reduce patient wait times, preparation time must be considered when scheduling patients into Eye Clinic. If information regarding preparation time is included, patients can be scheduled in such a way that they arrive to the Eye Care Centre at sporadic times, but are ready for examination by the ophthalmologist in fifteen minute intervals. This methodology is known as "Just-In-Time", or JIT, planning and scheduling.

Just-In-Time Planning and Scheduling Literature Review

According to Silver et al [3], the goal of the Just-In-Time (JIT) system is to "remove all waste from the manufacturing environment, so that the right quantity of products are produced in the highest quality, at exactly the right time (not late or early), with zero inventory, zero lead time, and no queues." Waste is considered to be anything that disrupts the flow of products and does not contribute to making or selling them. The JIT system also seeks to eliminate all uncertainty within the production process. JIT is "appropriate in a high-volume, repetitive manufacturing environment [3]." Although the IWK Eye Care Centre is not a manufacturing environment, but a service environment, it is desirable to reduce in-clinic patient wait time (work-in-progress). Silver et al [3] state that one of the benefits of JIT is a reduced work-in-progress inventory. Another benefit is short lead times. Thus, since this is what is desired in the Eye Care Centre, JIT serves as a useful paradigm.

Eye Clinic Just-In-Time Patient Scheduling

Although JIT is primarily utilized in manufacturing environments, the nature of Eye Clinic operations presents an opportunity for its application in a service environment. Under this assumption, patients will be considered a product that is to be manufactured. The Eye Clinic will be considered a production (or assembly) line. The product (patient) is considered to be "manufactured (serviced)" upon completion of the ophthalmologist examination and after which the patient the system (Eye Clinic). However, to achieve a balanced production line, it was first necessary to quantify the time necessary to complete each process the product requires along the production line (i.e. how much preparation time the patient requires before being examined by the ophthalmologist).

Eye Clinic Patient Appointment Types

There are two categories of patients that are examined in Eye Clinic: new and return. All patients register upon arrival to clinic, and are then "checked in" by an orthoptist. This orthoptist examination consists of tests that provide the ophthalmologist with information regarding the patient's condition. Orthoptist examinations for new patients require 30 minutes [1]. All new

patients are dilated during the orthoptist exam and require 40 minutes dilation time [1]. Once dilation is complete, the patient is ready for his/her 15 minute ophthalmologist examination.

The time required for a return patient orthoptist examination is determined during the patient's previous examination and can be 10, 20, or 30 minutes [1]. The ophthalmologist determines whether a patient will need to be dilated for his/her next Eye Clinic appointment [1]. All return patients are scheduled for a 15-minute ophthalmologist examination.

Thus, all patients can be categorized into one of six appointment types. These appointment types are shown in Figure 3. The method used to collect the preparation time information required to categorize a patient appointment is detailed in the next section of this report.

Figure 3: Eye Clinic Patient Appointment Types
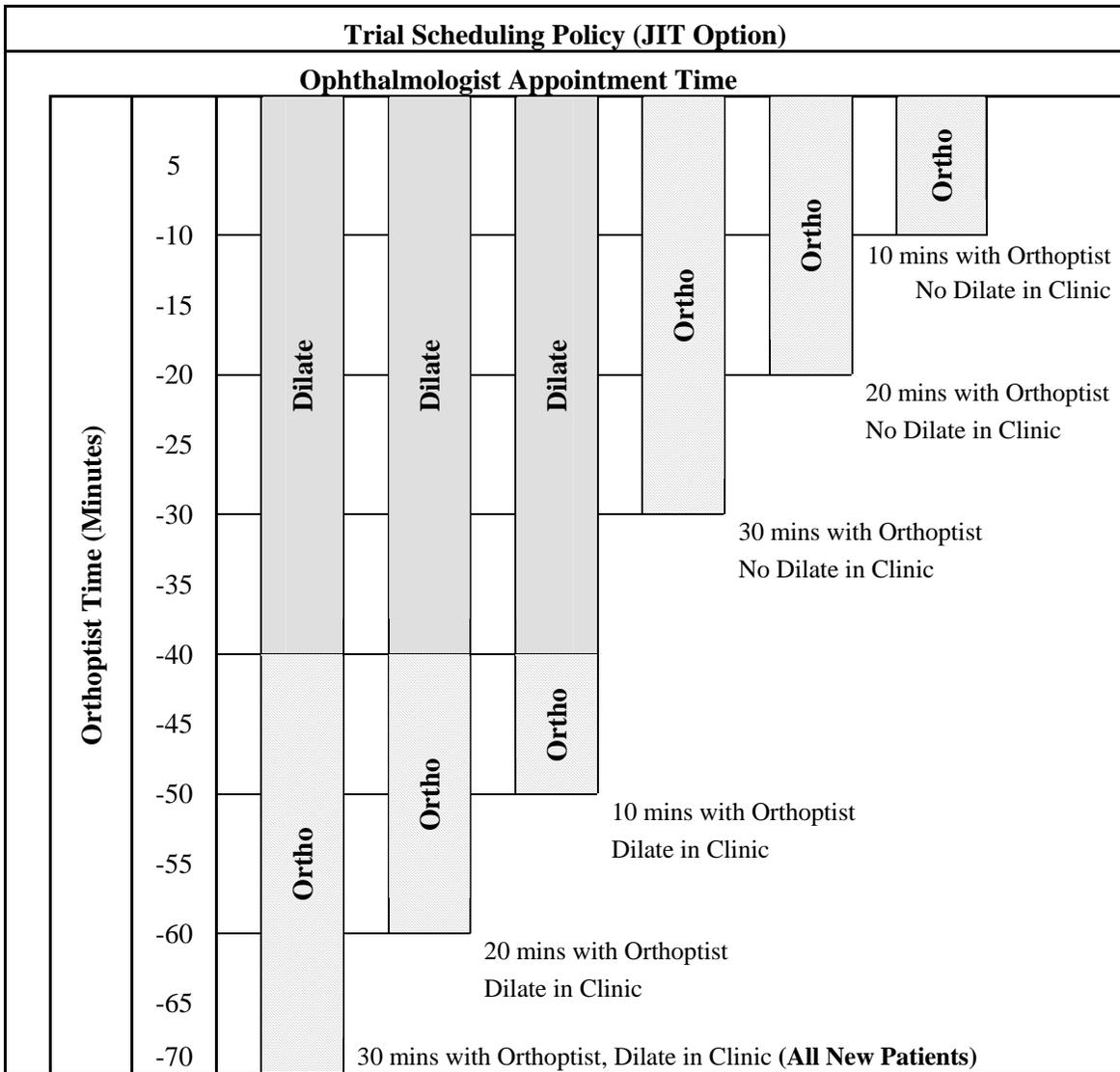
Not shown in Figure 3 is that new patients require a 10 minute registration time slot and return patients require a 5 minute registration slot.

