An Evaluation of an Appointment Scheduling System in an Ophthalmology Clinic

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Abstract

Appointment scheduling systems are often not appropriate based on the patient population's needs and the nature of the medical specialty. Timeliness, access, and efficiency are compromised if a health system's scheduling model is not well-suited for its environment. These compromises can be detrimental to the health of patients, the workload burden on providers, and the financial viability of health systems. Accessibility to healthcare services poses public health concerns, as some populations face added barriers when seeking timely care. An outpatient ophthalmology clinic was evaluated and proved to have a scheduling model that was causing a number of concerns. Accounting for the nature of the medical specialty, the variation in appointment lengths, and the needs of patients, a hybrid scheduling model with carve-out access accompanied by an electronic health record timing data is more appropriate for the outpatient ophthalmology clinic.

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1.0 Introduction

Appointment scheduling is instrumental when providing timely care to patients. Timeliness effects health outcomes and is an important factor for patient satisfaction and quality. Timeliness of access to healthcare resources varies widely in the U.S. and there are no specific guidelines or research that represent a standard of timeliness (Military Medicine 613). A survey that was conducted in the five specialties of cardiology, dermatology, obstetrics-gynecology, orthopedic surgery, and family medicine found that the average wait time to get a new patient appointment was 24.1 days in 15 major metropolitan areas. This is a 30% increase from 2014 to 2017 (MGMA).

Overscheduling and inefficient scheduling also leads to provider burnout and dissatisfaction among employees. The Physicians Foundation reported that 81% of physicians described themselves as overextended or at full capacity (MGMA). One root cause of provider burnout can be contributed to the implementation of electronic health records and the era of "over documentation." The Oregon Health and Science University found that their ophthalmologists see three to five percent fewer patients than before electronic health record implementation because they spend 40% more time on each case (Hribar et al.). Increasingly, patients find it difficult to navigate through the healthcare system and locate a provider that is accessible and in-network. Many patients revert to urgent care and walk-in clinics for ease and accessibility. However, these options may increase patients' financial burden and stress, while not being optimal for chronic conditions and coordination of care.

In addition to waiting for a scheduled appointment, patients often experience wait times that delay their appointment for hours. These types of access delays can be categorized into

indirect and direct waiting time. Indirect waiting is the wait time from when the patient requests an appointment to the time of that scheduled appointment. Direct waiting time is the wait time from the appointment time and the time when the patient is actually seen by a provider. In walk-in and urgent care settings, patients only experience direct waiting. Indirect waiting is typically significantly more harmful than direct waiting, however excessive indirect waiting can pose a serious safety concern (Denton and Gupta 801). A case study found that appointments with an indirect waiting time of less than a week had a 25% no-show or cancelation rate. This rate increased to 46% when the indirect waiting time was one-to two-weeks, and further increased to 53% when the indirect waiting time was more than three weeks (MGMA). In 2014, the Veterans Affairs (VA) Phoenix Health Care System left 1700 veterans that requested an appointment off the mandatory electronic waiting list for perceived low acuity. As a result, 40 veterans died while waiting for an appointment. The VA documented poor quality of care and this drew attention to the importance of timeliness, which has been overlooked when establishing the operations of many healthcare facilities (Kaplan 1449).

In “Transforming Health Care Scheduling and Access: Getting to Now,” the Institute of Medicine (IOM) state that the root causes of poor timeliness include mismatched supply and demand, a provider-focused approach to scheduling, outmoded workforce and care supply models, priority-based queues, care complexity, reimbursement complexity, financial barriers, and geographic barriers. The IOM established the following basic principles that address the root causes of poor timeliness:

-Matching supply with projected demand through formal, ongoing evaluation.

- Immediate engagement and exploration of patient's needs, at the time of their inquiry.

- Patient preference on the timing and nature of care, invited at inquiry.

- Need-tailored care with reliable, acceptable alternatives to clinician visits.
- Surge contingencies, or provisions for accommodating patients' acute clinical problems or questions that cannot be addressed in a timely manner.
- Continuous assessment of changing circumstances in each care setting.

These basic principles should be applied to any initiative to improve or establish a scheduling system for all specialties in healthcare (Kaplan 1449). Scheduling systems affect access, efficiency, and quality, which can lead to worsened healthcare experiences for both employees and patients. In turn, healthcare systems will find themselves at capacity prematurely and will have to overcompensate for the unnecessary utilization of resources. Medical specialties, access levels, scheduling models, and advanced scheduling solutions will be examined to determine an appropriate scheduling system for an outpatient ophthalmology clinic to address the effects of unsuitable scheduling.

