

Medication Reconciliation & Polypharmacy Work Group

Final Report and Recommendations

Submitted to: Connecticut General Assembly

June 30, 2019

Acknowledgements:

On behalf of the State of Connecticut, the Executive Director of the Office of Health Strategy (OHS) and the Health Information Technology Officer express their sincerest gratitude to all those who participated in the Medication Reconciliation and Polypharmacy (MRP) Work Group. The safe and effective use of medications is essential for the health of the citizens of Connecticut. The insights and perspectives of participants resulted in meaningful, practical, and realistic recommendations that will no doubt lead to improvements in the health and wellbeing of the citizens of Connecticut.

Executive Summary & Overview of Recommendations:

Medications are a large and growing component of the prescriber's armamentarium and are the first line treatment for 88% of chronic diseases.¹ The percentage of patients taking multiple prescription medications is also increasing. According to the most recent data (2011-2014) from the Centers for Disease Control and Prevention (CDC), 40.7% of seniors (65 years or older) and 10.9% of the total population were taking five (5) or more prescription medications within the past 30 days. For seniors, the 40.7% represents almost a three-fold increase from the period of 1988-1994 (13.8%).

Because a patient's medication regimen is the basis for many treatment decisions, it is extremely important that medication lists are accurate in order to maximize therapeutic impact and prevent potentially life-threatening patient safety events. Recognizing this critical need, the Connecticut General Assembly in May 2018 passed Special Act 18-6: *An Act Requiring the Health Information Technology Officer to Establish a*

¹ Ekstrand, MJ. *Transforming "Med Wreck" into "Med Rec: One Health System's Journey*. Webinar presentation: Pharmacy Quality Alliance; July 2017.

*Working Group to Evaluate Issues Concerning Polypharmacy and Medication Reconciliation.*² As a result, the MRP Work Group was appointed and began its deliberations in September 2018.

The MRP Work Group brought together a diverse group of stakeholders to develop concrete and meaningful recommendations to address medication reconciliation and the challenges associated with polypharmacy. The MRP Work Group subsequently developed a project charter and created four subcommittees to support their work: Medication Reconciliation & Deprescribing; Engagement & Safety; Technology & Innovation; and Policy. The MRP Work Group and its subcommittees met regularly from September 2018 through June 2019 to complete an in-depth review of data, issues, and potential solutions. These discussions led to the development of recommendations, structured as goals and objectives in eleven areas, which are summarized in Table 1. In addition, a schematic was developed to illustrate the eleven recommended areas (Figure 1). The recommended goals and objectives are described in greater detail later in this report.

Table 1: Medication Reconciliation and Polypharmacy Work Group Goals

<p>1. Best Possible Medications History (BPMH)</p> <p>The MRP Work Group recommends an incremental approach to support BPMH that enables near-term, value-added solutions while working toward longer-term, more complete and integrated solutions that include decision support tools and a ledger of medication transactions (e.g., including current and prior-canceled prescriptions).</p>
<p>2. Patient Engagement</p> <p>The MRP Work Group recommends the implementation of patient-centered and evidence-based best practices necessary to contribute to the development and maintenance of BPMH, supported by communication, education, and user-friendly digital tools.</p>
<p>3. Medication Reconciliation Process Improvements</p> <p>The MRP Work Group endorses the Joint Commission definition and process for medication reconciliation in ambulatory settings, while emphasizing that this definition and process could be used in almost all care settings.</p>
<p>4. Team Approach</p> <p>The MRP Work Group recommends the adoption of a team approach to medication reconciliation both within and across organizations, based on evidence-based best practices.</p>
<p>5. Implementation and Adoption of CancelRx</p> <p>The MRP Work Group recommends the implementation of the findings and recommendations from the CancelRx Work Group regarding the widespread adoption and use of the CancelRx standard.</p>
<p>6. Deprescribing</p> <p>The MRP Work Group recommends the identification and adoption of best practices in deprescribing, along with support from tools such as risk algorithms and training materials that are regularly re-evaluated and updated as new evidence becomes available. The group also encourages active research to develop and validate best practices.</p>

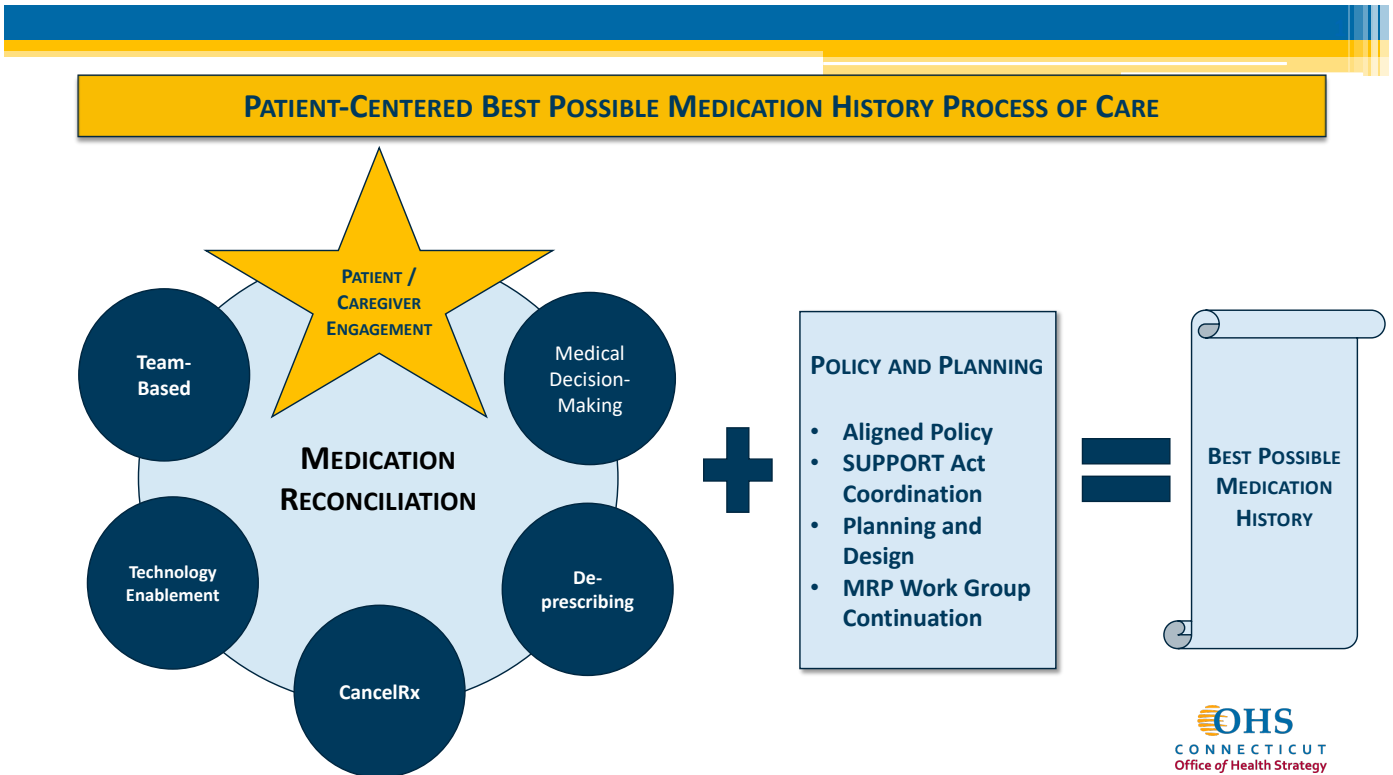
² <https://www.cga.ct.gov/2018/act/sa/pdf/2018SA-00006-R00SB-00217-SA.pdf>

<p>7. Technology</p> <p>The MRP Work Group recommends an incremental approach in deploying technology to support Recommendation 1 (BPMH) be undertaken once requirements have been developed and funding is available. Future development should focus on integration of additional clinical data (e.g., non-prescription medications including, over-the-counter medications, vitamins, herbals and supplements) and enhanced technical tools such as analytics, clinical decision support (CDS) and artificial intelligence (AI). In addition, ongoing surveillance of the industry should be conducted to identify promising solutions enabled by technological advancements.</p>
<p>8. SUPPORT Act Funding and Planning/Design Process</p> <p>The MRP Work Group recommends that the planning and design activities related to the Substance Use-Disorder Prevention that Promotes Opioid Recovery and Treatment (SUPPORT) for Patients and Communities Act be undertaken in close collaboration with the initiatives and future planning activities recommended by this Work Group.</p>
<p>9. Aligned Policy</p> <p>The MRP Work Group recommends an ongoing policy review to identify opportunities in both the public and private sectors, with the following initial areas of focus: medication quality measures; payments, resources and incentives for medication reconciliation; privacy and confidentiality; and an assessment of mandating CancelRx standards adoption and use.</p>
<p>10. Planning/Design Process and Use of IAPD Funding</p> <p>The MRP Work Group recommends that Implementation Advance Planning Document (IAPD) planning funds for federal fiscal year (FFY) 2019 and FFY 2020 be utilized to finalize planning, design, and requirements development for the projects and services recommended in this report, with future funding for implementation once these activities have been completed.</p>
<p>11. Continuation of the MRP Work Group</p> <p>The MRP Work Group recommends that the MRP Work Group be re-chartered as a standing committee of the Health IT Advisory Council and that an evaluation of membership occur to ensure continuity and appropriate stakeholder representation are maintained.</p>

In addition, the MRP Work Group developed a schematic (Figure 1) to support the communication of these recommendations, and to illustrate the following concepts:

- As with other activities and initiatives of the Health IT Advisory Council, the central premise of the MRP Work Group and its recommendations is that “The Patient is the North Star” in all deliberations and considerations;
- Foundational to success across all recommendations is that progress be made on the development of a BPMH;
- The engagement of patients, their families, and their caregivers is critical to BMPH development efforts and the effective reconciliation of medications;
- Technology and process re-design based on evidence-based best practices are key components for achieving meaningful and effective medication reconciliation; and
- Solutions should be developed incrementally and implemented as soon as possible to impact this important healthcare issue.

Figure 1: Schematic Overview of Recommendations



Background and Problem Statement:

Key Statistics

As stated in the Executive Summary, medications are a large and growing component of the prescriber’s armamentarium and are the first line treatment for 88% of chronic diseases.¹ Also increasing is the percentage of patients on multiple prescription medications. According to the most recent data (2011-2014) from the CDC, 40.7% of seniors (65 years or older) and 10.9% of the total population were taking five (5) or more prescription medications within the past 30 days. For seniors, the 40.7% represents almost a three-fold increase from the period of 1988-1994 (13.8%).

Unfortunately, the number of adverse drug events (ADEs) has increased along with this increase in prescription medications. ADEs are known to cause approximately 1

“Medication reconciliation (“Med Rec”), or “Med Wreck” as many now call it, has been a topic in the industry for over a decade. Some people believe it began as a major patient safety initiative. It is related to the universal observation that transitions of care are the most dangerous times in healthcare. Although we have made progress as an industry in the past five years with Med Rec improving patient care, it has its problems.”

Phil Smith, MD, *Med Wreck: Proposing a Solution for the Nightmare of Medication Reconciliation*, Applied Health IT Experts, LLC; First Edition

million emergency department visits and 125,000 hospitalizations per year.³ Annually, roughly \$3.5 billion is spent on excess medical costs as a result of ADEs.⁴

The aging of the population and the prevalence of chronic illness, particularly among seniors, combine to make medication reconciliation a concern that is likely to increase over time. Of Connecticut's 3.6 million residents, 14.8% were 65 years of age or older as of 2014. As with the rest of the U.S., this percentage continues to grow, driven by an increase in longevity and the impact of "baby boomers" entering this age cohort. Furthermore, according to the RAND Corporation, 41% of the total population and 82% of those 65 and older have multiple chronic conditions, while 12% of the total population have 5 or more chronic conditions⁵. On average, older adults have 51 medication fills per year.

Challenges of Medication Reconciliation and Polypharmacy

Dr. Phil Smith is a Board-Certified Family Physician and clinical informaticist whose seminal work (*Med Wr.eck*), cited at the beginning of this section, has served as inspiration to healthcare professionals and consumers to tackle the myriad challenges of dealing with polypharmacy and the reconciliation of medications across care settings. The MRP Work Group utilized several of Dr. Smith's schematics in the development of these recommendations. The first schematic (Figure 3) is a workflow diagram illustrating the many steps of the medication reconciliation process within a single electronic health record (EHR). Several important aspects and implications of this workflow diagram include:

- The medication reconciliation process begins with the development of a list of current medications, a challenging task and one that is identified as a foundational recommendation of the MRP Work Group;
- The medication reconciliation process within a single organization is complex and often involves multiple processes and systems, depending upon the care setting; and
- The medication reconciliation process becomes even more challenging when medications and processes span multiple organizations.

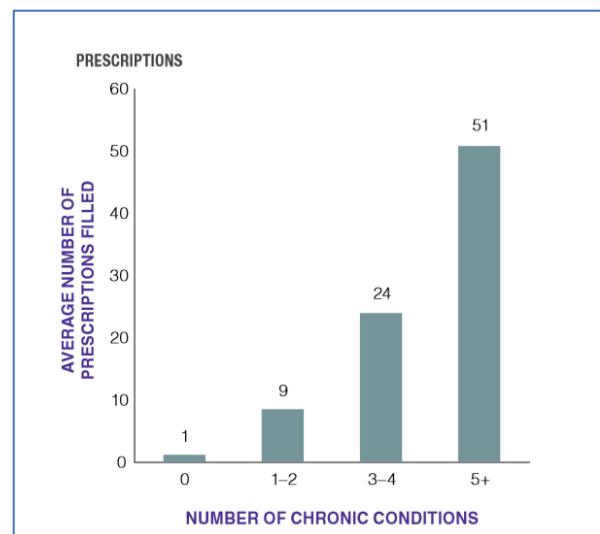


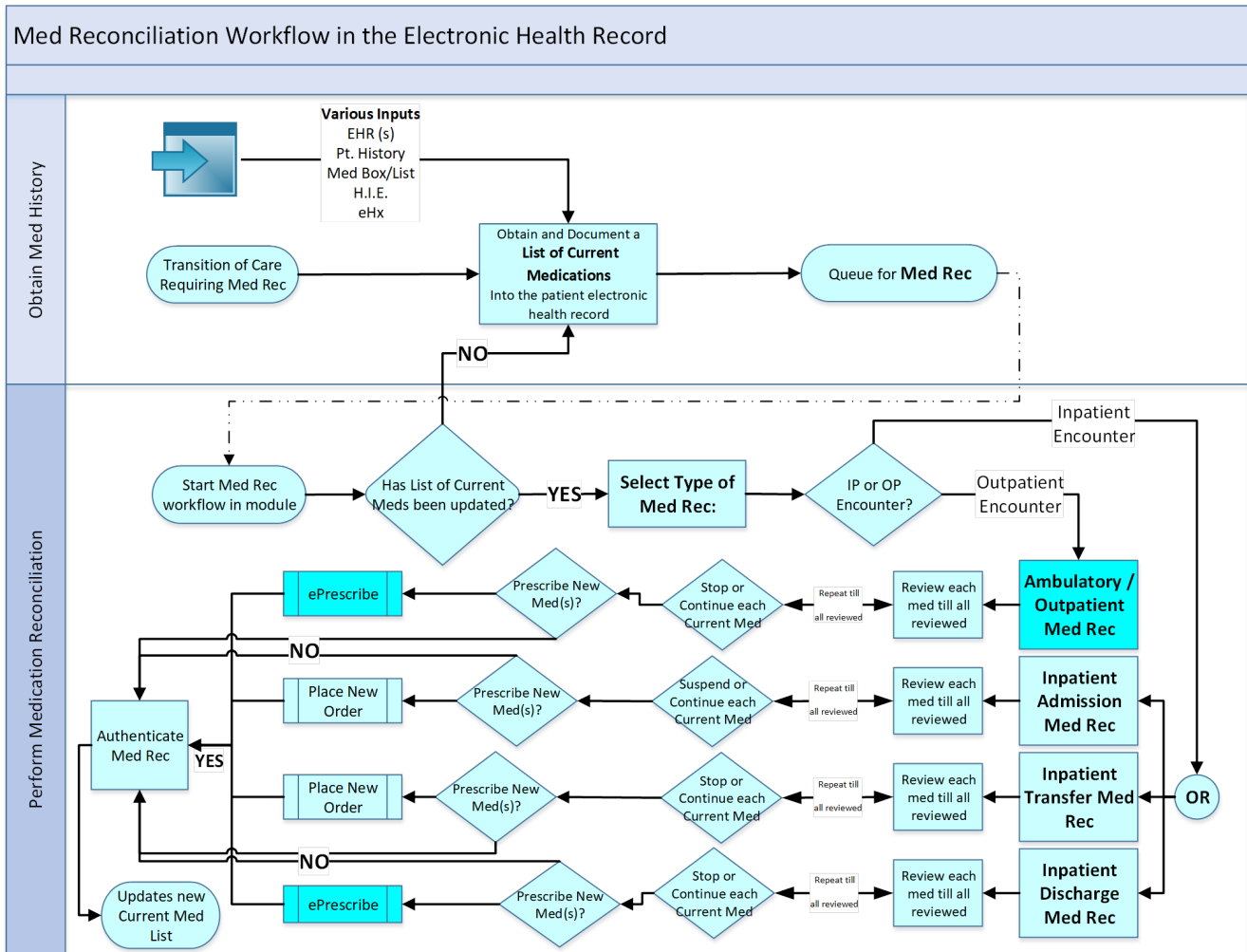
Figure 2: RAND Corporation statistics on chronic conditions and prescriptions

