



Invited Editorial

From MedWreck to MedRec: A Call to Action to Improve Medication Reconciliation

Nitu Kashyap¹ Sean Jeffery² Thomas Agresta³

¹Internal Medicine, Emory Healthcare, Emory University school of Medicine, Atlanta, Georgia, United States

²University of Connecticut School of Pharmacy, Storrs, Connecticut, United States

³Family Medicine, Center for Quantitative Medicine, University of Connecticut School of Medicine, Storrs, Connecticut, United States

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In moments that matter, clinicians frequently make treatment decisions based upon incomplete, inaccurate, and outdated medication histories.^{1,2} Poorly reconciled medications often lead to a series of unfortunate events, MedWreck. Medication Reconciliation (MedRec) is a three-step process of (1) verification, (2) clarification, and (3) reconciliation.³ Performing MedRec is generally a manual, time-consuming collection, and review of medication lists across prescribers, patients, and systems. Supply chain challenges e.g., recent drug shortages and resultant unanticipated drug substitutions have worsened this situation. There are, however, far more opportunities for reconciling medications in routine ambulatory care between primary care, specialists, ambulatory procedures, and retail pharmacies. Primary care physicians have been tasked as default custodians of a patient's medication list but with increasing complexity and specialization of medication regimens, there is a need to expand reconciling medications at every contact with a clinician.

There is evidence showing the clinical and financial value of effective MedRec.^{4,5} While the reconciliation process requires clinical expertise and often shared decision-making with the patient, technology has the potential to facilitate the verification and clarification steps. However, several critical gaps perpetuate an inefficient, expensive, and often ineffective MedRec such as siloed electronic health records (EHRs), unintegrated prescription dispense data from retail pharmacies, and failure to adopt universal prescription data standards. There is a need for a national, coordinated, strategic effort to widen important ongoing initiatives to improve MedRec.^{6,7}

Concerned about increasing medication use and health care costs, the Connecticut State Legislature formed a Medication Reconciliation and Polypharmacy workgroup. This was a diverse group of 22 experts to evaluate MedRec with a systems-based approach.⁸ **Fig. 1** illustrates a diagrammatic

view of a MedRec system. The year-long effort resulted in 11 recommendations to improve MedRec consisting of policy changes, promoting interoperability, and adoption of existing standards such as CancelRx.^{9,10} These recommendations were further developed by the subsequent Medication Reconciliation and Polypharmacy Committee into 22 business and 88 functional requirements needed for implementing an electronic Best Possible Medication History (eBPMH) in a real-world setting. This foundational work has led to the development of Connecticut State Health Information Exchange (HIE) eBPMH, which was launched recently.¹¹ T.A., N.K., and S.J. were involved in leading this process through its lifecycle. Insights gained from this process enhanced our understanding of the substantial challenges in optimizing MedRec.

We call upon stakeholders across public and private sectors to collaborate on a national strategic initiative, across 10 key areas to solve MedWreck. Key stakeholders not only include clinicians, pharmacists, nurses, and patients, but also standards bodies, policy makers, EHR and other health IT vendors, pharmaceutical manufacturers, Office of National Coordinator, Interoperability experts, to name a few.

What Is Needed?

With the 21st Century Cures Act and the new Trusted Exchange Framework and Common Agreement guidelines promoting interoperability, we are closer than ever to making MedRec more streamlined.^{12,13} We propose a 10-point action plan for solving this multifactorial problem.

1. A consolidated, deduplicated, single, eBPMH:
 - a. Promote medication exchange across prescribing and dispensing systems.