2.0 Literature Review

2.1 Scheduling by Medical Specialty

It is important to note that primary care, specialty care, and elective surgery appointment scheduling are all different due to the environment and nature of the care being received. Although this essay will evaluate an outpatient ophthalmology clinic, is it important to have a general understanding of the nature of other specialties because some specialties may not completely fit within one category and will possess characteristics from different environments. Urgent and emergency cases are unscheduled and unique in their own respect because they are usually prioritized and can be immediately life-threatening.

The time needed for primary care is the most predictable because most patients request services that are performed within a certain time frame. Standard primary care clinics allot equal time slots that are divided by available provider hours. This satisfies the vast majority of patients' needs and complex or chronic patients can be assigned multiple time slots if their services will take longer than the allotted time slot (Denton, Gupta 801). This does require medical knowledge and visit reasons upon the time of scheduling, and the front-line staff scheduling these patients should have an accurate capability to determine the length of time needed for each unique patient. The main issues that arise from primary care appointments are due to restrictions on how time slots can be filled and patient preferences on dates or times. Examples of likely restrictions are limitations on the number of new patient appointments per hour and physical examinations in any given day. Additional challenges arise when patients and providers have different perceptions on the urgency and severity of different conditions (Denton,

Gupta 802). Based on resources and the provider's availability, a primary care practice may schedule an appointment for a patient with chronic back pain in a week, but the patient might view the severity of their condition as urgent and will be dissatisfied with managing their pain untreated for that amount of time.

There is tremendous variation for services in specialty care clinics. The patients' diagnoses and pre-existing conditions account for much of the variation, but a significant amount of the variation is due to the rate of urgent appointment requests that happen soon after the condition's onset (Denton, Gupta 801). For example, neurosurgeons generally must see a patient within 24 hours if they show symptoms of a cord compression, whereas such urgency may not happen as often in a dermatology practice. Specialties with higher rates of urgent requests may block more time on their schedules for these types of cases, which in turn, reduces the available appointments for new patients and less emergent cases. If these emergency appointment blocks are not filled by the day before the clinic day, then the clinic can open these blocks to regularly schedule patients. This does require additional work on schedulers and front-line employees, as it adds another layer of verification and scheduling management.

Elective surgical scheduling can be complex when considering all the factors that effect on-time case starts in an inpatient setting. The surgery must be scheduled within the physician's operating room block time and the necessary equipment must be available during this time (Denton and Gupta 804). A typical surgical team includes a physician, charge nurse, surgical technician, anesthesiologist, and can often include additional nurses and medical residents or fellows. Each member has an essential role in the surgical process, and it can be difficult to have each person available at the desired start time. The surgical team working in the operating rooms are only one part of the treatment process and the caregivers in the preoperative and

postoperative areas must also fulfill their roles to ensure the patient's safety throughout the procedure. Prior to the day of surgery, the primary physician's outpatient office is responsible for scheduling pre-surgery appointments for clearances and examinations to confirm the patient's surgical eligibility. This presents challenges because clearances expire within certain timeframes and are dependent on other medical practices' ability to see the surgical candidates. For example, a knee replacement candidate with a pre-existing condition of chronic obstructive pulmonary disease must receive clearance from their pulmonologist 15 days before the scheduled surgery. If the pulmonologist cannot schedule the patient within this timeframe, the surgical date and following appointments must be changed. This leads to patient dissatisfaction, worse health outcomes, higher expenses, and overall inefficiency.

2.2 Access Levels

Based on the specialty's environment, practices should decide the most appropriate level of access to meet the needs of patients. The three common levels of access are advanced, carve-out, and traditional. Advanced access is when 65%-90% of appointments are reserved for walk-ins, when the remaining appointments are prescheduled. The maximum indirect waiting time is usually set to two days (Vidal et al. 3). Prescheduled appointments are usually return patients or unique patients that require some degree of preparation before being seen.

Carve-out access is when clinics divide appointments between walk-ins and prescheduled to any degree less than advanced access. The maximum indirect waiting time varies between five to ten days (Vidal et al. 3). Many clinics in the U.S. now have some variation of carve-out access, but very specialized clinics with high demand tend to not adopt any level of carve-out.

Traditional access is when all appointments are prescheduled. The indirect and direct waiting times are the most variable in this type of access, sometimes exceeding 30 days of indirect waiting and more than three hours of direct waiting time (Vidal et al. 3). Since traditional access leaves no room for unscheduled care, double-booking and extending the clinic days are ways providers accommodate patients. These methods generate extended periods of direct waiting time, contribute to employee burnout, and are costly when having to pay staff over-time. A study evaluating all three types of access showed that clinics with advanced access reported better overall quality scores (Vidal et al. 8). However, advanced access may not be the most appropriate level if a great deal of preparation is needed for a significant amount of the patient population. For example, advanced access is well suited for primary care clinics, but not for specialties like neurosurgery that usually require advanced imaging and insurance verification before the scheduled appointment.