³ <https://health.gov/hcq/ade.asp>

⁴ *Medication Safety Basics*. The Centers for Disease Control and Prevention Website. <https://www.cdc.gov/medicationsafety/basics.html#ref2>. Updated December 7, 2016. Accessed June 30, 2017

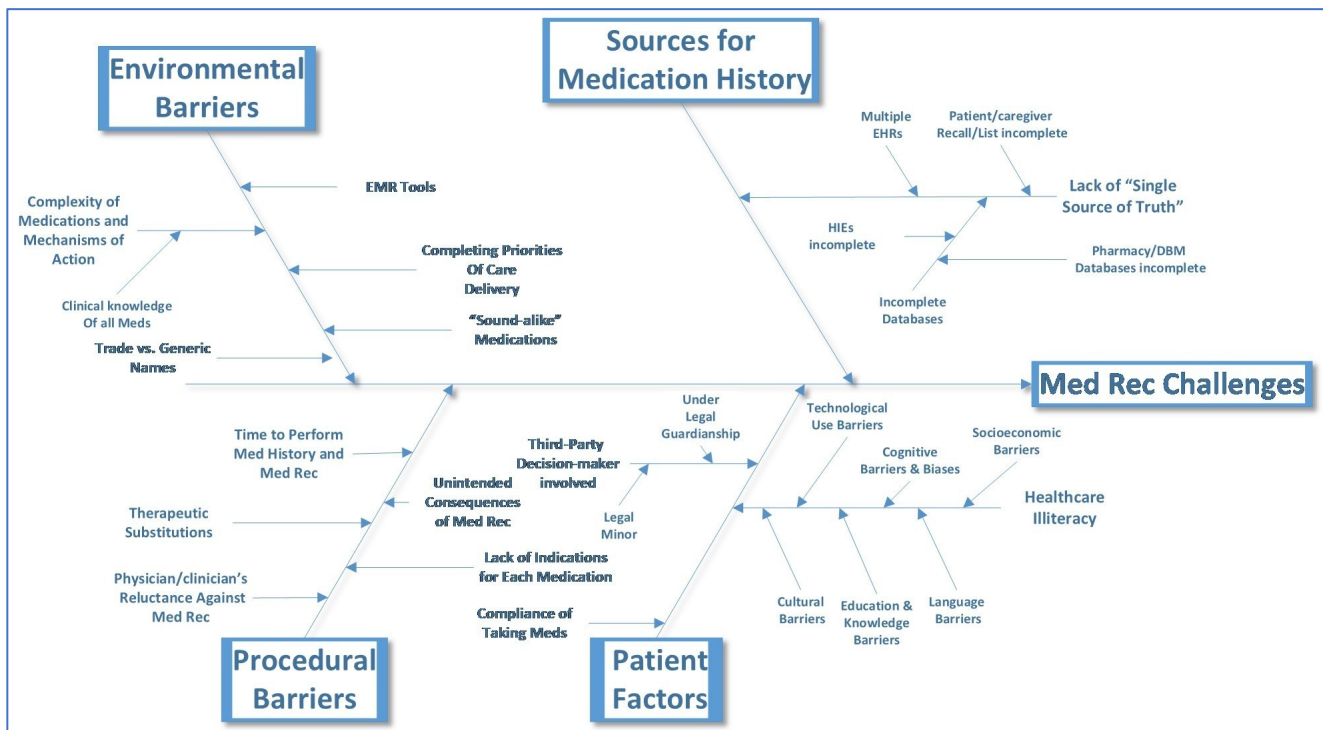
⁵ *Multiple Chronic Conditions in the United States*; Christine Buttorff, Teague Ruder, and Melissa Bauma. Published by the RAND Corporation, Santa Monica, Calif. © Copyright 2017 RAND Corporation

Figure 3: Medication Reconciliation Workflow in the Electronic Health Record (Med Wr_xeck)



Dr. Smith’s modified cause-and-effect diagram of medication reconciliation challenges (Figure 4) provides a compelling depiction of the scope of issues that confront patients, caregivers, prescribers, pharmacists, and other healthcare professionals. Given the complexity of medication reconciliation workflow displayed above, as well as the number of data sources and people involved, there are myriad opportunities for process barriers and failures. This diagram is representative of the challenges that were discussed in detail by the MRP Work Group during its planning and recommendations development process.

Figure 4: Medication Reconciliation Cause-and-Effect Diagram (Med Wr_xeck)



On April 5 and 6, 2019, University of Connecticut (UConn) Health and OHS sponsored a Medication Reconciliation Hackathon. The Hackathon brought together technical, clinical, and subject matter experts from across the industry to educate on the current challenges and opportunities in the use of electronic systems for medications reconciliation, to introduce technical concepts and systems, and to assist in the planning of medication management services for the State of Connecticut. The challenges of medication reconciliation described in Figure 4 are very much in alignment with those identified at the Hackathon. There was general agreement that the current medication reconciliation process often impedes a caregiver or provider’s ability to determine a current and accurate list of medications for each patient.

Major current state challenges of medication reconciliation identified at the Hackathon include:

- Despite widespread attempts at medication reconciliation at each transition of care, a large number of medication-related errors still occur;
- Compiling a patient’s medication list from numerous disparate sources is incredibly difficult because of duplicate, missing, or inaccurate information;
- A lack of information or context, such as the clinical reason why a medication was prescribed, impedes clinical decision-making by providers and pharmacists, and reduces patient engagement and understanding;
- Under-utilization of the available electronic prescribing standard for communicating medication discontinuation orders (CancelRx) puts patients at risk for adverse events;
- Physicians often bear the responsibility for reconciling complex medication regimens that are beyond their professional expertise, potentially impacting effective medical decision-making.

- There is not an efficient, effective, and patient-centric means of incorporating patient-reported medications, or a method of effectively sharing that information across disparate clinical and pharmacy information systems.
- It is widely recognized that OTC medications and supplements used by patients are not accurately or consistently documented or tracked by providers or their associated electronic systems.

The executive summary of the Medication Reconciliation Hackathon White Paper, including findings and recommendations, is included as Appendix A.

Another important contribution to the MRP Work Group's analysis was a targeted review of the pharmacy practice, medical literature, and key papers exploring the primary topic of medication reconciliation, conducted by a faculty member and two students from the University of Connecticut School of Pharmacy. The goals of this literature review were to examine literature support for the factors known to be associated and affect medication reconciliation processes and identify existing interventions to improve medication reconciliation.

The overall summary of the literature examined revealed five key themes:

- There are considerable discrepancies in accuracy across medication lists obtained by practitioners in different settings and especially at times when transitions of care occur;
- Using a single data source such as EHRs, patient portals, insurance claims data, and patient history is insufficient to ensure medication list accuracy and the use of multiple data sources improves medication list accuracy;
- Greater patient engagement in the medication reconciliation process resulted in fewer discrepancies;
- Pharmacist and pharmacist technician roles have a positive impact in the medication reconciliation process that can be seen across the hospital setting at admission, treatment, discharge, and among pharmacists in community settings; and
- Use of technology can be of value in bringing data sources together and creating functions to help automatically reduce medication list inaccuracies.

The Executive Summary of this literature review can be found in Appendix D, along with a summary of articles reviewed.

CancelRx and Deprescribing

One challenge associated with medication reconciliation is the ability to effectively cancel prescriptions that are no longer needed by patients. The CancelRx Work Group, a unique multi-stakeholder initiative in Connecticut, was formed in 2018 to discuss this issue and subsequently developed a recommendations report that was submitted to the Connecticut General Assembly in February 2019. This report has been well received and is informing medication reconciliation opportunities at both the state and national level. As described in the CancelRx Executive Summary, included as Appendix B, medications can be beneficial for the health of an individual, however they also pose potential health risks through side effects, adverse drug-drug or drug-disease interactions or inadvertent overdoses due to improper dosing or over-accumulation of active ingredients. These risks are increased when a medication that is intended to be discontinued, is taken inadvertently. Unfortunately, this occurs frequently for several identified reasons:

- 1) The patient continues to take medication they have at home, despite a discontinuation or change;
- 2) The pharmacy refills a medication that already exists within their pharmacy information system (PIS) that had previously been prescribed by a clinician but was ultimately discontinued or changed;
- 3) The patient receives medications from more than one pharmacy that are duplicates (e.g., brand name and generic of same drug) or overlapping in effect (drugs in the same pharmaceutical class or for the same indications, such as hypertension);
- 4) The clinician inadvertently responds to an electronic refill request that the pharmacy sends on a previously discontinued medication.

Recommendations from the CancelRx Work Group are included in the MRP Work Group's recommendations, goals, and objectives.

Similar to the process of canceling a prescription is a process called deprescribing. In an article titled, *Deprescribing: What Is It and What Does the Evidence Tell Us?*, Thompson, et al. define deprescribing as "the process of tapering, stopping, discontinuing, or withdrawing drugs, with the goal of managing polypharmacy and improving outcomes. Clinicians typically attempt to taper or stop agents on the basis of clinical experience and judgment, rather than using an approach guided by evidence."⁶ The importance of deprescribing as an integral aspect of medication reconciliation was thoughtfully considered by the Medication Reconciliation and Deprescribing Subcommittee of the MRP Work Group, and recommendations, goals, and objectives regarding deprescribing are described in detail later in this report.

Summary of Key Terms and Concepts

Medication Reconciliation: As defined by the Joint Commission, a process of comparing the medications a patient is taking (and should be taking) with newly ordered medications. The comparison addresses duplications, omissions, and interactions, and the need to continue current medications. The types of information that clinicians use to reconcile medications include (among others) medication name, dose, frequency, route, and purpose.

Polypharmacy: Masnoon, et al. conducted a systematic review to identify and summarize polypharmacy definitions in existing literature.⁷ Their findings indicated there is no consensus definition for polypharmacy. However, of the 138 definitions of polypharmacy identified, 111 (80.4%) were numerical only. For purposes of the MRP Work Group, polypharmacy refers to patients who are on 5 or more medications simultaneously. Note that this definition aligns with the definition of polypharmacy contained within Special Act 18-6, "Polypharmacy means the simultaneous use of multiple drugs by a patient to treat one or more ailments or conditions."

CancelRx: This is a technical messaging standard (SCRIPT Standard 10.6) developed by the National Council for Prescription Drug Programs (NCPDP) and adopted by the Office of the National Coordinator for Health IT (ONC). The cancel prescription request transaction is used to notify the pharmacy that a previously prescribed

⁶ *Deprescribing: What Is It and What Does the Evidence Tell Us?*, Wade Thompson, HBSC, Research Assistant and Barbara Farrell, BScPhm, PharmD, FCSHP, Scientist, Can J Hosp Pharm. 2013 May-Jun; 66(3): 201–202

⁷ *What is polypharmacy? A Systematic Review of Definitions*; Nashwa Masnoon, Sepehr Shakib, Lisa Kalisch-Ellett and Gillian E. Caughey, BMC Geriatrics 2017;17:230, <https://doi.org/10.1186/s12877-017-0621-2>

prescription should be canceled, and no additional product should be dispensed. The transaction is originated by the prescribing system as a Cancel Prescription Request Message (CancelRx).⁸

Deprescribing: Thompson, et al define deprescribing as “the process of tapering, stopping, discontinuing, or withdrawing drugs, with the goal of managing polypharmacy and improving outcomes. Clinicians typically attempt to taper or stop agents on the basis of clinical experience and judgment, rather than using an approach guided by evidence.”

Adverse Drug Events (ADEs): As published on the Center for Disease Prevention and Health Promotion website,⁹ an adverse drug event is an injury resulting from medical intervention related to a drug and includes medication errors, adverse drug reactions, allergic reactions, and overdoses.

Pharmacy Benefits Manager (PBM): As published by the American Pharmacists Association, a PBM is a third-party administrator of prescription drug programs.¹⁰ PBMs are primarily responsible for developing and maintaining the formulary used to determine insurance coverage or reimbursement, contracting with pharmacies, negotiating discounts and rebates with drug manufacturers, and processing and paying prescription drug claims. For the most part, they work with self-insured companies, insurance carriers, and government programs striving to maintain or reduce the pharmacy expenditures of the health plan while concurrently trying to improve health care outcomes.

Community Pharmacy: The MRP Work Group prefers the term “community pharmacy” to refer to independent pharmacies, chain pharmacies, and grocery store pharmacies that have state licenses to dispense medications to consumers in retail settings. Not included, generally, are online pharmacies, PBMs, and pharmacies in institutional settings such as acute care hospitals and long-term care facilities.

Legislative Action

On January 22, 2018, the Public Health Committee of the General Assembly held a hearing about issues related to polypharmacy and medication reconciliation. Testimony was provided on the scope of the problem and possible solutions.

Subsequent to the above hearing, another hearing was held on March 16, 2018 regarding Senate Bill 217, *An Act Requiring the Health Information Technology Officer to Establish a Working Group to Evaluate Issues Concerning Polypharmacy and Medication Reconciliation*. The proposed bill was the product of collaboration among the Health Information Technology Officer (HITO), providers, including pharmacists, university partners, and others to ensure that the state addresses the ongoing need for a uniform and workable method for addressing the potentially harmful problems of polypharmacy and the impacts incomplete, ineffective, or lack of medication reconciliation on the health of consumers and associated healthcare costs. The result of these deliberations was the passage of Substitute Senate Bill No. 217, Special Act No. 18-6.

⁸ National Council for Prescription Drug Programs: SCRIPT IMPLEMENTATION RECOMMENDATIONS (Version 1.46). (2018). Scottsdale, AZ: National Council for Prescription Drug Programs. Accessed at <http://www.ncpdp.org/NCPDP/media/pdf/SCRIPT-ImplementationRecommendations.pdf>

⁹ <https://health.gov/hcq/ade.asp>

¹⁰ *Pharmacy Benefit Management*; American Pharmacists Association. July 9, 2009. https://www.pharmacist.com/sites/default/files/files/Profile_24_PBM_SDS_FINAL_090707.pdf

This legislation required the HITO to establish a working group to evaluate issues concerning polypharmacy and medication reconciliation. It further mandated that, not later than July 1, 2019, the HITO shall report, in accordance with the provisions of section 11-4a of the general statutes, regarding the findings and recommendations of the working group to the joint standing committees of the General Assembly having cognizance of matters relating to public health and general law. The submission of this Final Report and Recommendations of the Medication Reconciliation and Polypharmacy Work Group is the fulfillment of this statutory requirement.

Project Structure and Process:

As mentioned in the Legislative Action section above, one of the mandates of Special Act 18-6 was the requirement for the HITO to establish a working group to evaluate issues concerning polypharmacy and medication reconciliation. Membership was required to include, but not be limited to, the following:

1. Two experts in polypharmacy;
2. Two experts in medical reconciliation;
3. A representative of the Department of Consumer Protection;
4. A pharmacist licensed under chapter 400j of the general statutes;
5. A prescribing practitioner; and
6. A member of the State Health Information Technology Advisory Council established pursuant to section 17b-59f of the general statutes.

