Sinai MedMaker Challenge: A model of experiential Team Science Education

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Background

Innovation in healthcare is increasingly dependent on the development of novel technology-based solutions, and effective collaboration amongst those working in healthcare and those in those in technology development. There is a general lack of understanding of the needs and nuances of the healthcare industry by the those in engineering and technology fields, and a limited grasp of the capabilities and processes in technology development by healthcare workers. This knowledge gap can hinder efficient communication between these diverse disciplines, generation of progressive problem/solution concepts, and implementation of practical technology solutions.

Team science and it's initiatives have recently emerged as a practice that leverages cross-disciplinary pollination of ideas and evaluates the outcomes of collaborative approaches. An intensive cross-disciplinary team-based competition was conducted at Mount Sinai to promote these practices and evaluate the impact on solution development to problems in the healthcare theme of pain and fatigue.

Goals

- To bring together students, trainees, faculty and other stakeholders in a fun and high-energy setting to explore technical solutions for problems in the assessment, monitoring, management and treatment of pain and fatigue
- To cultivate an ecosystem at Mount Sinai fostering multi- & trans-disciplinary team-based health-tech innovation

Educational Objectives

- Engage participants to identify and define healthcare problems which lend themselves to technology-based solutions
- Encourage teams to develop and implement effective and meaningful technical solutions through interaction with and learning of technology development processes
- Identify key factors, processes, and communication strategies which enhance multi and trans-disciplinary team success healthcare technology development

Approach

The Sinai MedMaker Challenge was an intensive, 48-hour team-based competition, modeled after previously held health "hackathons" and adapting guidelines provided by MIT Hacking Medicine. The event gathered participants from diverse backgrounds (clinicians, medical students, graduate students in biomedical science and humanities, software developers, engineers, & others), for the purpose of utilizing technology to address pressing problems in the diagnosis, management &/or treatment of pain &/or fatigue.

Event Flow
- Panel discussion with clinicians outlining a broad range of problems in pain and fatigue
- Participants pitched problems, and discussed and brainstormed solutions with eachother
- Teams self-assembled to develop solutions including hardware and software prototypes
- Mentors interacted with the teams to support in technical implementation of the solutions, and identify key factors in commercialization and deployment of the solutions.
- Teams finalized their prototypes on Sunday, prepared and practiced pitch presentations and then pitched to an audience of the participants and a panel of judges
- Judges evaluated each team's pitch, concept and prototype with 10 criteria categories
- Prizes were awarded to the top three teams and all groups were encouraged and supported to continue developing their solution after the event
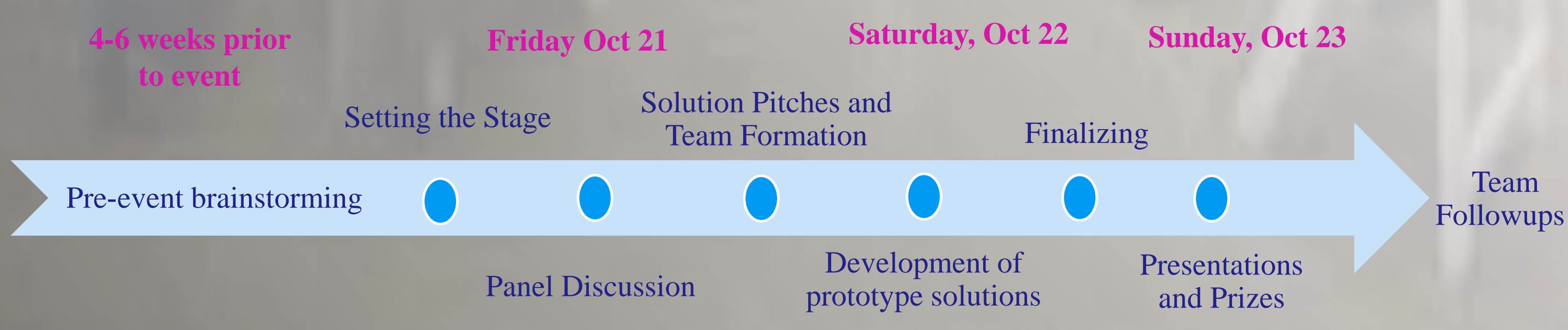
Results