2.3 Common Scheduling Models

Understanding the nature of different specialties and access levels is important to determine the appropriate scheduling model. The most commonly used scheduling models are centralized scheduling, decentralized scheduling, and hybrid scheduling. In a central scheduling model, patients request appointments for multiple clinics through one interaction that is usually a phone call. The schedulers have the capability to schedule patients for all clinics and see the availability of providers across departments. The advantages of a centralized scheduling model are that patients only have to contact one scheduler, available capacity is used efficiently, and there is shorter processing and waiting time. The purpose of this scheduling model is to offer

uniformity, but an advanced information system and highly skilled, robust schedulers are necessary for a high-performing central scheduling center (Aslani and Zhang 787).

In a decentralized scheduling model, schedulers only have the ability to schedule appointments for one department or clinic. If a patient requests multiple appointments, then the patient must contact each clinic individually. This allows the schedulers in each clinic to use their availability more efficiently. A decentralized model doesn't support a high number of patients with multiple appointments since the need for increased coordination and communication will increase cost and conflicts between clinics (Aslani and Zhang 788).

A hybrid scheduling model combines both centralized and decentralized models. Some clinics schedule appointments independently, while other clinic appointments are scheduled through central scheduling. For these reasons, a hybrid model shares the characteristics and advantages of both models. The hybrid model can function appropriately without an advanced information system and highly skilled workers (Aslani and Zhang 788). There may be communication gaps between clinics under the centralized and decentralized models, and patients with multiple appointments may have to contact several clinics to schedule appointments. In a case study published by the Journal of Industrial Engineering and Management, it was found that a centralized scheduling model is the most appropriate when there is a high volume of patients with multiple appointments (more than 70%) and a hybrid scheduling model is best for a medium volume of patients with multiple appointments (25%-50%). A decentralized scheduling model is best for low volumes of patients with multiple appointments (less than 15%) (Aslani and Zhang 785).

2.4 Advanced Scheduling Solutions

Electronic health record (EHR) timing data are the timestamps in health IT systems that evaluate the difference between patient arrivals, scheduled appointment times, and time they are seen by a provider. This timing data can be used to simulate the performance of scheduling models that are most appropriate for the practice. The simulations can test the proposed scheduling model before implementation to analyze how accurate and adept the model is to real-life situations. Scheduling models constructed using EHR timing data usually suggest the shortest appointment types in the beginning of the day and the longest towards the end of the clinic. This way, direct waiting time is minimized, and providers won't feel rushed when treating more complex patients in the middle or end of the clinic day. A study at the Oregon Health & Science University piloted a new scheduling model based on EHR timing data in an outpatient ophthalmology office. The study found that complex templates that were deemed optimal were hard for clinic staff to follow based on the competing priorities of the clinic. However, it was able to simplify the complex scheduling template (Hribar et al.). The complex scheduling model didn't account for the clinic's need to fill all appointment slots and accommodate urgent walk-in patients. The new model did significantly improve direct waiting time and session lengths when followed correctly (Hribar et al.).

Hash polynomial two factor decision tree (HP-TDT) is a scheduling model that minimizes response time based on Smart Health Care (SHC), Internet of things (IoT), and Open Address Hashing (OAH) concepts. Smart Health Care is technologies' ability to better diagnose disease, improve treatment, and enhance quality of life (Manikandan et al.). SHC is possible because of IoT. IoT-enabled devices and other technologies monitor patients' health and collects critical health data. Examples of SHC and IoT are wearable devices that continuously monitor a

patient's vitals. This allows providers to assess the patient's health status and risk anytime, as well as gather information on the patient's pre-existing conditions. OAH is used primarily for reducing response time by tracking suitable available appointments (Manikandan et al.). HP-TDT improves efficiency and reduces indirect waiting time significantly. The purpose of HP-TDT is to identify patients as being normal or in a critical state to best asses the most appropriate scheduling option for the patient. The system takes into account health records and the pre-existing conditions of the patient to more accurately identify the patient's risk.

Matching daily healthcare provider capacity to demand in advanced access scheduling systems has a more simplistic approach than the previously discussed scheduling models. In this model, the rate of no-shows, urgent appointments, and pre-scheduled appointments are used to set constraints or limits on the schedule (Qu et al.). Well-collected historical data and predicting trends can make the proposed schedule more accurate. The purpose behind this model is to adapt the schedule to the provider's historical patient population and needs, rather than focusing on theoretical optimization. Experience is valued over quantitative methods and stakeholder buy-in may be easier to achieve in this model.

