Virtual hackathon to tackle COVID-19 unmet needs

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INTRODUCTION

The COVID-19 pandemic has created an urgent need for healthcare innovation across the globe. In tandem, it has brought travel restrictions and social distancing measures which act as significant barriers to traditional methods of innovation. In this context, we explore the use of virtual hackathons to generate innovation during a global pandemic.

Hackathons are events which bring people from different disciplines together with the aim of solving predefined challenges through iterative innovation.[1] As the name suggests, this concept emerged from computer sciences, and the model has since been adapted and used in healthcare settings.[2] In healthcare hackathons, clinicians collaborate with computer scientists, engineers, physicists, biochemical scientists, industry representatives and patients to solve unmet clinical needs.[3] In education, hackathons have been used to facilitate collaborative learning and promote diversity in innovative thinking.[4] Hackathons are typically conducted via a large conference format and small group working over a period of hours or a small number of days.

MEDTECH FOUNDATION

The MedTech Foundation is a national, interdisciplinary collaborative group that connects members from medicine and engineering to other MedTech-related specialties. The group has Hubs in six universities across the UK. These each deliver an annual educational workshop series called the Innovation Programme, together with a portfolio of research studies, summer internships with industry, and a number of hackathons for a range

Summary box

What are the new findings?

► The COVID-19 pandemic prevented physical innovation formats and virtual innovation strategies such as the virtual hackathon proposed in this article may address this challenge.

► Virtual interdisciplinary collaboration between students and early career professionals can lead to rapid innovations to address urgent unmet clinical needs in times of global emergencies.

How might it impact on healthcare in the future?

► Innovation pathways should be augmented with virtual innovation strategies to break down barriers to engagement in healthcare innovation, improve global interdisciplinary collaboration and enhance rapid innovation adoption moving into the future.

► Particular healthcare technologies likely to be positively impacted by this include those in digital health, global health and medical device sectors.

of unmet healthcare needs.[5–7] In March 2020, a group of students and early career professionals from the MedTech Foundation recognised an opportunity to contribute to the COVID-19 response.[8] Due to the social distancing measures, running a hackathon via the traditional format was not possible and alternative methods to deliver a virtual hackathon were explored. Their aim was to conduct a virtual hackathon to address unmet needs that emerged from COVID-19 across the UK.

METHODS

To identify unmet needs for the hack, a social media strategy was used across several platforms, including Facebook, Twitter and LinkedIn. This involved a Google forms survey that facilitated free text submission of unmet needs across a wide audience range. These were targeted at both frontline healthcare workers and members of the public to describe current areas of unmet need at home or in their place of work/care. We opted for free text submission as we did not want to pre-empt the responses and sought to collate a wide range of varying unmet needs. An interdisciplinary team of medical students, junior doctors, engineering undergraduates and PhD students designed and facilitated the virtual hackathon. Microsoft Teams (Microsoft Corporation, Washington) was chosen as the platform to deliver the virtual hackathon as it facilitates the formation of multiple small groups, file sharing, intergroup and intragroup messaging, in-team video conferencing functions and whole group announcements. The organising team worked in shifts to facilitate the hackathon. Experts from healthcare, engineering and computer science were on standby to call in and advise teams throughout the hack. Participants were recruited 1 week prior to the hackathon start date.

RESULTS

Defining the unmet needs

A total of 15 questions were formed from the submitted unmet needs, which were grouped thematically and summarised in figure 1. There were five unmet need themes: 'community', 'education/training', 'mental health', 'public health' and 'hospital'. The diverse set of unmet needs demonstrated the wide impact that COVID-19 has on all areas of the health and social care system, as well as affecting the lives and work of most of the population. A varied set of needs requires a broad range of expertise to address them and a virtual platform for interdisciplinary collaborative working is essential to achieve the desired outcomes.

