

# Mobilising computable biomedical knowledge: challenges for clinical decision support from a medical knowledge provider

Kieran Walsh, Chris Wroe

**To cite:** Walsh K, Wroe C. Mobilising computable biomedical knowledge: challenges for clinical decision support from a medical knowledge provider. *BMJ Health Care Inform* 2020;**27**:e100121. doi:10.1136/bmjhci-2019-100121

Received 04 December 2019  
Accepted 10 February 2020

## ABSTRACT

**Introduction** This paper summarises a talk given at the first UK workshop on mobilising computable biomedical knowledge on 29 October 2019 in London. It examines challenges in mobilising computable biomedical knowledge for clinical decision support from the perspective of a medical knowledge provider.

**Methods** We developed the themes outlined below after personally reflecting on the challenges that we have encountered in this field and after considering the barriers that knowledge providers face in ensuring that their content is accessed and used by healthcare professionals. We further developed the themes after discussing them with delegates at the workshop and listening to their feedback.

**Discussion** There are many challenges in mobilising computable knowledge for clinical decision support from the perspective of a medical knowledge provider. These include the size of the task at hand, the challenge of creating machine interpretable content, the issue of standards, the need to do better in tracing how computable medical knowledge that is part of clinical decision support impacts patient outcomes, the challenge of comorbidities, the problem of adhering to safety standards and finally the challenge of integrating knowledge with problem solving and procedural skills, healthy attitudes and professional behaviours. Partnership is likely to be essential if we are to make progress in this field. The problems are too complex and interrelated to be solved by any one institution alone.

## INTRODUCTION

This paper summarises a talk given at the first UK workshop on mobilising computable biomedical knowledge on 29 October 2019 in London. It examines challenges in mobilising computable biomedical knowledge for clinical decision support from the perspective of a medical knowledge provider. In our case, the medical knowledge provider is BMJ and the medical knowledge resource is BMJ Best Practice. BMJ Best Practice is a clinical decision support tool that is designed for use at the point of care.<sup>1</sup> It offers content that is evidence based, continually updated and practical.

## METHODS

There are multiple challenges in mobilising computable biomedical knowledge for clinical decision support from the perspective of a medical knowledge provider. We developed the themes outlined below after personally reflecting on the challenges that we have encountered in this field and after considering the barriers that knowledge providers face in ensuring that their content is accessed and used by healthcare professionals. We further developed the themes after discussing them with delegates at the workshop and listening to their feedback.

## DISCUSSION

There are many challenges in mobilising computable knowledge for clinical decision support from the perspective of a medical knowledge provider.

First, there is the size of the task at hand. For example, BMJ Best Practice covers over 1000 topics—creating and updating this content set is a massive undertaking and carries huge risks of building the wrong thing. The major task is maintaining recommendations across 1000 conditions, so we know how much it takes before you add the complication of making the content computable. Should we start with some more focused practical applications that demonstrate the value and sustainability of computable knowledge? Should we develop partnerships to codevelop these applications? These are all important questions for the medical knowledge provider to consider.

Second, there is the challenge of creating machine interpretable content. Clinicians are at the heart of creating clinical content. They do not have the time to understand how recommendations become computable. How do knowledge providers ensure they



© Author(s) (or their employer(s)) 2020. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

BMJ Knowledge Centre, BMJ, London, UK

### Correspondence to

Kieran Walsh;  
kwalsh@bmj.com



encode what they intended? How can the process be streamlined? Is there enough capacity in the UK or elsewhere to create these resources? Is there a clear career pathway for health informaticians?<sup>2</sup> How are clinicians to be kept in the loop? They are busy practising medicine—can they also encode biomedical knowledge? It is a challenge to recruit active clinicians to write anything, a further challenge to get them to write clearly and a further challenge still to get them to write content that can be made computable.