Appointment scheduling models that use clustering algorithms emphasize the importance of reducing priority patient wait times. Through machine learning and mathematical programming, the scheduling model will cluster any patient who requests an appointment by priority classes and offer appointment times based on the priority class (Yousefi et al. 2). Patients grouped as high priority will receive appointment options with reduced indirect waiting periods, but patients grouped as lower priority may have an indirect wait that is longer than usual. Due to the scheduling and efficiency complications of seeing only complex or high priority patients in a clinic day, the model adjusts for proposing the best pattern of low and high priority patients,

given that the high priority patients are not in a critical state. Cluster priority scheduling can be used prior to the patient's arrival to provide an appointment time and in walk-in clinics to decrease the direct waiting time of high priority patients.

3.0 Ophthalmology Clinic Case

3.1 Background

An outpatient ophthalmology clinic sought out assistance for recommendations on how to make their appointment scheduling more efficient. At the time, certain appointments would take several hours and both patients and staff were frustrated when appointments were long, yet patients and staff were experiencing idle time within the workflow waiting for each other. The schedule did not reflect the true contact time required for most appointments. During these appointments, patients would often have to move between the different "zones" in the clinic; pre-evaluation, imaging, post-evaluation, and the procedure rooms. There was direct waiting between each zone. Multiple physicians of different subspecialties would hold clinics at the same time and the utilization of shared resources was not accounted for at the time of scheduling the appointment. Due to this, patients would have to wait to receive imaging or an evaluation because patients in the other clinics were utilizing the equipment. The different clinic schedules were kept separate and a designated employee would triage and manage the patient throughput. If the imaging equipment was holding up the patient queue, then the employee would bump up the patients that did not need imaging. This routine kept the clinics manageable, but when the employee was unavailable, the clinic became inefficient and wait times became difficult to manage.

A process improvement team was asked to evaluate the current state of the clinic. The team's scope was the entire care experience, including scheduling the appointment and the duration of the appointment. The ophthalmology clinic utilized a central scheduling model and

patients booked all appointments through the scheduling center. The central scheduling center routed calls based on specialty. Ophthalmology, dermatology, and otorhinolaryngology were a part of the same queue.

3.2 Methods

The team observed patients through their appointments and recorded all relevant time stamps. The start time was when the patient checked in and the end time was when the patient checked out. Included in the relevant time stamps were appointment lengths, time with caregivers (providers and clinical staff), and waiting times. The current process was determined by following a single patient at a time and recording where they went, their contact with caregivers, and what type of care or tasks they were receiving in chronological order.

A team member then observed employees in the appropriate central scheduling queue for a day and mapped out the current state processes. The observer recorded the full interaction patients had when being routed to the queue. The full interactions were all the actions the patient and call center agent had to undergo to schedule the requested appointment.

All team members used a note-taking application on their phones that included timers for each person and location observed. The application automatically time stamped every note that was input.

Scheduling data was analyzed from the health system's electronic health record for the months of June through December of 2018 in the Comprehensive and Cornea divisions. The data provided included the patients' reasons for scheduling appointments and customer relation management (CRM) messages. If the reason for visit or urgency deemed it necessary, the call

center agents sent a customer relation management (CRM) message to triage agents indicating the call could not be resolved by the call center. The call center agents did not have the ability to change or manipulate individual clinic schedules, but triage agents could. The triage agents would then call the patient back at a later time to finish scheduling the appointment. To understand more about CRM classified reasons for visit and how often they occur, the team analyzed CRM data by breaking down the CRM "topics" or reasons into percentages. The crude number of CRMs per topic was divided by the total number of CRMs for the 6-month period. The reasons for visit were analyzed by taking the crude number of appointments completed per reason divided by the total number of completed appointments for both divisions in the 6-month period.

3.3 Findings

The team identified the processes for both central scheduling and the office clinic by observing and recording all findings discussed in the methods section. Below, Table 1 summarizes the appointment lengths, waiting time, and actual caregiver time. The column "code" represents the patients that were shadowed. In total, 17 patients were shadowed between the ophthalmology specialties of glaucoma and retina. Shadowing continued until the point of knowledge saturation. On average appointments were 144 minutes and 50 seconds. Of the 144 minutes and 50 seconds, patients would spend 76 minutes and 46 seconds with a care giver and 66 minutes and 23 seconds waiting. The caregivers included the technicians, schedulers, physicians, and all other staff. Figure 1 maps out the appointment process from the patient's perspective. The blue segments represent parts of the process that are consistent, and the orange

segments are variations in the process that occur a significant amount of the time. The rectangular boxes on the right side of the figure are detailed descriptions of the tasks that happen in each segment.

