Beyond Adherence to Optimal Medication Management: *Essential Elements for Solving a* $528.4B *Problem*

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Introduction

Clinicians generally cite medication nonadherence as the primary reason patients don't achieve treatment goals or optimal outcomes, or gain control of their chronic conditions. This assertion is supported by the following data:

- 20% - 30% of new prescriptions are never filled
- 50% of medications for chronic diseases are not taken as prescribed
- Non-adherence costs the U.S. healthcare system $100B-$289B per year
- 125,000 people die annually from not taking their medicines

It's also widely recognized that about half of the medicines prescribed to patients are not taken as directed.

The preceding data comes from a landmark literature review published in the Annals of Internal Medicine,[1] in which reviewers evaluated papers, studies, and other reviews that addressed the issue of medication costs. In essence, the review indicated the above data and the fact that nonadherence was a prominent, high cost culprit of treatment failure and mortality.

But mounting evidence now indicates that nonadherence is in fact *not* the leading cause of failed clinical goals and poor treatment outcomes.

Figure 1, from a brief published by the American College of Clinical Pharmacy (ACCP), shows a breakdown of problems in medication therapy, using aggregated results from 19 distinct medication management service practices. The results include 11,804 patients older than 65 years and 21,213 documented encounters.[2]

What the data indicates is that, although nonadherence is a piece of the cost and mortality pie, there is a much larger issue at hand: *inadequate therapy,* which the ACCP defines as *dose too low, different* or *additional drug needed,* or *wrong drug.* In fact, inadequate therapy accounts for more than half of the problems encountered by patients, and is driving **nearly 57% of medication therapy problems.**
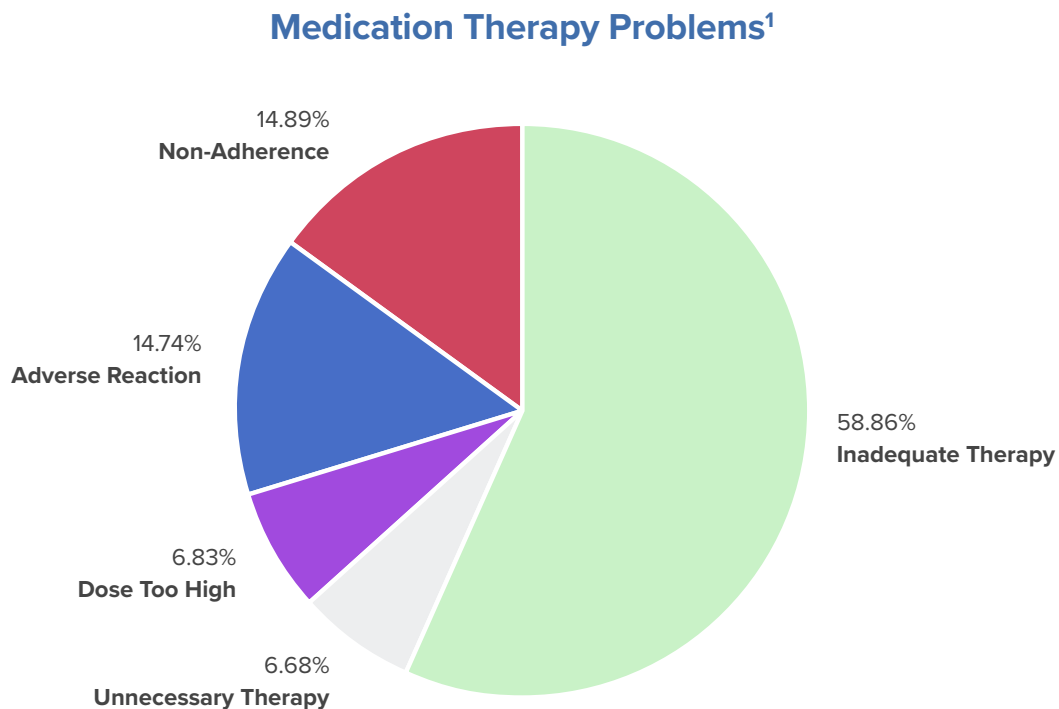
Medication Therapy Problems[1]

14.89%
Non-Adherence

14.74%
Adverse Reaction

6.83%
Dose Too High

6.68%
Unnecessary Therapy

58.86%
Inadequate Therapy

Figure 1: *Breakdown of Problems in Medication Therapy*

Inadequate Therapy: Causes and Costs

A common example of inadequate therapy is the post myocardial infarction (MI) patient who is discharged without being prescribed and instructed on the importance of taking a beta blocker and an aspirin daily. Evidence-based medicine indicates that daily aspirin and a beta blocker are the best medication regimen, post-MI. Yet, many patients are still discharged without this instruction or prescription. Another example is the asthmatic patient who is continuously prescribed rescue inhalers to quell attacks, but is never prescribed an inhaled corticosteroid, which has been proven to reduce the incidence of asthma attacks by better managing the underlying chronic inflammation associated with persistent asthma.

