Medication errors can jeopardize hospital patient safety at any point in care

Reconciling medications—from admission to discharge and beyond—greatly reduces the risk of medication errors. And yet, medication reconciliation is still one of the most troublesome National Patient Safety Goals for Joint Commission-accredited hospitals. If your facility is like many others across the country, you’re struggling to keep patient medication lists accurate and up to date from admission through discharge and beyond. With an ever-increasing focus on patient safety, and decreasing regulatory tolerance for medication errors, compliance with this National Patient Safety Goal could get even tougher.

Help is here!

Medication Reconciliation: Practical Strategies and Tools for Joint Commission Compliance, Second Edition, has been completely updated, with more field-tested advice for building an effective, comprehensive medication reconciliation program—or revamping one that’s already in place. It includes new forms and data collection tools that support the Joint Commission’s latest expectations and scoring, as well as case studies and additional resources to help answer your toughest medication reconciliation questions.

Use this book to:
• Develop and keep an accurate list of patient medications
• Recruit an effective medication reconciliation team
• Create and test reconciliation forms and gather supporting data
• Implement your medication management processes in every area of care

Plus…

The accompanying CD-ROM includes customizable presentations that make a strong case for medication reconciliation. Use these tools to gain buy-in from physicians and staff. Additional tools on the CD-ROM can be used for gathering data and identifying areas that need improvement, and for charting your progress as you roll out medication reconciliation to your entire facility.

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About the Coauthors

Kristine M. Gleason

Kristine M. Gleason, RPh, is a Quality Leader within the Clinical Quality Management Department at Northwestern Memorial Hospital (NMH) in Chicago. She has 16 years experience as a pharmacist and has worked in a variety of clinical settings in acute academic healthcare, as well as in patient and medication safety, and clinical quality.

Gleason has participated in many patient safety initiatives examining systems and errors, and has generated research, presentations and publications on patient safety and operational improvements. Most recently, through a grant from the Agency for Healthcare Research and Quality (AHRQ), Gleason helped lead a medication reconciliation research team, focusing on how healthcare providers obtain and communicate medication histories and risk factors that may lead to inaccurate medication histories and reconciliation failures.

She was also instrumental in conducting an organizational risk assessment related to medication reconciliation and, based on these findings, helped to organize and support the medication reconciliation design and implementation efforts at NMH. In addition to medication reconciliation, her other interests include active surveillance, medication safety, team training, patient/provider communication, and patient education.
**Molly R. McDaniel**

Molly R. McDaniel, PharmD, formerly a Patient Safety Research Coordinator for the Patient Safety Team at NMH, has been involved in a variety of patient safety initiatives, including failure mode and effect analysis, anticoagulation safety, adverse drug event surveillance and medication error reporting and prevention.

In the last two years, McDaniel was one of the lead investigators in a research grant supported by the AHRQ looking at medication reconciliation; specifically at how healthcare providers obtain medication histories and risk factors that may lead to inaccurate medication histories and reconciliation failures. She helped lead the design, implementation and education of the medication reconciliation process at NMH.

Recently, McDaniel joined Sanford University of South Dakota Medical Center in Sioux Falls, S.D., as a Medication Safety Officer, where she continues to be involved in a variety of medication and patient safety initiatives.
Acknowledgments

We would like to recognize the enormous contributions of Northwestern Memorial Hospital’s (NMH) multidisciplinary Medication Reconciliation Improvement Team, lead by process improvement leader Mary Lou Green. We would also like to recognize the tremendous support and participation of our Medication Reconciliation Leadership Team, lead by Dr. Charles Watts, Senior Vice President of Medical Affairs and Chief Medical Officer, and Dr. Daniel Derman, President, Northwestern Memorial Physicians Group. We would also like to thank Dr. David Liebovitz, Medical Director, Clinical Information Systems, and the Clinical Information Systems Team at NMH for their assistance from a technology perspective. In addition, our Patient Safety Team, directed by Cynthia Barnard, provided invaluable support and insight throughout this entire process. The input and dedication of all of these individuals and team members are evident throughout this book.

Lastly, we would like to extend a special thank you to the Agency for Healthcare Research and Quality (Grant No. 5 U18 HS015886) for its support of our Medications At Transitions and Clinical Handoffs (MATCH) research team. We express our sincere appreciation to our Principal Investigator Dr. Gary Noskin, Associate Chief Medical Officer at NMH, and our AHRQ Project Officer Robert Borotkanics, as well as our Joint Commission research collaborators Gerard Castro, Project Director, International Center for Patient Safety; and Nancy Kupka, Project Director, Division of Quality Measurement and Research - Department of Health Services Research. We are truly grateful to our multi-disciplinary MATCH team, a collaboration between NMH, Northwestern University Feinberg School of Medicine, and The Joint Commission, for their dedication and contributions in the field of patient safety and medication reconciliation research.
Reconciling a patient’s medications throughout a hospital stay is vital to ensuring the most positive outcomes possible. The Joint Commission, the Institute for Healthcare Improvement, and other organizations recognize the role of medication reconciliation in the reduction of adverse medication events. The Joint Commission’s medication reconciliation National Patient Safety Goal calls for accredited hospitals to implement an effective medication reconciliation system throughout the facility, and be able to show proof that the system is in place and that it works.