Figure 2 outlines the pathways of scheduling ophthalmology appointments in the central scheduling department. Call center agents are the first point of contact, where triage agents are only contacted if a CRM is initiated. CRM data findings are summarized in Tables 2, 3, and 4. In Table 4, “Do Not Schedule” indicates that there is a clinical reason that the call center agents cannot schedule the patient.

Table 1 Outpatient Ophthalmology Office Appointment Durations (Minutes)

CODE	TOTAL APPT LENGTH	TIME W/ CAREGIVERS	TIME WAITING
A	152	60	92
B	185	55	130
C	94	37	57
D	216	85	131
E	54	33	21
F	133	85	48
G	116	60	56
H	86	47	39
I	270	163	107
J	129	66	63
K	78	45	33
L	106	72	34
M	153	96	57
N	203	115	57
O	236	159	77
P	98	48	50
Q	148	74	74
AVERAGE	**144.5294118**	**76.47058824**	**66.23529412**

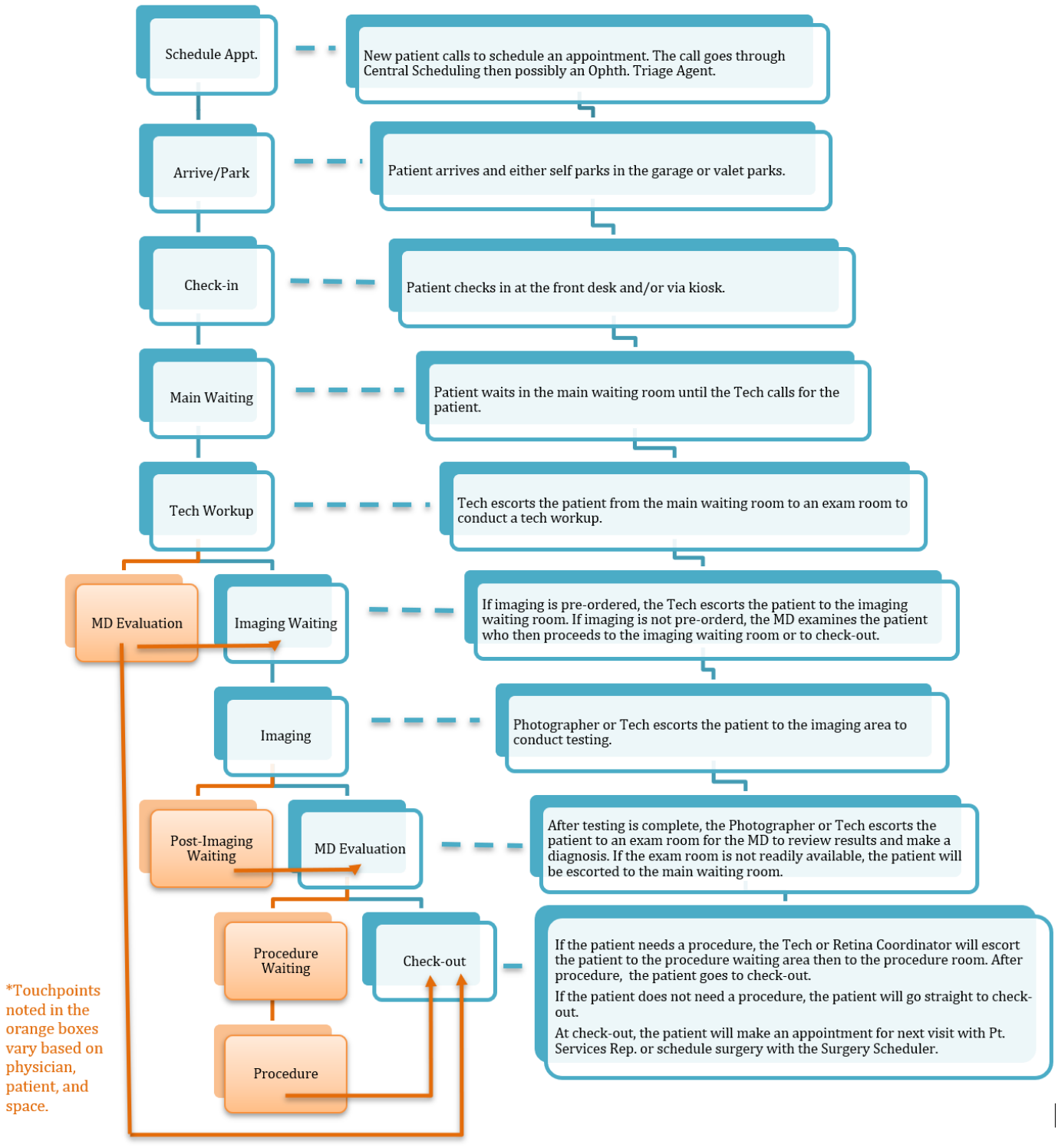

Figure 1 New Patient Ophthalmology Care Flow Map

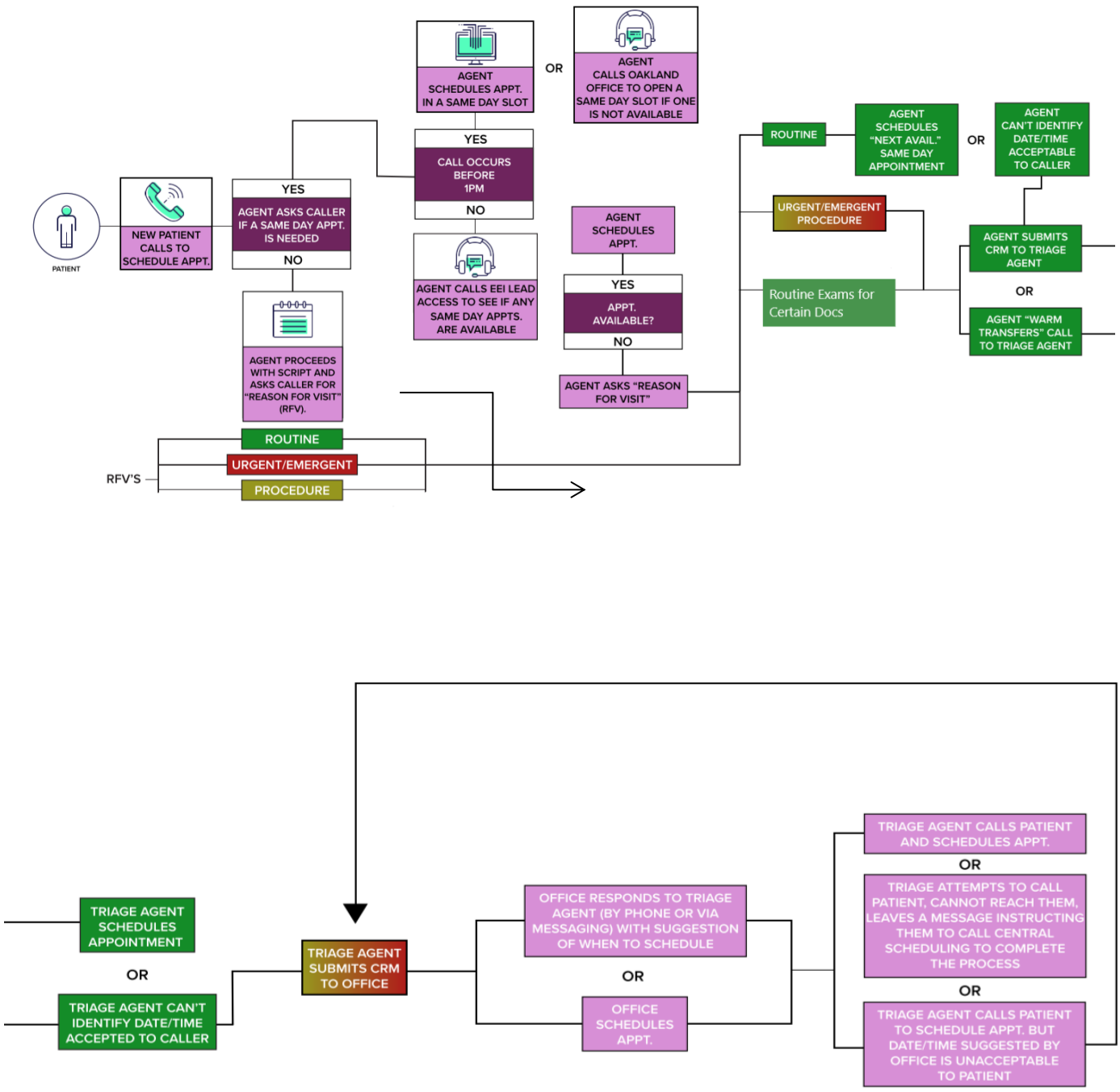

Figure 2 Central Scheduling Process Map

Table 2 Comprehensive Eye Services Top 12 Reasons for Visit

Reasons for Visit	Percent of Total Patients
Cataract Evaluation	20.11%
Diabetic Check	9.73%
Routine Eye Exam-No Contact Lens Request	8.85%
Dry Eyes	8.52%
Testing Appt Request	5.90%
Post Op	3.39%
Stye	2.95%
ER Follow Up	2.84%
Glaucoma Evaluation	2.73%
Annual exam for glasses	2.08%
Poor Vision	1.97%
Macular Degeneration	1.42%
Other	29.51%
Total	**100.00%**

