

'Improving smart medication management': an online expert discussion

David W Bates,¹ Hsiang-Yin Cheng,² NT Cheung,³ Rita Jew,⁴ Fraz Mir,⁵ Robyn Tamblyn,⁶ Yu-Chuan Li ⁷

To cite: Bates DW, Cheng H-Y, Cheung NT, *et al.* 'Improving smart medication management': an online expert discussion. *BMJ Health Care Inform* 2022;**29**:e100540. doi:10.1136/bmjhci-2021-100540

Received 04 January 2022
Accepted 18 April 2022

ABSTRACT

Medication safety continues to be a problem inside and outside the hospital, partly because new smart technologies can cause new drug-related challenges to prescribers and patients. Better integrated digital and information technology (IT) systems, improved education on prescribing for prescribers and greater patient-centred care that empowers patients to take control of their medications are all vital to safer and more effective prescribing. In July 2021, a roundtable discussion was held as a spin-off meeting of the International Forum on Quality and Safety in Health Care Europe 2021 to discuss challenges and future direction in smart medication management. This manuscript summarises the discussion focusing on the aspects of digital and IT systems, safe prescribing, improved communication and education, and drug adherence.

INTRODUCTION

Medications are a cornerstone in patient management in primary, secondary and tertiary care. However, with about 9% of prescriptions containing errors¹ and patients often taking their prescribed medications incorrectly or not at all, medication safety continues to be a problem inside and outside the hospital.

As the baby boomer generation enters their senior years, the population that needs most medications is expected to double by 2036, when one in four persons will be 65 or older.² This trend is present in many industrialised countries, where both health and social policy efforts are being mobilised to reduce preventable morbidity that leads to healthcare use and loss of independence.^{3 4}

In recent years, apps and other digital tools have been implemented in healthcare systems to assist in drug management. Yet, these new smart technologies can cause new challenges to prescribers, nurses, pharmacists and patients. Healthcare systems and staff need to ensure correct prescriptions and that patients take their medications as prescribed and report if side effects occur. To achieve

improved outcomes for patients, human factors are as important as technology's role.

In July 2021 a roundtable discussion was held as a spin-off meeting of the International Forum on Quality and Safety in Health Care Europe 2021 to discuss challenges and future direction in smart medication management.

This manuscript summarises the discussion focusing on the aspects of digital and information technology (IT) systems, safe prescribing, improved communication and education, and drug adherence.

IMPROVING DIGITAL AND IT SYSTEMS FOR SAFER PRESCRIBING

In many developed countries, prescriptions are nowadays written mostly electronically. This allows them to be checked for safety related problems such as drugs that interact, allergies, doses that are too high or too low, and appropriateness of dosing in patients with conditions such as chronic renal insufficiency.

One of the main drivers for developing and implementing electronic medical records (EMRs) systems has been the promise of improved healthcare quality, using tools like Computerised Physician Order Entry and Clinical Decision Support (CDS).⁵ The ability of EMRs, especially CDS, to improve medication safety has been demonstrated^{6 7} and their transformative potential shown.⁸

However, more recently, it has been established that drug alerts as part of CDS being delivered routinely appear to result in almost no benefit. This has occurred with the almost complete conversion in the USA to commercial drug knowledge and alert applications. For example, one study⁹ showed that the effectiveness of warnings about drug interactions fell dramatically after conversion to a commercial drug knowledge system. Another study¹⁰ demonstrated that among about 5000



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¹Division of General Internal Medicine and Primary Care, Brigham and Women's Hospital, Boston, Massachusetts, USA

²Taipei Medical University, Taipei, Taiwan

³Hong Kong Hospital Authority, Hong Kong, Hong Kong

⁴ISMP, Horsham, Pennsylvania, USA

⁵Addenbrooke's Hospital, Cambridge, UK

⁶McGill University, Montreal, Québec, Canada

⁷Taipei Medical University, Taipei, UK

Correspondence to

Professor David W Bates;
dbates@bwh.harvard.edu

warnings about renal dosing, physicians responded to none of them. A third¹¹ showed that high-priority drug–drug interaction alerts were regularly overridden, probably because clinicians were getting so many warnings that they developed alert fatigue and ignored even the most important.