It should be noted that any one of the appointment types shown in Figure 3 could also be considered a "time plus" appointment. The majority of Eye Care Centre patients are children, and due to the nature of children, patients are sometimes not as co-operative as desired. If a patient is particularly difficult to examine, he/she will be considered as "time plus." A "time plus" appointment offers the same services as a normal appointment, but the time allotted for each service is doubled to ensure that all examinations can be successfully completed.

Execution of Just-In-Time Patient Scheduling

To successfully execute the JIT patient scheduling system in the Eye Clinic, all relative information required to determine the patient's appointment type must be accessible to the scheduling clerk. Thus, a booking slip was designed and will be attached to patient charts. The booking slip is shown in Figure 4.

Figure 4: JIT Patient Scheduling Booking Slip

-------- Eye Clinic Booking Slip --------

| Orthoptist Section |
| --- |
| Estimated Check in Time _____ |

Ophthalmologist Section		
Dilate(in Clinic):	Yes	No
Orthoptist Check In:	Yes	No
Time Plus Patient:	Yes	No

This slip will be completed by the appropriate medical specialists and sent back to the scheduling clerk. The clerk will then determine the appointment type the patient requires. Once determined, the clerk will schedule the patient's appointment with the ophthalmologist, and then using the amount of preparation time the patient requires determine the time the patient is required to come in for registration. For example, if a patient is scheduled to see the ophthalmologist at 10 a.m., and requires a 40 minute dilation time, 20 minute orthoptist examination, and 5 minute registration time, the patient should be asked to arrive in clinic $40 + 20 + 5 = 65$ minutes before his/her scheduled 10 a.m. ophthalmologist examination time. This means that this specific patient should arrive in clinic for registration at 8:55 a.m. This registration time is what patients will now be provided when notified for an appointment. Using this scheduling methodology, patients will arrive in clinic to be registered at sporadic times, but will be ready to be examined by the ophthalmologist every 15 minutes, or, "just-in-time."

Just-In-Time Patient Scheduling Trial

A trial date for the proposed JIT scheduling methodology was set for August 28, 2006. Since booking slip information for the patients selected for clinic on that day was not yet available, the Eye Care Centre core team (including medical specialists) examined each patient's history and individual appointment types were determined. Using the JIT scheduling methodology, a visual schedule of Eye Clinic for August 28, 2006 was developed and is shown in Figure 5.