In addition, *unnecessary therapy* - such as prescribing an 85 year old patient Lipitor to lower cholesterol, or prescribing donepezil for a patient with advanced dementia - is the cause of nearly 7% of medication therapy problems. In these two cases, neither medication will have much, if any, therapeutic benefit for these patients, given their advanced age or disease state. And continuing them adds the risk of drug to drug interaction as well as toxicity build-up in the liver.

The combination of problems that result from inadequate and unnecessary therapy, and nonoptimized medication regimens come at a very high cost, and this has recently been made even more clear in a 2018
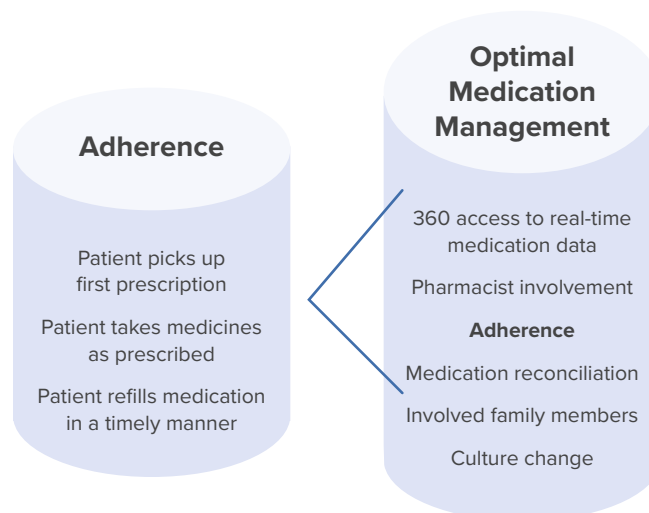
review published in the Annals of Pharmacology. The objective of the study was to update the 2012 generally accepted data into 2016 dollars, as well as estimate the most cost of prescription drug-related morbidity and mortality in the United States. What the authors learned in their analysis was that the average pathway costs of morbidity and mortality resulting from nonoptimized medication regimens, which include medication nonadherence - but also include the cost of treatment failure (TF) and New Medical Problems (NMPs) - are in fact signficantly higher than previous reviews have shown. The authors calculated that:

- The annual cost of prescription drug-related morbidity and mortality resulting from nonoptimized medication therapy is **$528.4B in 2016 US dollars,** *with a plausible range of $495.3 billion to $672.7 billion,*

- Nonoptimized drug therapy results in about **275,689 deaths** per year, and

- The average cost of an individual experiencing TF, NMP, or TF and NMP after initial prescription use were **$2,481, $2,610, and $2,572,** respectively.[3]

In essence this new data reveals that the cost of suboptimal medication management is approximately $239.4B more than the currently accepted industry costs. And it causes about 150,000 more deaths each year than previously realized. Further, the authors' analysis of average pathway costs support the ACCP data that ***nonadherence is not the primary driver of cost and mortality as has been generally accepted; suboptimal medication management/inadequate treatment therapy is.***

So, although nonadherence and escalating drug prices are certainly factors, they are only part of the medication cost ecosystem. And as **Figure 2** illustrates, nonadherence is only one slide of optimal medication management, which has multiple components.

