

# EDUCATION

## Hackathons within medical education: Promoting cutting-edge innovation in surgery

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### Abstract

Medical students need to begin to learn how to innovate earlier in their training. Hackathons offer opportunities to foster innovation in healthcare. We launched a hackathon for medical students to generate solutions to a real-world surgical problem. We focused on generating solutions to better support more women in surgery, an area of medicine where women remain underrepresented. The goal of our event was to not only generate solutions at a systemic level but within our own medical school, break down barriers for female medical students by allowing them to network with Dalhousie surgeons and better explore potential career goals by attending the event. Attendees reported the event provided an opportunity to build problem solving skills, communication skills and the opportunity to network with like-minded peers. Our hackathon supported idea generation however further emphasis on translation of solutions from idea generation to implementation within our healthcare system is needed.

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Our healthcare system's longevity relies in part on creative change. Innovative solutions are needed to address challenges within our healthcare system. These innovative solutions will be required by the next generation of physicians, yet few opportunities exist within the medical curriculum to practice and foster skills in innovation. Hackathons are one of the most reliable methods to foster innovation within healthcare starting from idea generation, idea acceptance and idea implementation<sup>1</sup>. With this in mind, we created an organized hackathon opportunity for medical students to begin building these necessary innovation skills earlier in their training.

Our Cutting-Edge Hackathon Event invited Dalhousie medical students from all four years of training in both Nova Scotia and New Brunswick campuses to work in teams to tackle a real-world surgical problem. The event was mentored by surgery and health systems experts and offered medical students the chance to build teamwork, problem solving, adaptability, communication, critical thinking, and creativity skills relevant to future practice.

The surgical problem being addressed by students at this event was: "How can we better support more women in surgery?"

With medicine being traditionally a male-dominated profession, more structural barriers exist for female career advancement at all levels. Despite increased female representation in medical student class sizes in recent years, women remain underrepresented in surgery in Canada with only 30% of Canadian surgeons, and 43% of surgical trainees being women<sup>2</sup>. In a systematic review by Lim et al. (2021), female surgeons and train-

ees in Canada reported a lack of female mentorship and role models and felt that they miss out on professional opportunities as a result<sup>3</sup>.

While the event aimed to build awareness of existing barriers for women within the surgical profession at a system level and generate solutions, the event also aimed to break down barriers for female medical students at Dalhousie, allowing them to network with surgeons and better explore their own potential career goals by attending the event. Furthermore, ideas and solutions generated during the event have the potential to contribute to real-world change within our healthcare system.

The event was organized and hosted by two female medical students at Dalhousie in collaboration with the Dalhousie Womxn in Surgery Interest Group. At the Dalhousie Medicine New Brunswick Campus (DMNB), Dr. Alison Wong, a reconstructive, hand and peripheral nerve plastic surgeon with a Master of Science in innovation from Johns Hopkins University was recruited to be a mentor and judge for the event. Dr. Wong also supervised and supported the planning of the initial design of this event in months prior. At the Dalhousie Medicine Nova Scotia Campus (DMNS), mentors/judges included Dr. Gwynedd Pickett, a cerebrovascular neurosurgeon and program director for the Dalhousie Neurosurgery residency program, Dr. Becky Power, a 1st year urology resident and ex-world cup Team Canada athlete, and Dr. Noreen Kamal, an industrial engineer with a research focus on health systems and quality improvement.

Advertisements and a link to register for the event were posted to the Dalhousie Womxn in Surgery Inter-

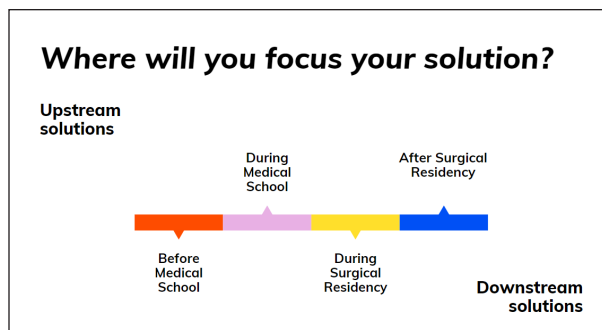


Figure 1. Graphic displayed during the hackathon to assist students in deciding on a barrier affecting women in surgery.

est Group social media pages. Upon registration, students were asked why they wanted to participate and if they had any experience related to innovation. We created balanced teams based on graduation year and any relevant innovation experience. Nova Scotia students were grouped with those in Nova Scotia and New Brunswick students were grouped with those in New Brunswick.