There were 58 participants of varying self-identified roles forming 14 teams which worked on the development of software and hardware prototypes, (apps/websites, devices, wearables) addressing a variety of pain & fatigue problems, culminating in final pitch presentations to a panel of judges comprised of academic experts, clinicians, patients and entrepreneurs in the technology start-up space.
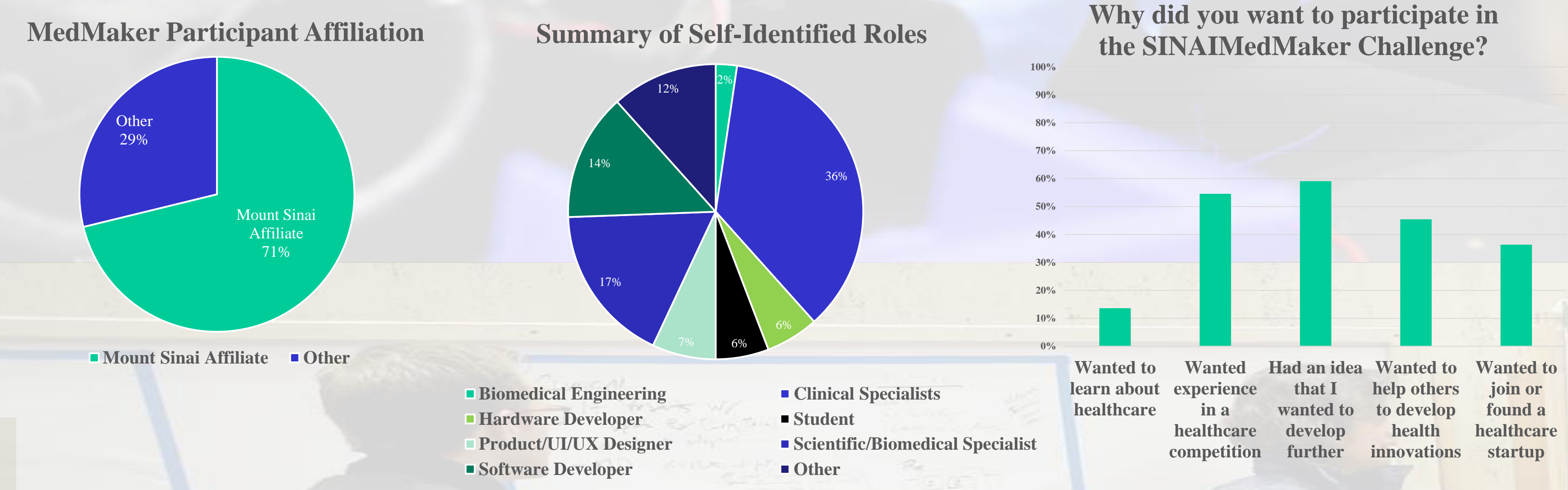

Figure 1: Participant Registration Survey Results . *The majority (71%) of participants identified themselves as Mount Sinai affiliates vs 29% who were affiliated with other institutions. The most common self-identified role was a "Clinical Specialist" (36%) and the least common was "Biomedical Engineering". Of note, six percent identified as a" Hardware Developer" and fourteen percent as "Software Developer".*

	Team Name	Category/Description	Team Size	Technical	Clinical	Faculty
1	InnerPeace	Pain and Fatigue Treatment; Therapeutic App	4	✓	✓	✓
2	Pt partners	Pain Treatment; Wearable and App	4	✓	✓	
3	Chronic Pain App	Pain Assessment and Management App	4		✓	✓
4	Clarity	Fatigue treatment and monitoring; device and app	4	✓		
5	Vr Analgesic	Pain treatment; virtual reality software	2	✓	✓	
6	SickleMeNot	Pain monitoring; app and website	9	✓	✓	✓
7	DoSecure	Pain treatment; device and app	7	✓	✓	
8	Synco	Pain assessment and monitoring; app	3	✓	✓	
9	LessMeds	Pain management; app	3	✓		
10	bioLumen	Pain treatment; device and app	6	✓	✓	
11	Drug Decider	Pain treatment and management; software	3	✓		
12	LesPain	Pain monitoring and management; app	4	✓	✓	
13	Signforce	Fatigue management; software	4	✓	✓	
14	ListenWithMe	Pain treatment; app	2	✓		