In today’s healthcare settings, however, it can be extremely challenging to put in place an organizationwide, admission-to-discharge medication reconciliation program that works—and keeps on working. Obstacles range from patients’ uncertainty about what medications they take at home, and at what dosage, to unclear instructions for starting medications or stopping others during care, to incomplete or contradictory medication instructions at discharge. And with more patients on more medications arriving for care, these challenges will not diminish in the coming years.

Implementing a medication reconciliation process can also be difficult because disciplines and caregivers in different settings must communicate as well as completely understand their respective responsibilities for the process to be successful. The process requires understanding the roles and responsibilities for both the sending and the receiving units—thus, facilities might have trouble identifying who is responsible for reconciliation when a patient is admitted through the emergency department or is transferred from the intensive care unit to another unit.

Further complicating matters, many hospitals are in the process of moving to electronic medical records. One department might use paper forms to document patients’
medication lists, updating the page(s) as the patient moves through—but when the patient is transferred to a different unit, his or her medication list must be put into an electronic form and updated electronically for the remainder of his or her stay.

It is easy to see why medication reconciliation remains such a challenge for so many healthcare facilities. Everyone understands that medication reconciliation is vital to ensuring patient safety, but because it’s a systemwide process, it requires systemwide buy-in, commitment, and understanding.

How to Use This Book

Through our work in implementing the medication reconciliation program at Northwestern Memorial Hospital, in Chicago, we understand the issues and obstacles associated with building a hospitalwide system. This book provides no-nonsense guidance for building or fine-tuning a medication reconciliation process that works. The step-by-step instructions, customizable forms, and encouragement can help you figure out what to do, when, and why. Whether you’re creating a new program or tweaking your current medication reconciliation system, you’ll find useful the tools you need for:

• Getting everyone on board
• Building an effective team to engage all departments
• Designing a system and testing it
• Educating and training staff at all levels
• Gathering data and locating trouble spots
Additional resources include an appendix of related case studies, and questions and answers. Customizable versions of many of the forms are included on the accompanying CD-ROM, along with useful PowerPoint presentations making the case for medication reconciliation.

Keeping a reconciled list of patient medications may never be easy, but having a functional system in place will make the process safer for patients and less time-consuming for staff members who are already pressed for time. An accurate list of medications, updated as necessary, that moves with the patient provides benefits far beyond compliance with Joint Commission requirements.
CHAPTER ONE

GET EVERYONE ON BOARD
Making the Case

All levels of an organization must be committed to medication reconciliation if this initiative is to succeed. In all likelihood, however, your hospital is trying to implement many organizational initiatives. Therefore, it is imperative that senior leadership be fully engaged to help prioritize medication reconciliation among all these initiatives. You will need to educate everyone involved on the importance of medication reconciliation from a patient safety and regulatory point of view so they understand why it should be a priority.

This chapter will assist you in your efforts to educate leadership and healthcare providers about the importance of medication reconciliation and the potential impact it can have on patient safety. Specifically, this chapter will discuss:

- Presenting medication reconciliation to obtain leadership and staff buy-in
- Effectively communicating your message regarding medication reconciliation: Talking Points
- Creating a business case for prioritizing medication reconciliation
- Educating staff about medication reconciliation through presentations and case studies
Then we will discuss methods that can help you define the extent of the problems associated with your current process, as well as solutions. Several process improvement methodologies and tools will be introduced, along with examples regarding their applicability to medication reconciliation, including:

- Failure Mode and Effect Analysis (FMEA)
- The Model for Improvement

**Presenting medication reconciliation to senior leadership**

To promote medication reconciliation as an organizational priority, it is helpful to present external and internal data showing the importance and need for this process. Figure 1.1 includes some talking points which may be useful in crafting presentations or communications with leadership, management or frontline staff. This is by no means a comprehensive review of the literature on medication reconciliation, but it does highlight data published to support the process of medication reconciliation and the effects on patient safety.
Medication errors occur in the prescribing phase,\textsuperscript{1-8} due to a lack of essential drug knowledge and patient information at the time of ordering.\textsuperscript{1,3,8}