Figure 5: Eye Clinic JIT Visual Schedule
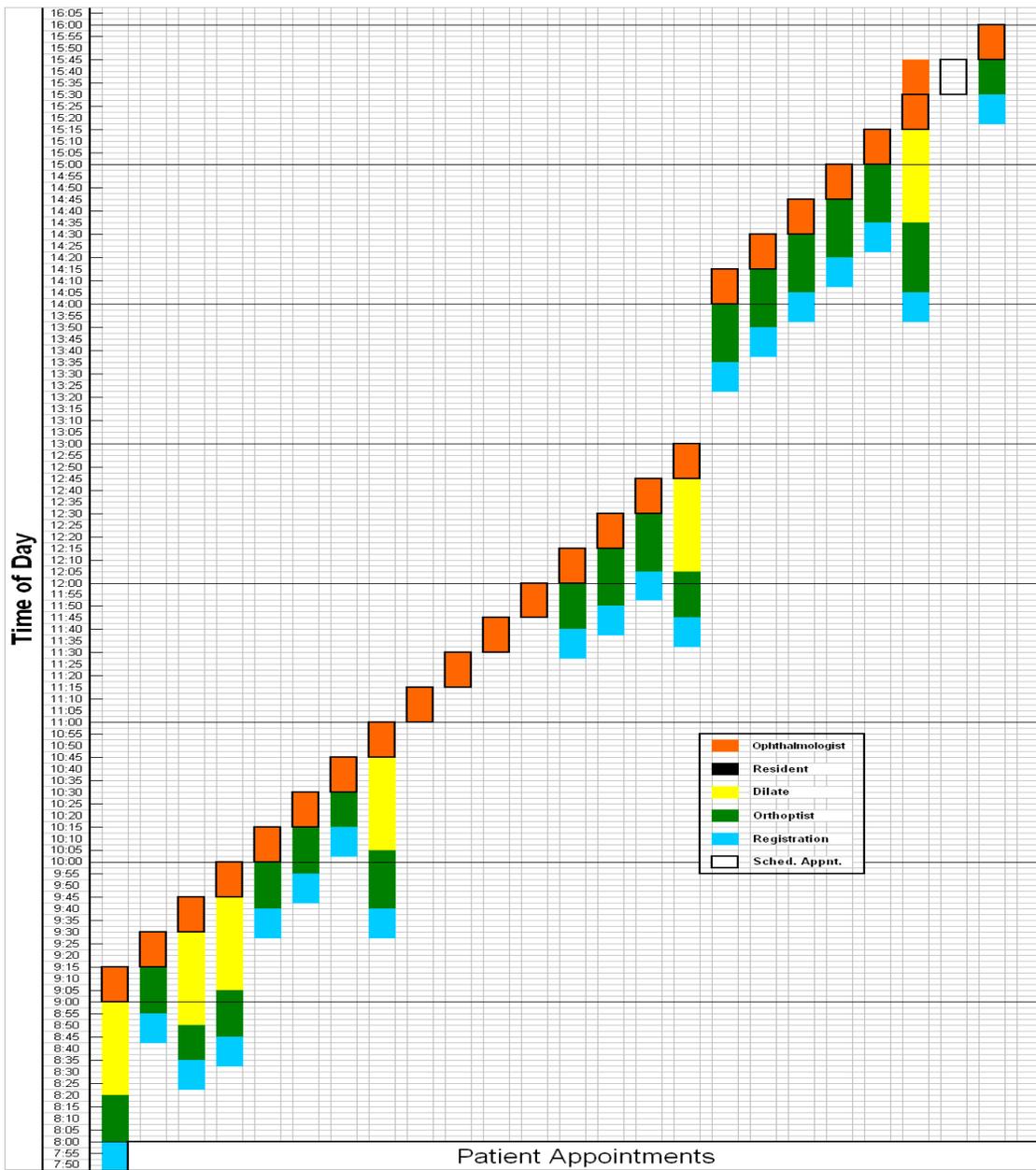
Recommendations

Based on the data collected and the research conducted, the following recommendations were made to the IWK Eye Care Centre:

- Provide an information session for all Eye Care Centre staff to present the "Just-In-Time" scheduling methodology and discuss how it will affect the Eye Clinic's operations;
- Train the Eye Care Centre's scheduling clerk to use the "Just-In-Time" scheduling methodology;
- Develop a standard procedure document for the scheduling clerk outlining the steps required to schedule patients using the "Just-In-Time" methodology;
- Implement the "Just-In-Time" patient scheduling methodology for the Eye Clinic; and
- Periodically review the standard procedure document and "Just-In-Time" scheduling methodology to ensure they conform to Eye Care Centre operations.

If these recommendations are implemented, it is believed that the IWK Eye Care Centre will experience a reduction in patient wait times between registration and specialist examination, as well as fewer disruptions in patient flow.

Conclusion

The objective of this study was to reduce patient wait time between registration and specialist examination through improvements to patient scheduling and flow. Based on the observations and data collected, it was determined that to achieve this objective a new patient scheduling methodology was required for the Eye Care Centre. A new scheduling methodology based on "Just-In-Time" philosophy was devised, proposed, and trialed. Results from the trial date were positive; reductions in patient wait times were realized and disruptions in patient flow were minimal. Three additional trials were conducted in October 2006. Based on the results of these trials, Eye Care Centre staff has decided to implement the "Just-In-Time" scheduling methodology for all Eye Clinics.

References

[1]   E. Hahn, Private Communication, 2006.

[2]   IWK Health Care Centre, < http://www.iwk.nshealth.ca/allaboutus/index.cfm>, Accessed August 31, 2006.

[3]   E. Silver, D. Pyke, and R. Peterson, *Inventory Management and Production Planning and Scheduling*, Third Edition, John Wiley & Sons Inc., 1998.