To that end, the MRP Work Group was appointed by the HITO, following a public solicitation and recruitment process, and began meeting in September 2018. The members of the MRP Work Group represent an extraordinary assembly of dedicated and diverse healthcare professionals, consumer advocates, industry representatives, informaticians, and subject matter experts, as detailed in Table 2 below.

Table 2: MRP Work Group Members, Organizations, and Membership Categories

Member Name	Organization	Membership Category
Sean Jeffery, PharmD, BCGP	Integrated Care Partners – Hartford Healthcare	Expert in medication reconciliation
Nitu Kashyap, MD	Yale New Haven Health	Expert in medication reconciliation
Kate Sacro, PharmD	Value Care Alliance	Expert in medication reconciliation
Amy Justice, MD, PhD	Dept. of Veteran Affairs, Connecticut Healthcare System	Expert in polypharmacy
Janet Knecht, PhD, MSN	University of Saint Joseph	Expert in polypharmacy
Nathaniel Rickles, PharmD, PhD, BCPP	UConn School of Pharmacy	Expert in polypharmacy
Marghie Giuliano, RPh	Connecticut Pharmacists Association	Pharmacist
Anne VanHaaren, PharmD	CVS Health	Pharmacist
Thomas Agresta, MD, MBI	UConn Health	Prescribing practitioner
Bruce Metz, PhD	UConn Health	Health IT Advisory Council

R. Douglas Bruce, MD, MA, MSc	Cornell Scott-Hill Health Center	Prescribing practitioner
Ece Tek, MD	Cornell Scott-Hill Health Center	Prescribing practitioner
Lesley Bennett	Consumer / Patient Advocate	Represents consumers
MJ McMullen and Stacey Ward-Charlerie	Surescripts	Represents expertise in CancelRx Workflow
Jennifer Osowiecki, JD, RPh	Connecticut Hospital Association	Represents expertise in law
Diane Mager, RN-BC	Connecticut Association of Healthcare at Home	Represents LTPAC / Hospice
Jameson Reuter, PharmD, MBA, BCPS	ConnectiCare	Represents payers
Jeremy Campbell, PharmD, MHI	Boehringer-Ingelheim	Represents pharmaceuticals
Peter Tolisano, PsyD, ABPP	Dept. of Developmental Services	Represents a state agency
Rodrick Marriott, PharmD	Dept. of Consumer Protection	Representative of the Dept. of Consumer Protection
Barbara Bugella	Dept. of Mental Health and Addiction Services	Represents a state agency
Marie Renauer, PharmD, MBA, BCACP	Yale New Haven Health	Represents hospitals

Given the enormity and complexity of issues related to medication reconciliation, the MRP Work Group gave thoughtful consideration to how it would organize its work in order to meet the statutory requirement of a final report and recommendations by July 1, 2019. Two major activities were undertaken in that regard: the development and approval of a project charter and the formation of four subcommittees.

The Project Charter provided a definition of activities, process and intended outcomes and included the following:

1. Develop, implement, and operate an effective organization structure and process;
2. Establish foundational definitions for Work Group activities;
3. Secure funding for planning, design, and development/implementation activities;
4. Develop strategies to operationalize medication reconciliation by defining responsibilities, communication, and training requirements for healthcare professionals;
5. Identify mechanisms to enhance efficiency and effectiveness of cancelling prescription medications;
6. Develop strategies to operationalize deprescribing by defining responsibilities, communication, and training requirements for healthcare professionals;
7. Develop strategies for communicating with and engaging key stakeholders;
8. Support the implementation of priority recommendations based on funding availability and design approval (including proposed State Medication Management Services funding request); and
9. Evaluate the effectiveness of any implemented standards and solutions.

Four subcommittees were formed in January 2019 to provide in-depth analysis on different aspects of medication reconciliation and polypharmacy, and to support the development of recommendations. The subcommittees were composed of MRP Work Group members and supported by additional subject matters

experts. The four subcommittees included: (1) Engagement and Safety; (2) Medication Reconciliation and Deprescribing; (3) Technology and Innovation; and (4) Policy. Note that Sean Jeffery and Tom Agresta served as co-chairs of the MRP Work Group and participated in all the sub-committees. These subcommittees were diligent in their work, both in monthly meetings and through emails and phone conversations. The MRP Work Group members who participated in the subcommittees are as follows:

Table 3: MRP Work Group Subcommittee Members

Medication Reconciliation & Deprescribing	Engagement & Safety	Technology & Innovation	Policy
Amy Justice (chair)	Nathaniel Rickles (co-chair)	Bruce Metz (chair)	Peter Tolisano (co-chair)
Anne VanHaaren	Anne VanHaaren (co-chair)	Jennifer Osowiecki	Marghie Giuliano (co-chair)
Diane Mager	Kate Sacro	Marie Renauer	Jameson Reuter
Ece Tek	Lesley Bennett	Nitu Kashyap	Lesley Bennett
Jameson Reuter	Marie Renauer	Rodrick Marriott	Rodrick Marriott
Jennifer Osowiecki	Rodrick Marriott	Sean Jeffery	Sean Jeffery
Marghie Giuliano	Sean Jeffery	Stacy Ward-Charlerie	Tom Agresta
Marie Renauer	Tom Agresta	Tom Agresta	
Nathaniel Rickles			
Nitu Kashyap			
Rodrick Marriott			
Sean Jeffery			
Stacy Ward-Charlerie			
Tom Agresta			

The MRP Work Group also leveraged the work of other related initiatives in Connecticut, namely the Medication Reconciliation Hackathon and the CancelRx Work Group. The executive summaries of these two initiatives are found in Appendix A and Appendix B, respectively.

Also beneficial to the MRP Work Group’s analysis was a comprehensive literature review conducted by students from the University of Connecticut School of Pharmacy, under the direction of Nate Rickles, Anne VanHaaren, and the Engagement & Safety Subcommittee. The literature review’s major findings are found in Appendix D.

Finally, the MRP Work Group was also supported by a number of additional individuals and resources, including: The Office of Health Strategy; UConn Health; Dr. Phil Smith (whose work was referenced above); Brenda Shipley (consumer advocate); and the consulting team from CedarBridge Group.

Final Recommendations and Considerations of the Medication Reconciliation & Polypharmacy Work Group

Recommendations Overview

The following recommendations, goals, and objectives, organized into eleven domains, are the result of a nine-month planning process by the MRP Work Group and its four subcommittees, as described above in the Project Structure and Process section. A schematic was developed to support the visual display of these recommendations (Figure 1), as well as the central premise of the MRP Work Group that “The Patient is the North Star” in all deliberations and considerations.

The recommendations, goals, and objectives for the MRP Work Group are as follows:

Recommendation 1: Best Possible Medications History (BPMH)	
Premise and Goal	
<p>It is well recognized by healthcare professionals, patient advocacy groups, and policymakers that an accurate list of active medications, medications history, and history of adverse reactions/side effects to medications are necessary to evaluate the efficacy, appropriateness, and safety of medications use. The importance of this information increases when the patient is on multiple medications (including over-the-counter medications, complementary alternative medications, and supplements), when the patient is seeing multiple prescribing providers, when providers do not share a common EHR platform, or when the patient needs the assistance of a caregiver for the patient’s healthcare needs.</p> <p>Statewide databases like the Connecticut Prescription Monitoring and Reporting System (CPMRS) and networks like Surescripts have established feasible methods of maintaining and accessing prescription medication fill data and have largely addressed issues of privacy, data security, data storage, and data access. With appropriate resources and legal empowerment, these databases might form the basis of a centralized master list of active prescription medications and medication history.</p> <p>The MRP Work Group recommends an incremental approach to support BPMH that enables near-term, value-added solutions (for example, beginning with a best possible medications list of current medications rather than a full medications history), while working toward longer-term, more complete and integrated solutions that include decision support tools and a ledger of medication transactions (e.g., including current and prior-canceled prescriptions).</p>	
Objectives	
<ol style="list-style-type: none">1. Near-term efforts (1-2 years) should be focused on making tangible progress toward an enhanced and uniform best possible medication <i>list</i> and should include:<ul style="list-style-type: none">o Integration of data derived from groups such as pharmacy benefit manager (PBMs) and community pharmacies, EHR-based medication data, and prescription monitoring program (PMP) / CPMRS data, in coordination with the statewide health information exchange (HIE);o Dispensed prescription medications (i.e., initially <i>not</i> including non-prescription medications, OTCs, vitamins, herbals, and supplements);	

- Specification of characteristics of BPMH to support longer-term vision and planning; and
 - Evaluation of expanding CPMRS data and functionality for supporting BPMH requirements
2. A longer-term vision (3-4 years) for BPMH should be implemented and should include:
- Detailed business (legal, financial, operational), technical and functional requirements for best possible medication *history*;
 - A ledger, or a cross-platform log, of medication transactions and considerations including those associated with medication reconciliation (e.g., canceling a prescription);
 - Integrated clinical decision support tools; and
 - Inclusion of OTC medications, dietary supplements, and other complementary alternative medicines.

Recommendation 2: Patient Engagement

Premise and Goal

Engaging patients and their family and caregivers throughout the medication reconciliation process leads to better results.

The MRP Work Group recommends the implementation of patient-centered and evidence-based best practices necessary to contribute to the development and maintenance of BPMH, supported by communication, education, and user-friendly digital tools.

Objectives

1. A process for patient and family/caregiver engagement should be designed, implemented, and adopted statewide. This process will likely vary depending on the setting in which medication reconciliation is being performed; however, key elements of patient or family/caregiver engagement should include the following:
 - Evidence-based and proven communication techniques, such as asking open-ended questions and teach-back method;
 - Initiating the engagement process before the patient comes to appointment;
 - Reminders for providing up-to-date medication information to their providers; and
 - Training on digital tools.
2. Tools for patients that support their ability to better manage their medications should be identified, developed if necessary and shared.
 - A communications plan should be developed for providers regarding how to most effectively engage patients and their families in the medication reconciliation process.
 - A systematic review should be undertaken to identify the most effective tools for supporting a patient's ability to keep medications up-to-date and communicated to their prescribers and care team.
3. A public awareness campaign to elevate the understanding of the importance of medication reconciliation and keeping one's provider up-to-date on active and discontinued medications.

Recommendation 3: Medication Reconciliation Process Improvements

Premise and Goal

As defined by the Joint Commission under its Ambulatory Health Care Accreditation Program, medication reconciliation is “a process of comparing the medications a patient is taking (and should be taking) with newly ordered medications. The comparison addresses duplications, omissions, and interactions, and the need to continue current medications. The types of information that clinicians use to reconcile medications include (among others) medication name, dose, frequency, route, and purpose.”¹¹

In addition, the Joint Commission recommends the following process for medication reconciliation:

1. Obtain and/or update information on the medications the patient is currently taking.
2. Define the types of medication information to be collected in different settings and patient circumstances.
3. Compare the medication information the patient brought to the organization with the medications ordered for the patient by the organization in order to identify and resolve discrepancies.
4. Provide the patient (or family as needed) with written information on the medications the patient should be taking at the end of the episode of care (for example, name, dose, route, frequency, purpose).
5. Explain the importance of managing medication information to the patient at the end of the episode of care.

The MRP Work Group endorses the Joint Commission definition and process for medication reconciliation, while emphasizing that this definition and process could be used in almost all care settings.

Objectives

1. A repository of evidence-based, best practice medication tools, technical advisories, subject matter experts, and policy and regulatory guidance documents should be developed.
2. A provider and prescriber communications plan for the dissemination of the above definitions, processes, and tools should be developed and implemented.
3. A statewide public health campaign to raise awareness around medication and patient safety issues, including the importance of the CancelRx standards adoption and use, should be launched.

¹¹ https://www.jointcommission.org/ahc_2017_npsgs/

Recommendation 4: Team Approach

Premise and Goal

Team approaches to medication reconciliation are generally more accurate and provide more up-to-date medication lists than non-team approaches, where multiple data sources are needed to improve the quality of the medication reconciliation effort. When team approaches are supported by effective and integrated digital tools, results will be further enhanced. A team approach can only be effective when roles and accountability are clear, training is effective, and the team is properly resourced.

The MRP Work Group recommends the adoption of a team approach to medication reconciliation both within and across organizations, based on evidence-based best practices.

Objectives

1. Mission critical team members, whose participation in medication reconciliation is essential for success, should be identified.
2. All staff involved in medication reconciliation should receive proper training, including how to engage patients and families, employment of best practices, and the use of digital tools.
3. All organizations should clearly define team members' roles and responsibilities for medication reconciliation, within scope of practice and including accountability and decision-making.
4. Teams and staff involved in medication reconciliation should adopt evidence-based, best practice processes.
5. Teams should be properly resourced to support effective care management for the number and complexity of patients for which they are responsible.

Recommendation 5: Implementation and Adoption of CancelRx

Premise and Goal

While medications can be beneficial for the health of an individual, they also pose potential health risks through side effects, adverse drug-drug, drug-food, or drug-disease interactions, and excessive dosing. These risks are increased when a medication that is intended to be discontinued is taken inadvertently.

The ability to cancel a prescription medication electronically has existed from a technical perspective for several years through a technical messaging standard (SCRIPT Standard 10.6) developed by NCPDP and adopted by ONC.¹² However, there remains no requirement or incentive to incorporate this standard into EHRs and pharmacy information systems. As a result, adoption has been slow at both the pharmacy and provider side.

¹² <https://www.ncdp.org/NCPDP/media/pdf/NCPDPEprescribing101.pdf>

The MRP Work Group recommends the implementation of the findings and recommendations from the CancelRx Work Group. The executive summary of the CancelRx Work Group’s Final Report can be found in Appendix B of this report.

Objectives

1. A formal assessment of the return on investment (ROI) for the CancelRx standard and other medication reconciliation recommendations to support the widespread adoption by pharmacies should be conducted.
2. A formal assessment of the legislative/policy considerations associated with a mandate to require participation in the CancelRx standard by Connecticut pharmacies and practitioners.
3. The possibility of utilizing HIE funding to support onboarding, technical assistance, education, training, and implementation for pharmacies and practitioners should be explored and pursued.
4. Pharmacy CancelRx workflows through technical assistance support should be adopted.
5. A business case for the sustainability of CancelRx that is endorsed and supported by the state’s HIE effort and associated stakeholders (e.g. payer-led cost containment analyses) should be developed.
6. An incentive program to support the adoption and use of the CancelRx standard and conduct pilot programs to determine ROI for each organization should be developed.
7. An analysis of funding opportunities available to help address polypharmacy and reduce opioid misuse should be conducted.
8. A partnership with the Department of Consumer Protection (who oversees and manages the CPMRS), the Substance Abuse and Mental Health Services Administration (SAMHSA), and other organizations/stakeholders should be developed to support CancelRx program objectives.

Recommendation 6: Deprescribing

Premise and Goal

Once medication reconciliation is accomplished, medications identified as potentially inappropriate, no longer needed, or where the risk outweighs the benefit should be considered for discontinuation. However, scientific evidence supporting this decision-making process is limited. To date, providers are often caught between disease-specific guidelines recommendations, patient-specific needs, and concerns regarding polypharmacy and potential drug interactions. Because the evidence is limited and new evidence is likely to become available with time, the joint patient-provider decision to stop (deprescribe) specific medications requires clear and thoughtful communication between the patient and prescriber(s). Many medications may require slow tapers, as opposed to abrupt cancellation.

The MRP Work Group recommends the identification and adoption of best practices in deprescribing, along with support from tools such as risk algorithms and training materials that are regularly re-evaluated and updated as new evidence becomes available. The group also encourages active research to develop and validate best practices.

Objectives

1. Evidence-based best-practices for deprescribing should be identified and added to the repository of medication reconciliation tools in Recommendation 3: Objective 1 and included in provider and prescriber communications (Recommendation 3: Objective 2).
2. A shared decision-making model that engages patients and providers in discussing deprescribing should be created.
3. Risk algorithms to identify population health strategies for potential medications for deprescribing should be developed.
4. Prescribers should be surveyed regarding educational needs for deprescribing.
5. Have a mechanism for updating these educational materials and decision support tools as new evidence becomes available.

Recommendation 7: Technology

Premise and Goal

Technology continues to advance in ways that can help redress the challenges of medication reconciliation, polypharmacy management, deprescribing and CancelRx. Progress toward BPMH is of highest priority, and near-term, high-value steps should be undertaken as soon as practical in support of Recommendation 1. In addition, artificial intelligence, blockchain, and clinical decision support tools should be evaluated for integration into these solutions. Patient-facing digital tools will become increasingly important for supporting patient engagement.

