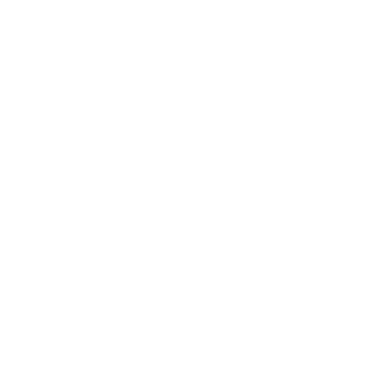
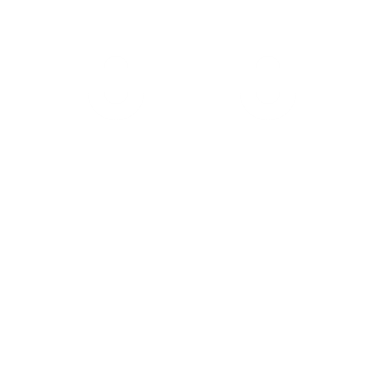
# https://static1.squarespace.com/static/5a4052aecf81e03172cda960/t/5aa708b50d9297f0912afe02/1537309126551/?format=1500wOEC 2019 Programming Challenge:

**Location**: McMaster University  
**Date**: January 18 – January 19, 2019

# Reducing hospital patient wait times for a growing urban population

I. Introduction

The goal of the OEC 2019 programming category is to encourage software engineering students to produce industry-quality software with all of the proper user and administrative documentation. This competition will challenge students to apply engineering methods and concepts to solve an open-ended problem. The teams will use their software development skills, their technical writing abilities, and their project management skills to design a solution to a real-world problem. This solution will then be presented to company executives (judging panel) for approval.

The problem

Hamilton is a growing city that accommodates a large population in its hospitals. Thus, the demand for hospital services has been steadily increasing while the physical infrastructure remains the same. Hospital overcrowding has led to increased waiting times for patients, which is especially unfavorable because patients visiting hospitals are already in pain and discomfort.

There are several causes for congestion. One issue is the administrative delay that causes patients to be seen by doctors later than normal. Another issue is that hospital staff currently have to run back and forth in order to alert patients that they are ready to be seen. Furthermore, another issue is that determining the priority (triaging) that patients are seen is done manually. In addition to those mentions, there are many other areas for improvements within the hospital organization and scheduling pipeline, which can be discovered through research on the domain. Participants are welcome to identify other pain points in the process.

See Appendix A: References and Resources for more background information.

The challenge

Your task is to develop a software solution for hospitals in the Hamilton area in order to help remedy the issue of hospital overcrowding. Note that the solution may not necessarily be an app. The goal is to create a software solution that can **help speed up hospital delay times**. You may tackle your problem from any focus as long as it meets the goal stated.

Within the time limit of 6 hours, you must have a working prototype of your solution and be able to demonstrate its functionality in front of a panel of judges. You may be asked to input test cases of the judges’ design as part of the review process. You may also be asked questions during the presentation.

Competition deliverables

**All deliverables must be emailed to [taos1@mcmaster.ca] by 2:00am Saturday morning.** Please use “OEC 2019 Programming Submission – [team name]” as the subject line, and include the following information in the body:

1. Administrative information, including:
   1. Names and emails of team members
   2. Group number
   3. Project title
2. All code used for the project
   1. To a public repository (with link in body of email), or attached as a .zip file
   2. Well-documented, both from a maintainer/developer’s perspective and a user’s perspective
   3. With additional instructions to compile and run the project for the judges, if not already included in b)
3. A brief, one-page report outlining engineering problem to be solved. The report should:
   1. Identify the stakeholders and the problem, explaining why the problem is relevant to stakeholders
   2. Identify the chosen solution and how it addresses the chosen problem
   3. Identify the target users
   4. Give a high-level overview of the solution design
4. A presentation to the judges demonstrating their solution and how it works. Oral presentations should:
   1. Be no more than 10 minutes in length, including a 2-minute question period
   2. Briefly summarize the contents of the report
   3. Walk the judges through the implementation, including technologies used and any difficult technical challenges the team has faced
   4. Demonstrate the solution, including inputs defined by judges where relevant

Scoring

|  |  |  |
| --- | --- | --- |
| Category | Description | Score |
| 1. Report | Problem and solution identification (0–5)  Consideration of stakeholders and users (0–5)  Solution design (0–5)  Report design (0–5) | /25 |
| 2. Code | The code is clean and well-structured, following good software engineering principles (0–10)  The code is robust, working for a variety of test cases that the judges input (0–10)  The project is well-documented for users (0–5)  The project is easy to run for target users (0–5)  The code is well-documented for developers (0–5)  The code appears easy to maintain (0–5)  The project is technically challenging and demonstrates engineering adeptness (0–10) | /50 |
| 3. Presentation | Team communicates effectively and delivers an engaging presentation (0–5)  Each team member appears to be knowledgeable about the entire project (0–5)  Team members answers the questions to judges’ satisfaction (0–5)  Solution is functional during demonstration, and delivers on promises made by the team in their presentation (0–5)  Overall impression (0–5) | /25 |
| Penalties | The code does not compile and/or run (–20)  Presentation over time (–10)  Late submission (–2 / minute)  Plagiarism (–100) |  |
|  | **TOTAL SCORE** | /100 |

Appendix A: References and Resources

**How is patient order determined?**

*Below information is an extract from Compass [https://www.compassphs.com/blog/how-hospitals-work-part-2-the-doctors-you-see/].*

The process of seeing patients in a hospital is called rounding. The term dates back to the early 1900s and was believed to have been started at the hospital where I trained — Johns Hopkins.

