

Nurse's Contributions to Collaborative Problem Solving, Entrepreneurship and Innovation at virtual MIT Hackathons During the Covid-19 Pandemic

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Abstract

Background: The COVID-19 pandemic propelled the use of online collaborative platforms to bring diverse individuals together to drive rapid innovation in healthcare. Massachusetts Institute of Technology (MIT) Hacking Medicine hackathons served as an ideal space for collaborative problem-solving, entrepreneurship, and innovation. We aimed to assess the impact of nurses within MIT-led hackathons, which may provide insight into the value nurses bring to other challenges in healthcare.

Methods: An anonymous 25-item Google forms survey was disseminated to the MIT COVID-19 Challenge participants through the SLACK online platform for six MIT-led hackathons in 2020.

Results: Out of 65 responses, 48 met the inclusion criteria. Nurses' contributions were considered "very" or "extremely" valuable in helping to identify and break down the problem (85%), and in helping to brainstorm and iterate the solution (88%). The participants were "very" and "extremely" satisfied with the nurses' abilities to be an asset to the team and valuable contributors (88%), knowledgeable (94%), and effective communicators (90%). They recognized the nurses as a source of high-quality information outside the clinical context (92%), indicated an interest in seeking expertise from nurses (90%), seek nurses as a mentor (83%) and as team members (79%).

Conclusions: Nurses can make important contributions to teams working on innovative healthcare solutions across the globe via online platforms. Involving them in problem-solving teams should be encouraged.

Keywords

MIT hackathons, online platforms, nurse contributions, healthcare innovation, collaborative problem solving, COVID-19 pandemic.

Background

The COVID-19 global pandemic highlighted gaps in healthcare delivery, especially in socio-economic segments and geographic areas, stimulating worldwide collaboration and innovation. The hackathon solution—where groups of people with diverse

backgrounds meet to solve problems in a compressed time frame, generally a weekend — is ideal for meeting this kind of challenge. Hackathons rapidly identify problems, ideate together, and create low-cost, inventive solutions.

Nurses make up one of the largest segments of the healthcare workforce, (American Association of Colleges of Nursing (AACN), 2019; National Council of State Boards of Nursing (NCSBN), 2020), and are intimately involved with every aspect of patient care, offering a bird's eye view of healthcare's most difficult problems. During the pandemic, leaders within the healthcare industry turned to nurse leaders for guidance (Butler, 2020; Kagan & Connor, 2022; HIMSS New York State, 2020). The pandemic presented an opportunity to bring nurses together across the globe to solve major health challenges.

Nurses have been present at multiple hackathons in recent years; some with a specific nursing focus and others as contributors (Kagan et al., 2021). As trusted experts and bedside caregivers, nurses make ideal hackathon participants. The requirement for virtual meetings during the pandemic increased the opportunity to participate in hackathons.

The Massachusetts Institute of Technology (MIT) Hacking Medicine held multiple hackathons in 2020 focused on challenges such as the pandemic and solving racism in healthcare. Nurses had the opportunity to engage with engineers, scientists, and software developers by joining teams in various capacities as participants, team mentors, team leaders, and judges. Our goal was to assess nurses' impact within these hackathons and to provide insight into the value nurses bring to teams in solving challenges in healthcare.

Methods

An anonymous 25-item Google forms survey (Koszalinski et al., 2021) was electronically distributed to participating hackers (scientists, designers, engineers, and others) 18 or older who engaged with nurses for any length of time in six MIT- led hackathons via the general announcement channel on the Slack platform. The questions on the survey were related to the iteration process which 1) identifies the problem, 2) breaks the problem down into a clear understanding of the root cause, 3) brainstorms for solutions, and 4) iterates and improves. This iterative process is followed until a solution is achieved.

Screening questions determined participation eligibility by establishing age and confirmation of having interactions with a nurse. Six demographic questions collected de-identified data about the participant's gender, education, discipline, region, and race/ethnicity. Participants were also asked to check all that apply to the nurse's role with the team, such as mentor, pitch mentor, judge, team member, or team leader.

Likert-type questions were designed: four questions assessed nurses' contributions to the four areas of the hackathon process framework, four questions assessed the quality of interactions, and four questions assessed the likelihood to engage with a nurse in the future. One question solicited three descriptors from the participant's view of the nurses. The final question asked the disposition of the team (winner/non-winner in category). Participants had an opportunity to include additional comments in text format. The survey tool was analyzed for internal consistency using Cronbach's alpha and reliability using inter-item correlation.

Results

Out of 65 total participant responses for all six events, 48 participants met the inclusion criteria. Five respondents from *India Turning the Tide*, 19 from *Hacking Racism in Healthcare*, five from *Grand Hack*, and six from *Hack4TheFuture*. Included are 8 responses from MIT COVID-19 Challenge *Beat the Pandemic II* and five responses from *Latin America vs. COVID-19* that were previously reported (Koszalinski et al, 2021).

