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MEETING REPORT

Learning Health Systems

# Summary of fifth annual public MCBK meeting: Mobilizing computable biomedical knowledge (CBK) around the world

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## Abstract

The massive growth of biomedical knowledge in computable formats poses a challenge for organizations as they consider mobilizing artifacts to be findable, accessible, interoperable, reusable, and trustable. Formed in 2016, the Mobilizing Computable Biomedical Knowledge (MCBK) community is taking action to ensure that health organizations have the infrastructure in place to access and apply computable knowledge; to develop national policies and standards that require all data to be discoverable and available for safe and fair use; and to promote the widespread adoption and implementation of health knowledge in support of healthcare, biomedical research, public health, and education. This report summarizes the main outcomes of the Fifth Annual MCBK meeting, also considered the first manifestly global MCBK meeting, which was held virtually July 12 to 13, 2022. Over 200 participants from diverse domains around the world joined this meeting to frame and address important dimensions for mobilizing CBK.

**KEYWORDS**

mobilizing computable biomedical knowledge, MCBK, annual meeting, global

## 1 | BACKGROUND

Although there is incredible growth of computable biomedical knowledge in the United States,[1] as well as a related movement to advance learning health systems (LHSs),[2] the gap in health disparities nonetheless continues to widen.[3] Variation in healthcare and health outcomes between certain populations is not a unique problem to the United States, and the COVID-19 global pandemic has magnified those differences.[4] There is a larger evidence base and number of possible treatments, but it is difficult to widely disseminate and implement these into practice as there are several challenges to overcome including volume, relevance to patients, and the need to adapt to workflows and electronic health record (EHR) technologies in spaces where health-related decisions are made.[5,6]

For rapid and wide dissemination, actionable knowledge needs to be distributed in easily usable and readily implementable formats—that is, computable biomedical knowledge (CBK). CBK, such as predictive models, rules, alerts, clinical pathways, or data visualizations, is necessary for the interventional approach of a learning health system. The mobilization of CBK can result in rapid mass access to computable knowledge, which has the capacity to improve the health of individuals and populations on a large scale.[5] We believe that, for CBK artifacts to be widely shared, they must be findable, accessible, interoperable, reusable, and trusted (FAIR+T) by all stakeholders.[7] This is essential to improve the health of individuals and populations at scale and to achieve high functioning learning health systems.

Work in this space has progressed for many years, but the movement to mobilize computable biomedical knowledge (MCBK) began 5 years ago through the collaboration between several thought leaders and a diverse multistakeholder community of interest. The MCBK community aims to achieve improved health in diverse settings by widely sharing knowledge in a computable format,[8,9] and by bringing together

a group of stakeholders that is truly global. In this report, we present a summary of the Fifth Annual MCBK public meeting held virtually on July 12 to July 13, 2022, in the western hemisphere.

## 2 | MEETING AND PARTICIPANT INFORMATION

Due to the continuing COVID-19 pandemic and the global spread of attendees, the meeting was held as a virtual interactive conference. 495 people from 44 countries registered for the meeting and 260 people from 30 countries attended the 2-day meeting. The organizations represented by the attendees are as follows:

- Universities/Academic Medical Centers (n = 125 [48%])
- Commercial/Industry and Consultants (n = 36 [14%])
- Multidisciplinary Clinicians (n = 19 [7%])
- Government (n = 47 [18%])
- Other (n = 13 [5%])
- Students/Fellows (n = 20 [8%])

## 3 | 2022 MEETING STRUCTURE AND OVERVIEW

A multidisciplinary and multistakeholder steering committee guided the selection of topics and activities. To accommodate for the global spread of time zones for participants, there were two meeting sessions per day—one starting at 9 AM EST and the other starting at 7 PM EST. The virtual meeting included remarks from global leaders, presentations, and two sessions of 10 lightning talks each. These lightning talks were selected after careful review of the abstract submissions from the MCBK meeting committee. There were also breakout discussions where attendees could ask more detailed questions from the lightning talk speakers. The meeting agenda, list of speakers, registered participants, and presentations are available at http://www.mobilizecbk.org. Slides and videos for all talks are available at https://mobilizecbk.med.umich.edu/news-events/annual-meetings/2022-meeting.