Adherence is Only One Component of Optimal Medication Management

Adherence

Patient picks up
first prescription

Patient takes medicines
as prescribed

Patient refills medication
in a timely manner

**Optimal
Medication
Management**

360 access to real-time
medication data

Pharmacist involvement

Adherence

Medication reconciliation

Involved family members

Culture change

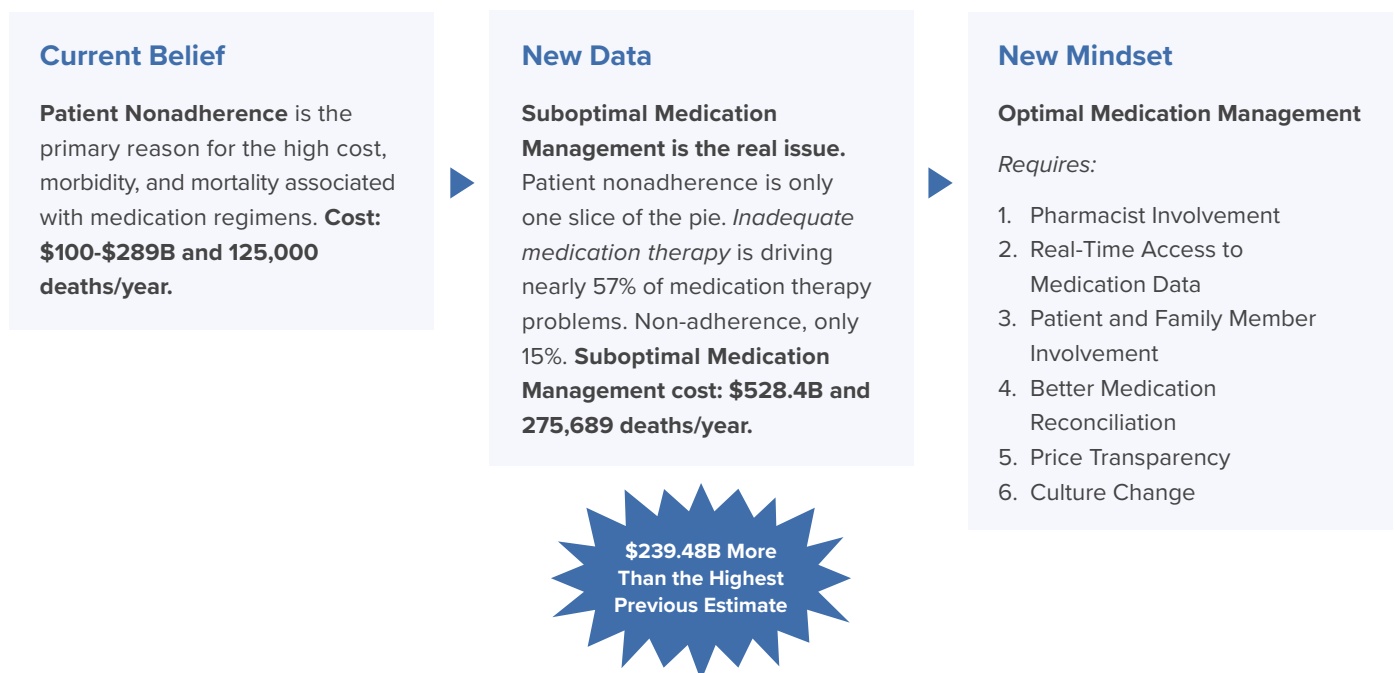**Figure 2:** *Optimal Medication Management is More than Adherence*

This distinction is more than a nuance. And it represents a very different message than the one our industry has heeded in the past. This new data indicates that we must rethink the elements that are currently associated with drug therapy management. And this requires a new mindset that casts a far wider net over medication management than solving the problem of adherence and rising prescription costs. (See **Figure 3.**)

These new findings should inspire healthcare leaders to shift away from generally accepted beliefs about medication costs and adherence, and expand the way their organizations and clinicians optimize medication management for patients. Only then is there an opportunity to truly solve the problem.

But in order to do this, we must ask difficult questions such as these:

- Do we have the right professionals overseeing patient medication regimens? Who should be on the care team, and who is accountable for treatment success?
- Given that patients and families are poor historians, how can care teams gain access to accurate and complete medication data?
- Which methods and protocols can be used to reduce the number of patients on the wrong drug or the wrong dose?
- How do we communicate the right clinical and medication data and deliver it at the right time to the right people?
- How can we modify cultural norms to ensure medication therapy is efficatious and cost-effective?