Third, there is the issue of standards. There is a continual risk of coming unstuck by developing against one electronic health record and then being unable to transfer the content to another—that is, the problem of interoperability. Initiatives such as SMART Health IT, CDS Hooks and openEHR are helping to address interoperability. Knowledge providers must ask themselves should they follow standards for computable guidelines—so that computers can follow these.<sup>3</sup>

And if so, which ones should they follow? If knowledge providers want to move quickly, they need to access expertise in the community to help them build against these standards. How is that to be found in the UK? Certainly, there is a need for more clinician informaticists. There is also the problem that lots of the patient data is not actually coded—as it consists of free text in the clinical notes, and so requires natural language processing to extract. There needs to be agreed safe processes to do that.

Fourth, there is a need to do better in tracing how computable medical knowledge that is part of clinical decision support impacts patient outcomes. To achieve this, providers need more collaboration with hospital analytics and informatics teams and/or electronic healthcare providers. This should then enable outcomes research. But currently there are insufficient incentives to collaborate.

Fifth, there is the challenge of comorbidities. Currently, clinical decision support resources based on computable knowledge are built around single conditions. But medicine is increasingly about patients with multiple comorbidities.<sup>4</sup> Knowledge resources on comorbid conditions can be made computable—however, the challenge is about how best to fit these computable knowledge resources together so that they become an integrated whole that healthcare professionals will find useful and usable. BMJ Best Practice is working on a solution in this regard and plans to partner with healthcare institutions to evaluate and iterate this solution.

Sixth, computable biomedical knowledge resources must be safe. Safety standards must be followed where provision or use of information has potential to cause harm to patients or service users. This is especially so when these resources are to be used at the point of care. This takes a good deal of resource to do properly, and

must be clinically led and integrated with the rest of the work that is being done on the resources.

Seventh and last, knowledge is just one small part of practising medicine. Even if all the challenges of creating and mobilising computable biomedical knowledge were to be overcome, healthcare professionals would still need to develop problem solving and procedural skills, healthy attitudes and professional behaviours. Moreover, these competences need to be integrated with knowledge (computable or otherwise)—it is not wise or even possible to try to compartmentalise them. Thought also needs to be given to the role of the healthcare professionals in the new world with knowledge continually at their fingertips and how this has and will continue to change the relationships between healthcare professionals and patients.

This short article touches on just some of the challenges in mobilising computable biomedical knowledge. There are other challenges—but we have tried to concentrate on ones that are most important to the individuals, institutions and partners that use our content. And partnership is likely to be essential if we are to make progress in this field. The problems are too complex and interrelated to be solved by any one institution alone. Knowledge providers must be willing to partner with organisations and institutions from different sectors if they are to achieve the ultimate aim—computable biomedical knowledge resources that can be used at the point of care to drive improvement in the provision of healthcare to patients and populations.

**Contributors** KW and CW both made substantial contributions to the conception of the work. KW wrote the first draft and both KW and CW revised it critically for important intellectual content. Both approve the final version to be published.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** KW and CW work for BMJ which produces the clinical decision support tool BMJ Best Practice. CW is also a member of the SMART Health IT Advisory Committee.

**Patient consent for publication** Not required.

**Provenance and peer review** Commissioned; externally peer reviewed.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

## REFERENCES

- 1 Campbell JM, Umaphysivam K, Xue Y, *et al*. Evidence-Based practice point-of-care resources: a quantitative evaluation of quality, rigor, and content. *Worldviews Evid Based Nurs* 2015;12:313–27.
- 2 Fridsma DB. Developing the health informatics workforce of the future: academic and industry partners. *J Am Med Inform Assoc* 2017;24:677–8.
- 3 Peleg M, Tu SW. Design patterns for clinical guidelines. *Artif Intell Med* 2009;47:1–24.
- 4 Yarnall AJ, Sayer AA, Clegg A, *et al*. New horizons in multimorbidity in older adults. *Age Ageing* 2017;46:882–8.