The MRP Work Group recommends an incremental approach to supporting Recommendation 1 (BPMH) be undertaken once requirements have been developed and funding is available. Future development should focus on integration of additional clinical data (e.g. OTC medications) and enhanced technical tools such as analytics and clinical decision support. In addition, ongoing surveillance of the industry should be conducted to identify promising solutions made possible through advancements in technology.

Objectives

1. Near-term (Years 1-2) focus should be placed on developing a best possible medication list, leveraging existing data resources that include community pharmacies, PBMs, and EHRs.
2. A longer-term (Years 3-4) vision for BPMH should be defined, including business, technical and functional requirements.
3. Advanced technologies, such as blockchain, analytics and clinical decision support tools should be monitored on an ongoing basis and integrated with BPMH based on value and funding.
4. The statewide HIE should be leveraged to support the incremental development of BPMH, and medications should be made available as a meaningful component of the clinical payload of the statewide HIE.

5. Patient-facing digital tools should be evaluated and an approach to integrating medications data should be defined.
6. An implementation plan and technology roadmap should be finalized, including business, functional, and technical requirements.
7. Ideas and lessons learned from the Med Rec Hackathon should be considered as technology options are reviewed and attempts to facilitate additional prototype development should be contemplated.
8. Adding the CancelRx transaction to the CPMRS should be formally assessed.

Recommendation 8: SUPPORT Act Funding and Planning/Design Process

Premise and Goal

Among its various funding opportunities, the SUPPORT for Patients and Communities Act¹³ provides resources to better integrate and utilize state prescription drug monitoring programs (PDMPs), or PMP in Connecticut (CPMRS). The Department of Social Services (DSS), the Department of Consumer Protection (DCP), and OHS are submitting a request to the Centers for Medicare and Medicaid Services (CMS) to fund a planning and design process to identify specific, tangible, value-added initiatives related to CPMRS.

The MRP Work Group recommends that the planning and design activities related to the SUPPORT Act be undertaken in close collaboration with the initiatives and future planning activities recommended by this Work Group.

Objectives

1. A process for communication and coordinated planning should be implemented between the SUPPORT Act activities and the initiatives and future planning activities recommended by the MRP Work Group.
2. An assessment should be made to identify mechanisms to include CPMRS data in the statewide HIE and the planned approach to build the BPMH.
3. The PMP database should be considered and evaluated for its potential to be used as a resource for establishing a single source of truth for all controlled and non-controlled medications.

¹³ <https://www.congress.gov/bill/115th-congress/house-bill/6>

Recommendation 9: Aligned Policy

Premise and Goal

Policies in the public and private sectors can support the achievement of the MRP Work Group's recommendations, as well as eliminate certain barriers to the achievement of those recommendations.

The MRP Work Group recommends an ongoing policy review to identify opportunities in both the public and private sectors, with initial areas of focus indicated below.

Objectives

1. Medication quality measures that align clinically meaningful outcomes with MRP Work Group initiatives should be identified and implemented.
2. Incentives for medication management, medication reconciliation, and the reduction of potentially inappropriate medications should be identified for inclusion in value-based care initiatives in Connecticut.
3. Privacy and confidentiality of medication-related information should be of high priority in all solutions.
4. An assessment of a policy mandate for CancelRx standard (as described in Recommendation 5) should be undertaken.
5. Healthcare provider scope of practice should be reviewed and revised as necessary to support team-based medication reconciliation efforts.

Recommendation 10: Planning/Design Process and Use of IAPD Funding

Premise and Goal

As a component of the overall IAPD funding request to establish HIE services in Connecticut, funding is also being requested to provide subject matter expertise to facilitate the planning and development of digital tools to support the goals and objectives identified in these recommendations. This request provides \$100,000 in FFY 2019 and \$150,000 in FFY 2020 for the facilitation of design groups, development of business, functional, and technical requirements to support priority use cases, workflow mapping, and additional stakeholder engagement and outreach.

The MRP Work Group recommends that a work plan be developed for these subject matter expertise / planning and development funds for those areas prioritized by the MRP Work Group for further research, planning, and design, as indicated below. This work should be done in a manner that complements the planning and design activities pursuant to funding provided to Connecticut through the SUPPORT Act (Recommendation 8).

Objectives

1. Funds from the current IAPD should be utilized to finalize planning, design and requirements for the projects and services recommended in this report.
 - a. A portion of funds should be allocated to conducting stakeholder interviews and focus groups to validate value created from services being proposed through this planning initiative.
 - b. A dedicated team to conduct these interviews and begin the process of developing Med Rec Use Cases for consideration within the HIE should be empowered, funded and assigned and begin work as soon as possible. They should work with the HIE Entity, the OHS and the reconstituted MRP Work Group to lay out potential use case options for evaluation within 3 months
2. Future funding for implementation should be sought once planning, design and requirements have been developed.

Recommendation 11: Continuation of the MRP Work Group**Premise and Goal**

The Medication Reconciliation and Polypharmacy (MRP) Work Group has demonstrated the ability to bring a diverse group of dedicated professionals together to tackle a daunting healthcare and public health challenge.

The MRP Work Group recommends the continuation of the MRP Work Group as a standing committee of the Health IT Advisory Council.

Objectives

1. The MRP Work Group should be constituted as a Standing Committee of Health IT Advisory Council.
2. A new charter should be established for the MRP Work Group, reflecting the priorities and focus associated with ongoing strategy and policy development along with oversight of implementation of MRP recommendations. Specific milestones and timelines should be included in the charter.
3. Membership of the MRP Work Group should be evaluated to ensure representation of stakeholders and subject matter experts necessary to support the new MRP charter.
4. The MRP Work Group should meet not less than quarterly.
5. The MRP Work Group should provide an annual report to the Health IT Advisory Council on progress in implementing MRP recommendations and positively impacting medication reconciliation and polypharmacy management in the state.

Next Steps and Closing Thoughts:

The members of the MRP Work Group are grateful for the opportunity to convene, collaborate, engage and strategize. It is the hope of the MRP Work Group that this work advances the pursuit of meaningful solutions for the broad and complex challenges of medication reconciliation and the issues associated with polypharmacy.

The real impact of this work will be determined by the extent to which proposed solutions are implemented and put to use in supporting our patients and those who care for them. Immediate next steps include: the continuation of our MRP Work Group, re-chartered as a standing committee of the Health IT Advisory Council; planning, design, and implementation of technical solutions; collaboration with other initiatives such as the SUPPORT Act; and identification and dissemination of evidence-based best practices. We are confident that these steps will result in tangible value, while laying a foundation for even more success in the future.

Appendix A:

Report on Medication Reconciliation Hackathon

Executive Summary

REPORT ON MEDICATION RECONCILIATION HACKATHON

The Medication Reconciliation Team Member Contributors:

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June 20, 2019

*Report prepared for:
The Office of Health
Strategy -
Medication
Polypharmacy
Workgroup*

UConn
SCHOOL OF MEDICINE

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Executive Summary

Connecticut is currently in planning for Health Information Exchange (HIE) services to connect digital health records for patients across the state. The Health IT Advisory Council¹ prioritized a list of ten high priority use cases for HIE services; medication reconciliation was one of the major objectives. The CT Legislature mandated the formation of the Medication Reconciliation and Polypharmacy (MRP) Work Group to make recommendations by June 2019, under the oversight of the CT Office of Health Strategy (OHS). There were nine objectives that were defined by the MRP Workgroup, with three being directly relevant to medication reconciliation and management.

UConn Health, as an advisor to OHS on HIE efforts, co-sponsored a Medication Reconciliation Hackathon on Friday, April 5th and Saturday, April 6th, 2019 at the UConn Health Academic Building in Farmington. Objectives included:

- Educate participants about some of the current challenges and newer opportunities in the use of electronic systems for the medication reconciliation,
- Introduce basic technical aspects of Fast Healthcare Interoperability Resources (FHIR) for electronic exchange of healthcare information,
- Identify key “pain points” from various user perspectives and propose viable solutions, and
- Assist in the planning for medication management services for the State’s HIE.

Participants included a wide range of clinical (physicians, nurses, pharmacists), technical (engineers, computer scientists, analysts and programmers) and industry subject matter experts as well as students and patient / privacy advocates. Following a half-day of presentations, the participants self-selected into group collaborations to discuss challenges in four areas and develop a specific prototype solution.

The four areas and their key findings were:

1. **Patient / Caregiver Engagement** addressed patient-caregiver perspectives. Their prototype was a patient-centered, interactive medication management application
 - Key Insights:
 - To effectively do medication reconciliation, the indication / reason for each prescription is currently missing and if visible would improve the process.
 - The patient with the app and/or printed list can take an active role in validating what they are really taking and why.
 - The Pharmacist can more effectively counsel patients when the indication for each med is included.
 - When a list exists, a family member or Home Health Aid (or nurse) can search the house to see if it is really being taken.
2. **Extended Care Facilities and Home Health** created a prototype for active collaboration and reconciliation of medications between home health services and the physician office, leveraging real time inspection of actual meds in the home and patient involvement.
 - Key Insights:

The software standard FHIR has several different electronic message types for medication management that were considered for utilization but some inconsistencies between them could cause complications in their desired communication between Home Health Nurse and the patient's clinical provider.

- For example, the "request" domain has an "intent" field, but the "statement" domain does not. The intent field would describe the prescriber's reason or clinical indication for a medication (such as Hypertension).
- The group recommended that all fields should be available across the different domains.
- In their prototype they a two-way interaction between the prescriber and the Home Health Nurse - to acknowledge when a medication is not being taken (and remove from the medication list) or add a medication to the list that the patient was actually taking such as an over-the-counter (OTC) med or one prescribed by a different clinician.

3. Inpatient Hospital Venue created a prototype that would compile and summarize a potential list of current medications with an automatically calculated confidence indicator as to whether a patient was actually taking any given medication on the list. Physicians, nurses and pharmacists could leverage this at the time of admission to a hospital. The solution would rate medication data sources for their reliability to help better manage discrepancies that occur.

- Key Insights:
 - Fast Healthcare Interoperability resources (FHIR) could create a unique physician / clinician view through a dashboard feature within their EHR, for faster and more accurate medical decision-making than is available now. The dashboard must:
 - Include a quick summary (snapshot) of current medication information.
 - Leverage machine-learning algorithms to create a confidence level/indicator using many disparate information systems.
 - Allow for a drill down/access to detailed information pertaining to medication, prescriber, refill histories, comments, confidence levels, and past medication history.
 - The group recognized that there was a need to better harmonize the various FHIR resources and their unique attributes.

4. Ambulatory Primary Care Physician (PCP) Venue envisioned a digital health service within the HIE that would compile a list of medications from various information sources into a single source-of-truth database which users would access seamlessly within their clinical/pharmacy information systems for medication management.

- Key Insights:
 - Starting with an end goal of creating a "single source of truth" for medication information, within the state, Connecticut could develop Cloud-based services to compile and transform current medication lists from all systems that hold a patients' medication data.

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- Allowing a single place to manage transactions (add, modify, cancel, comment, validate and reconcile) would likely improve safety and efficiency for medication management and reduce medication-related errors.
- The system would facilitate, the “right prescriber” validating and updating the right information regarding a patient’s medication list, reducing the risk that specialists and primary care physicians would inadvertently make errors on medications prescribed outside the scope of their usual clinical practice.
- This group also echoed the need for “Indication” on each medication to drive improved care and more Clinical Decision Support (CDS); automatic intelligent filtering and display of medication lists; and Artificial Intelligence (AI) opportunities.
- A long-term solution could be to create this database as an HIE “service”^A that the EHRs would electronically connect to rather than duplicate medication list management in the EHR. It would be critical to ensure effective integration into the clinical workflow.

Summary

The Medication Reconciliation Hackathon brought together Subject Matter Experts for education and collaboration on improving medication management for the State of Connecticut. There was general agreement that the current medication management process often impedes our ability to determine a current and accurate list of medications for each patient.

Major challenges of the current state include:

- Despite widespread adoption of (attempting to perform) medication reconciliation at each transition of care, a large number of medication-related errors occur.
- Substantial difficulty remains in compiling a patient’s medication list from numerous disparate sources, often containing duplicate, missing or inaccurate information.
- Not knowing a clear indication or reason why each medication was prescribed impedes best practice for both pharmacist and physician decision-making and reduces patient understanding and engagement.
- Under-utilization of the available messaging standard, **CancelRx**, to electronically discontinue a medication puts patients at risk for adverse outcomes and this standard should be more routinely adopted and used by prescribers and pharmacies.
- Physicians often bear the responsibility for reconciling complex medication regimens outside their professional expertise and this can have a significant impact on effective medical decision-making. A robust solution that allows shared reconciliation of medications could potentially improve this.
- We currently lack an efficient, effective and patient-centric means of incorporating patient-reported medications and a method of sharing that information in a methodical manner when

^A Current EHRs have built-in processes for managing the patient’s medication list. This creates a unique instance of a list of current medications. A “service” would allow the HIE to host the patient’s current med list and allow each EHR to interact and update the HIE list, rather than create a standalone list that may no longer be up to date beyond the single EHR encounter.

UConn Med Rec Hackathon Report

across disparate clinical and pharmacy information systems. An enhanced solution could have substantial safety benefits.

- The industry recognizes that under-documentation of patients' over-the-counter medications and supplements occurs and could potentially be improved through a patient-facing system.

The Hackathon demonstrated that current technology standards exist, such as the FHIR RESTful API and other data standards that could improve the acquisition of a more accurate medication list from a number of electronic and human sources. It could also simultaneously facilitate the development of new mobile applications, user interfaces and features such as, specialty applications or features in a patient portal that could empower the patient (or guardian/parent) to report useful information (e.g. side effects, adherence, and undocumented OTC meds, prescriptions and supplements) that are often overlooked today. These should be designed to improve the longitudinal sharing of this information across the various health IT platforms and venues of care.

A centralized medication management service for statewide prescription data could potentially evolve into a single source of truth for medication reconciliation. If successful, this could eventually become a service that replaces the proprietary medication process in each clinical and administrative database.

Access, consent, privacy and security are four critically important areas of specific focus of the MRP Work Group that are under discussion in a separate regulatory subcommittee and a Consent Design group for the HIE.

Acknowledgements

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- Matt Englehart and Joseph Anderson – FHIR-PIT – MiHIN

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- Steve Demurjian Ph.D., Chris Gilman - UConn School of Engineering
-

For Set-up and Maintenance of the GITHUB repository:

- Cory Brunson Ph.D. - UConn Center for Quantitative Medicine

Appendix B:
CancelRx Work Group Recommendations
Executive Summary

FINAL REPORT EXECUTIVE SUMMARY – CANCELRX WORKGROUP – SUBMITTED TO THE HEALTH INFORMATION TECHNOLOGY OFFICER

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February 1, 2019

*Report prepared for:
Connecticut General
Assembly*

**Healthcare Cabinet
Data & Cost
Containment
Group**

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CancelRx Executive Summary

Introduction:

At the American Medical Informatics Association (AMIA) meeting in Washington DC in November 2017, a group of clinical informatics leaders (physicians and pharmacists) from within Connecticut convened to discuss how they productively engage in Health Information Exchange (HIE) planning and implementation activities in collaboration with the emerging plans for state-wide HIE services and the priority use cases that had recently been approved by the Health Information Technology (HIT) Advisory Council, a legislatively approved body advising the State Health Information Technology Officer (HITO) of Connecticut.

As the various use cases were discussed, it became clear that medication reconciliation was a major pain point and identified patient safety issue for all of these clinical leaders within their healthcare organizations. In fact, a single challenge was introduced as an example that should be solvable, but remained elusive: the ability for a clinician to electronically cancel via their own Electronic Health Record (EHR) a prescription that was no longer appropriate for a patient to take. This, despite the fact that they are required by law to send prescriptions electronically for all controlled substances coupled with the reality that most prescriptions are sent electronically in CT and that all Meaningful Use Certified EHR's at the 2015 standard were required to have this function which is identified as CancelRx and has been supported by a data transmission standard and the major eprescribing software data transmission hubs. The clinicians noted that all in the room were currently unable to use this safety and efficiency feature of their certified EHR's.