New Mindset is Essential to Medication Success

Current Belief

Patient Nonadherence is the primary reason for the high cost, morbidity, and mortality associated with medication regimens. **Cost: $100-$289B and 125,000 deaths/year.**

New Data

Suboptimal Medication Management is the real issue. Patient nonadherence is only one slice of the pie. *Inadequate medication therapy* is driving nearly 57% of medication therapy problems. Non-adherence, only 15%. **Suboptimal Medication Management cost: $528.4B and 275,689 deaths/year.**

$239.48B More Than the Highest Previous Estimate

New Mindset

Optimal Medication Management

Requires:

1. Pharmacist Involvement
2. Real-Time Access to Medication Data
3. Patient and Family Member Involvement
4. Better Medication Reconciliation
5. Price Transparency
6. Culture Change

Figure 3: *Optimal Medication Management Requires a New Mindset*

Getting at the answers to these questions will require a sea change. One that includes new perspectives and roles on the care team, better access to data, and more collaboration among clinicians, patients, pharmacists, and family members.

Six essential elements are required for successfully optimizing medication management:

1. Pharmacist involvement
2. Real-time access to accurate medication data for every patient
3. Better medication reconciliation
4. Effective strategies for improving adherence
5. Price transparency
6. Culture change

Achieving all of these won't be easy. But we believe that each is an imperative that healthcare leaders must embrace. Not only because it's the right thing to do for patient safey and outcomes. But also because as organizations assume greater risk, the opportunity to achieve significant cost savings rests in the ability to get medication therapy right. Optimizing medication therapy reduces inpatient and post-acute care ADEs, longer lengths of stay due to medication-related events, and emergency room/physician office visits.

Centers for Medicare and Medicaid Services Leading the Charge

With increased prevalence of chronic conditions in the U.S. population, increasing prescription prices, and the Medicare enrollee population predicted to rise to 81.8M by 2030,[4] we cannot afford to wait to solve this problem. And in fact, the Centers for Medicare and Medicaid Services (CMS) isn't waiting.

In 2014, CMS began requiring Medicare Part D plans to include Medication Therapy Management (MTM) programs, which aimed to ensure that the covered prescription drugs provided to Medicare beneficiaries by Part D Providers were *"appropriately used to optimize therapeutic outcomes through improved medication use and to reduce the risk of adverse events, including adverse drug interactions..."* Under the program, Medicare Part D Plan sponsors were required to incorporate an MTM program into their plans' benefit structure.

Outcomes of the initial MTM program were mixed. Although one major study found that MTM programs improved patients adherence and quality of care for conditions such as congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), and diabetes, it also indicated significant performance variation across Part D organizations.[5]

As a result, CMS revised the program requirements to improve outcomes and performance, and relaunched an Enhanced MTM program in 2017. The three key elements of the 2017 model are:[6]

1. Additional flexibility to allow more individualized and risk-stratified interventions,
2. Prospective payment for more extensive MTM interventions that will be external to a plan's annual Part D bid, and
3. A performance payment, in the form of an increased direct premium subsidy, for plans that successfully achieve a certain level of reduction in fee-for-service expenditures and fulfill quality and other reporting requirements.

So far, the Enhanced MTM is meeting with success. A first year fact sheet posted on November 30, 2018 indicated that for the program's performance year 2017, participants in the model spent approximately $325 million less than the anticipated spending benchmark 1 across the 1.7 million beneficiaries enrolled in participating plans.[7]

As the old adage goes, *"where Medicare goes, commercial payors follow."* We believe the time is now for forward-thinking health leaders and organizations to transform the way they manage medication therapy. The goals: optimal medication management, fewer deaths, and lower costs.

Essential Elements for Optimal Medication Management

Make no mistake: This will not be easy. Achieving success will require leaders to think differently, and for organizations to modify their mindset about the data used for medication management and the care team members who oversee it.

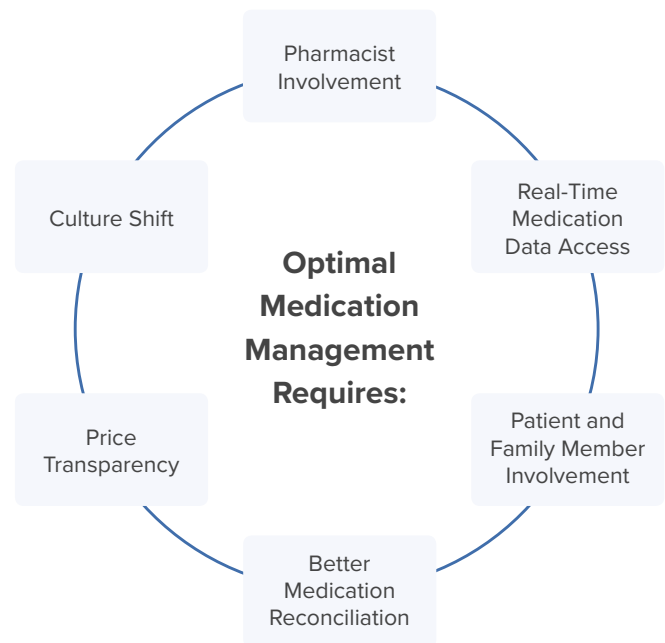We believe there are six essential elements for success.