A professional AV service was used to set up the IBM virtual platform to stream the meeting live to viewers. Central meeting moderators led the two-day conference from a studio in Ann Arbor, Michigan. The IBM platform streamed the pre-recorded presentations and live footage of the in-studio moderators. Attendees interacted with each other and submitted questions in the chat and question-and-answer windows on IBM. Zoom, due to its interactivity and widespread familiarity among the global audience, was used for breakout discussions and huddle sessions on relevant topics to advance MCBK.

## 4 | WELCOMING ADDRESS AND REMARKS FROM NATIONAL LEADERS

*Dr. Charles (Chuck) Friedman*, *Dr. Phillip Scott*, and *Dr. Wendy Chapman*, the Global MCBK Meeting co-chairs, opened the meeting with an overview of the 2-day meeting agenda and a history of the MCBK movement.[10] Drs. Friedman and Scott emphasized the imperative of FAIR and trusted computable knowledge to improve health for everyone around the world. Knowledge is the keystone that holds the learning health system cycle together and one of the fundamental MCBK propositions is that computable knowledge will help close the improvement gap, which can be roughly 17 years. There must be an infrastructure to support improvement at scale and libraries are a key part of that as they curate, manage, and disseminate computable knowledge at a rapid pace. The overarching goals of this meeting are to strengthen the foundation of shared principles for MCBK, to share projects from around the world related to MCBK, and to discuss the future goals and opportunities for collaboration in a global MCBK community.

## 5 | KEYNOTE PRESENTATIONS ON DAY 1

### 5.1 | What kinds of high-quality clinical knowledge objects can LHS readily produce?

*Dr. Jeremy Wyatt*, Director of Wessex Institute Health Research and emeritus professor of digital healthcare at University of Southampton, gave an opening keynote presentation that asked if learning health systems can produce reusable, trusted, clinical computable knowledge objects.[11] He started by talking about how decision support systems help clinicians apply the vast amount of clinical knowledge as computable knowledge, and there is evidence that shows decision support systems have improved clinical practice. However, there is only a 6 % absolute improvement in clinical practice, so there is clearly a need for mobilizing CBK for both decision support systems and for other purposes. The challenge for learning health systems is ensuring that the computable knowledge be reusable and trusted; clinical research organizations typically follow the steps needed to get there but can all learning health systems do so? In particular, Dr. Wyatt notes the problem of the data to knowledge (D2K) step – instead of focusing on retrospective data collection that can have the problems of bias, missing data, or too much data, use the data to suggest novel hypotheses for later study and perform analysis on a complete data set.

### 5.2 | Translating computable knowledge to meaningful action

*Dr. Kristi Holmes*, Director of Halter Health Sciences Library and Learning Center and associate professor of preventive medicine at Northwestern University Feinberg School of Medicine, gave a presentation on moving from knowledge to impact.[12] Impact reflects value and can be seen in meaningful health outcomes and community health benefits, but also extends to effects on the economy, environment, and public policy. The Translational Science Benefits Model is a framework from Washington University in St. Louis that public health and clinical health scientists can use to identify and measure the impact of their work. Performing research and having significant

findings is a great feat, but it will not have much impact until there is knowledge exchange where the results can be shared. Libraries are ideal partners and champions to empower CBK in domains like infrastructure, ethics and accessibility, workforce development, and organizational culture. Dr. Holmes shared two projects, NIH Comparative Genomics Resource (CGR) and the generalist repository ecosystem initiative (GREI), which demonstrated the role of libraries in helping data become findable and reusable. Dr. Holmes closed by stating the importance of culture and inclusivity in the workforce to increase impact.

### 5.3 | FHIR for computable knowledge

*Grahame Grieve*, the founder of HL7's Fast Healthcare Interoperability Resources (FHIR), and *Bryn Rhodes*, the Chief Technology Officer and co-founder of Alphora, introduced FHIR as an open community lead by HL7 and an open standard accessible to anyone, which started as a way to transform the broken processes in healthcare.[13,14] FHIR specification will only capture what everyone agrees upon, so Grieve suggests using it for smaller communities, like countries or domains, so that there can be more chances for agreement. Grieve states that FHIR intentionally wants to be disruptive to the process of providing healthcare so that there can be better care coordination and care management. Rhodes spoke about knowledge exchange at different points in the continuous improvement cycle and how FHIR can enable that exchange. FHIR aims to reduce the development effort required for clinical systems to support evolving standards of care by enabling precise and unambiguous sharing of clinical knowledge.