Respondents had diverse backgrounds. The majority (67%) were between ages 18 and 34 and held a master's degree (40%) or bachelor's degree (35%). Nurses were identified as team mentors (35%), team members (33%), pitch mentors/coaches (15%), final pitch judges (6%), and team leaders (2%). Table 1 contains additional details.

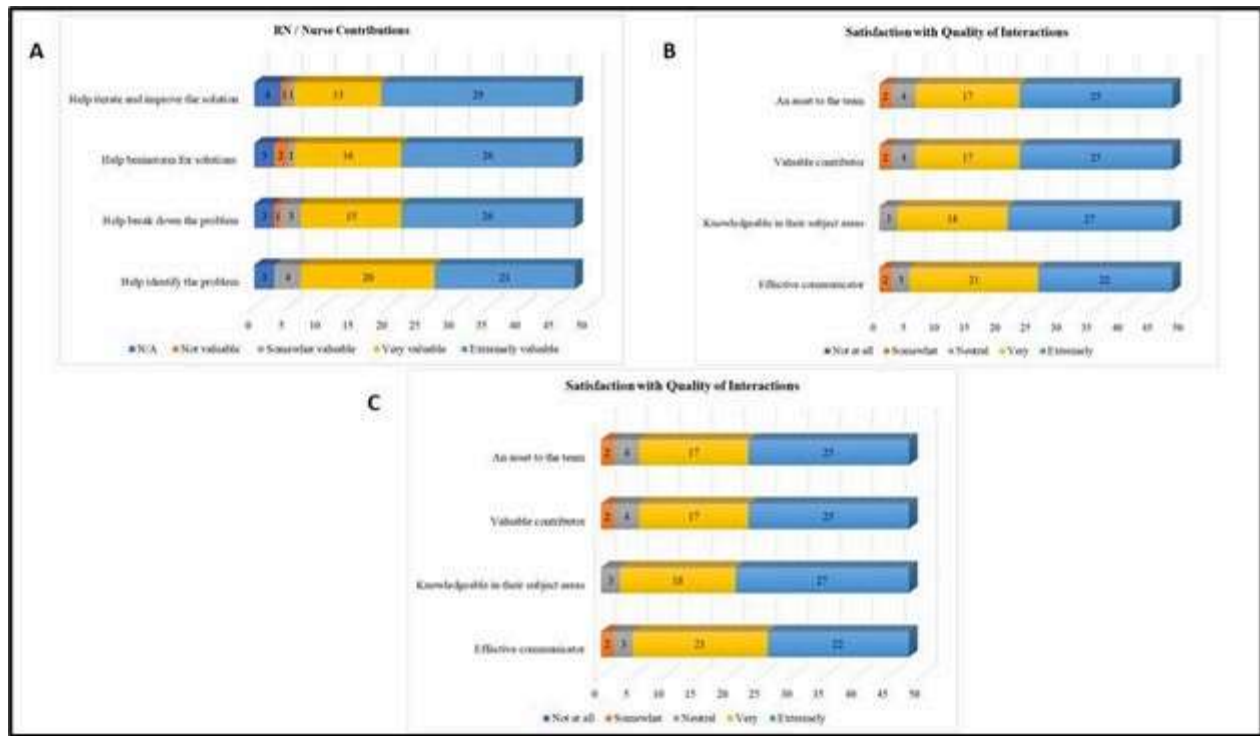
Table 1: Demographic Data

Characteristics		Frequency=N*	Percentage %
Age (range)	18-24	20	41.7%
	25-34	12	25.0%
	35-44	9	18.8%
	45-54	5	10.4%
	≥55	2	4.2%
Gender	Female	25	52.1%
	Male	22	45.8%
	Non-binary	1	2.1%
Race	Asian	17	35.4%
	White	16	33.3%
	American Indian	5	10.4%
	Black/African American	5	10.4%
	Other	5	10.4%
Level of Education	Current College Student	8	16.7%
	Bachelor's Degree	17	35.4%
	Master's Degree	19	39.6%
	Doctorate [Non-PhD]	3	6.3%
	Doctorate [PhD]	1	2.1%
Location	Asia	11	22.9%
	Canada	2	4.2%
	Europe	2	4.2%
	Mexico	3	6.3%
	South America	5	10.4%
	United States	25	52.1%
Area of Practice/ Discipline	Academia	2	4.2%
	Business/Finance	4	8.3%
	Data Engineer / Data Scientist	3	6.3%
	Designer [Product, graphic, print, etc]	3	6.3%
	Engineer [electrical, mechanical, biological, chemical, etc]	10	20.8%
	Entrepreneur	6	12.5%
	Patient/Patient Family	2	4.2%
	Provider [Physician, Nurse, Physical Therapist, EMT, etc]	14	29.2%
	Software Professional [Developer, IT Professional]	4	8.3%
	Academia	2	4.2%

The majority of the respondents were non-healthcare professionals (71%). The role of the nurse's contributions, quality of interactions, and likelihood to engage with a nurse in the future is described in Figure 1. Nurses' contributions were considered "very" or "extremely" valuable in helping to identify the problem (85%), break down the problem (85%), brainstorm for solutions (88%), iterate and improve the solution (88%), (Figure

1A). The participants were “very” and “extremely” satisfied with the nurses’ abilities to be both an asset to the team and a valuable contributor (88%); knowledgeable (94%), and an effective communicator (90%) (Figure 1B). Participants’ responses indicated their experience/interaction with nurses’ as positive and indicated they were “very” or “extremely” likely to recognize nurses as a source of high-quality information outside the clinical context (92%), to seek input/expertise from a nurse (90%), to request a nurse as a mentor (83%)and to have nurses as a team member (79%). (Figure 1C).

