

## MOBILE BLOOD DONOR CLINIC: A DISCRETE EVENT SIMULATION MODEL

*Felipe Rodrigues wrote this case solely under supervision of Professor Rasha Kashef 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.*

*This publication may not be transmitted, photocopied, digitized, or otherwise reproduced in any form or by any means without the permission of the copyright holder. Reproduction of this material is not covered under authorization by any reproduction rights organization. To order copies or request permission to reproduce materials, contact Ivey Publishing, Ivey Business School, Western University, London, Ontario, Canada, N6G 0N1; (t) 519.661.3208; (e) cases@ivey.ca; www.iveycases.com.*

Copyright © 2017, Richard Ivey School of Business Foundation

Version: 2017-08-17

Henry Rogers was a graduate student in management science, researching process improvements in patient flows. Every day, on his way to his office, he walked by the university community centre, where he often stopped for a cup of coffee or to get a meal from the cafeteria. One particular cold winter morning, late for a meeting, he hurriedly passed the cafeteria and noticed a sign that said, "Blood Donor Clinic Today from 11:00 a.m. to 4:00 p.m. Donate blood today. Give life! Room 2104." Rogers realized that it had been a year since he had last donated blood. If only he had known that the university hosted blood donor clinics, it would have saved him a lot of time and effort. The last time he had donated, he had to take two busses to reach the blood donor clinic, way beyond downtown. "This will be very convenient," he thought. "I'll go there after my meeting."

After meeting his advisor and deciding on his defence proposal date (less than two months away), Rogers had a lot in his plate. He rushed back to the office, when he noticed that it was almost 11:00 a.m. "The clinic will open soon," he thought. He briskly walked the few blocks that separated his office from the community centre. Once he got there, he was surprised. The clinic was not open, and there was already a significant queue forming. His immediate thought was that the organization that managed blood donations in the city had found a jackpot. "These kids are healthy and socially engaged; they should put up shop here every day." As a researcher of patient flows in hospitals, Rogers had queuing theory in his veins, and this intrigued him. When the clinic opened, he looked inside and noticed that only eight people could donate blood at the same time. Looking at the line forming outside, he figured he might as well go to the printing room to print some journal articles to include in his dissertation before joining the queue. He thought that after the initial build up, the line and wait time would be shorter. "I'll need all the time I can spare if I'm to defend by early May."

When Rogers returned to the blood clinic, he could see that they were running the little mobile clinic at full speed. There were students everywhere. He reached the help station, and the nurse asked him kindly, "Have you donated blood before?" "Yes, ma'am. I've donated quite a few times," he said proudly. "Great. Please let me see your donor card," the nurse replied.



"I'm sorry ma'am. I don't have it with me." Rogers recalled that he had done some decluttering in his wallet; he must have put the donor card in the drawer with other cards he'd decided he did not need to carry around all the time.

The help-station nurse kept her cool and asked for his driver's license. "I don't seem to find you in our system, sir. Are you sure you've donated blood with us?" Rogers knew this was going to happen, and he had a ready response. "I'm sorry ma'am; I have two last names. If you look for 'Rogers,' you will find me." Sure enough, she did. "Aha! Here you are," she said. Rogers could not help but notice that more people were arriving and he was contributing to an increase in the waiting line; years of queuing research had made him apprehensive about that particular fact. "Okay, Mr. Rogers. Please have a seat and wait to be called to the questionnaire kiosk," said the nurse.

Rogers thought that donating blood was beginning to feel like a queuing system; noticing the wait line, he decided to investigate a little further. "Excuse me, nurse," he said, "If you don't mind me asking, how many people arrive to the clinic every day?" Surprised, the nurse replied, "Usually, when we open, there are already 5–10 people at the door. On a busy day, about 25–30 people per hour."

Rogers waited until the nurse had registered another donor to ask more questions. He noticed that the student had his card and spent maybe one minute at the help station. "How long does it take for you to register a donor?" She guessed, and with a grin, replied, "Maybe about two minutes, give or take. Returning donors with their cards take barely a minute; first-timers take 5–10 minutes; people who forget their donor cards or whose names we have trouble finding also take around five minutes." He sensed this was his cue to stop asking questions of the nurse. She was very busy, and he was taking too much of her time.