### 5.4 | Computable medical knowledge research in China

*Dr. Luxia Zhang*, associate dean of the National Institute of Health Data Science at Peking University and nephrologist at Peking University First Hospital, and *Dr. Guilan Kong*, associate research professor at the National Institute of Health Data Science at Peking University, shared the mobilization of CBK in China and addressed the opportunities and challenges computable knowledge presents.[15] Drs. Zhang and Kong described the pilot learning health systems study about chronic kidney disease at the regional and national level that has so far resulted in sharing narrative knowledge and creating computable knowledge objects, including a computing phenotype, risk prediction model, and localized Knowledge Grid, for clinical decision support. There is a recognized need for CBK in China and Dr. Kong stated that they have developed a plan for CBK research and promotion that involves CBK generation, dissemination, and application, and there are plans to form an MCBK community in China.

## 6 | LIGHTNING TALKS

Twenty abstracts were presented as 3-min lightning talks, 10 in the first session and 10 in the second session. After watching the recorded lightning talks, meeting attendees entered virtual Zoom meetings to have more in-depth conversations with the abstract authors about their work. Three additional abstracts that were selected for publication in the *Learning Health Systems* journal were also part of the breakout discussions.

The selected abstracts represented the perspectives of knowledge developers, disseminators, and users, with 13 (57%) from academia, 4 (17%) from government, and 6 (26%) from commercial entities. The themes of the 23 lightning talks (MCBK 2022 Lightning Talk Abstracts—Google Docs) were as follows:

- Standards, Interoperability, Metadata, Technical Models, and Infrastructures for CBK (n = 10 [43%])
- Implementation, Evaluation, and Stakeholder Value of CBK (n = 6 [26%])
- Ethics, Equity, Inclusion, and Trust Related to CBK (n = 3 [13%])
- Education for CBK (n = 2 [9%])
- CBK Governance, Policy, and Curation (n = 1 [4%])
- National and Global Ecosystems and Economics Related to CBK (n = 1 [4%])

## 7 | CLOSING COMMENTS ON DAY 1

*Dr. Douglas Van Houweling*, Professor Emeritus at University of Michigan School of Information and University of Michigan Medical School Department of Learning Health Sciences shared his thoughts on how he had seen the development of this movement since the beginning in 2016 and he was pleased to find that significant progress has been made.[16] The lightning talks and breakout discussions showed the global range of efforts, from a private enterprise in Kenya using CBK to deliver care to Scotland having government support for a comprehensive effort at delivering CBK decision support. Dr. Van Houweling emphasized that this is all built on people working together and that is the foundation for all the progress we are going to make. This global meeting is an evidence of striking scholarly and scientific efforts on building the scaffolding that supports the development and use of CBK. There is increased implementation of CBK in the clinical domain, which is exciting, but Dr. Van Houweling notes that there are opportunities to start thinking about the role of CBK in the larger learning health systems cycle and how knowledge objects can be continually improved. The MCBK movement is now ready to draw together the many global implementations and build a better model of how to move forward. The key to the future of CBK lies in having a global fabric of trust for CBK.

*Dr. Enrico Coiera*, Director of the Centre for Health Informatics and professor in medical informatics at Macquarie University, started by highlighting the importance of the 60-30-10 number.[17,18] 60% of healthcare is in line with best practice evidence, 30% is low-value, and 10% leads to harm. There is a huge gap of 17 years between best practice evidence research getting into the hands of clinicians, but computational decision support systems can make a big difference in reducing diagnostic error by finding ways to interpret data in electronic health records so that the burden can be shared and not solely

fall on clinicians. He emphasized that the focus of everyone working on mobilizing CBK should be on the public good and reducing health disparities. Best evidence must be reflected, and knowledge objects must be FAIR and trusted. After listening to the talk on FHIR, Dr. Coiera mentioned that it is hard to create standards that will be accepted by everyone, so an open community approach and focus on helping patients can help reduce that conflict. Based on the talk about CBK research in China, Dr. Coiera observed that there are parallel streams of narrative knowledge, text-mining, and computational phenotypes in electronic health records, and that in the next 5-10 years, everyone will be using those sources.