Conducting a virtual hackathon

One hundred and twenty-three participants signed up to the hackathon: 38 medical students (30.1%), 9 National Health Service doctors (7.3%) (including 7 junior doctors and 2 consultants), 12 industry representatives (9.8%), and 64 non-clinical students and academics (52%) (42 undergraduates; 22 postgraduates) mainly from engineering subjects, product design and computer science. Approximately one-third were based in the Leeds City Region, one-third from Cambridge and one-third from elsewhere across the UK. Each participant ranked the unmet needs in order of preference, and teams were formed based on these while trying to maintain a broad range of disciplines within each team. Initially, 18 teams were formed.

The virtual hackathon ran continuously from 3 to 5 April 2020. At the end of the event, each team submitted a project proposal and business canvas that captured their main ideas. Some teams were working on similar concepts and so in these circumstances, teams were combined to collaborate on a solution together. There were 12 unique solution concepts submitted at the end of the hackathon. Unlike other hackathons, all teams (rather than a singular team) were offered further support to progress their submitted ideas where practically possible.

Translating the hack outcomes

Of the innovations submitted (as of 27 April 2020), seven were primarily digital solutions, three were primarily device and hardware solutions and two involved a combination (table 1). The post-hack support took the form of each team being assigned a dedicated mentor from the MedTech Foundation. This mentor connected the team to industry or research partners where necessary, gave them coaching on idea and
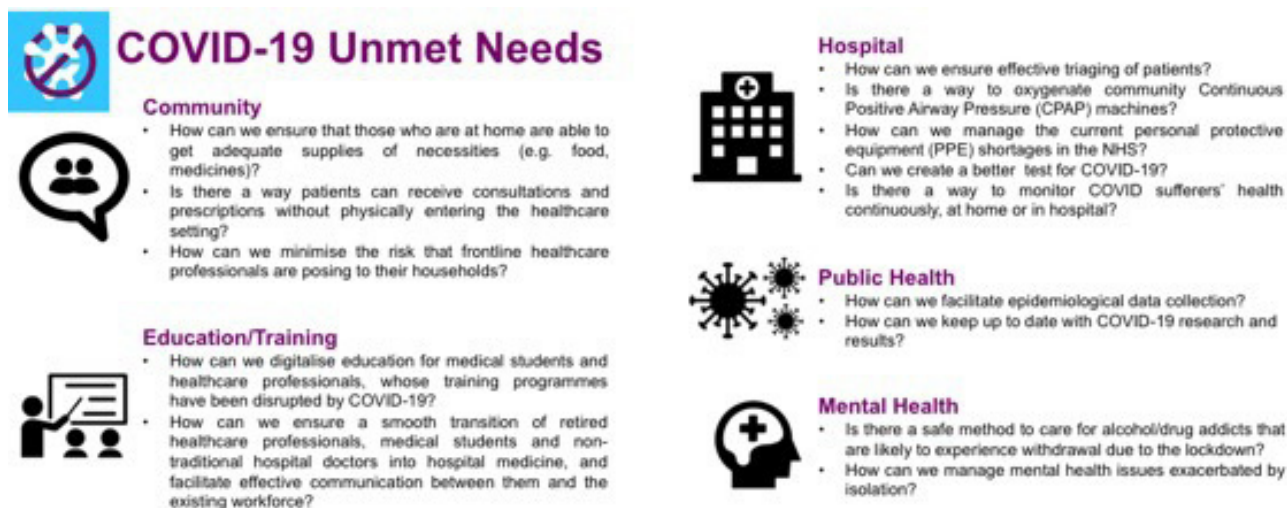
Figure 1 Themes of the COVID-19 unmet needs tackled in the MedTech Foundation virtual hackathon.

Table 1 Initial outcomes for projects emerging from the MedTech Foundation virtual hackathon to address COVID-19 unmet needs