Doctors typically round on patients in the morning…often very early. It is reasonable to expect doctors to start rounding at 6 AM – 7 AM. This is important because if you have a family member in the hospital and you want to talk to the doctor in person, you will need to be there early in the morning when the doctor is rounding. If you cannot be in the hospital at that time, it is highly unlikely that the doctors will come back to the room to talk to you. However, you may be able to have the nurse page the doctor so you can talk to him or her on the phone.

During rounding the doctor performs an assessment: performing an exam, reviewing vital signs, lab/test results and nurses/other doctors’ notes. Then the doctor determines the plan for the day: a change in medication, additional testing, evaluations by physical therapy and occupational therapy, a possible procedure, discharge or transfer to a higher level of care because you have become more ill.

“Floors” in hospitals are roughly divided into 3 levels of care:

* The regular ‘Floor’ (least sick)
* Step-Down (sicker, ‘Step-Down’ is a step down from the ICU, hence its name)
* Intensive Care Unit (sickest, aka ICU)

There are several things that are different on each of these levels, but the biggest thing that changes is the ratio of patients to nurse.

On the regular floor, the ratio is typically 4-5:1 during the day and up to 8:1 at night.

On Step-Down, the ratio is typically 3-4:1 during the day and a little higher at night.

In the ICU, the ratio is typically 1-2:1 both day and night.

**Types of Doctors in the Hospital**

*Below information is an extract from Compass [https://www.compassphs.com/blog/how-hospitals-work-part-2-the-doctors-you-see/].*

Hospitalists: It has become almost standard for a non-surgical patient in the hospital to be seen daily by a hospitalist. A hospitalist is typically a general internist who only practices in the hospital or has dedicated a block of time (say 1 month, 4x per year for a total of 4 months) to only practicing in the hospital. If a patient has a primary care physician (PCP) in the community, it is likely that the PCP will NOT see them in the hospital. A reason hospitalists now exist is because inpatient care has become very ‘busy’ — lots of tests/procedures/etc and there needs to be a dedicated physician for each patient to coordinate/dictate all that care. Another reason hospitalists exist is because it is very difficult/inefficient for a doctor who works in an office to also see patients in the hospital. Hospitalists are constantly paged and interrupted and if the office doctor had this many interruptions, they could never finish seeing the 20+ patients per day that they need to see in their clinic.

Specialists: In addition to a hospitalist, often a specialist (or multiple specialists) will see a patient for their particular condition. For example, if a patient is having breathing problems, the patient will also be seen by a pulmonologist. If the patient is having kidney problems, a nephrologist will also see the patient. If the patient has a severe infection, the patient will also be seen by an infectious disease physician.

Surgeons: Surgeons typically take care of their own patients and do not have a hospitalist or other specialist see their patients. Patients are admitted, have their surgery and are discharged. Examples of surgeons include: general surgeons, urologists, orthopedists, etc. Hospitalists and Specialists will see surgical patients if there is a complication with the surgery or if the patient does not do well after surgery for some reason. An example may be, as a result of IV fluid a patient received during surgery, the patient’s blood pressure may be too high afterwards. In this case, the surgeon may call in a hospitalist on consult to get the patient’s blood pressure under better control.

**Miscommunication**

*Below information is an extract from Compass [https://www.compassphs.com/blog/how-hospitals-work-part-2-the-doctors-you-see/].*

It is VERY COMMON for miscommunication to occur among the hospitalist, specialists, surgeons, etc. It should be ASSUMED that miscommunication is going to occur until proven otherwise.

What are the implications of this miscommunication?

If a patient is unconscious or not fully coherent because of their illness, it is crucial that a friend or family member talk to each of the doctors directly on a daily basis. Often this requires the friend or family member sitting in the patient’s room the entire day. If the friend or family member cannot do that, then the nurse can be asked to put a note on the charge to have the doctor call the friend or family member after they have seen the patient to tell them the ‘assessment and plan.’

Believe it or not, frequently the doctors who see the same patient never talk to each other. All they do is leave notes in the chart and read each other’s notes. The problem with this lack of direct communication is that the notes are often unclear or the doctor reading them may have additional clarifying questions. There is really only one true central ‘Hub’ of communication in a hospital and that is the patient themselves OR their friend/family member.

**Final note**

This information is meant to provide a common jumping-off point for all the different teams. Challengers are encouraged and expected to do further research, summarizing what they have found in the report and presentation.