"You will wait here to be called by another nurse, who will proceed with your health screening," she said politely. Rogers took the opportunity to ask her one question. "Excuse me, again. I noticed that the questionnaire is longer. How long are people taking to answer it?" She gave it some thought and replied, "I've been doing this a long time. I know it is between five-and-a-half and six minutes. I measured it myself. Though people who have travelled a lot or who come from other countries take more than that because we have to screen for different diseases that occur in Europe and in tropical areas." Rogers knew what had taken him so long: a recent trip to South America might have triggered a host of questions that would not show up for people who had not been to that part of the world.

After he had waited a few minutes, another nurse came and called him to her cubicle. She introduced herself and explained to him that she would look for signs of intravenous use and would measure his blood pressure, temperature, and heart rate. Rogers took the time to ask her how many screening cubicles they had; she said there were six screening cubicles, with one nurse in each. Before starting her procedure, she took a large binder and opened it to a page that contained a detailed map of South America.

"Where did you say you were again?" she asked.



Rogers replied, "I recently visited my folks down in southern Brazil." She seemed a little lost in the map, so Rogers helped her by pointing to the exact location. It was in a green area of the continent. Most of the equatorial part of the map was marked in red.

The nurse said, "That is okay. If you had gone to this red area over here, we couldn't take your blood due to the risk of malaria."

Rogers replied, "I'm aware. Every time I donate blood, I have to explain this. Maybe you should add that to your files so we could save some time in the process." She disagreed with his suggestion and explained that recent travels and other events could change his answers to the questionnaire, and that they had to be extra careful every single time. "We are better off spending a few minutes here rather than risking getting someone sick later on." Rogers nodded embarrassedly. "How long does the screening usually take?" he asked. The nurse replied, "Usually 10–12 minutes, but it can take up to 30 minutes in cases where we have to dig deeper into the questionnaire or where we might have to take more blood samples or measure the temperature or blood pressure more than once."

After the screening was done, Rogers was taken to yet another waiting area. Now he was a bit worried that his blood pressure might be a little too high. "It must be pre-proposal defence stress," he thought. There were many students waiting, and Rogers could see there was a total of eight pods where the blood donations were taken. Some students were donating blood, others were just waiting for a nurse to give them permission to stand up and leave, others were waiting for the donation to start, and one student seemed to have fainted, drawing attention from the whole crew. To Rogers's surprise, the fainted student seemed to be a rather big athlete. "All I have to do is look away from the needle," he thought, remembering when he, himself, had fainted after seeing the needle being drawn out of his arm.

After Rogers had waited for some time, a nurse came to direct him to his donation station. The nurse was friendly and efficient, and Rogers took the time to get more information from her.

"How often do people faint?" he asked the nurse.

"Every once in a while," she said. "Some people don't take needles too well, others feel the drop in blood volume, and some are very thin and need time to recover." As she was saying this, Rogers felt the needle and realized he had made a bigger deal of the process than it really was.

The nurse proceeded: "We want to make sure people are okay, so we usually let them sit at least five minutes after we finish collecting the blood."

"What would be the average donation time?" he asked.

"If all goes well, 14–15 minutes," she said. "We collect the blood and let the donor rest for a bit. However, some people faint; with others, we have a harder time picking a good blood vessel. On occasion, the blood flow is interrupted and we have to draw blood from another vessel in the other arm. On rare occasions, donors stay here up to 30 minutes, tops."

Rogers thought that they had the system pretty well mapped out, but it seemed that there was too much variance in the system, and it was bound to have peaks of congestion. Before he knew it, his blood had been collected. He was cordially led to the refreshment area, where 10 students were indulging themselves with cookies and juice boxes. Rogers decided to join them in the sugary bonanza. He noticed that the young athlete, now fully recovered, seemed to have an unusual appetite for vanilla chocolate chip cookies.

and apple juice. Rogers thought he must have had 10 cookies by now. Rogers decided to stay as long as the young man did, and he gauged that another 5–10 minutes at that station would be enough.

As Rogers was about to leave, he approached the young athlete and said, “Excuse me, dude. Make sure you follow the recommendation and don’t exercise today.” To this, the athlete replied, “Thanks, old man.” Rogers left, feeling old, stressed, and newly aware of his hypertension. He thought that maybe the donor flow in the blood clinic might need some improvement. After all, he had spent about one-and-a-half hours there. He also thought he could easily make some assumptions, use averages or modes when available, and simulate the mobile blood donor clinic to try out some new ideas. He thought that a person donating blood should not spend more than 45 minutes there and should not wait more than five minutes at each step in the system.