



URGENT CARE

Simio 2015 Fall
Competition

Urgent Care Center
Problem



Forward Thinking

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Problem Overview

Urgent care centers serve unscheduled primary care needs; i.e. situations for which a patient cannot wait days/weeks for an appointment, but that do not require emergency treatment. The urgent care center can take the stress off the hospital emergency department by diverting nonemergency patients to a more appropriate care setting.

The purpose of this project is to analyze and appropriately size a new urgent care center that will be open 7 days a week from 7am in the morning until 9pm at night. The facility will be comprised of a registration area, waiting room, triage area, and rooms that can be used for exams and procedures. The facility will be staffed by a Receptionist, Nurses, General Physicians, Imaging Technicians, Orthopedic Physicians, Orthopedic Technicians, and Physician's Assistants (PAs).

The facility will see nine types of patients arriving to the facility. The first type is mild sickness and does not require lab testing for treatment and can be seen by a Physician Assistant. The second type is standard sickness and requires lab testing and requires treatment by a Physician. The third type is orthopedic injuries requiring setting and casting of the bone. The fourth type is orthopedic injury not requiring setting/casting. The fifth type is lacerations requiring stitches. The sixth type is minor cuts/bruises not requiring stitches. The next two types of patients are standard checkup/exams such as physicals, flu shots, etc., and cardio problems such as mild strokes and irregular/rapid heartbeats. The ninth type is those requiring advanced emergency care who are immediately transferred by ambulance to the emergency department.



The following summarizes the flow for each of the nine patient types. Depending on the treatment required, varying nurses, technicians or doctors are required. Also note that due to the equipment required, some procedures are only done in a Procedure Room, not an Exam Room.

Mild Sick

Step	Activity	Location	Resource	Processing Time (min)
1	Registration	Registration Area	Receptionist	Triangular (1.5,3,7)
2	Triage	Triage Area	Nurse	Normal (2,.3)
3	Treatment	Exam Room	Physician Assistant	Uniform (13,16)
4	Checkout	Registration Area	Receptionist	Triangular (3,4,5)

Sick

Step	Activity	Location	Resource	Processing Time (min)
1	Registration	Registration Area	Receptionist	Triangular (1.5,3,7)
2	Triage	Triage Area	Nurse	Normal (2,.3)
3	Treatment	Exam Room	Physician	Uniform (15,21)
4	Lab Draw	Exam Room	Nurse	2
5	Checkout	Registration Area	Receptionist	Triangular (3,4,5)

Orthopedic injury requiring Setting/Casting

Step	Activity	Location	Resource	Processing Time (min)
1	Registration	Registration Area	Receptionist	Triangular(1.5,3,7)
2	Triage	Triage Area	Nurse	Normal (5,1)
3	Imaging	Procedure Room	Imaging Technician	Uniform(10,16)
4	Setting	Procedure Room	Orthopedic Physician	Triangular(9,10,15)
5	Casting	Procedure Room	Orthopedic Technician	Triangular(10,15,20)
6	Checkout	Registration Area	Receptionist	Triangular(3,4,5)

Orthopedic injury not requiring setting/casting

Step	Activity	Location	Resource	Processing Time (min)
1	Registration	Registration Area	Receptionist	Triangular(1.5,3,7)
2	Triage	Triage Area	Nurse	Normal (5,1)
3	Imaging	Procedure Room	Imaging Technician	Uniform(10,16)
4	Treatment	Procedure Room	Orthopedic Physician	Triangular(18,20,22)
5	Checkout	Registration Area	Receptionist	Triangular(3,4,5)

Lacerations requiring Stitches

Step	Activity	Location	Resource	Processing Time (min)
1	Registration	Registration Area	Receptionist	Triangular(1.5,3,7)
2	Triage	Triage Area	Nurse	Normal (5,1)
3	Treatment	Procedure Room	Physician Assistant	Normal(25,3)
4	Checkout	Registration Area	Receptionist	Triangular(3,4,5)

Minor cuts/bruises

Step	Activity	Location	Resource	Processing Time (min)
1	Registration	Registration Area	Receptionist	Triangular(1.5,3,7)
2	Triage	Triage Area	Nurse	Normal (4,.5)
3	Treatment	Exam Room	Physician Assistant	Normal(15,2)
4	Checkout	Registration Area	Receptionist	Triangular(3,4,5)

Standard Checkups/Treatments

Step	Activity	Location	Resource	Processing Time (min)
1	Registration	Registration Area	Receptionist	Triangular(1.5,3,7)
2	Treatment	Exam Room	Physician Assistant	Normal(15,3)
3	Checkout	Registration Area	Receptionist	Triangular(3,4,5)

