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## Correspondence

# It is time for computable evidence synthesis: The COVID-19 Knowledge Accelerator initiative

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Dear *JAMIA* Editors,

A 2020 perspective article published in *Journal of the American Medical Informatics Association* (*JAMIA*) posed a timely question, “Is it time for computable evidence synthesis?”<sup>1</sup> The shortest answer is, *yes*. The novel coronavirus disease 2019 (COVID-19) pandemic poses an immediate demand for evidence synthesis, given that nearly 30 000 articles have been published in fewer than 6 months since that first case in Wuhan, China.<sup>2</sup> It provides the informatics community with a unique opportunity to accelerate development and interoperability of many systems to realize the aspirations of computable evidence synthesis. In this letter, we describe the origins and status of the COVID-19 Knowledge Accelerator (COKA).

There are tremendous inefficiencies in our current scientific dissemination systems, in which many researchers compute the results then convert the data to various noncomputable forms for human-readable displays, and then many other knowledge processors work with the various human-readable displays to extract the data and enter it into computable form for evidence synthesis. This inefficient pattern is repeated incrementally across multiple steps in an extended series of processes while reports are re-evaluated and reused in subsequent reports. Thus, structured (computable) results directly from research and research publications would greatly accelerate evidence synthesis.

Trial registries such as ClinicalTrials.gov are a good place for identifying early system developments for processing structured results data, but structured results data would be especially useful as a companion to scholarly publications, preprint publications, and derivative works in which systematic reviewers and other evidence processors are evaluating currently unstructured results data. For ex-

ample, COVID-19 studies have already resulted in hundreds of systematic reviews.

Achieving a state of structured results data as standard practice will not likely occur through a single universal repository, but we believe that it can be achieved with universal standards for data exchange, and multiple component standards that account for the many types of data that represent and support research results.

Several groups—including the Guidelines International Network—seeking to accelerate evidence synthesis through collaborations set out to define standards for computable expressions of evidence, statistics, and evidence variables. In 2018, we started a project through Health Level Seven (HL7) International to extend the Fast Healthcare Interoperability Resources (FHIR) standard to achieve this. The group is called Evidence-Based Medicine on FHIR (EBMonFHIR).<sup>3</sup> In less than 2 years, the EBMonFHIR project established draft standards for expression of evidence (<http://build.fhir.org/evidence.html>), evidence variables (<http://build.fhir.org/evidencevariable.html>), Statistics (<http://build.fhir.org/statistic.html>), and ordered distributions for statistical arrays (<http://build.fhir.org/ordereddistribution.html>).

Recent developments to overcome the COVID-19 pandemic have stimulated many researchers, scholars, and information professionals to initiate large consortium-based efforts to share their work and advance our knowledge of the virus and the pandemic. Examples include the COVID-19 Open Research Dataset (CORD-19) (<https://cset.georgetown.edu/research/covid-19-open-research-dataset-cord-19/>), the COVID-19 Evidence Network to support Decision-making (COVID-END) (<https://www.mcmasterforum.org/>)

networks/covid-end), and the Australian National Clinical Evidence Taskforce (<https://covid19evidence.net.au/>). Several of these consortia asked to leverage EBMonFHIR efforts to provide standards for interoperable evidence syntheses.

In response to these requests, our group initiated COKA ([https://www.gps.health/covid19\\_knowledge\\_accelerator.html](https://www.gps.health/covid19_knowledge_accelerator.html)). The specific strategy of COKA is to establish universal standards for each component of knowledge exchanged and thus enable stakeholders to share and reuse their efforts by using the same format for electronic data exchange.

As of May 11, 2020, COKA had 50 working meetings with more than 40 active participants from more than 25 organizations from academia, industry, government, and nonprofits in 7 countries. The group has created additional draft FHIR standards for expressions of citations (<http://build.fhir.org/citation.html>) and evidence reports (<http://build.fhir.org/evidencereport.html>) that provide compositions of all the preceding concepts.

We strongly encourage developers of systems for evidence identification, evaluation, and dissemination to use these resources now as foundational elements to create a computational evidence ecosystem. This environment includes the building blocks for achieving computable evidence synthesis. Other resources not noted previously, such as resources for computational logic expressions, may ultimately be needed for the complete ecosystem. If we can develop standards for each granular component, we can then weave together the many overlapping systems and consortia to accelerate realization of this complex evidence ecosystem.

Computable evidence synthesis is not the endpoint, but rather is another step in a larger knowledge ecosystem. For instance, the EBMonFHIR project is closely related to a CPonFHIR project (<http://build.fhir.org/ig/HL7/cqf-recommendations/>) extending FHIR to support clinical guidelines. Past and present consortia efforts that have or are considering advancements for this ecosystem include the Agency for Healthcare Research and Quality evidence-based Care Transformation Support (ACTS) initiative (<https://digital.ahrq.gov/acts>), the Centers for Disease Control and Prevention's Adapting Clinical Guidelines for the Digital Age (<https://www.cdc.gov/ddphss/clinical-guidelines/>), Logica ([\[health.org/\]\(http://health.org/\)\), Mobilizing Computable Biomedical Knowledge \(MCBK\) \(<http://mobilizecbk.org/>\), and the Patient-Centered Clinical Decision Support Learning Network \(PCCDS LN\) \(<https://pccds-ln.org/>\).](https://covid-19-ig.logica-</a></p>
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Although creating a computational environment for evidence could be done for any domain or subject matter,<sup>4,5</sup> COVID-19 currently presents a unique human interest with urgency and impact, thus providing a special openness to collaboration. We invite your participation at [https://www.gps.health/covid19\\_knowledge\\_accelerator.html](https://www.gps.health/covid19_knowledge_accelerator.html).

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## AUTHOR CONTRIBUTIONS

All listed authors contributed to this correspondence.

## CONFLICT OF INTEREST STATEMENT

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