The timeline of the event was as follows: 20 minutes for introductions and initial presentation discussing the event timeline and how to determine a barrier to focus on, 20 minutes for initial team brainstorming, 20 minutes for further prompts and isolating solutions, 35 minutes for turning the solution into a pitch, 30 minutes for team presentations, and 20 minutes for judges to deliberate, announce winners, and event wrap up. The event was 2.5 hours in total.

The event was hosted from the DMNS campus and the team at DMNB participated via teleconference. Participants arrived, were introduced to their teammates, given a short presentation, and then were given the following prompt: “How can we better support more Womxn in Surgery?”

Teams had to first identify a barrier that women pursuing surgical careers face. Teams were guided with a systems-based approach to focus on a barrier from either upstream, for example: barriers within medical school vs. downstream, for example: barriers after resi-

ducing training (Figure 1). From there, teams were guided to isolate the root cause of their problem by differentiating it as a source or a symptom of a larger underlying barrier. Once teams determined their barrier’s root cause, they worked to develop a solution. Throughout this process, mentors supervised and supported each group, giving guiding prompts or helping to focus their ideas (Figure 2). Teams were also prompted to consider how their solution related to the success of existing initiatives through identifying relevant stakeholders, determining potential funding avenues, evaluating limitations to existing initiatives, and theorizing potential unforeseen circumstances of their solution (Figure 3). The teams presented a 2-minute pitch outlining their innovative solution to the other groups and the judges/mentors. Judges asked follow-up questions about logistics, design, or execution of their solution and ultimately judges awarded points based on creativity, systems thinking, cost-effectiveness, inclusivity, and ease of implementation.

Food and drinks were provided for participants and mentors funded by the Dalhousie Medical Students’ Society. The winning team won a small prize, and the event was concluded.

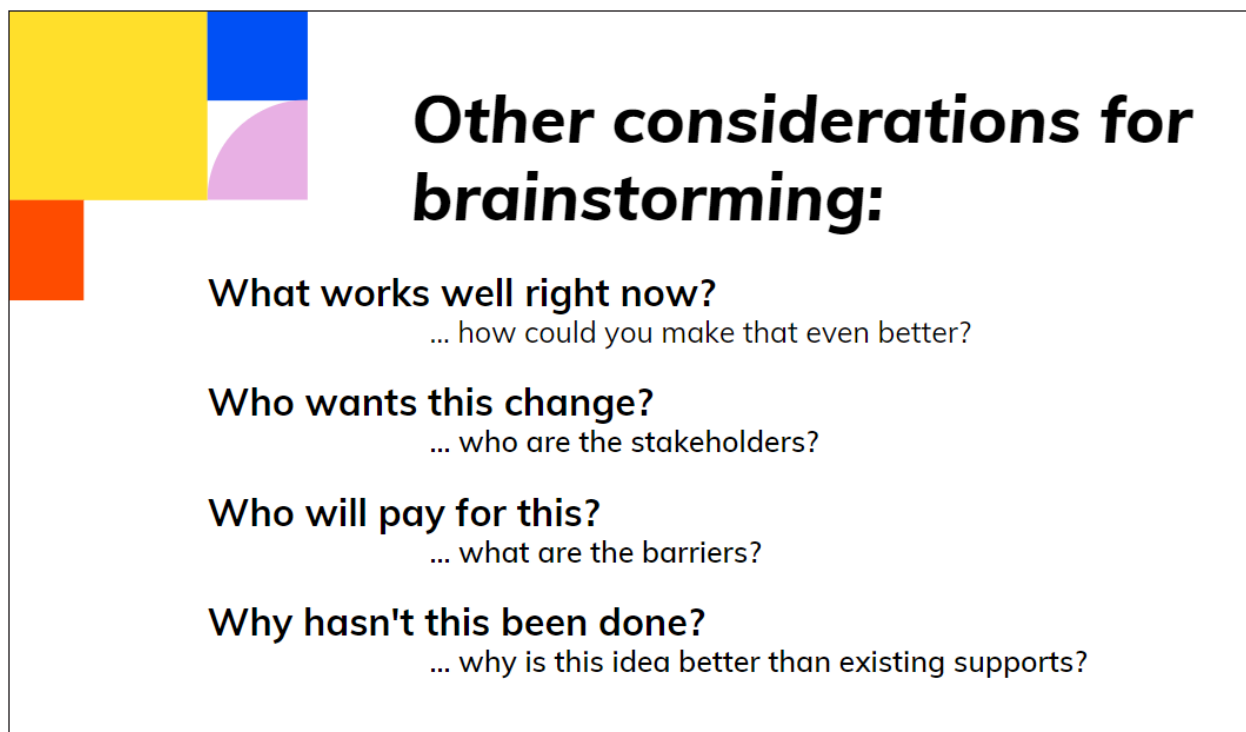
Following the event, participants were sent a feedback survey to complete asking about the biggest learning takeaways, how we could improve the event, or any skills gained from attending the event.