Cardio Problems

Step	Activity	Location	Resource	Processing Time (min)
1	Registration	Registration Area	Receptionist	Triangular(1.5,3,7)
2	Triage	Triage Area	Nurse	Normal (5,1)
3	Treatment	Procedure Room	Physician	Uniform(23,25)
4	Observation	Procedure Room		Uniform(45,60)
5	Checkout	Registration Area	Receptionist	Triangular(3,4,5)

Advanced Emergency Care

Step	Activity	Location	Resource	Processing Time (min)
1	Registration	Registration Area	Receptionist	Triangular(1.5,3,7)
2	Triage	Triage Area	Nurse, Physician	Normal(5,1)
3	Transfer	Triage Area	Ambulance	

Note that all patients first register, and then all but those receiving standard checkups/ treatments are triaged by the Nurse, and for emergency cases a Physician will assist in the triage. All patient movements between the Waiting Area, Exam Room, and Procedure Room require assistance by a Nurse.

The following table specifies the patient mix (percentage by type), priority, and the maximum LWBS (Leave Without Being Seen) time. This time is defined as the difference between the time a patient enters the Registration Area until they enter an Exam or Procedure Room.

Patient Type	Mix	Priority	Leave Without Being Seen
Mild Sickness	11	5	Uniform(15,35)
Standard Sickness	32	4	Uniform(25,40)
1st Injuries Ortho-setting/casting	7	2	Uniform(30,40)
2nd Injuries Ortho- Non setting/casting	5	3	Uniform(30,40)
3rd Injuries - Laceration	13	2	Uniform(25,35)
4th Injuries – Minor Cut Bruise	4	3	Uniform(30,40)
Standard Checkup/Exams	10	5	Uniform(10,20)
Cardio problems	10	1	Uniform(10,30)
Severe Non-Treatable	8	1	Uniform(5,10)

The below table identifies the demographics of the various patients.

Patient Demographics	Percentage of Patients
Male	58
Female	42
Pediatric (under 18 years of age)	37
Geriatric (over 65 years of age)	21

The arrival rate of patients to the facility varies over the time of day as shown in the following table. Note that our facility closes to all new patients at 9 PM, but remains open until all patients in the system are processed. Therefore, it may make sense to schedule caregivers to stay until 10PM or later. Any caregivers that are required to work beyond their scheduled shift will receive overtime pay (50% premium). Overtime must be in increments of one hour.

Time Period	Patient Arrivals per Hour
7am – 9am	11
9am – 11am	6
11am – 2pm	10
2pm – 3pm	7
3pm – 6pm	11
6pm – 8pm	8
8pm – 9pm	4

Note that staffing rules require 9-hour shift patterns with a 60-minute mid-shift break for all caregivers.

Shift Type	Working Periods
Early	7am – Noon, 1pm – 5pm
Late	Noon – 4pm, 5pm -10pm

The hourly cost for each category of caregiver, along with the hourly cost of owning/operating each exam room and procedure room is summarized in the following table.

Resource Required	Cost per Hour
Receptionist	\$13
Nurse	\$35
Physician Assistant	\$55
Orthopedic Technician	\$25
Imaging Technician	\$21
Physician	\$90
Orthopedic Physician	\$110
Exam Room – Operating Cost	\$15
Procedure Room – Operating Cost	\$30



The primary objective of this project is to minimize the cost of the proposed urgent care center in terms of the number of exam rooms, procedure rooms, and staffing levels to achieve a reasonable value of the LWBS. Although an LWBS of 0 is ideal, this may be cost prohibitive to achieve. An LWBS of 10% or more is considered unacceptable.

Evaluation Questions:

1. Evaluate the concept of allowing activities that require Exam Rooms to be done in Procedure Rooms when available.
2. Study the effect of allowing other caregiver types to tend to patients. For example, allow a Physician to do anything a PA can do, an Orthopedic Physician to do anything an Orthopedic Technician or Physician can do or a PA to do anything a Nurse can do.
3. Evaluate the impact of more flexible shift patterns, such as part time workers.
4. Since there is a relatively low demand for Orthopedic Physicians, you have the option of scheduling them to be on-call for part or all of the day. If on-call, it takes about 30 minutes to arrive to the center. In this scenario, they will receive 50% of their regular pay while on-call and 150% if called in.
5. Assume that a mass accident occurs nearby causing 30 patients distributed evenly between types 3-6 to arrive within a 15-minute period. How will the system respond? How could the system be temporarily or permanently changed to improve this response?