Table 3 Cornea Services Top 14 Reasons for Visit

Reasons for Visit	Percent of Total Patients
Cataract Evaluation	26.85%
Post Op	23.19%
Serum Drops	9.45%
Keratoconous	4.69%
Corneal Scarring	4.49%
Testing Appt Request	3.80%
Corneal Dystrophy	3.38%
ER Follow Up	3.38%
Dry Eyes	3.04%
Fuchs Dystrophy	1.93%
Corneal Opacity	1.73%
Corneal Abrasion	1.45%
Corneal Erosion	1.04%
Routine Eye Exam-No Contact Lens Request	1.04%
Other	10.56%
Total	**100.00%**

Table 4 List of CRM and Transfers in Ophthalmology Zone

Subtopic	Percent of Subtopic
Do Not Schedule	36.60%
General Questions	8.34%
Other	7.42%
No Availability for Physician or Site / No Correct Openings (e.g. new patient or return patient)	5.05%
Physician is a Do Not Schedule	4.85%
Requesting Return Call	4.54%
Appointment Cancelation	4.26%
New Appointment Request	4.21%
Physician Not in Subgroup	3.75%
Attempted to Warm Transfer	3.34%
Patient wants to speak to Nurse	3.18%
0	1.99%
Requesting Specific Date/Time that is Unavailable	1.97%
Paperwork Needed	1.22%
Unable to Reschedule	1.10%
Patient wants to speak to Physician	1.08%
Patient Refused to Schedule	1.07%
Schedule Surgery	0.89%
No Availability for Physician or Site	0.89%
Patient Scheduled	0.73%
Physician Template Unavailable for Future Date	0.60%
No Correct Openings (e.g. new patient or ret patient)	0.56%
Tried to call back line per protocol	0.52%
Request to Coordinate Multiple Appointments	0.37%
General Surgery Related Questions (Pre-Surgery)	0.22%
Test Results	0.20%
Patient returning call from Nurse	0.17%
Insurance/Coverage Question	0.16%
Reschedule Surgery	0.16%
Cancel Surgery	0.13%
Unable to Schedule-Requesting more than 2 family members appointments	0.11%
Post Surgery Question	0.10%
General Surgery Related Questions (Post-Surgery)	0.08%
Physician requesting return call	0.03%
Requesting Sooner Appointment than what is available	0.03%
Reassign	0.03%
Patient returning call from Physician	0.03%
Lab Results Request	0.01%
Reschedule Surgery	0.01%
Grand Total	100.00%

4.0 Discussion

4.1 Recommendations

The outpatient ophthalmology clinic would benefit most from a hybrid scheduling model with carve-out access that utilizes electronic health record timing data. The hybrid scheduling model would allow patients to be re-routed to the appropriate ophthalmology subspecialty, where call agents would be more knowledgeable about specific clinical conditions. Table 4 highlights that nearly 40% of the CRMs in ophthalmology are due to urgent clinical reasons that require some modification of the available schedule. With a significant amount of the patient population having urgent conditions, the scheduling model should offer flexibility in scheduling that is more efficient, less convoluted, and eases the staff's workload burden. A hybrid model would offer needed flexibility in subspecialties that have higher rates of urgent appointments, while still offering a central scheduling department that retains the structure of routine appointments. This scheduling modeling would also restructure the relationship between central scheduling agents and triage agents. In the current system, the triage agents are the second point of contact, after the central scheduling agents, even though a significant portion of calls are routed to triage. In a typical setup, triage agents should be the first point of contact since they can readily determine the urgency and appropriate course of treatment for patients. Then, triage can route non-urgent appointments to central scheduling, where agents can complete the appointment within the same call. This would remove confusion patients face when they cannot book an appointment within one call and would minimize the indirect waiting time.