Figure 1: Survey items



The survey tool reliability demonstrated a Cronbach’s alpha of 0.78 for the 4-item value of the RN contributions sub-scale, 0.94 for the 4-item satisfaction with RN contributions sub-scale, and 0.86 for the 5-item likelihood for future engagement of nurses’ sub-scale (Table 2). Inter-item correlation is described in Table 3. These results support the use of our measures.

Table 2: Psychometric properties for three scales

Scales	M	SD	Range	Cronbach's Alpha
RN contributions	12.96	3.452	4-16	.779
Quality of Interactions	17.52	2.813	5-25	.945
Likelihood to engage	17.42	3.052	5-25	.864

Table 3: Inter-Item Correlation Matrix for Three Scales

1. The nurse's contributions to				
	Identify problem	Breakdown problem	Brainstorm solutions	Iterate/improve solution
Identify problem	1.000	.521	.677	.288
Breakdown problem	.521	1.000	.345	.465
Brainstorm solutions	.677	.345	1.000	.537
Iterate/improve solution	.288	.465	.537	1.000
2. Quality of interactions with nurses				
	To be effective communicator	Knowledge in their subject areas	To be valuable contributor	To be an asset to the team
To be effective communicator	1.000	.731	.901	.901
Knowledge in their subject areas	.731	1.000	.699	.699
To be valuable contributor	.901	.699	1.000	.935
To be an asset to the team	.901	.699	.935	1.000
3. Likelihood to engage with nurses to				
	Be part of a team	Be a mentor	Seek input/expertise	Gain high-quality information outside the clinical context
Be part of a team	1.000	.652	.480	.461
Be a mentor	.652	1.000	.785	.679
Seek input/expertise	.480	.785	1.000	.722
Recognize nurses as a source of high-quality information outside the clinical context	.461	.679	.722	1.000

Additionally, respondents provided three words they believed described nurses (Figure 2).

Figure 2. Descriptors of nurses by the survey respondents.



Verbatim comments captured the intent of the collaborative events with the following examples:

“[Mentor’s] inputs were really valuable and helped us take our pitch to the next level.

I am an engineer/designer and those interactions... encouraged me to continue towards the path I initialized recently of becoming a nurse.”

“I believe the nurse on our team led us to victory! Nurses are innovators and deserve recognition.”

Discussion

The increased involvement of nurses in hackathons beginning in 2019 created the opportunity for nurses to attend, influence, and lead the larger and well-known hackathons sponsored by MIT the following year. Hackathons provide nurses with an opportunity to collaborate with stakeholders from other industries in developing healthcare solutions. By working with interdisciplinary teams, nurses can leverage their skills, knowledge, and experience. Non-healthcare participants welcomed nurses as part of their teams and as mentors, identified their contributions as valuable, and found nurses to be both knowledgeable and good communicators. They looked forward to

engaging with nurses in future innovation spaces. Health leaders may want to ensure that nurses are included in interdisciplinary teams to solve healthcare challenges locally and globally.

Prior to 2019, nurses were mostly absent from collaborative innovation (Kagan et al., 2021). In the United States, only one article (Chen et al., 2020) specifically mentioned the involvement of a Nurse Practitioner student. In other healthcare hackathons nurses' participation, if any, was not documented. Similarly, minimal information was given about nurses' participation in Israel (Ramadi et al., 2019) and Thailand (Pathanasethpong et al., 2020). In Pakistan nurses and nursing students described the use of hackathons (Baig et al., 2021; Butt et al., 2021; Farooqi et al 2017) and the importance of involving all the stakeholders, including patients, nurses, and members of other professions was noted.

MIT Hacking Medicine (MIT Hacking Medicine, n.d.), is known for the inclusion of various categories of healthcare professionals and other disciplines. In 2020, nurses were invited as participants, mentors, coaches, organizers, and judges. As invitees we wished to provide insight into nurses' impact during six MIT-led hackathons with the goal of informing others about the value nurses can bring to teams.

We demonstrated the importance of nurses' contributions to innovation and entrepreneurship during these events, wherein the majority of participants were non-healthcare professionals. Nurses' expertise was well-received and valued. Looking toward the future, seeking nurses' expertise, and inviting them to teams to solve problems in healthcare should be strongly encouraged. Capitalizing on the use of currently available online platforms, more nurses are encouraged to pursue these event opportunities to collaborate with and contribute to healthcare innovation worldwide.

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