Put the Pharmacist Front and Center

This will be a major cultural change for most organizations, where physicians and mid-level providers typically lead the medication management and reconciliation process.

The trouble with the current model of physician-led medication management is that physicians and other clinicians are primarily trained in diagnosis, treatment, and care as opposed to medication management. While certainly prescribing medications should be part of the physician's role, most do not have the deep knowledge or training to adequately optimize the patients medication plan. Nor do most have sufficient time in the clinic schedule to provide comprehensive education, address adherence issues, and optimize the medication plan.

Involving pharmacists is essential to reducing TFs and optimizing medication management. In collaboration with a physician, pharmacists can evaluate the patient's clinical status to ensure appropriate alignment between the patient's syndromes and the medication therapy. Optimization also includes developing a treatment plan that incorporates follow-up to assess progression toward treatment goals.[8]

The same review in the Annals of Pharmacology that calculated the cost of suboptimal medication management at $528.4B also concluded that expanding medication management programs to be overseen by clinical pharmacists, in collaboration with physicians and other prescribers, can mitigate avoidable costs and improve patient outcomes. Such an approach can address issues such as the "prescribing cascade" which occurs when an ADE is misinterpreted as a new condition, and a new medication is prescribed for it. Instead of assuming the new issue is a new condition, the entire medication regimen must be assessed to determine if an existing medication or combination of them is causing the "new" condition and should therefore be removed.

Pharmacist Involvement

Culture Shift

Real-Time Medication Data Access

Optimal Medication Management Requires:

Price Transparency

Patient and Family Member Involvement

Better Medication Reconciliation

Given the needed improvement in ED medication safety and cost-effectiveness, the American Society of Health-System Pharmacists and the Institute of Medicine's Committee on the Future of Emergency Care recommend inclusion of pharmacists in ED care teams. And a review in the *Annals of Internal Medicine* found strong evidence that improved medication adherence was accompanied by pharmacist-led high blood pressure management. The study showed that "education with behavioral support; reminders, and pharmacist-led, multicomponent interventions enhanced adherence..."[9]

In a year-long improvement study, Citrus Valley Health Partners-Foothill Presbyterian Hospital used "best practices" and Lean Six Sigma tactics to train and deploy pharmacy techs to perform medication reconciliation in two hospital EDs. The hospital reduced its overall error rate by nearly 40% and increased the accuracy rate for all medications to almost 96%.[10] In addition, a retrospective study of 490 medication orders found that ED pharmacists reduce medication errors by two-thirds.[11]

Other studies indicate that inpatient ADEs can be significantly reduced when pharmacists or pharmacy technicians are involved. One showed that having a pharmacist on an inpatient rounding team reduced the rate of preventable ADEs by 78%.[12]

It's also known that a patient's trusted relationship with a pharmacist improves adherence. The number one predictor of adherence, according to the ACCP's Annual National Report Card on Medication Adherence, is a *patients' personal connection with a pharmacist or pharmacy staff.* How patients connect with the pharmacists appears immaterial - it could be in-person, by phone, or by telepharmacy visit. But this relationship between patient and pharmacist is a key predictor of adherence, which we know is important to treatment outcomes.

If you are concerned about the cost of adding pharmacists to the ranks, keep in mind there are multiple analyses that show a positive return on investment (ROI) for these professionals. One study by Prime Therapeutics showed $8.6M in avoided costs and a 10:1 ROI in ten months on five pharmacists that were hired to oversee managed care plan medication therapy.[13] As well, accuracy of medication reconciliation at admission and care transitions improves in pharmacist-led environments, which in turn can reduce readmissions and errors that have a negative impact for hospitals in risk sharing arrangements.