Theme addressed	Solutions (n=) and type Total n=12	Initial outcomes (as of 27 April 2020)
Community	Digital solutions **n=2** Hardware or hybrid solutions **n=1**	Beta platform created and in use **n=1** Connected to industry partners **n=1** On-going concept refinement **n=1**
Education and Training	Digital solutions **n=1** Hardware or hybrid solutions **n=2**	Connected to industry partners **n=1** On-going concept refinement **n=2**
Hospital	Digital solutions **n=1** Hardware or hybrid solutions **n=2**	Beta platform created and in use **n=1** On-going concept refinement **n=2**
Public health	Digital solutions **n=2** Hardware or hybrid solutions **n=0**	Beta platform created for testing **n=1** Connected to industry partners **n=1**
Mental health	Digital solutions **n=1** Hardware or hybrid solutions **n=0**	On-going concept refinement **n=1**

strategy, and helped them compile grant applications or further business pitches where appropriate. Three teams subsequently linked with companies working in a similar area and have continued to explore how their ideas may be integrated into existing solutions. Three digital solution teams have created beta versions for preliminary testing, including one artificial intelligence website solution that aims to help frontline healthcare workers find answers to COVID-19 questions using trusted guidelines/sources. This already has >100 unique users per day.[9] In this exemplar, the solution addressed the education/hospital unmet need we identified of easily allowing busy frontline staff to keep up to date with the latest guidance and evidence tailored to COVID-19 patients. One collaborative funding application has been submitted and more are in preparation. Another has developed a beta and is currently collaborating with a clinical trials unit to improve their epidemiological data collection.[10] The remaining teams are either refining their concepts, or may pivot away from their original idea to explore new areas.

DISCUSSION

This short communication provides a rare examination of how a wide variety of disciplines can rapidly mobilise to hack and translate innovation in response to a global crisis. In less than 4 weeks, a virtual hackathon was conducted and tangible outputs realised. The virtual format is ideal for times of social-distancing, but in an ever-globalised world, these working methods are increasingly relevant to connect geographically diverse groups together to innovate effectively.

A criticism of hackathons has been that they often fail to result in tangible outputs.[11] In healthcare innovation, it is essential that suitable ideas emerging from hackathons are given the environment to translate into either patient, public or healthcare worker benefit. It may not be possible, or indeed necessary, to do this with every concept that emerges. For example, following further market research or preliminary scientific investigation, it may become apparent that the initial proposal is unfeasible. In our commentary, we demonstrate that producing tangible outputs is possible via a rapidly delivered virtual hackathon.

Virtual hackathons have been conducted elsewhere to address COVID-19 challenges.[12–14] In Germany, the government launched a virtual hackathon to tackle the biggest challenges arising from the COVID-19 outbreak. Over 42 000 people participated resulting in over 800 projects being submitted to a government sponsored panel to decide which will receive funding to be taken forward.[15] Delivering at this scale requires the backing of governmental departments or big industry to fund and administer the event. Although the concept of hackathons is not new, virtually delivered hackathons are comparatively rare and there appears to have been a dramatic increase in the number of virtual hackathons since the COVID-19 outbreak. Virtual formats are attractive as they can offer quickly organised and scalable collaboration, although the challenge of achieving translation and impact remains. Additional issues that arise from virtual formats come from practically navigating who, and where, the ideas belong to, and how decisions around their translation should be conducted after the fact. In many COVID-19 related innovation activities, concepts are being developed open source as a contribution to citizen science.[16–18] In our hackathon, we took a similar approach and participants were advised of this policy before taking part. Post-outbreak, the authors recommend the wider adoption of virtual hackathons as a strategy to generate innovation efficiently and effectively while breaking down discipline and geographic silos. Mechanisms to achieve open collaboration while maintaining and protecting intellectual property rights can greatly enhance the overall efficiency of the innovation pathway.[19] Face-to-face hackathons are often

intensely enjoyable and concentrated experiences owing to the close contact of multiple different disciplines working together. Some properties may be difficult to replicate over a virtual 'hack from home' format. However, attitudes may change as people become increasingly familiar with virtual events. Virtual formats also offer an extra element of inclusivity, where potential barriers to traditional formats such as physical impairments and child care commitments can be mitigated.

The COVID-19 outbreak has forced the rise in the use of these virtual delivery formats and many lessons will be learnt and hopefully shared with the wider innovation community. We demonstrate that innovation via virtual hackathons is possible and effective at generating solutions to unmet needs in healthcare. In the future, virtual formats will likely become increasingly popular and used to augment the delivery of innovation, and as such, innovate how we innovate.

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