Table 1: Summary of Teams. *14 Teams participated with team sizes ranging from 2 to 9 people. The 3 prize-winning teams are highlighted in blue; all winning teams had at least 3 team members and at least 1 member with clinical and technical backgrounds*
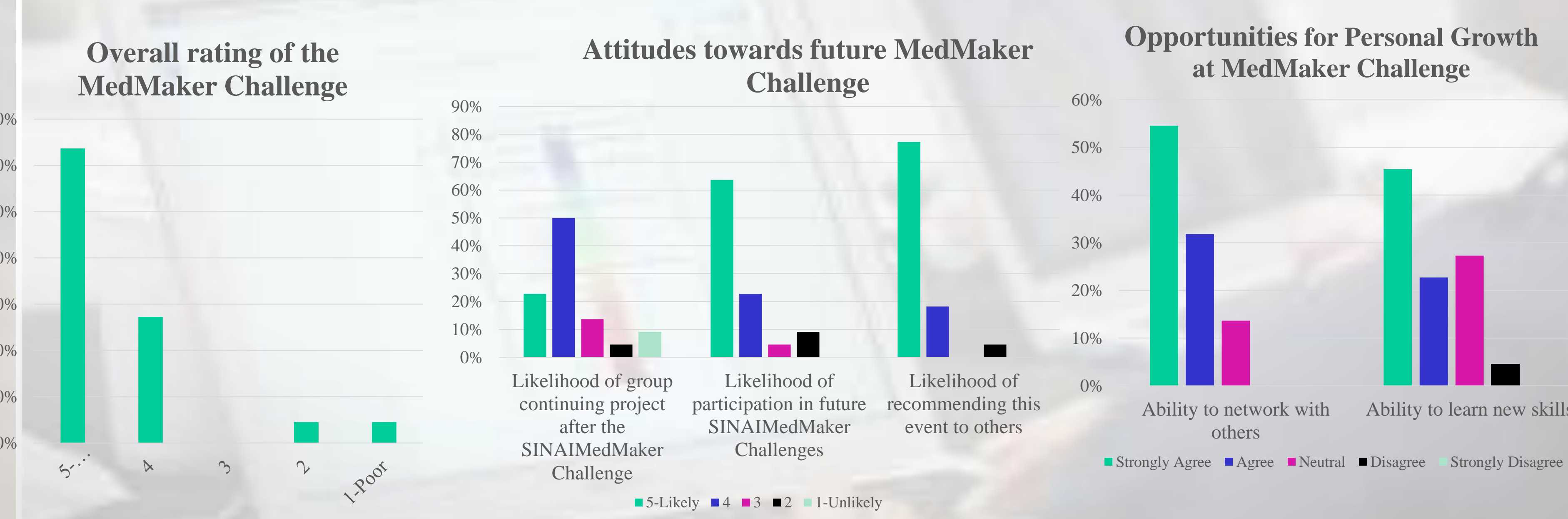

Figure 2: Post-event survey results: *The majority (64%) of participants rated the SINAIMedMaker Challenge as "Excellent". When asked about whether respondents thought they would continue their projects after the event, 73% replied with a 4 or 5 out of 5 on the likelihood scale. In addition, 86% responded a 4 or 5 on the likelihood scale that they would participate in future challenges and 95% ranked a 5 or 4 out of 5 on the likelihood scale of recommending the event to others. The majority strongly agreed (55%) or agreed (32%) that the ability to network with others was an appealing part of the event. In addition, 67% strongly agreed or agreed that the ability to learn new skills was an appealing part of the event.*

Testimonials

"I thought this event was great! I never participated in a hack-a-thon before and was under the impression it was only for computationally inclined people. A lot can happen with interdisciplinary teams like this. Great feedback and support. Awesome job to the organizers."

"Overall, I think this was a fantastic event! It was well organized and supported."

"This event was unlike anything I've ever participated in before. It encourages creativity and innovation. It allows anyone from any background, education, gender, or ethnicity to join and that really means a lot. I felt welcomed and felt like I made a meaningful contribution. The support there was great. I will be back next year!"

"Lesson learned is to be innovative. If you don't have what you need to get the job done, create it. The opportunities are endless if you are willing to confront the challenge."

Conclusion

The Sinai MedMaker Challenge:

- Was a compelling and productive forum to bring together students, trainees, faculty and other stakeholders to explore tech-based solutions for management, monitoring, and treatment of pain and fatigue
- Demonstrated how diverse teams of people with technical and clinical backgrounds are able to come together to break down knowledge barriers and develop innovative healthcare technology solutions
- Received highly positive feedback overall - participants ranked the event as excellent with a majority responding that they were likely to attend future events and recommend the event to others
- Can be repeated annually, fostering a "Community of Practice," & expanded to offer pre & post event opportunities to encourage iterative learning and ongoing creative output

Future Considerations

- There was a large variation in team size, with some teams having only 2 members and others up to 9; having a minimum team size and facilitating formation of diverse team compositions among all groups may be beneficial
- Expanding team formation process to include pre-event networking and training sessions may enable teams to fill gaps in their composition and have more time to recruit proficient technology developers or other missing backgrounds

Acknowledgements