For example, one review notes a study in which *telephone calls from a pharmacist to a patient within 24 days following discharge significantly reduced both 30-day hospital readmission rates and emergency room visits compared with a group of discharged patients a pharmacist was unable to contact. Another study found that a model involving the combined efforts of pharmacists and social workers at transition-of-care points significantly reduced 30-day, all-cause readmission rates.*[14] Both of these outcomes can reduce penalty payments and losses for health systems that have risk contracts.

As an alternative to hiring pharmacists, if your system has technology systems that highlight therapeutic duplications and alert users about drug interactions, you may be able to employ lower cost pharmacy technicians. The national average salary for hospital pharmacy technicians is approximately $44,000, according to ZipRecruiter which is approximately 1/3 the average salary paid to hospital pharmacists.

Prioritize Resources to Fix Front End Workflows

With so many areas of the health system in need of quality improvement, it can be difficult to decide which departments and workflows to prioritize. When working to improve medication management, the area to focus resources is on the front end: in admissions and the ED. When the team gets medications right in these two departments, length of stay and inpatient and post-acute ADEs decrease.[15]

When admitting teams get it wrong, the inaccurate data forms the basis of the medication record throughout the patient's stay and at discharge, which increases the opportunity for an ADE or NMP. In fact, approximately 20% of patients have an ADE within three weeks of discharge.[16] Certainly the medication reconciliation process can and should be done during inpatient transfers and at discharge too. But the highest value is gained when hospitals allocate the right resources to the front end of the patient process. Fix the front end and you will avoid much of the back end boomerang of ADEs.

There are multiple studies indicating that including pharmacists and technicians on the front end of the process can improve accuracy and decrease mortality. One study found that, when pharmacists provided admission drug histories, 3,988 deaths were avoided.[17] Another found that potential errors were reduced by 82% when trained pharmacy technicians obtained medication histories.[18] And another focused on the emergency department, where the intervention of pharmacists reduced overall medication reconciliation discrepancies by 33%.[19]

Due to its fast pace, the ED in particuar is a tricky place to conduct medication review and reconciliation. Add to that the highly variable conditions of patients who come through its doors, and it's an environment ripe for medication errors.

Although strategies for reducing medication errors in the ED aren't that much different than in other areas in the hospital, the ED's big challenge is the high number of rotating staff, some well-versed in medications, others not, and the variability of those staff depending on time of day and day of the week. In most hospitals, the front-end personnel doing the medication reconciliation are not nearly well-versed enough in the medications they are discussing with patients, especially complex patients. And the resulting medication errors are perpetuated throughout the hospitalization and beyond discharge. This variance is not good practice.

Operational and process change takes significant time and effort. Which is precisely why hospitals and provider organizations must start rethinking their front end systems now.

Use Accurate Real-Time Data to Improve Medication Reconciliation

As a way to reduce ADEs, improve quality, and maintain their JCAHO accreditation, hospitals and healthcare systems have implemented medication reconciliation processes at a high rate over the last ten years. Medication reconciliation is the process of documenting the complete list of a patient's current medications, adding new or making changes to current medications based on the nature of the patient's visit, and creating the most current list of medications in the medical record.

But despite new workflows and supporting EHR features, medication reconciliation is still often incomplete, inaccurate, or overlooked when patient volume becomes overwhelming.

Qualitative research conducted by Cureatr found that medication reconciliation is a huge pain point for every organization represented in the study. Most clinical leaders recognize that the process is stymied with gaps, inconsistencies, and inaccurate data.

At best, most leaders say it's being done inconsistently. There is tremendous variability depending on time of day, day of the week, and compliance with the organization's standard policies. The process is fractionated, full of gaps, paper/fax-based in some cases, and takes too long. Often clinical staff must call other facilities or pharmacies to piece together a patient's medication information. And in most cases, the patient is not a reliable historian when it comes to recounting what they are taking, how often, for what, and at which dosage. Finally, everyone interviewed recognized that the "checkbox" reconciliation feature in most EHRs does not always result in the most accurate list. It only meets a regulatory requirement.

Clinical leaders shared these as their most challenging issues:

1. **There is no easy way to find and use a current medications list.** Often the data in the EHR can't be trusted. And, even if it is accurate, it only represents known information within the system; there is no visibility into medication lists from other physician organizations or systems.

2. **The medication reconciliation process is being completed by multiple people.** These include pharmacists, pharmacy technicians, physicians, ED nurses, floor nurses, and medical assistants. This varies depending on shift.