After discussions amongst stakeholders and with the permission of the HITO and the HIT Advisory Council, a multi-stakeholder group led by a UConn Health Clinical-Informatician, was organically formed to gather further information about this issue, evaluate potential solutions, pilot those solutions, share their findings with each other and inform the HIT Advisory Council and HITO of their findings and how that could advance the Medication Reconciliation Use Case for HIE.

Background Information and Problem Statement:

While medications can be beneficial for the health of an individual, they also pose potential health risks through side effects, adverse drug-drug or drug-disease interactions or inadvertent overdose due to improper dosing or over-accumulation of active ingredients. These risks are increased when a medication that is intended to be discontinued, is taken inadvertently. This unfortunately occurs frequently due to several issues: 1) the patient continues to take medication they have at home 2) the pharmacy refills a medication that already exists within their Pharmacy Information System (PIS) that had previously been prescribed by a clinician but ultimately discontinued or changed, 3) the patient receives medications from more than one pharmacy that are duplicates (brand name and generic of same drug) or overlapping in effect (drugs in the same pharmaceutical class or for the same indications such as hypertension) 4) the clinician inadvertently responds to an electronic refill request that the pharmacy sends on a previously discontinued medication.

In addition to the potential for patient harm, there can be significant costs associated with having a medication filled when not desired by a clinician, including: 1) the actual cost of the medication to patient and insurer 2) the costs of any side effects or adverse events that may result in lost work or school time and 3) costs associated with avoidable physician visits, ER visits and hospitalizations due to adverse side effects or drug-drug interactions.

The ability to cancel a prescription medication electronically has existed from a technical perspective for several years through a technical messaging standard (SCRIPT Standard 10.6) developed by the National Council for Prescription Drug Programs (NCPDP) and adopted by the Office of the National Coordinator for Health IT (ONC).¹ NCPDP SCRIPT Version 2017071 is available to test and ensure correct implementation of this version ahead of the January 1, 2020, implementation timeline. In fact, this has been a required standard for incorporation, but not use, into 2015 Certified EHR systems. Healthcare organizations have been required to use 2015 Certified EHR's to meet the Meaningful Use 3 objectives to participate in federal and state healthcare quality programs. This certified technology is in use by almost all of the large and medium sized hospital and ambulatory healthcare organizations in Connecticut. Yet there remains no requirement or incentive to incorporate this standard into Pharmacy Information Systems and adoption had been slow at both the pharmacy and provider side as of the beginning of 2018. (See Surescripts data in Appendix)

Using the CancelRx function is part of a solution to reduce polypharmacy and reconcile medication lists to achieve "Med Rec." CancelRx is a message sent through the ePrescribing Transaction Hub (SureScripts vendor tool or PrescribersConnection) from prescriber to pharmacist if a) If the prescriber wants to correct a mistake on a prescription by cancelling and then re-ordering or b) If the prescriber wants to discontinue therapy of a prescription that is still active (i.e. there are refills left on the prescription at the pharmacy).²

SureScripts data from January 2018 shows that within the state of CT, only 20.1% of prescribers and 28.6% of pharmacies were certified and enabled to use CancelRx. Increasing the adoption and use of CancelRx could help a variety of stakeholders improve care and reduce cost/waste.³

See Appendix 1-3 for SureScripts Tables³⁻⁴

Overview/Approach:

In January 2018, a CancelRx workgroup was formed in CT to work on medication reconciliation as aligned with state efforts and the determination of Med Rec as a priority Use Case identified by the Health Information Exchange. The goals of this group were to define the problem clearly, outline some potential solutions, participate in some pilot projects and inform each other of progress and develop a set of recommendations that might be helpful to the HITO and the HIT Advisory Committee. Collectively, the CancelRx Workgroup decided to take a 3-pronged approach. The three working subgroups formed were 1) Workflow 2) Return on Investment for each stakeholder and 3) Technical Standards.

In the summer of 2018, a state-level legislatively approved Office of Health Strategy (OHS) Medication Reconciliation and PolyPharmacy (MRP) Workgroup was formed to work on the larger issues of Medication Reconciliation (Med Rec). CancelRx was considered to be a portion of what is required for Med Rec and so it was decided to end the separate group and pass on what was learned in these 3 working CancelRx subgroups.

Methods/Process:

In January 2018, the first of these multi-stakeholder groups was convened by a physician- informatician at University of Connecticut (UConn) Health to create recommendations and propose pilot solutions for sharing & dissemination across CT for continued work. There were 11 CancelRx meetings held in total from January- September 2018. Each meeting was in-person but also had a call-in option where meeting materials were shared for feedback and review. This allowed for the workgroups to engage

members across the country. This was especially important to get vendor participants with the expertise necessary to participate and provide feedback on their products and services to best understand the market and current solutions.

The Convener of these workgroups reached out to potential members who had the expertise and were able to chair the meetings in-person in the Greater Hartford Area in CT. With the support of the State of CT HIE Project Coordinator for UConn Health, meetings convened and these workgroups constructed both the Workflow and Technical Diagrams, as well as an ROI Matrix of Pros and Cons of CancelRx adoption.

The CancelRx Workflow Workgroup captured CancelRx transaction information that was put into graphical format, in a Workflow Diagram using Viseo. This shows the process within organizations. The Tech Workgroup followed a lot of the same processes but instead created a Technical Diagram using Viseo focused on the electronic transaction within systems. And from a business logic perspective, a Return on Investment (ROI) Workgroup was formed to identify stakeholder organization's individual and group ROIs. Due to the detailed nature of these documents they are not included in this executive summary but are available upon request.

Summary of the Key Findings:

The group concluded that there were several key issues to consider:

- 1) There was a significant opportunity to enhance patient safety if the CancelRx standard was adopted in a manner that was workflow-friendly for prescribers, pharmacists and patients.
 - a. This includes a reduction in adverse drug reactions, drug-drug interactions and drug-condition interactions.
 - b. This is balanced by a small but real risk of inadvertently de-prescribing an intended medication.
- 2) There were a number of stakeholders who would benefit financially from a reduction in inadvertent prescribing that would occur.
 - a. The patient and family would have reduced medication costs and costs associated with physician visits, ER visits and hospitalizations from adverse drug events.
 - b. The insurer and payer of healthcare would have reduced costs spent on medications that were not intended for consumption and for reduced costs associated with adverse events.
 - c. The pharmacy would have reduced costs to restock medications not utilized and time spent calling prescribers to clarify intended discontinuation of medications.
 - d. The prescribing physician and their organizations would have reduced time and effort spent calling pharmacies to verify a discontinuation event.
- 3) There are a number of challenges that need to be overcome for widespread adoption and effective use to occur.
 - a. Many CT pharmacies (<50%) did not have pharmacy information systems that had enabled CancelRx as of the time of the group meetings. There may be significant costs for non-chain pharmacies to adopt or upgrade PIS to accept CancelRx.
 - b. Fewer CT physician offices had enabled CancelRx (20%) as of early 2018.³
 - c. Enabling the use of the standard (i.e. enabling it within the Health Information System) does not equate to actually using to de-prescribe a medication. There are often several additional steps that must be taken including education of providers, setting up the EHR / PIS to correctly handle the messages required.

- d. Despite having an appropriate SCRIPT standard for data transmission and an ePrescribing hub (Surescripts and PrescribersConnection), this is not widely adopted.
- e. When enabled in an EHR, CancelRx workflow often created confusing and duplicative messages within the EHR, especially when pharmacies were not enabled, prompting some organizations to disable this feature.
- f. There was a general lack of knowledge across a broad stakeholder group about the facts around the CancelRx standard and how it functions within an actual health eco-system, including from clinicians, pharmacists, EHR vendors, pharmacy chain leaders, staff from skilled nursing facilities, IT staff at healthcare organizations and even the ePrescribing hub vendors.
- g. Some prescribers who would still benefit from adoption of this standard, work in settings where Certified EHR technology is not in routine use due to the location of care, such as Skilled Nursing Facilities, Visiting Nurse etc.

Recommendations:

1. Conduct a formal assessment of the Return on Investment for the CancelRx standard and other medication reconciliation recommendations to support the widespread adoption by pharmacies.
2. Conduct a formal assessment of the legislative / policy considerations associated with a mandate to require participation in the CancelRx standard by CT pharmacies and practitioners.
3. Explore the possibility of utilizing HIE funding to support onboarding, technical assistance, education, training, and implementation for pharmacies and practitioners.
4. Standardize pharmacy CancelRx workflows through technical assistance support.
5. Launch a statewide public health campaign to raise awareness for medication safety, CancelRx, medication reconciliation, polypharmacy, election prescriptions for controlled substances, etc.
6. Develop a business case for the sustainability of CancelRx that is endorsed and supported by the state's HIE effort and associated stakeholders (e.g. payers conducting cost containment analysis).
7. Develop incentive program to support the adoption and use of the CancelRx standard and conduct pilot programs to determine ROI for each organization.
8. Conduct analysis of funding opportunities available to help address polypharmacy and reduce opioid misuse.
9. Partner with the Connecticut PDMP, the Substance Abuse and Mental Health Services Administration (SAMHSA), and other organizations / stakeholders to determine how CancelRx can be supported by, or provide support to, relevant program efforts.

Conclusion:

The CancelRx workgroup was an organically organized but very productive multi-stakeholder group that gained a great deal of insight into a socio-technical problem facing patients, family members, providers and pharmacists. The energy shown by its dedicated volunteer members clearly indicates the importance of addressing the challenges related to effectively and efficiently discontinuing a medication through a reliable electronic means.

The lessons learned in this process have already born fruit with regards to the collaborations formed between the various organizations around a common purpose of increasing medication safety and improving healthcare costs. The recommendations made from this ad-hoc group should serve as the basis for more robust recommendations, actions and funding to bring about effective solutions.

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The leadership of this group would like to thank the members for their dedication and time. They also would like to thank the Office of Health Strategy in CT for its support and the legislature for establishing the Medication and Polypharmacy Workgroup which will likely enhance and create a path forward for executing on many of the recommendations made.

CancelRx Workgroup Members:

Name	Affiliation & Position	Workflow Member	Return on Investment Member	Technical Member
Thomas P. Agresta, MD, MBI	Professor of Family Medicine- UConn & Clinician-informatician working on the State of CT Health Information Exchange	Convener	Convener	Convener
Nitu Kashyap, MD	Assistant Professor of Medicine & Executive Director of Clinical Informatics at Yale	Leader	X	X
Sudeep Bansal, MD, MS	Primary Care Physician, Diplomate in Clinical Informatics	X	Leader	
Sean Jeffery, Pharm D, CGP, FASCP, FNAP, AGSF	UConn Clinical Professor, Pharmacy; HHC Group: Director of Clinical Pharmacy Services at Integrated Care Partners	X	X	Leader
Kate Hayden, MPH	UConn HIE Coordinator	Coordinator	Coordinator	Coordinator
MJ McMullen	Principal Business Advisor, SureScripts	X	X	X
Roderick Marriott, Pharm D	Director, CT Drug Control Division- Department of Consumer Protection	X	X	X
Anne Van Haaren, Pharm D	CVS Health: Director, Health Systems Alliance, RI	X	X	X
Jennifer Richmond, LCSW, CHC	CT OHS Senior HIT PMO Sr. Program Manager – HIE Services	X	X	X
Maria Summa, Pharm D, BCPS	Chair and Associate Professor, University of Saint Joseph School of Pharmacy, Clinical Pharmacist, Family Medicine Center at Asylum Hill	X	X	X
Allan Hackney, CISM, CRISC	CT Health Information Technology Officer (HITO)	X	X	

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Jake Star, MIS	Chief Information Officer of VNA Community Healthcare and Health IT Advisory Council member	X	X	
Mary Higgins-Chen, MD, MPH	PGY-1 resident, Yale Primary Care Residency Program	X	X	
Marie Smith, Pharm D	Assistant Dean for Practice & Public Policy Partnerships & Dr. Henry A. Palmer Endowed Professor of Community Pharmacy Practice-UConn	X	X	
Jennifer Miglus, MLS	UConn Health medical library-Information Services Librarian & HMS Librarian	X	X	
Stacy Ward-Charlerie, PharmD	Pharmacist Data Manager, Critical Performance Improvement	X		X
Angela Giarratano, PharmD	Pharmacy Resident at Hartford Hospital (Sean Jeffery's student)	X		
Lauren Barillari	Pharmacy student (Sean Jeffery's student)	X		
Ken Whittemore, Jr. R.Ph., MBA	VP, Professional & Regulatory Affairs- Surescripts LLC	X		
Amy Justice MD, PhD	Professor of Medicine (General Medicine) and of Public Health (Health Policy)	X		
Tom Turbiak, MD	CMIO of Trinity Health NE	X		
Erika Vuernick, PharmD	Post-Doctoral Fellow (Henry A. Palmer Fellowship in Pharmacy Practice Transformation)	X		
Stephanie Ledoux	CVS Caremark Corporation: Director, Health System Contracting at CVS Caremark Corporation, RI	X		
Alejandro Gonzalez-Restrepo, MD, MBI	St. Francis psychiatrist with informatics degree	X		
Stephen Atlas, MD	Clinician Educator, Yale Primary Care Residency Program		X	

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Margherita Giuliano, RPh	The Connecticut Pharmacy Service Corporation, CPA Executive Vice President		X	
Kimberly Henderson, MD, JD	Medical director for the Health Systems Alliance at CVS Health and regional medical director for MinuteClinic		X	
Christopher Merrick	Pharmacy student		X	
Teresa Strickland	Technical Analyst/Model Facilitator-Standards Development, NCPDP			X
Erika Tillier	Supervisor, Rx Customer Care at CVS Corporation			X
Erika Vuernick, PharmD	Post-Doctoral Fellow (Henry A. Palmer Fellowship in Pharmacy Practice Transformation)			X
Samantha Ramberg	Senior Business Analyst, Surescripts			X
Cindy Maclaren	Lead Systems Analyst at Cleveland Clinic			X
Sonya Oetting	Director of Network Services & Partner Interfaces at PrescribersConnection, LLC			X
Jerry Krupa	Dir Product Management, Allscripts			X
Scott Bonczek PharmD, Rph, MSHS-HCQ	ITS Quality & Regulatory Applications Analyst, Hartford HealthCare			X
Charlie Oltman	President, NCPDP Foundation			X
Mike Menkhaus	Pro Rx Consulting-SME for ePrescribing, CS Reporting and PDMP Utilization			X
Kori Eastman	Business Analyst, SureScripts			X
Betsy Thornquist	VP and CIO ProHealth Physicians, Inc.			X
Robert Wenick, MD	VP of Population Health for ProHealth Physicians			X
Shelly Spiro	Executive Director at Pharmacy HIT Collaborative			X

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Tatiana Cole	Senior Integration Product Owner, ePrescribing and Regulatory at PointClickCare			X
Leann Lewis	Pharmacy vendor			X
Cameron Szychlinski	Interface Analyst at Epic			X
Tim Stollendorf	Epic Integration Engineer/Interface Analyst			X
Suzanne Florczyk, Pharm D	ProHealth Physicians Clinical Pharmacist OptumCare Network of CT – Medical Management			X
Jim Green, Pharm D	SureScripts Director, Clinical Quality, Pharmacist			X
Tyler Power	Pharmacy student			X
Jason Brasfield	VP Sales & Marketing at PrescribersConnection			X
Terri Brengman	SureScripts Product Analyst			X

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2. SureScripts. (2016) *CancelRx FAQs* [PDF file]. Retrieved from <https://surescripts.com/docs/default-source/PressRelease-Library/cancelrx-faqs.pdf>.
3. SureScripts. *CT Cancel Enablement Summary by Metropolitan Statistical Area (MSA)*. January 2018.
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Appendix:

CT CANCEL ENABLEMENT BY MSA

MSA Name	NewRx	Total Active Prescribers	Total Cancel Enabled Prescribers	% Cancel Enabled Prescribers	Active Pharmacies	Cancel Enabled Pharmacies	% Cancel Enabled Pharmacies	% of Pharmacy NewRx Cancel Enabled
Hartford	654,274	6,803	1,684	24.8 %	275	88	32.0 %	53.6 %
New Haven-Meriden	342,586	3,939	453	11.5 %	119	30	25.2 %	38.7 %
Bridgeport	250,796	2,072	441	21.3 %	94	25	26.6 %	42.2 %
Stamford-Norwalk	163,631	1,692	239	14.1 %	72	26	36.1 %	56.3 %
New London-Norwich, CT-RI	141,783	1,006	199	19.8 %	69	17	24.6 %	41.3 %
Waterbury	123,966	1,050	239	22.8 %	59	12	20.3 %	40.3 %
Danbury	108,097	1,046	258	24.7 %	38	14	36.8 %	53.6 %
	84,209	700	171	24.4 %	54	11	20.4 %	32.3 %
Worcester, MA-CT	7	2	1	50.0 %				
Total	1,869,349	18,310	3,685	20.1 %	780	223	28.6 %	46.5 %

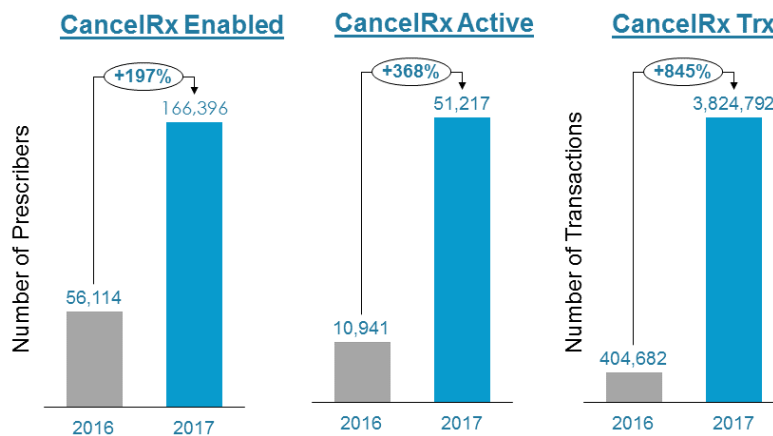
- A blank MSA indicates a group of zip codes that don't fall into a broader MSA
- MSA is from the perspective of where the prescriber is located
- % of Pharmacy NewRx Cancel Enabled looks at how many NewRx's were received by the pharmacy that is enabled for Cancel
 - It is a better indicator of the market share of pharmacies that can receive the transaction
- Data is from Jan 2018

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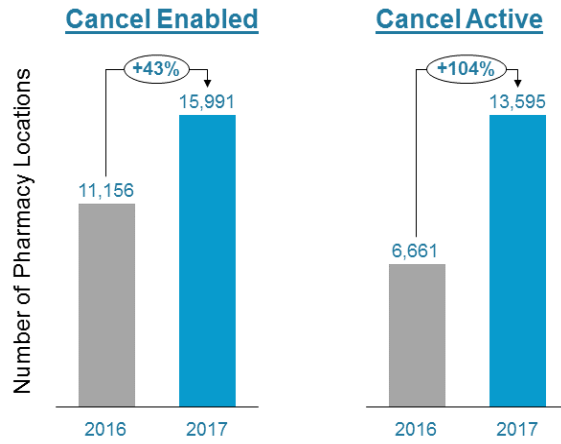
3

While CancelRx enabled prescribers increased 197% and transactions increased 845%, 69% of enabled prescribers are still not currently active.



4

85% of CancelRx enabled pharmacies received a transaction in 2017.



Appendix C: Medication Reconciliation & Deprescribing Subcommittee Recommendations

Accurate Medications List: *Obtaining an accurate list of filled, active, prescription medication and making it available to patients, providers, and patient’s designated care givers.*

A. What has been accomplished?

Background. The vital importance of an accurate list of active medications for the safety and appropriateness of medications is well recognized by pharmacists, physicians, patient advocacy groups and policymakers (REFS). The importance of this list increases when the patient is on multiple medications (especially five or more), when the patient is seeing multiple prescribing providers or when the patient needs the assistance of a caregiver for the patient’s healthcare needs. In these circumstances, electronic databases¹⁴ could provide the needed information, but these secondary sources are sometimes not interoperable or easily accessible. Some of these sources include: pharmacy information management systems; medical providers’ electronic health records (EHRs) or electronic medical records (EMRs); paid claims databases for health insurance carriers and government health insurance programs (such as Medicare, Medicaid and Tricare); and certain governmental databases, such as prescription drug monitoring programs (PMPs or PDMPs). Each of these databases, however, has limitations that reduce the accuracy, completeness, and reliability of using the data from them to compile an accurate list of any given patient’s medication history and use. Some examples of these databases, and their limitations, are discussed in the following paragraphs.

Retail Pharmacy Databases. Community pharmacies have been using computer software to process prescriptions and track dispensing data since the 1960s, with the popularity of pharmacy system software increasing in the 1970s and 1980s.¹⁵ Initially, community pharmacy electronic databases were maintained by the individual pharmacy location. Today, retail community pharmacies with common ownership (also called chain pharmacies, examples of which include CVS, Walgreens, Wal-Mart, and Rite-Aid) often operate online, real-time, shared databases that enable access to information about dispensed medications to all pharmacies within that entity’s system.¹⁶ While a chain pharmacy may be able to share its prescription dispensing information to all stores within its network across a broad geographical area (sometimes across a state, an

¹⁴ While a substantial number of community healthcare providers (and prescribers) still do not use EHR/EMR, and do not e-prescribe (<https://dashboard.healthit.gov/quickstats/pages/FIG-Health-Care-Professionals-EHR-Incentive-Programs.php>.) electronic data is still available recording most of these prescriptions.

¹⁵ See <https://www.qs1.com/index.php/about/history/> (describing the development of one of the early retail pharmacy software dispensing systems known as QS/1 in 1977) (accessed 02/20/2019). See also, “E-Prescribing: History, Issues and Potentials” in the Online Journal of Public Health Informatics 4(3):e10, 212 at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3615836/> (accessed 02/20/2019)

¹⁶ Note: While the information is maintained and accessible across a shared database, privacy laws often restrict access to specific circumstances and personnel. For example, under the Health Insurance Portability and Accountability Act of 1996 and its implementing regulations, a pharmacy provider may access all of an individual patient’s information in the system (known as “protected health information” or “PHI”) for treatment purposes, but is restricted to accessing only the “minimum necessary” PHI if the access is for payment or healthcare operations.

interstate region, or even nationally), unrelated pharmacies (i.e., pharmacies that do not share an online database) do not electronically share the same prescription dispensing information. If the patient (or patient's caregiver) cannot provide an accurate list of medications, a retail pharmacy's dispensing record may be the next most accurate source of information for an outpatient (that is, a patient not being cared for in a healthcare setting such as a hospital, a skilled nursing facility, hospice or similar healthcare provider) but only if: (a) the patient uses only one pharmacy¹⁷ for all prescription medications;¹⁸ (b) the patient always obtains the prescription medication that has been filled (i.e., dispensed) by the retail pharmacy; and (c) the patient takes the medication according to the directions that the pharmacy has used to label the medication.

The Veterans Healthcare System. The Veterans Healthcare System has a national database of VA-dispensed medications accessible at all VHA sites.

Hospital-Affiliated Health Care Systems. Large healthcare systems such as the Yale-New Haven Healthcare System also have means of sharing patient information among providers in their system's EHR. Under certain conditions, other health systems on a common EHR (e.g., Epic) can share clinical data, including medication data, with authorized users.

Pharmacy Benefit Managers (PBMs) and Health Insurers. PBMs have near real-time data on authorized and filled prescriptions. Additionally, governmental and private insurers have access to this information through claims data for prescriptions paid for on their covered lives. A limitation of these data, however, is that they cannot confirm that a patient has actually picked up or self-administered the prescription medication. Another limitation is that the database will not reflect any prescription medication that is dispensed but not covered by insurance (or that the patient has purchased without insurance), or that is covered by some other entity (for example, workers' compensation or a discount/coupon program).

Surescripts. Surescripts, the nation's largest health information network through its Medication History product, aggregates prescription dispense data from multiple data sources including directly from retail and mail order pharmacies and PBMs. Currently, in the state of Connecticut, the data coverage rate 82%. That is, a medication history list is provided for 8 out of 10 requested patients, most at no cost to the provider. Contributing to that coverage is that 65% of pharmacy stores in Connecticut provide Surescripts with their dispense records. The patient aggregated medication history is provided to the clinician real-time at the point of care using a standardized format (NCPDP SCRIPT) via their EHR or e-prescription platform provided the

¹⁷ The reasons why a patient may use more than one pharmacy are multiple; just a few examples include: a better price at one pharmacy over another; a change in insurance that incentivizes the use of mail-order pharmacy, or one retail chain over another; the unavailability of a particular medication at the patient's customary pharmacy; whether a medication is available only from a specific specialty pharmacy under a REMS program approved by the FDA; whether the patient finds a particular pharmacy more convenient under certain circumstances (e.g., a one-time pain medication after a visit to a hospital emergency department versus a chronic therapy medication for a condition such as hypertension or diabetes).

¹⁸ An accurate list of non-prescription medications (also known as over-the-counter medications or OTCs), dietary supplements (such as vitamins and minerals), and herbal remedies would also be useful to know about outpatients seeking medical care. Information about an outpatient's use of these items, however, is not generally collected by any component of the healthcare system, and current software for pharmacies, prescribers, and healthcare facilities does not typically have structured data fields to allow for collection of these data. The best source of information about what an outpatient is taking would customarily be the patient and/or the patient's caregiver.

EHR/health system subscribes to the service. In Connecticut there are over 18,000 active prescribers using mediation history data in the ambulatory setting. However, there are some gaps in the Surescripts data such as from pharmacies and PBMs not utilizing their network, OTC meds, hospital meds, etc. Further, Surescripts does not make their data directly available to patients.

Prescription Data Monitoring Program (PDMP). In Connecticut, the Connecticut Prescription Monitoring and Reporting System (CPMRS) is operated under the authority of the Department of Consumer Protection and electronically collects information on dispensed controlled substances from all in-state retail pharmacies, outpatient hospital pharmacies, and prescribing dispensers including veterinarians. See Conn. Gen. Stat. § 21a-254(j). Notably, methadone clinics do not have to report dispensing data to the CPMRS. Controlled substances represent approximately 14% of all prescriptions dispensed to patients. As of 2018, every state in the union has implemented a database of controlled substances including prescription opioids, benzodiazepines, and other legally controlled (Schedule II-V) drugs and some non-controlled substances. Many of these statewide databases communicate with each other, and Connecticut currently has the capability to exchange data with 32 other states plus Puerto Rico. While these statewide databases are accessible to providers, they are not accessible to patients or their caregivers. The majority of these databases do not include prescription medications that are not controlled.

Opportunity. Statewide databases like CPMRS and networks like Surescripts have established feasible methods of maintaining and accessing prescription fills which have addressed issues of privacy, data security, data storage, and data access. With appropriate resources and legal empowerment, these databases might form the nidus of a centralized master list of active prescription medications. In Connecticut, the expansion of CPMRS to create a Statewide Medication Management Service (SMMS) is an option recommended for further evaluation and assessment. This approach could create an up-to-date clearinghouse for filled and ordered medications that would leverage existing resources and that could be accessed in real-time through standard Application Programming Interfaces (APIs). This could be done through centralizing information or through accessing it dynamically from its source. Ideally all of this information would have a mechanism to allow for the sharing of the data through the statewide HIE.

B. Barriers

Data Use and Privacy: The access of medication information must address data use and privacy. Prescription medications are often clearly linked with particular diagnoses, including mental health conditions and major health conditions. Patients have a right to privacy and these rights will need to be protected. Some of these issues have already been addressed in establishing the controlled substance databases, but this remains a legitimate ongoing concern.

Requirements Surrounding Access by Patients and their Designees: Another concern regards what level of customer support and safety monitoring would attend the creation of such a database of medications. Would the state have an obligation to monitor this data for known drug safety issues and alert patients and providers to this threat? Would there be a need to provide online information and counselling for questions or concerns

that patients or their caregivers might have separate from what they might obtain from the prescribing provider?

Infrastructure Support: Finally, the creation, maintenance and enhancement of a complete and centralized database of medications will require significant ongoing financial support. Financial sustainability is paramount for such an undertaking and should be addressed specifically in the feasibility assessment process.

Interoperability and Reporting: Pharmacies (Dispensers) will need to develop a mechanism to connect to and support reporting on an ongoing basis. Many pharmacies already report today with a sustainable business model; this will be net new but not necessarily replace what exists today. Existing resources and assets should be leveraged and utilized whenever possible and practicable.

C. Recommendations for Next Steps

Potential expansion of CPMRS. A detailed assessment should be conducted for the expansion of CPMRS to include all dispensed medications. Such an assessment should include how to leverage existing resources and should address issues of access, use and privacy. Financial sustainability should also be addressed in this assessment. Features and capabilities for any statewide medication management system should include:

- a) Standards-based data structures and nomenclature to support integration and interoperability.
- b) Ability to distinguish filled, dispensed, and picked up medications.
- c) Capture of clinical trials.
- d) Date of last data transfer to document the period for which information on prescription medication is available.

Role of the State. Specific recommendations should be developed regarding the responsibility of the State in the creation of a centralized database of active medications accessible by consumers and caregivers.

Integration with Statewide HIE. An assessment should be undertaken to define how a centralized medication database can be integrated in the statewide health information exchange, enabling ease of access of all available clinical data.

De-Prescribing: *Convincing patients and providers to stop (deprescribe) medications that may be harmful either due to known contraindications or due to problematic side effects such as neurocognitive compromise, toxicity, falls, etc.*

A. What has been accomplished?

Raising Patient Awareness

- **Direct to Consumer Advertising:** American is one of three countries in the world that allow direct-to-consumer advertising of prescription medications (USA, New Zealand, Hong Kong [SAR] China). On a daily basis, television ads remind patients of potential side-effects and to discuss this with their prescribers/pharmacists. In addition to PharMA advertising, media also focus on lawsuits from adverse drug effects. The cost of prescription medications is also featured prominently in the news and political discussions in Congress. An opportunity exists to leverage the public's heightened awareness of potential medication dangers and increased costs with a discussion on goals of care with providers. Required Medicare Annual Wellness Visits could serve as a forum to discuss patient medication goals of care. Specifically outlined goals of care are an important step when considering deprescribing.
- **Cognitive Dissonance:** The EMPOWER trial utilized patient educational materials to elicit cognitive dissonance in patients as a way to initiate conversation on deprescribing of benzodiazepines.¹⁹
- **Choosing Wisely:** The American Board of Internal Medicine Foundation- Choosing Wisely campaign was launched to promote conversations between patients and providers on unnecessary medical tests, treatments and procedures. For example, "Avoid Opioids for Most Long-Term Pain" is a pamphlet intended to be available to patients in primary care offices in order to raise their awareness of unnecessary opioid use. Over use of PPI's was another topic. This campaign has provided patients with guidance on how to discuss potentially inappropriate medications (PIMS) with their prescribers.

Raising Provider Awareness:

Tools to aid providers in deprescribing are available from various organizations. Explicit tools include those that objectively discourage the use of certain medications. The American Geriatrics Society's Beers Criteria is one example. This regularly updated list contains medications that are known to be harmful in elderly patients. STOPP/START is a similar list developed by a group out of the University College Cork in Ireland, which recognizes medications that are harmful in elderly patients and should be stopped, while also recommending potentially beneficial therapies to start.

Canada has set an ambitious goal of reducing unnecessary medications by 50% nationally. To achieve this the Canadian Deprescribing Network (CaDeN) was founded by Dr. Barbara Farrell, a pharmacist, and Dr. Cara Tannenbaum, a physician, based out of The Bruyère Research Institute in Ottawa and Université de Montréal.

¹⁹ Tannenbaum C, Martin P, Tamblyn R, Benedetti A, Ahmed S. Reduction of inappropriate benzodiazepine prescriptions among older adults through direct patient education: the EMPOWER cluster randomized trial. JAMA Intern Med. 2014; 174(6): 890-8

CaDeN created several deprescribing guidelines to reduce or stop potentially harmful medications. The five major medication classes they focus on are benzodiazepines and Z-drugs, proton pump inhibitors, antipsychotics, antihyperglycemics, and antihistamines. These guidelines, as well as other useful resources, such as patient information pamphlets and infographics, are available at deprescribing.org. This website also functions as a resource for finding research related to deprescribing and for networking with others who are looking to reduce polypharmacy and implement deprescribing in practice.