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 Nitu Kashyap, MD, FAMIA, Emory Healthcare, Internal Medicine, Emory University School of Medicine, 201 Dowman Drive Atlanta, GA 30322, United States (e-mail: nitu.kashyap@emoryhealthcare.org).
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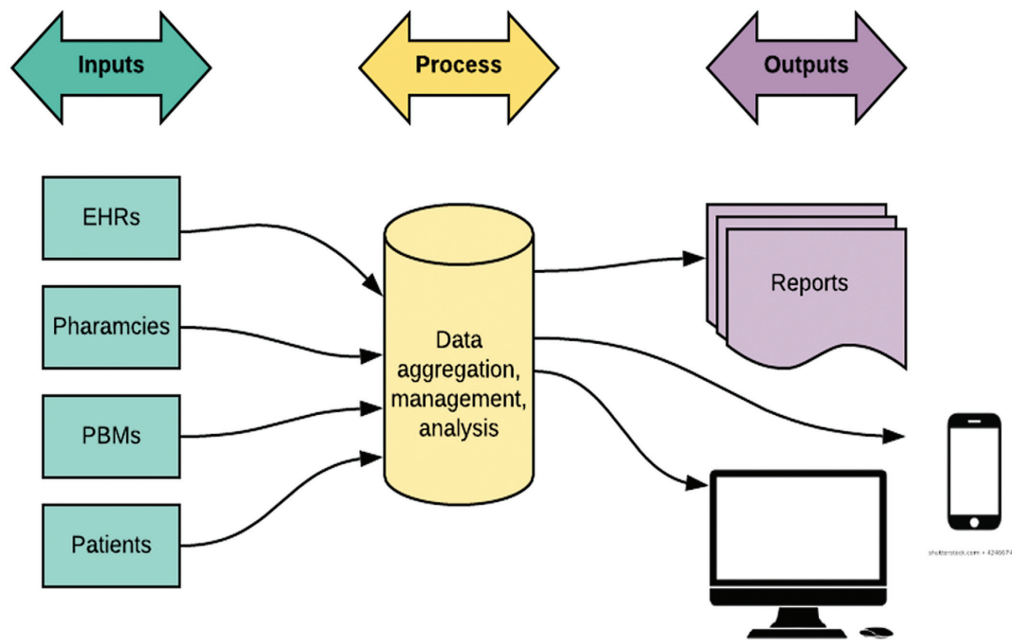


Fig. 1 Achieving MedRec requires a holistic approach across the various component systems and interactions between them. Prescribing and dispensing systems provide data inputs, which is processed by an aggregating engine and output includes user facing systems such as electronic health record modules or patient applications. (Reproduced with permission from Agresta et al⁹.)

- b. Smart deduplication: create a single most recent medication list by deduplicating medications across this consolidated list by dose, strength, and recency of prescription/fill date. Just as patient identity mapping has become a standard module in most systems, a medication deduplication module is needed to identify unique medications by recency of prescribing and medication fill activity.
2. Optimization and Universal adoption of CancelRx: the National Council for Prescription Drug Programs CancelRx electronic messaging standard transmits details about deprescribed medications to the pharmacy.^{14,15} Closed systems with owned pharmacies or health plan-based clinics may already have cancelled medications visible in the prescribing system. However, the vast majority of the U.S. health system and practices prescribe to retail pharmacies using e-prescribing systems. Despite recent efforts, this messaging standard is not universally adopted in the United States, leading to medications that get refilled after clinical discontinuation.¹⁵ Some critical gaps in functionality need to be addressed. For instance, messaging standard(s) need to support visibility of remaining refills and medication cancellations outside of the prescribing system.
 3. Reason for prescribing and deprescribing: reason for prescribing and reason for discontinuing have been promoted as “required” fields. But concerns about increased burden of documentation are very real. There is need for expert and policy guidance for EHR vendors and pharmacy system vendors to surface this important information rather than implementation mandates that add additional clicks for an overburdened clinician. A middle-path approach might be where this additional information is required for high-risk, high-value medications such as cardiovascular, asthma, or other chronic conditions. This allows for long-term tracking of medications tried previously and the reason for choosing an alternative therapy.
 4. Real-time availability of medication data: limiting medication data interoperability across disparate EHRs to visit-based transactions alone impedes disease management endeavors. Patients have a choice to seek care from clinicians who often do not use the same EHR system. Interoperability infrastructure and mandates have begun to open these EHR silos. However, information availability via these interoperability channels is often only available during a clinical visit limiting the utility to assess a complete medication history in-between visits. In its current state, an incomplete medication history may erroneously be interpreted as nonadherence, leading to ill-founded dose adjustments, or unrecognized drug interactions.
 5. Increase adoption of discrete and codified signetur (S&C SIG): Currently, not all systems across the medication continuum support storing and transmitting discrete Sigs (preparation, strength, route, frequency, start and end date for medication). While the use of S&C SIG has increased, several strategies are proposed to increase adoption.¹⁶ Medication shortages and supply chain challenges in recent years have made this problem worse. In addition to supply chain challenges, pharmacy substitution of “on formulary” meds from an individual’s pharmacy benefit systems are also a contributor of discrepancies between prescribing and dispensing