3. **Patients are the worst sources for accurate medication information,** but they are often used as the primary source.

4. **A thorough reconciliation often takes more time than busy clinical staff have.** Reconciliations for elderly, incoherent, and other complex patients with polypharmacy can take an hour or more. That is time many clinicians don't have; so reconciliation often ends up incomplete.

Addressing these challenges requires an easy way for clinicians to access accurate, real-time medication data - without calling or faxing the pharmacy, without connecting multiple system EHRs, and without having to rely on patient and family member memories. Historically, this data has not been available to provider organizations in a way that it could be easily consumed or used at the point of care.

But new platforms such as Cureatr's **Meds 360°** are changing the game by delivering accurate, real-time prescription fill data, past and present, in an easy to read longitudinal view, organized by drug categories. **Figure 4** shows the tool's data display on a mobile device, which includes pick up and refill data for all of a patient's ambulatory medications, dosage changes, therapeutic duplications, drug to drug interactions and refill gaps.

Figure 4: *Meds360° gives the care team real-time, accurate access to medication data.*

Using analytics to compute proportion of days covered (PDC) as a proxy for nonadherence, **Meds 360°** provides physicians, pharmacists, and other clinicians the information needed to have sensitive conversations with patients. The information is also integrated into Cureatr's secure communication and messaging platform, which alerts and proactively notifies providers about drug-to-drug interactions and

problematic opioid prescribing, such as multi-provider and excess morphine milligram equivalents (MMEs). Providers can securely send the data and any relevant messages to the patient, pharmacist, family member, or other care provider, from a mobile device.

What Physicians and Clinical Leaders Say About the Value of Meds360 Data

"If you give this to physicians you'll never get it away from them…People are going to want this product more than the EHR."

– Chief Medical and Safety Officer, Southern U.S. Health System

"I really like the {organization of} the medication list. I love the adherence information… Right now I have no clue."

– Chief Medical Informatics Officer, Regional Medical Center

"I'm not aware of many other platforms currently that can give you the data in a concise format in real time with alerts."

– Physician VP of Quality and Safety, East Coast Health System

"The pharmacy staff would LOVE something like this, especially with the problems of care transitions from other faciltiies. It's better than anything I've seen in EPIC. More detailed and much more real-time."

– Director of Pharmacy Operations, West Coast Medical Group

"I think this is a must-have. I see so many errors downstream due to incorrect medications. If I could get accurate information, I could improve 90%."

– Chief Medical Informatics Officer, Regional Medical Center

"I get no Surescripts feeds like this. My understanding of adherence is purely subjective from the patient and family members. It's appealing to me from that perspective if nothing else."

– Physician VP of Quality and Safety, East Coast Health System

Platforms such as Meds360° are an essential step for improving medication reconciliation accuracy. Further, organizations seeking population management and other risk arrangements must have access to timely, accurate data in order to optimize medication management, reduce unnecessary costs, and mitigate risks. Without accurate real-time data like the feeds that **Meds360°** puts into the hands of the care team, complete medication reconciliation will continue to be time-consuming and potentially filled with holes and inaccuracies that result from patient's lack of understanding their medication regimen.

Set Strategies for Improving Medication Adherence

Medication nonadherence is a subset of optimal medication management. But it's still a major issue to getting patients to the right therapeutic outcome.

When patients do not follow instructions with respect to the timing, dosage, and frequency of all their medications, they don't get the right amount of medicine into their bodies at the right time. And that can lead to poor outcomes, increased doctor visits, and potential readmissions to the hospital, particularly for people with chronic conditions.

Nonadherence is a multifactorial issue - behavioral, economic, and cultural. It's a very difficult problem to solve, yet organizations must be diligent at developing strategies that move patients toward compliance. Although involving pharmacists, improving medication reconciliation workflow, and giving care teams access to accurate, real-time data are all essential to optimal medication management, if the patient doesn't, won't, or can't take his or her medicine, all of these efforts have zero impact and no result.

Medication non-adherence results from intentional as well as unintentional actions. If a regimen doesn't fit into the patient's routine and lifestyle, there's a good chance they won't take their pills. If they can't afford the copay or don't have transportation to the pharmacy, they won't fill the prescription. Physicians, nurses, pharmacists, and other care providers must be trained and skilled at handling sensitive conversations about these topics.