Medstopper.com is another example of an explicit tool that can be used by both providers and patients. The user enters a list of all the medications and their indications into the online tool. Medstopper then sequences the drugs from "more likely to stop" to "less likely to stop." This is based on the potential of the drug to improve symptoms, to reduce the risk of future illness, and to cause harm.

Suggestions for how to taper the medication are also provided along with potential symptoms that may be experienced. This tool was developed by Barbara Farrell and colleagues through a Knowledge Translation grant provided by the Canadian Institute of Health Information through the University of British Columbia.

Implicit tools for determining medication appropriateness consider factors such as comorbidities, indications for use, side effects, and potential drug interactions. One widely used and validated tool is the Medication Appropriateness Index (MAI) by Hanlon JT et al. The MAI poses 10 questions for clinicians to consider while evaluating a medication list in order to determine if a medication is appropriate to continue.

The American Society of Consultant Pharmacists has created a transitions of care toolkit which contains a curated list of deprescribing resources.²⁰

In addition to implicit and explicit criteria for prescribing, special populations of patients likely to benefit from deprescribing have also been studied. Dr. Holly Holmes created a conceptual framework to reconsider medication appropriateness in late life. Medication appropriateness using her model is based on:

- Patient's life-expectancy based on life-expectancy tables
- Time to Benefit (TTB) of the medication - the average amount of time the patient will be on the medication before seeing benefits
- Goals of Care- patient specific goals that determine when to stop or initiate therapy for patients later in life
- Treatment Targets- should align with patient's goals of care

As the government and payers have pushed for greater value and increased quality in healthcare, quality measures were created to assess prescribing of specific medication subsets. For example, Healthcare Effectiveness Data and Information Set (HEDIS) is a comprehensive set of standardized performance measures designed to provide purchasers and consumers with the information they need for reliable comparison of health plan performance. HEDIS has specific pharmacy measures, set forth by the National Committee for Quality Assurance (NCQA) and the Pharmacy Quality Alliance (PQA) that incentivize prescribing on chronic

²⁰ (https://c.ymcdn.com/sites/www.ascp.com/resource/collection/6E0B1C1E-CBCD-4CA4-955E-5A8213B09250/FINAL_MSTOC_Section_2.3.pdf)

disease medications. HEDIS also measures the use of high-risk medications in the elderly. This HEDIS measure was previously considered in Medicare Part D Star ratings.

Available standard to deprescribe

NCPDP through its membership created the CANCELRX transaction to facilitate bidirectional communication between a provider (via EHR) and pharmacy (via PMS) to indicate when a provider has deprescribed a medication. This allows the pharmacy to serve as a line of defense if a patient tries to fill a deprescribed medication.

B. Barriers to Deprescribing:

- 1. No standardized approach to deprescribing:** Data sources and algorithms are often proprietary if they exist at all. Healthcare professionals would benefit from systematically identifying high-modifiable risk patients. Tools such as these would give providers an idea of who to start with when considering deprescribing in patients. Prescribers also lack a standard approach to identifying which patients would benefit from deprescribing and where to start the process.
- 2. Lack of interoperable EHR/HIE data:** Obtaining an accurate medication list is the first step in considering if deprescribing is required.
- 3. Reimbursement:** Deprescribing is a time-consuming process that includes multiple providers. In addition, there is no payment mechanism or incentive to deprescribe.
- 4. Accountability:** Identifying the responsible prescriber is another barrier. Many PCPs are reluctant to deprescribe medications started by other clinicians. Fear of medical-legal issues is one potential concern. Deprescribing is difficult when multiple specialists are involved.
- 5. Communication.** Deprescribing can occur at any time or setting and not necessarily tied to a patient encounter (face-to-face or other). There is not an established protocol/communication pathway to ensure this important information is shared with the healthcare team including the pharmacy and more importantly the patient. (does the patient get a phone call, a letter, an update medication list etc.)

C. Next Steps:

- 1. Medication Reconciliation:** The MRP Work Group focused on creating an accurate medication list that will provide the foundation for future deprescribing opportunities
- 2. Risk-stratification:** Explore decision support tools for EHRs that risk-stratify patients into high-modifiable deprescribing targets. Further provide guidance on how to initiate this process.
- 3. Policy opportunities:** Re-evaluate HEDIS high-risk medications (HRM) quality measure for potential incorporation into State of Connecticut value-based contracts (e.g. PCMH+ program). Explore incentive programs for reducing Potentially Inappropriate Medications (PIMs).

Appendix D: Student-led Literature Review and Analysis (*Executive Summary and Annotated Bibliography*)

A faculty member and two students from the University of Connecticut School of Pharmacy conducted a brief targeted review of the pharmacy practice and medical literature of key papers exploring the primary topic of medication reconciliation. The goals of this specific literature review were to examine literature support for the factors known to be associated and affect medication reconciliation processes and identify existing interventions to improve medication reconciliation. The Medication Reconciliation and Deprescribing Subcommittee guided the literature review team to identify studies and papers that provided evidence on the extent to which different factors affected the construction of a “true or most accurate” medication list. This review involved searching key databases such as PubMed, International Pharmaceutical Abstracts, Science Direct, and that of the American Medical Informatics Association (AMIA). The focus was on relatively recent publications within the past 15 years. Key search terms included “medication reconciliation”, “accuracy of medications”, “errors in medications”, “patient verification”, “methods of medication reconciliation”, and “pharmacist involvement.”

This review led to the identification of 23 manuscripts that involved a variety of settings, methods, and outcome measures. A majority of the papers identified were projects done in the primary care/ambulatory/community settings. Several papers described were done in countries outside the United States which limits the generalizability of findings to the US healthcare system. There were only five randomized, controlled intervention trials (RCTs). RCTs are considered by many as a gold standard for scientific methodology for investigations that control for possible confounders and biases affecting study findings. Most of the papers in this review retrospectively analyzed existing data sources such as electronic medical records, insurance claims data, and patient charts or data sampled at one point in time such as cross-sectional surveys. Several papers in this brief literature review explored the impact of pharmacists and other health professionals on the medication reconciliation process. Outcome measures of medication reconciliation were diverse and defined in different ways given the populations, settings, and methods used. For example, a common approach to measure medication reconciliation efforts was the number of discrepancies between different sources of medication reconciliation.

Overall summary of the literature examined revealed five key themes. First, there are considerable discrepancies in accuracy across medication lists obtained by practitioners in different settings and especially at times when transitions of care occur. For example, Walsh et al. (2018) noted a wide range of agreement from 50-90% across between lists obtained by interview and in the charts. Several papers on the Studies highlight a key source of inaccuracy are medications erroneously prescribed electronically and not properly discontinued (Yang et al., 2018; NCPDP, 2019; Dhavle, 2019; Fischer et al., 2019; Allen et al., 2019). Another important source of inaccuracy relates to the lack of awareness regarding patient initial and continued use of prescribed medications, and over-the-counter medications used (Aznar-Lou et al., 2017; Fitzgerald, 2009). A second theme is that using a single data source such as electronic medical records, use of patient portals, insurance claims data, and patient history in itself is insufficient to ensure medication list accuracy; the use of multiple data sources improves medication list accuracy (Comer et al., 2014). A third theme found that greater patient engagement in the medication reconciliation process resulted in fewer discrepancies (Staroselsky et al., 2007; Schnipper et al., 2012).

A fourth theme found across several papers reviewed involved the value of pharmacist and pharmacist technician roles and their positive impact in the medication reconciliation process (Martin et al., 2018; Abdulghani et al., 2017; Jani et al., 2017; Salameh et al., 2018; Bolster & Koyle, 2019). This impact of pharmacy personnel can be seen across the hospital setting at admission, treatment, discharge, and then among pharmacists in the community settings. These personnel given their professional focus on medication distribution and safety can help improve the awareness and communication about what is being currently being prescribed and used by the patient. Another intervention and fifth theme found in the literature was the critical role of technology in bringing data sources together and creating functions to help automatically reduce medication list inaccuracies. The CancelRx program allows for cancellation of electronic prescriptions and improves medication reconciliation (Yang et al., 2018). A new tool added to one EHR was a program called PharmaCloud used in Taiwan (Liao et al., 2019). Providers and pharmacist have access to all pharmacy claims through cloud-based data with a secured internet portal. The average number of prescribed medications have decreased along with intra-hospital rate of duplicate scripts.

These five key themes and their supporting literature helped guide the framework and specific recommendations found in the present report. Future work should expand on this literature search efforts to uncover more studies that might bring to light additional sources of discrepancies that affect the accuracy of medication lists, identify other educational, behavioral, and technological solutions to improve the accuracy of the lists shared among patients, pharmacists, nurses, physicians, and other clinicians. It is also hoped this literature review inspires more local pilots in Connecticut that will test new and innovative strategies to identify, intervene, and monitor the accuracy of medication lists. The research reviewed only helps us know what the problems and solutions are for other geographic locations, such data may not be applicable to different healthcare stakeholders across Connecticut's healthcare systems.

Electronic Health Record Medication List Accuracy

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Walsh KE et al. (2018)	Retrospective chart review	<ul style="list-style-type: none"> - N=180 patients w/ inflammatory bowel disease (IBD); 379 IBD medications - Medication list vs. clinical narrative - 6 gastroenterology centers 	<ul style="list-style-type: none"> - There was a range in the accuracy of medication list compared to the clinical narrative - Variation by center (90%-50% agreement between the med list and clinical narrative) 	<ul style="list-style-type: none"> - Analytic or care decision should not solely rely on medication order data - This information may be helpful for site seeking to improve data quality 	Outpatient

Walsh KE, Marsolo KA, Davis C, et al. Accuracy of the medication list in the electronic health record—implications for care, research, and improvement. *Journal of the American Medical Informatics Association*. 2018;25(7):909-912. doi:10.1093/jamia/ocy027

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Staroselsky M et al. (2007)	A study to evaluate the efficacy of a secure web-based patient portal called Patient Gateway (PG) in producing more accurate med list in EHR	<ul style="list-style-type: none"> - N= 163 patients; - 84 Patient Gateway users vs. 79 non-users - Sending PCP a clinical message providing patient-reported information vs. no clinical message 	<ul style="list-style-type: none"> - A lower % of PG users' drug regimen was reported to be correct than those of PG non-users (54% vs 61%) - Notifying physicians of medication discrepancies via email had no effect 	<ul style="list-style-type: none"> - Med lists in EHRs were frequently inaccurate - Patient access to PG was not associated with more accurate medication lists in EHR - Clinical messages to physicians containing patient-provided medication updates did not result in physician updating the med list in EHR 	Primary care

Staroselsky M, Volk LA, Tsurikova R, et al. An effort to improve electronic health record medication list accuracy between visits: Patients' and physicians' response. *International Journal of Medical Informatics*. 2008;77(3):153-160. doi:10.1016/j.ijmedinf.2007.03.001

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Schnipper JL et al. (2012)	Cluster-randomized trial	<ul style="list-style-type: none"> - N=541; 267 Intervention vs 274 controls - 11 primary care practices that used the same Personal Health Record (PHR) - Intervention practices received access to a medications module promoting patients to review their documented med, identify discrepancies and generate 'eJournals' 	<ul style="list-style-type: none"> - The proportion of medications per patient with unexplained discrepancies was lower in the intervention arm vs the control (42% vs 51%) 	<ul style="list-style-type: none"> - Discrepancies between documented and patient-reported medication regimens can be reduced with a PHR medication review tool linked to the provider's medical record 	Primary care
<p>Schnipper JL, Gandhi TK, Wald JS, et al. Effects of an online personal health record on medication accuracy and safety: a cluster-randomized trial. Journal of the American Medical Informatics Association. 2012;19(5):728-734.</p>					

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Comer D et al. (2014)	Retrospective cohort study	<ul style="list-style-type: none"> - Medication listed in the primary care office EHR vs pharmacy claims data available through the EHR - Identified and characterized the discrepancies between the 2 lists - 14 primary care sites providing care for over 100,000 people and the surrounding communities - All practices share an EHR; providers can request aggregated pharmacy claims data in real time within the EHR 	<ul style="list-style-type: none"> - The majority of patients (468 of 609; 76.8%) had at least 1 medication discrepancy. - Patients with a discrepancy were more likely to have had a hospitalization in the past year 	<ul style="list-style-type: none"> - Aggregated pharmacy claims data available within the provider EHR can be used to identify discrepancies at the individual level in a multi-payer setting. - Availability of this information in real time should be made a priority 	Primary care
<p>Comer D, Couto J, Aguiar R, Wu P, Elliott D. A New Frontier: Using Pharmacy Claims Within the EHR To Conduct Medication Reconciliation in Primary Care Practice. Value in Health. 2014;17(3), p.A123.</p>					

CancelRx

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Yang Y et al. (2018)	Retrospective analysis	<ul style="list-style-type: none"> - N=1,400,000 - 410,591 prescribers using 734 EHRs - 7 day follow up (Nov 6, 2016-Nov 12, 2016) - The sample size was calculated to be representative with a margin of 0.8% error at a confidence level of 99.9% - Variable: New Rx with cancellation message vs CancelRx 	<ul style="list-style-type: none"> - Identified 9735 (0.7% of the total) NewRx messages containing prescription cancellation instructions with 78.5% observed in the Notes field; 35.3% of identified NewRxs were associated with high-alert or LASA medications. - The most prevalent cancellation instruction types were medication strength or dosage changes (39.3%) and alternative therapy replacement orders (39.0%) 	Wider adoption of CancelRx in the EHR and pharmacy systems can significantly impact patient safety by reducing duplication and inappropriate medications	
<p>Yang Y, Ward-Charlerie S, Kashyap N, Demayo R, Agresta T, Green J. Analysis of medication therapy discontinuation orders in new electronic prescriptions and opportunities for implementing CancelRx. <i>Journal of the American Medical Informatics Association</i>. 2018;25(11):1516-1523.</p>					

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
NCPDP	Report by PRWeb	Primary objective is to implement CancelRx functionality in EHRs and pharmacy management systems in the ambulatory setting	- Reported 3% Rx are filled erroneously following discontinuation	- Implementation of CancelRx would minimize erroneous filling and medication error	Ambulatory Care
Ncpdpfoundation.org. (2019). [online] Available at: http://ncdpfoundation.org/PDF/NCPDP_Foundation_Grant_Johns_Hopkins_Medicine.pdf [Accessed 27 May 2019].					

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Dhavel A	Article	Objective was to focus on integration of cancel Rx both from provider end and pharmacy end to reduce inappropriate therapy	<ul style="list-style-type: none"> - n Study conducted in Brigham and Women's - 1.5% of all discontinued prescription medications in their target medication study sample were dispensed by pharmacies. - More importantly, investigators reported at least 50 patients, or 12% of those receiving discontinued medications, had experienced some adverse outcome that ranged from mild side effects to life-threatening allergic reactions. 	Prescribers and pharmacists should reach out to their software technology providers and convey to them the urgency and the need to implement the CancelRx /Response Rx transaction capability	
Dhavel A. The Case for Electronic Cancel or Discontinuation of Prescription Therapy at the Pharmacy. LinkedIn. https://www.linkedin.com/pulse/case-electronic-cancel-discontinuation-prescription-therapy-dhavl . Accessed May 27, 2019.					