systems. While there are systems that can share dispensed drugs, reconciliation at the level of dose and frequency are also critical and need this information to be stored and transmitted as discrete data mapped to standard terminologies.

6. Align prescriber-pharmacy nomenclature: while this may appear to be obvious to some, prescribers, clinical systems, pharmacy systems, and pharmacists often use different terminologies to describe specific events in the medication life cycle. Industry definitions for key concepts such as medication end date, prescription expiration date, and medication expiration date must be harmonized to prevent interpretation errors. While patients and clinicians may use these terms interchangeably, they mean specific things. Medication end date reflects the prescribing clinician's recommendation to stop taking a medication after the end date, which may be an exact calendar date or days since starting medication. Prescription expiration date refers to the duration of time for which a given prescription of a medication can be filled at the pharmacy. Pharmacy systems will often have a default based on scheduled substance categories. A medication expiry date would be the date the pharmaceutical manufacturer deems the product to remain stable. Retail pharmacy systems and pharmacists are often the first ones to see medication changes, duplications, and deletions. This unified nomenclature could also enable retail pharmacists to reconcile medications for patients at the time of prescribing.
7. Ease of medication identification: being able to identify an individual medication, when outside its dispensed packaging, is important for both patients and providers. Updated pill image libraries are necessary.¹⁷ Furthermore, ensuring patients can read identifiers on pills will potentially decrease errors. We need universal medication image libraries with metadata that takes advantage of image recognition to allow automated identification of the actual medication in the brown bag the patient often brings into the office. Pharmaceutical manufacturers can have a role to play in this space. They already produce high-resolution images of a product. Making it more easily available to clinicians and the public would aid in recognition of medications. This is especially important when medication suppliers may change due to cost considerations or different formulations are used. This could be a model for federally regulated publicly available resource.¹⁸
8. Medication reconciliation training: health professional curricula should develop interprofessional MedRec educational activities. Additionally, postgraduate continuing professional development should include training on MedRec and deprescribing.
9. Incentive redesign: current incentives often do not facilitate true reconciliation. Redesigning metrics to take advantage of click logs and metadata in the EHR, incentivizing team-based care that involves other roles such as pharmacy technicians and community and long-term care pharmacies should be considered. Primary care

physicians have been tasked as default custodians of a patient's medication list, but with increasing complexity and specialization of medication regimens, this skillset and responsibility needs to be expanded. Realigning incentives is one way of promoting medication reconciliation at every hand off in ambulatory care and not just an activity focused on transitions from care settings (hospital-post acute care home continuum).

10. Patient engagement: applications designed to show eBPMH to patients and allow patient annotations that can be shared with prescribers and pharmacies are likely to engage patients in their care. User-centered design efforts are needed to design applications, tools, or other resources to meet the needs of patients of all ages, abilities, and diverse backgrounds.¹⁹ Special consideration is needed to bridge the digital divide and engage diverse groups of patients in an equitable manner. Standardizing medical list output for patients could be a potential first step, with subsequent additions following development of an eBPMH.²⁰ Patient-facing technologies that allow patients to share over-the-counter medications, vitamins, and herbal products as well as "consumables" not just the "orderables" should not be overlooked.

Call to Action

A strategic national collaboration with multiple stakeholders is needed to improve MedRec. This will include representation from standards bodies, software vendors (prescribing, pharmacy, app developers, HIE, e-prescribing), clinical informatics professionals, health care professionals, payers, policy experts, researchers, funding agencies, and most importantly patients.

You are either part of the solution or part of the precipitate.

Conflict of Interest

None declared.

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