There can be many ‘unintended consequences’¹² which may include increased risk of medication errors, or new types of errors.¹³ Poorly designed or implemented EMRs are widely implicated in clinician burn-out¹⁴ which can also lead to poorer quality of healthcare.¹⁵

How then can the original goal of improved healthcare quality and medication safety through EMRs be achieved? The aviation industry provides a good example. A sustained focus on safety throughout the industry has transformed the inherently unsafe activity of flying into one of the safest forms of transportation in the world. Although the flying machines themselves have improved, consideration of human factors in designing cockpits, the development of safety procedures and continuous monitoring of risks and incidents has allowed continuous improvements in safety over the decades.¹⁶

To achieve similar success in medication safety, two areas of improvement are important. First, usability and human factors are critical to building safe and effective medication management in EMRs with end user input in CDS design increasing the likelihood of it being successful.¹⁷ Some features have been verified that increased the alert’s perceived utility and can be used to improve effectiveness and reduce omitted warnings, for example, in a CDS tool targeting QT-interval prolonging medications.¹⁸

Second, a whole systems approach is needed. EMRs are complicated tools, being deployed in the complex healthcare delivery environment. The effects of interventions may be impossible to predict. Just focusing on the prescribing physician and the prescription will not be sufficient. All the processes, and all the healthcare providers involved in medication management in a patient’s healthcare journey must be considered. In particular, the role of the patients themselves has been underexplored in the field of medication safety.

There are also other areas that represent ongoing challenges in safe prescribing. Medication lists are often incomplete, and there is still no clear approach to getting the most accurate medication list. Patients’ role and common medication process practices agreed in hospital are crucial to ensure medication lists are up to date.

Difficulties also persist in writing prescriptions with complex descriptions of how the patient should take medications for example, prednisone that often requires stepwise tapering. In the inpatient and outpatient setting better approaches are needed to enable different specialties and all parts of the hospital team, including nursing, pharmacy, physicians respectively to be ‘on the same page’ regarding what the patient is taking. EMR records need to be implemented into practice and healthcare providers need to be educated how to use them in the medication process.

Still, the most obvious challenge—especially given the huge costs which have been expended on developing EMRs—is getting the point-of-care CDS to deliver important suggestions to clinicians—yet not bombard them with unimportant warnings. This issue represents a burning platform if EMRs are to realise their benefits on the medication safety front.

IMPROVING EDUCATION AND COMMUNICATION REGARDING PRESCRIBING

All prescribers must have a basic understanding of the medicines they prescribe to their patients. This traditionally includes knowing the indication for a particular drug, its pharmacological mechanism of action, common side effects and important interactions. In addition, they need to at least be aware of the evidence-base and trial data underlying its use, either first-hand or by following derived ‘guidelines’. However, the pros and cons of taking drugs are much less appreciated by prescribers when it comes to individual patients. As a rule, both clinicians and patients tend to overestimate the benefits and underestimate the harms of medicines.¹⁹ More ‘real-life’ research and studies are needed to inform prescribers.²⁰ In the future, it is likely that artificial intelligence generated algorithms, including pharmacogenetic variables, will also support this process.

Teaching and education around the practicalities of prescribing, adherence and polypharmacy need to be incorporated into medical school curricula as a matter of routine. The advent of the Prescribing Safety Assessment in the UK has certainly helped in this regard by focusing teaching on a hitherto neglected area.²¹

Furthermore, communication skills training for clinicians has tended to centre on explaining diagnoses, rather than the drugs patients take—why they need them, what they do, what effects the patient might feel, and what to note or look out for—all outlined in simple to understand language or graphics.

A single prescriber to co-ordinate all therapies, as opposed to having multiple prescribers, has obvious benefits in terms of making communication about drugs more efficient. Similarly, sharing the decision-making process with individual patients before starting or indeed stopping treatments is pivotal (figure 1).²² Making time for this is demanding, particularly if the patient has cognitive

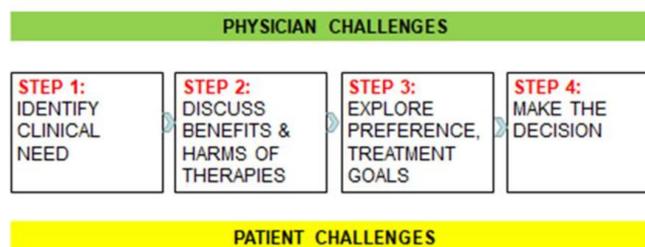


Figure 1 Decision-making challenges for physicians and patients.²²

impairment or learning difficulties and the clinician has a finite consultation period. Agreeing on the 'goal of treatment' also presents a substantial hurdle: should the emphasis be primarily on longevity or on comfort and symptom control only? Finally, education on geriatric pharmacotherapy is needed to improve prescribing on geriatric patients.

Empowering patients by educating them about the medications they take is also a crucial element of ensuring maximal adherence.²³ Even basic steps such as encouraging patients themselves to keep an up-to-date list of their medications (prescribed, over the counter and herbal remedies) has evident advantages, especially during the transition between primary and secondary healthcare or vice versa.

As the coordination of patients' medication is often missing, explaining to patients how to monitor the effects of pharmacotherapy and identify potential risk is important.