E-Discontinuation					
Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Fischer S et al. (2017)	JAMA network Viewpoint	Opinion paper		E-prescribing systems that do not allow electronic cancellation of med orders, or e-discontinuation, and can lead to more medication reconciliation errors	
Fischer S, Rose A. Responsible e-Prescribing Needs e-Discontinuation. JAMA. 2017;317(5):469–470. doi:10.1001/jama.2016.19908					

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Allen et al. (2012)	Retrospective cohort study	<ul style="list-style-type: none"> - To assess the frequency of and potential patient harm associated with pharmacy dispensing of discontinued medications in the ambulatory setting within 12 months - 30,406 adult patients with an electronic discontinuation order 	<ul style="list-style-type: none"> - A large amount of prescriptions electronically canceled in EHRs were still filled at the pharmacy - Among 83,902 targeted medications that were electronically discontinued, 1,218 were subsequently dispensed by the pharmacy 	<ul style="list-style-type: none"> - The dispensing of discontinued medications represents an important ambulatory patient safety concern. - Better communication between providers and pharmacists is needed to improve medication safety 	Ambulatory care
Allen AS, Sequist TD. Pharmacy dispensing of electronically discontinued medications. Ann Intern Med. 2012;157:700-5. [PMID: 23165661]					

Pharmacist-Led Medication Reconciliation

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Martin P et al. (2018)	A cluster randomized trial	<ul style="list-style-type: none"> - To compare the effectiveness of a consumer-targeted, pharmacist-led educational intervention (to send patients an educational deprescribing brochure in parallel to sending their physicians an evidence-based pharmaceutical opinion) vs usual care on discontinuation of inappropriate medication among community-dwelling older adults. - 69 community pharmacies were recruited -Patients included were adults aged >= 65yo who were prescribed 1 of 4 Beers criteria medications 	<ul style="list-style-type: none"> - Pharmacist led intervention led to greater discontinuation of inappropriate prescriptions after 6 months. - 106 of 248 patients (43%) in the intervention group no longer filled prescriptions for inappropriate medication compared with 29 of 241 (12%) in the control group. 	A pharmacist-led educational intervention compared with usual care resulted in greater discontinuation of prescriptions for inappropriate medication after 6 months	Community
<p>Martin P, Tamblyn R, Benedetti A, Ahmed S, Tannenbaum C. Effect of a Pharmacist-Led Educational Intervention on Inappropriate Medication Prescriptions in Older Adults. <i>Jama</i>. 2018;320(18):1889. doi:10.1001/jama.2018.16131</p>					

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Abdulghani KH et al. (2017)	Prospective 3-month study	<ul style="list-style-type: none"> - To identify the types of medication discrepancy that occurred during medication reconciliation performed by a pharmacist gathering the best possible medication history - Medication histories taken by physician and by pharmacist gathering the BPMH were compared 	<ul style="list-style-type: none"> - Total number of medications recorded by physicians was 2,548, versus 3,085 by the pharmacist. - 48.3% of patients had at least one unintended medication discrepancy by physicians. 	<ul style="list-style-type: none"> - Patient medication histories are frequently recorded inaccurately by physicians during admission of patients, resulting in medication-related errors and compromises in patient safety. - Pharmacists can help in reducing these medication-related errors 	Tertiary care hospital
<p>Abdulghani KH, Aseeri MA, Mahmoud A, Abulezz R. The impact of pharmacist-led medication reconciliation during admission at tertiary care hospital. International Journal of Clinical Pharmacy. 2017;40(1):196-201. doi:10.1007/s11096-017-0568-6</p>					

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Jani Y et al.(2017)	A collaborative project	<ul style="list-style-type: none"> - The objective was to assess the completeness, timeliness and reconciliation in primary care of medication information on hospital discharge summaries. - Clinical Commissioning Groups (CCGs) pharmacist identified patients retrospectively from GP prescribing system and collected data that were then entered onto an excel spreadsheet and submitted electronically for collation and analysis 	<ul style="list-style-type: none"> - 47 CCGs participated and submitted data for 1,454 patients - Although many discharge summaries were generated (89%) and transferred (72%) electronically, only 43% were received by the GP practice on the same day (range 0-38 days) - Intentional changes were actioned on the GP system within 7 days of the discharge for 42.5% of patients. - At least one change was actioned incorrectly for 5.5% of patients. 	<ul style="list-style-type: none"> - Medication reconciliation in primary care is as important as on admission to hospital - There is scope to maximize transfer and action on information to improve safety 	Primary Care
<p>Jani Y, Shah C, Hough J. Isqua17-3144Medicines Reconciliation in Primary Care Following Hospitalization. International Journal for Quality in Health Care. 2017;29(suppl_1):39-40. doi:10.1093/intqhc/mzx125.62</p>					

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Salameh LK et al. (2018)	Randomized controlled study	<ul style="list-style-type: none"> - To evaluate the effect of pharmacist's directed services (reconciliation plus counselling) on reducing medication discrepancies during a 3-month study period - 200 internal medicine patients from Jordan University Hospital - 2 groups: control vs intervention - The number and types of medication discrepancies were identified at admission. - At discharge, the number of unintentional discrepancies was evaluated for both groups 	<ul style="list-style-type: none"> - The total number of identified unintentional discrepancies was 84 for the intervention group compared with 60 discrepancies for the control group. - At discharge, a significant reduction in the number of unintentional discrepancies was achieved for the intervention group, while no significant change was found for the control group 	<ul style="list-style-type: none"> - The presence of clinical pharmacists in hospital wards had a promising effect on decreasing the number of medication errors 	Hospital
<p>Salameh LK, Farha RKA, Hammour KMA, Basheti IA. Impact of pharmacists directed medication reconciliation on reducing medication discrepancies during transition of care in hospital setting. <i>Journal of Pharmaceutical Health Services Research</i>. 2018;10(1):149-156. doi:10.1111/jphs.12261</p>					

Technician-directed Medication Reconciliation

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Bolster and Koyle (2019)	A pilot program; retrospective chart review	<ul style="list-style-type: none"> - Boise VA Medical Center - A program aimed to evaluate a pharmacy technician-directed medication reconciliation process in the primary care setting from Feb 2015 - April 2015 - Following completion of the pharmacy tech-directed MR pilot, a retrospective chart review was done to identify the number of resolved discrepancies 	<ul style="list-style-type: none"> - The pharmacy technician had identified 837 discrepancies, 712 of which were considered to be of minor clinical significance and unlikely to affect patient safety and 109 of which were of moderate clinical significance 	<ul style="list-style-type: none"> - The pharmacy technician–directed MR process helped avoid a number of errors, improved patient care, and ultimately decreased cost to the health care system. - These experiences highlight the opportunities available to technicians to improve the accuracy and completeness of MR in the primary care setting. 	Primary care
<p>Pharmacytimes.com. (2019). <i>Technician Medication Reconciliation in Primary Care Is an Overlooked Opportunity</i>. [online] Available at: https://www.pharmacytimes.com/publications/issue/2019/january2019/technician-medication-reconciliation-in-primary-care-is-an-overlooked-opportunity [Accessed 27 May 2019].</p>					

Initial Medication Non-adherence

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Aznar-Lou I et al. (2916)	Retrospective, cohort study	<ul style="list-style-type: none"> - The aims of this study were to determine prevalence and predictive factors of initial medication non-adherence (IMNA)- defined as not obtaining a medication the first time it is prescribed in the Catalan health system (Spain) - 1.6 million patients with 2.9 million prescriptions were included 	<ul style="list-style-type: none"> - Total IMNA prevalence was 17.6% of prescriptions - Predictors of IMNA are younger age, American nationality, having pain-related or mental disorder and being treated by a substitute/resident general practitioner in a resident-training center. 	<ul style="list-style-type: none"> - Attempts to strengthen trust in resident general practitioners and improve motivation to initiate a needed medication in the general young and older immigrant population should be addressed in Catalan PC. 	Primary Care

Aznar-Lou I, Fernández A, Gil-Girbau M, et al. Initial medication non-adherence: prevalence and predictive factors in a cohort of 1.6 million primary care patients. *British Journal of Clinical Pharmacology*. 2017;83(6):1328-1340. doi:10.1111/bcp.13215

Over-The-Counter Medication Inclusion

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Fitzgerald RJ (2009)	Review	Emphasized the importance of complete medication history from different sources e.g. physicians, pharmacists and case notes that includes allergy, drug interaction, OTC inclusion, common side effects.	- Cited one study where 59 patients out of 101 patients reported the use of 129 forms of CAMs, but only 36 were documented in the medical record	Recommended some measures that would provide complete medication list <ol style="list-style-type: none"> 1. Pharmacist-led med history taking 2. Educating newly qualified prescribers on clinical pharmacology, OTC 3. E-prescribing with pre-populated warning messages 	
Fitzgerald RJ. Medication errors: the importance of an accurate drug history. British Journal of Clinical Pharmacology. 2009;67(6):671-675. doi:10.1111/j.1365-2125.2009.03424.x					

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Jane Barnsteiner	Book chapter	Discussed medication reconciliation in different care settings	<ul style="list-style-type: none"> - Ambulatory setting: Miller et al. studies found about 87% of charts had incomplete documentation of medications - Inpatient: Vira et al. found 38% discrepancy rate for inpatient hospital setting - Transition of care: Pronovost et al. found 94% discrepancy between discharge orders from ICU to transition of care 	<p>Recommendations:</p> <ul style="list-style-type: none"> - Identify a standard location where the med history would be reported, an assigned person to document the med history, time frame to resolve the variations, and a standard template to document medication history - Educate provider as well as patient, caregivers - Design and implement monitoring process to evaluate the outcome of the process 	Multiple settings
Hughes R. Patient Safety and Quality: An Evidence-Based Handbook for Nurses. Rockville, MD: Agency for Healthcare Research and Quality; 2008 pp.459-468.					

Patient Safety

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Condren M et al 2019	Retrospective evaluation	This was a retrospective evaluation of a medication reconciliation across care transitions (MRAT) program developed and piloted for one year in an academic pediatric primary care medical home. The MRAT involved chart review and contacting caregivers upon receiving external specialist notes or hospital discharge summaries. Data obtained from the program were used to determine the frequency and types of medication discrepancies for children with complex and noncomplex chronic conditions.	MRATs for 124 encounters were evaluated, 74.0% in response to specialist appointments. Chart review revealed a mean of 3.64 discrepancies per patient, and telephone calls revealed 1.39 additional discrepancies per patient. The number of medication discrepancies from both chart review and telephone calls between complex and noncomplex patients was statistically significant, with a mean of 5.63 vs. 3.77 per patient (p = 0.005). Therapy delays occurred in 16.1% of patients due to insurance rejections, family not starting a new medicine, or confusion about the medication change. Mean time required for reconciliation was 24 minutes. In addition to medication reconciliation, 107 interventions completed during MRATs included patient education, adjusting drug therapy, coordinating care between providers, recommending laboratory monitoring, and facilitating patient appointments	Children are more prone to medication changes during hospitalization. Timely identification of changes improves patient safety.	Pediatric primary medical care

Condren M, Bowling S, Hall B, Woslager M, Shipman A, Mcintosh H. Medication Reconciliation Across Care Transitions in the Pediatric Medical Home. The Joint Commission Journal on Quality and Patient Safety. 2019. doi:10.1016/j.jcjq.2019.01.003

Drug Disposal					
Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Akici A et al 2017	Cross-sectional survey	The survey assessing participants' drug handling and storage behaviors was answered by 1,121 employees from across eight provinces of Turkey in 2016. Participants were also significantly less likely to dispose of drugs inappropriately, practice self-medication, be unaware of expired drugs at home, or fail to store drugs according to the labelling	Main outcome measures were storage and disposal of unused/unwanted drugs at home in a rational way. Results: The percentage of participants who declared that they keep unused/unwanted drugs at home was 28.0%. About one-third of participants disposed their unused/unwanted drugs via the "garbage, sink, toilet, etc.". Participants 30 years old and living with <4 household members significantly tended to bring their unused/unwanted drugs to the company's drug-box. Nearly half of all participants (46.5%) stated a recent change in their disposal behavior. The vast majority of participants (94.6%) who previously took drugs back to the company's drug-box stated that they either had, or would, help their contacts adopt such behaviors.	Findings showed that while a substantial number of participants still had unused drugs at home or disposed of them inappropriately, it is understood that they started to exhibit more favorable behaviors in recent years. Unused drugs at home might result in an inappropriate medication list during admission.	Multi-sector private company
Akici A, Aydin V, Kiroglu A. Assessment of the association between drug disposal practices and drug use and storage behaviors. Saudi Pharmaceutical Journal. 2018;26(1):7-13. doi:10.1016/j.jsps.2017.11.006					

Potential Solution					
Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Smith M et al. (2011)	Demonstration project	<ul style="list-style-type: none"> - 9 pharmacists worked closely with 88 Medicaid patients from July 2009 through May 2010. - The pharmacist was paid to review medical charts and pharmacy claims before meeting with patient, develop patient medication action plans and send summary medication management reports to providers after meeting with patients. 	<ul style="list-style-type: none"> - The pharmacist identified 917 drug therapy problems and resolved nearly 80% of them after 4 encounters. - The result was an estimated annual saving of \$1,123 per patient on medication claims and \$472 per patient on medical, hospital, and emergency department expenses. 	Pharmacists can identify and resolve numerous drug therapy problems. Such pharmacist-supported medication management can have a significant impact on clinical and economic outcomes.	Primary Care
<p>Smith M, Giuliano MR, Starkowski MP. In Connecticut: Improving Patient Medication Management in Primary Care. Health Affairs. 2011;30(4):646-654. doi:10.1377/hlthaff.2011.0002</p>					

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Boockvar KS et al. (2017)	Cluster-randomized controlled trial	<ul style="list-style-type: none"> - To determine the effect of health information exchange (HIE) on medication prescribing for hospital inpatients - Patients admitted to an urban hospital received structured medication reconciliation by an intervention pharmacist with access to a regional HIE vs no access to the HIE - The HIE contained prescribing info from the largest hospitals and pharmacy insurance plan in the region - Primary endpoint was discrepancies between pre-admission and inpatient medication regimens 	<ul style="list-style-type: none"> - 186 pts (intervention) vs 195 (control) - There was no difference between intervention and control in number of discrepancies, discrepancies-associated ADEs. 	<ul style="list-style-type: none"> - HIE may improve outcomes of medication reconciliation, however more efforts are needed to understand and increase prescriber's rectification of medication discrepancies 	Inpatient
<p>Boockvar KS, Ho W, Pruskowski J, et al. Effect of health information exchange on recognition of medication discrepancies is interrupted when data charges are introduced: results of a cluster-randomized controlled trial. <i>Journal of the American Medical Informatics Association</i>. 2017;24(6):1095-1101. doi:10.1093/jamia/ocx044</p>					

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Chandrasekhar D et al. (2019)	Cross-sectional interventional study	<ul style="list-style-type: none"> - The study was conducted to identify, prevent and resolve potential medication-related problems, optimize pharmacotherapy and assist in achieving better health outcomes for patients at home through Home Medicines Review (HMR) - HMR is a patient-focused, meticulous and collaborative health care service provided by pharmacists in the community setting. - Study was conducted for a period of 6 months in 85 patients where discrepancies of the prescriptions, knowledge gap of the patients, use of other medication and storage conditions of medicines were evaluated 	<ul style="list-style-type: none"> - The patient had a lack of knowledge in factors like the name of the drug (34%), the reason for taking the medication (27%), etc. - Drug interaction was a primary concern main discrepancy found in majority of the prescriptions. - Around 32% of the population experienced ADR on taking the medication and among the patients interviewed, 64% of them didn't use any OTC drugs along with prescribed drugs. - Around 60 of the interviewed patients stored multiple drugs in a same container and 52 of the patient's medicines had illegible labels. 	<ul style="list-style-type: none"> - Qualified pharmacists can play a major role in improving the appropriateness of prescribing, preventing medication related adverse events. 	Community
<p>Chandrasekhar D, Joseph E, Ghaffoor FA, Thomas HM. Role of pharmacist led home medication review in community setting and the preparation of medication list. <i>Clinical Epidemiology and Global Health</i>. 2019;7(1):66-70. doi:10.1016/j.cegh.2018.01.002</p>					

Study	Article/study type	Methods	Outcomes	Recommendations	Setting
Liao C-Y et al. (2019)	Prospective intervention design	<ul style="list-style-type: none"> - PharmaCloud is a new technical platform adopted by the National Health Insurance Administration of Taiwan to collect patients' medical information via cloud technology - The system provides instant access to detailed cloud-based pharmacy claims data from different healthcare facilities for the past 3 months with a lag time of 2 days; it enables healthcare providers to obtain a patient's medication information via a secured internet portal - Patients were assigned to the PharmaCloud group and the non-PharmaCloud group in the outpatient setting, and then compared their medication usage and expenditure 	<ul style="list-style-type: none"> - After the application of PharmaCloud, the average number of prescribed drug items significantly decreased. - Intra-hospital medication duplication rates also decreased. 	<ul style="list-style-type: none"> - The implementation of cloud technology improved patient medication safety while also controlling overall drug expenditure. 	Outpatient

Liao C-Y, Wu M-F, Poon S-K, et al. Improving medication safety by cloud technology: Progression and value-added applications in Taiwan. International Journal of Medical Informatics. 2019;126:65-71. doi:10.1016/j.ijmedinf.2019.03.012