The event took place on November 22, 2022. Nineteen students applied to attend the event, and 15 students were in attendance. Of the 15 students who attended, three students reported previous experiences related to healthcare innovation. We had students with backgrounds prior to medicine varying from engineering, nursing, policy design, and community advocacy. We generated five teams, one at DMNB and four at DMNS, each with two to four participants.

The winning team created an implementation plan for on-site childcare services at the Halifax Infirmary. Other solutions generated involved: (1) virtual networking platforms as a space to provide mentorship



Figure 2. Photo taken during the event of participants and mentors brainstorming potential solutions.



**Figure 3.** Graphic displayed during the hackathon to assist students in designing their solution to better support women in surgery.

and peer support among female trainees and surgeons; (2) teaching features of gender-based discrimination within existing simulation training; (3) small group case-based learning modules during pre-clerkship years to explore barriers faced by women in surgery; (4) shared full-time equivalent (FTE) contracts for surgeons to ensure sufficient coverage of a service with flexibility for the surgeon to raise a family.

Results from the post-event survey indicated that the majority of participants surveyed found that the event helped build problem-solving skills, communication skills, and the opportunity to network with like-minded peers. Roughly half of the participants surveyed felt the event provided an opportunity to network with surgeon mentors and helped them better understand the barriers and possibilities of a career in surgery.

The Cutting-Edge Hackathon Innovation event provided an opportunity for students to work in teams with the support of representative mentors to generate creative, innovative solutions for real-world surgical problems.

When registering for the event, students were asked why they wanted to participate. In response to this question, most participants indicated they were interested in pursuing a surgical specialty. Students voiced themes articulating a desire for increased representation in surgical mentorship, opportunities to discuss barriers related to pursuing surgical careers,

networking with peers, and opportunities to begin learning how to innovate within their future desired field. Many of these themes are echoed on a larger scale across Canada, with female trainees reporting insufficient female mentorship and role models<sup>3</sup>. The solutions generated at our event tackle these barriers and others existing among Canadian trainees such as lack of maternal support for female surgeons and gender-based discrimination<sup>3</sup>.

We believed the event timeline worked well as did the small mentor-to-student ratio. Students reported that the biggest takeaways from the event were “learning barriers in implementing change...”, “hope that these changes can be implemented in the future!”, “ways to communicate/brainstorm/receive and apply constructive feedback when working with a group under pressure”, and “that it is possible to create services that benefit surgeons...”

Improvements for the next event could involve increasing momentum with funding opportunities post-competition to continue pursuing solutions, and potentially involving hospital administrators as mentors/judges. Participants voiced a desire to work with the other teams over the course of the event as well as to connect with more peers. Some students reported in the survey they didn’t feel they had sufficient opportunity to network specifically with surgeons and recommendations for future events were to host a networking/cocktail hour before or after the hackathon

so participants could chat with surgeons one on one and discuss specific career questions. Finally, gender is one of many marginalized identities within surgery and moving forward more emphasis on intersectionality and other underrepresented perspectives within surgery is needed with the design of our future hackathons.

With the reproducibility of our hackathon design structure, future directions following this hackathon are abundant. We are currently planning a second hackathon with a focus on global health in collaboration with Dalhousie's Canadian Global Surgery Trainee Alliance scheduled for February 2023. We are also reaching out to collaborators to hopefully launch a similar hackathon for attendees during upcoming student conferences. We hope to launch future hackathons with a focus on creative solutions to reduce existing surgical wait times in Nova Scotia, or to tackle the growing list of Nova Scotians without a family doctor.

Hackathons can contribute to healthcare advancement at an individual and system level. Events such as these offer the potential for students to build problem-solving skills, communication skills, teamwork, and creativity, all skills relevant to future practice. Providing students with the opportunity to tackle relevant barriers to their future careers is empowering, but post-event momentum is needed to ensure meaningful change.

Thank you to the Womxn in Surgery Interest Group for their collaboration with this hackathon and to the mentors who participated in our hackathon event, it would not have been a success without your excitement, patience, and guidance.

### Conflict of Interest

AM is an editor for the Dalhousie Medical Journal but was not involved in the editorial process for this article.

### References

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