The act of medicines reconciliation with pharmacist input is in itself an informative exercise. Many health IT tools such as integrated electronic prescribing platforms, and apps on mobile devices help to improve communication about drug prescribing and adherence to medication, respectively.²⁴ Most apps are based around 'reminder technology', although more sophisticated ones that help patients with their drugs list are becoming available. In this regard, the utilisation of dosette boxes and medication administration records for those with dementia and in care settings provides an excellent support tool.

Finally, regular review of medication lists is mandatory to safeguard against polypharmacy and maintaining the focus on the goals of therapy. Again, time and training to do this as well as building it into routine clinical practice is an increasing necessity.

IMPROVING ADHERENCE TO MEDICATION

Non-adherence to disease-modifying medications is an avoidable cause of emergency department (ED) visits and hospitalisations. The prevalence of non-adherence varies by condition and study^{24–29} from 40% to 60% in chronic obstructive pulmonary disease,^{24 25} 26% to 65% in myocardial infarction^{26–28} and up to 93% in heart failure.²⁹ The estimated risk of ED visits and hospitalisations associated with non-adherence varies from 45% to 85%^{30–32} and may be higher in patients with heart failure—a twofold increase in the risk of hospitalisation or death when adherence to disease-modifying medication is less than 80%.³³

Previous studies reveal three primary reasons for medication non-adherence^{34–38}:

- ▶ Cost.
- ▶ Fear of or experience with adverse medication effects.
- ▶ Ambivalence, or lack of perceived need or relevance to the patient.

Depression, other psychiatric problems and cognitive impairment also contribute to non-adherence^{35 37 38} as do polypharmacy and complex drug regimens.^{37 39}

Social support and a collaborative trusting relationship with the healthcare team increase adherence.

Systematic reviews of adherence interventions illustrate the wide variability in interventions evaluated and populations, conditions and medications targeted.^{24 40–43} Almost all targeted single groups of drugs demonstrated modest effect sizes at best and only a minority improved clinical outcomes. Moreover, while most adherence interventions are multifaceted, they typically combine generic medication information with simplistic behavioural strategies (eg, reminders, pill organisers).^{24 40–43} The Information-Motivation-Behavioural Skills model provides a comprehensive theoretical framework for designing adherence interventions, bringing together key aspects of behaviour change theories to target and improve adherence. Interventions that incorporate self-determination theory^{38 44} and motivational interviewing^{45–47} to directly target intrinsic motivation, confidence and autonomy have proven efficacy in smoking cessation,⁴⁸ weight loss⁴⁴ and medication adherence.⁴⁹ However, such interventions to change behaviour have not been extensively implemented due to resource intensity, inadequate health professional training and lack of reimbursement models to support implementation.^{40 41}

Mobile technologies have emerged as popular and potentially powerful tools to provide individualised support to change health behaviours.⁵⁰ In 2019, 53% of older adults in the USA owned a smartphone.⁵¹ This creates a new opportunity to assess how well mobile apps can improve health behaviours and outcomes among older adults. Although there are more than 700 medication management apps, most have not been evaluated,^{52 53} and none have exploited the potential of this medium, limiting features to maintaining a medication list (by manual entry), pill reminders and refill requests.^{52 54–57}

Hybrid interventions that combine mobile apps with monitoring and triage to the health team based on patient need can empower and motivate patients and caregivers via tools that help identify and address ambivalence, promote adaptive problem solving and provide quicker access to the health team to address knowledge gaps. Systematic reviews of web-based and hybrid interventions show that they increase patient empowerment, motivation, medication self-efficacy,^{58–61} and in some cases patient outcomes.^{60–64} To date, hybrid interventions have not been used to improve medication adherence.^{59 61–63}

CONCLUSION

Better integrated digital and IT systems, improved education on prescribing for prescribers, and greater patient-centred care that empowers patients to take control of their medications are all vital to safer and more effective prescribing. Future research should leverage the considerable investment made by many countries in advancing

digital healthcare infrastructures and develop and evaluate multifaceted hybrid interventions to reduce avoidable adverse events and improve adherence.

Funding The roundtable discussion was supported by an unrestricted educational grant by BD.

Competing interests DWB grants and personal fees from EarlySense, personal fees from CDI Negev, equity from ValeraHealth, equity from Clew, equity from MDClone, personal fees and equity from AESOP, personal fees and equity from Feelbetter, and grants from IBM Watson Health, outside the submitted work. H-YC None to declare. NTC None to declare. RKJ ECRI (ISMP is an affiliate of ECRI) has a non-binding agreement with AESOPFAM None to declare. RT None to declare.

Patient consent for publication Not applicable.

Provenance and peer review Commissioned; externally peer reviewed.

Data availability statement No data are available. Not applicable.

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ORCID iD

Yu-Chuan Li <http://orcid.org/0000-0001-6497-4232>

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