Carve-out access can provide further flexibility by allowing some providers to have walk-in clinics. As noted, before, some ophthalmology subspecialties have greater numbers of urgent appointments and holding walk-in clinics would minimize changes in appointment slots for prescheduled appointments. In Table 3, the second and third top reasons for visit for Cornea Services, post-op and serum drops, are automatic CRMs and indicate clinical urgency. Meaning, 33% of patients who request Cornea services must be accommodated as soon as possible. Currently, urgent appointments are accommodated by extending clinic days, shortening lunches, or scheduling patients with a different provider. These alternatives contribute to employee burnout and patient dissatisfaction. While walk-in clinics generally have longer direct waiting times, this is not the case with the outpatient ophthalmology clinic. The team identified through shadowing, in Table 1, that prescheduled patients still may have long direct waiting periods. The clinic can benefit by increasing access to reduce over-booking during regular clinic days. The Cornea service line may dedicate more hours to walk-in appointments than the Comprehensive service line to better suit the needs of their patient population.

The length of appointment times can vary within ophthalmology and subspecialties. Depending on the patient's pre-existing conditions and treatment regimen, the clinic may have to order imaging, testing, blood work, or perform an evaluation. The ophthalmology clinic accounts for the varying appointment times by designating an employee to manage the throughput of patients. However, this is not possible if the employee in not available or has other tasks that are urgent. The electronic health record timing data can sort the prescheduled patients ahead of time by predicting the shortest appointments to the longest appointments. This scheduling system is not prone to human error and can account for all health records, instead of just the most recent entry. The direct waiting time should decrease and allot providers more time to hold walk-in

clinics. In conjunction with a hybrid scheduling model and carve-out access, electronic health record timing data can improve the patient experience, increase access to specialty services, and improve health outcomes.

4.2 Ethical Considerations

Utilizing EHR timing data and walk-in clinics poses ethical considerations since healthcare workers prioritize patients based on the perceived level of urgency and acuity. Prioritization is especially difficult in healthcare because each patient is unique and may present an irregular combination of symptoms. Clinical workers will have to determine who will be seen, as opposed to running on a first-come, first-serve basis. It may not be fair to keep a patient waiting for over two hours because someone who just walked in has slightly worser symptoms. Some conditions that present symptoms like pain may be even more difficult to triage since pain tolerance varies and is difficult to measure. A standard protocol may mitigate some variation and provide clarity. The COVID-19 pandemic in 2020 has exacerbated the issues related to prioritizing patients and has brought to light the ethical concerns when choosing who gets access to limited resources. The combination of limited resources and high demand leads to treating those with the highest survival rate, in turn, this puts those who are most vulnerable at an incredible disadvantage. The protocol to only test patients for COVID-19 when they appear to have symptoms may prolong the availability of resources but does not prevent the need for systematic changes.

4.3 Public Health Implications

Access varies by specialty and location, and the patient's health insurance plays a large role in receiving the appropriate treatment at the right time. A survey in 2015 showed that only 45% of primary care providers were accepting new Medicaid patients, while 94% were accepting new privately insured patients (Hsiang et al.). Medicaid patients have a harder time finding in-network providers because of the well-known low reimbursement rates that Medicaid renders for services. An additional study found that patients with Medicaid had a 1.6-fold lower likelihood of scheduling a primary care appointment and a 3.3-fold lower likelihood of scheduling a specialty appointment compared to patients with private insurance (Hsiang et al.). While the Medicaid acceptance rate varies by location, Medicaid patients in large metropolitan areas with already limited healthcare delivery resources may experience an even more difficult time finding the right treatment. Health systems in rural areas with higher acceptance rates for Medicaid patients are struggling to remain financially viable with a significantly larger Medicaid portion in their payor mix. Due to these barriers in access, Medicaid patients do not receive timely healthcare services and may not have the opportunity to be treated until their health status worsens to the point of urgency. These barriers lead to higher emergency department and urgent care utilization rates and may cause higher readmission rates if patients struggle securing follow-up appointments. Non-Hispanic black patients wait longer for emergency department care than whites because of where they receive that care (Sonnenfeld et al. 338) based on a study that highlights the disparities between healthcare access and waiting times based on race and location. Emergency department locations with higher rates of non-Hispanic black patients tend to have higher waiting times.

Appropriate scheduling has a profound role in healthcare delivery. It can mean life or death in some cases, and morbidity in others. It can cause premature retirement of much-needed health professionals and leave some patients more disadvantaged than others. Inefficient scheduling models are costing health systems millions of dollars and causing spikes in urgent care utilization rates. If health systems want to transform into consumer-driven organizations, a well-suited scheduling model is necessary to improve processes, access, and timeliness. Scheduling is the foundation on which health systems operate and patients are seen. Health systems should consider their patient population's needs and the nature of their services when formulating a scheduling model. An emphasis on appropriate scheduling is essential to improving the patient experience and health outcomes.

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