The communication technique of Motivational Interviewing (MI) has proven to be effective as a framework for provider to patient conversations

about adherence. The blame-free, non-confrontational tenets of MI can be particularly helpful when physicians and nurses are trying to determine if cost is a reason patients aren't taking their pills. Providers must be sensitive to the price of the drugs they are prescribing, and do their best to find an option that is affordable; especially for polypharmacy patients.

Because of the stigma and embarrassment many people feel about not being able to afford their medicines, create a handout of available resources and provide it proactively to everyone. It's a non-threatening way to get information into everyone's hands. In addition to listing resources such as NeedyMeds, RX Assistance Programs, state assistance programs, and local agencies that can help, use the handout to reinforce the importance of taking medicine as prescribed.

Most conversations about medication adherence happen during a patient's doctor visit or hospital discharge. But the truth is, once patients leave the office or hospital, patients are on their own. A patient's decision about whether or not to comply with a medication regimen happens outside the walls of the hospital and clinic.

That's why educating patients about why and how to take medicines can't be a one-time conversation. It has to be ongoing, and the communication must come from multiple people on the care team, in multiple modalities. In-person education with teach-back. Written handouts. Follow up calls or texts to remind patients of the importance of what they are taking. **Figure 5** suggests four that have proven successful.

Figure 5. Post-Acute Care Adherence Tactics That Work

1 **Follow Up Calls.** Reaching out by phone to discuss treatment regimens, answer questions, and remind patients about the importance of refills has worked well to improve adherence.

2 **Text Reminders.** Sending text message reminders is a cost effective strategy that can approximately double the odds of medication adherence, according to a meta analysis in JAMA Internal Medicine. According to the analysis, the increase translates into adherence rates improving from 50% (assuming this baseline rate in patients with chronic disease) to 67.8%, or an absolute increase of 17.8%. [20]

3 **Telehealth.** Health systems and clinics are testing telehealth for many types of follow up interactions and medication compliance is one of them. In North Carolina, Greensboro-based Triad HealthCare Network just began using a telehealth platform to measure medication adherence in Medicare Advantage members dealing with chronic conditions.

4 **Reminder Apps.** Many free apps offer medication reminders, refill alerts, and other features. *Mango Health, MyMeds Medication Management,* and *MediSafe Meds and Pills Reminder* are just a few. More robust options, such as Wellth, integrate incentives based on behavioral economics with a hospital or healthcare organization's nursing and care management platforms.

Investing the time to create materials and train the care team to use them in patient education will make a big difference in patient understanding about the importance of adherence. And in turn, improve the chance that patients adhere to treatment plans.

Conclusion

Nonadherence is not our biggest medication management problem; suboptimal medication management is. The treatment failures, new medical problems, and poor outcomes caused by suboptimal medication management cost $528.4B and 275,689 lives each year.

One reason medication management is not optimized is because physicians and nurses are in charge. Not only do they not have the right amount of focused available time to perform the elements essential to medication optimization, they don't have the right training. Pharmacists must oversee the synchronization of medication and clinical condition. They must be involved in medication reconciliation, adherence, and treatment regimens.

And to do this, they - as well as the entire care team - must have access to the right data assets and clinical resources.

These changes require a cultural shift. They also require a change in mindset: from one that has focused on patient nonadherence being the primary issue to high medication costs and poor outcomes, to one that recognizes nonadherenece as only one piece of a larger, multi-faceted problem we must solve.

Medication reconciliation will never be accurate without access to real-time data. Providers cannot rely on patients and family members. And medication data within EHRs only includes information from prescriptions and providers within the network or health system system. It does not include real-time pharmacy feeds, nor complete lab data. Successfully optimizing medication management requires a 360 view of the patient's clinical and pharmaceutical data, with medication-specific annotations.

All of this represents big changes for most organizations. But the time has come to make them.

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20.   [In Figure 4] Jay Thakkar, FRACP, Rahul Kurup, MBBS; Tracey-Lea Laba, PhD, etal, Karla Santo, MD; Aravinda Thiagalingam, PhD; Anthony Rodgers, PhD; Mark Woodward, PhD; Julie Redfern, PhD; Clara K. Chow, PhD, Mobile Telephone Text Messaging for Medication Adherence in Chronic Disease: A Meta-analysis. JAMA Intern Med. 2016;176(3):340-349. doi:10.1001/jamainternmed.2015.7667. https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2484905. Last accessed, 1/5/19.