## 8 | DAY 2—MOBILIZING CBK AROUND THE WORLD

The first and second sessions of Day 2 of the meeting opened with a presentation from Dr. Friedman and Dr. Scott on the work of MCBK in the United States and the United Kingdom, which is preliminary to a discussion about making MCBK a global community.[19] In the United States, MCBK consists of a steering committee, annual meetings, and three workgroups: Technical Standards and Infrastructure, Trust and Policy, and Sustainability and Inclusion. Dr. Scott talked about the progress of MCBK in the United Kingdom since the inaugural 2019 meeting. MCBK-UK collaborates with the National Institute of Health and Care Excellence (NICE) and has involvement from government, academic, and industry stakeholders.

## 9 | KEYNOTE PRESENTATIONS ON DAY 2

### 9.1 | Data-enabled responses to the pandemic: lessons for accelerating the creation of learning health systems

*Sir Aziz Sheikh*, Dean of Data, Director of the Usher Institute, and Chair of Primary Care Research and Development at University of Edinburgh gave a presentation on initial data-enabled responses to the pandemic, the development of a data infrastructure and analytic capabilities for a more strategic response and moving from pandemic responsiveness to preparedness.[20] The initial responses included physical mobility mapping, identifying COVID-19 hotspots, and understanding public sentiments by analyzing data from social media. EAVE II was created as Scotland's national COVID-19 data infrastructure to investigate the epidemiology of COVID-19, patterns of healthcare utilization and outcomes, and the effectiveness and safety of vaccines and treatments; this platform captured a cohort of the entire Scottish population. Sir Sheikh said that once the right platforms are up with curated data that can be analyzed, insights can be generated much faster, so the platforms should not be limited to use for the COVID-19 pandemic but also be used to aid in other "pandemics" such as cancer, cardiovascular disease, and diabetes. Creating a national learning health system may be possible with the proper resources and capacity to process and interpret data.

### 9.2 | The future of healthcare to 2030—Implications for mobilizing computable biomedical knowledge

*Dr. Jeffrey Braithwaite*, President of the International Society for Quality in Healthcare (ISQua), talked about the future of healthcare and how MCBK fits in.[21] One big problem in the health system, from a research perspective, is that it takes an average of 17 years[22] for only 14% of new discoveries to enter practice, and only 60% of care is in line with evidence or consensus-based guidelines, 30% of healthcare is waste, and 10% of patients are harmed when receiving care.[17] Health systems are incredibly complex, so the solution will not be linear. Dr. Braithwaite then outlined the five main trends shaping health systems of the future and nine main solutions, and he asked how MCBK might benefit from understanding these trends and priorities or if there are others that need to be taken into consideration. He finished by suggesting that plans for mobilizing CBK should be based on implementation science, continuous evaluation and implementation should be performed and the scale of interventions should grow larger.

## 10 | CLOSING SESSION ON DAY 2—MOVING FORWARD WITH MCBK

The annual global meeting ended with a short summary of the 2-day event and a discussion facilitated by the meeting co-chairs.[23] Participants were asked via an interactive presentation toll, Mentimeter, to share what they believe to be the highest priority goals for MCBK and what concrete steps need to be taken in the next 3, 6, and 12 months to advance global MCBK activity. Interest in establishing regional MCBK chapters and taking on leadership roles was also measured through polling. Further discussion took place in a Zoom meeting where participants could speak and share their thoughts in more detail.

## 11 | NEXT STEPS

At the end of the meeting, attendees discussed their ideas of where the MCBK movement should go from here. There was sizeable interest in building a federation of regional chapters so each chapter could meet the needs of their geographic region appropriately while sharing information and learning with other regions. Some high priority goals mentioned included promoting adoption of CBK by engaging more with decision makers and end-users, building a common metadata framework, having a network to create standards, and creating a working example of CBK in action.

MCBK continues to fill an important but broad niche based on the diversity of meeting attendees. The University of Michigan will continue to provide communications and logistical support for the US MCBK community and will collaborate with international MCBK groups in the future. The MCBK is an open and inclusive community.

Anyone interested in learning more about the movement can visit the organization's website at http://mobilizecbk.org.

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## CONFLICT OF INTEREST

The authors have no competing interests to declare.

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