Due to barriers, such as the time required for a comprehensive interview and the patient’s inability to participate, healthcare providers often gather medication history information from other sources, such as past medical records, outpatient clinic/office records, prescription bottles and/or outpatient pharmacy records, which may be discrepant with one another.\textsuperscript{9}

Researchers from a variety of clinical settings have shown that discrepancies exist between what is documented in the patient’s past medical record, outpatient clinic/office records, prescription bottles and outpatient pharmacy records compared to what the patient is actually taking.\textsuperscript{9-13}

One study showed more than 70% of drug-related problems were recognized only through a patient interview.\textsuperscript{14}

One study reported a 51% reduction in medication errors when pharmacists were involved in the medication history process.\textsuperscript{15}

Prescribing errors due to inaccurate or missing patient medication histories and medication omissions may not be preventable with most currently available CPOE (computerized prescriber order entry) systems.\textsuperscript{8}

Medication reconciliation confirms the patient’s current medication regimen and compares this against the physician’s admission, transfer and discharge orders to identify and resolve discrepancies.\textsuperscript{16}

One study demonstrated a reduction in the rate of medication errors from 213 per 100 admissions before implementation to 63 per 100 admissions after implementation of a medication reconciliation process upon admission, transfer and discharge.\textsuperscript{17}
A review of patients’ medical and anesthesia records, in addition to a review and verification of patients’ allergies and home medications, were compared to medication orders written upon ICU discharge. Baseline data revealed 94% of patients had orders changed due to medication errors, which dramatically dropped after a medication reconciliation process was implemented.

73% of patients had at least one medication discrepancy between the surgery and anesthesiology preoperative medication histories.

Up to 27% of all hospital prescribing errors can be attributed to incomplete medication histories at the time of admission.

Discrepancies between physician-acquired prescription medication histories and comprehensive medication histories at the time of hospital admission were common, occurring in up to 67% of cases.

33% of patients discharged from the ICU had one or more of their chronic medications omitted at hospital discharge.

22% of medication discrepancies could have resulted in patient harm during their hospitalization and 59% of the discrepancies could have resulted in patient harm if the discrepancy continued after discharge.

Reconciliation by pharmacists of discrepancies in admission medication histories and orders decreased opportunities for medication errors and the potential for patient harm.

This is not intended to be a comprehensive review of the literature on medication reconciliation but it does highlight key points published to support the process of medication reconciliation and the effects on patient safety.
**Effective communication of talking points**

When preparing communications, documents, or presentations, it is important to know your audience and craft the message accordingly. The presentation you give to your senior leadership will be different than the presentation you give at a staff meeting of frontline caregivers. The same is true if you are presenting to different disciplines (i.e., physicians, nurses, pharmacists, etc.).

Always support presentations on medication reconciliation with data. Whether it is external data from the literature or your own internal data, senior leadership will be interested in learning how medication reconciliation can improve patient safety and how this process will help to achieve compliance with accreditation if required. Other audiences such as managers will be interested in pure data as well as how they can motivate their staff to participate in medication reconciliation. Frontline caregivers will be most concerned with how medication reconciliation will impact their daily workload.

Prepare for these different types of audiences by anticipating their individual questions and concerns regarding medication reconciliation.

The CD-ROM that accompanies this book includes two example PowerPoint presentations that could be used when presenting medication reconciliation to various audiences (leadership, clinical staff, etc.). These presentations, titled “Making the Case for Leadership” and “Making the Case for Staff,” are intended to initiate conversations about the importance of medication reconciliation—however, they are not intended to explain in great detail how an organization will accomplish this initiative.

It is important to start with the “why” message to make sure everyone agrees on the importance of this process and then move into “how.” If you start with the “how,” everyone will get overwhelmed with the details of the process and the potential increase in workload, and will miss the message of how important this is from a patient safety perspective.
The business case for medication reconciliation

When creating a business case for medication reconciliation, you must be prepared to present financial data to senior leadership. This will make it easier to advocate for the additional resources that may be needed to perform medication reconciliation on every patient.

If possible, collect internal data on your current medication reconciliation process and apply that data to the sample business cases. Inserting your own internal data into a business case helps “bring home” the point of prioritizing medication reconciliation as an organization, and helps justify additional resources to effectively implement medication reconciliation and decrease patient harm. Any internal data you are able to collect will be helpful in highlighting the need for organizational support for this process.

The sample business cases that follow present a graphic reminder to organizational leaders that providing safe and quality care always makes good business sense in the end.

Business case – Example 1

The Institute of Medicine and others have published data that a certain percentage of people admitted to a healthcare organization will experience a discrepancy in their medication regimen and a certain percentage of those discrepancies will lead to an adverse drug event (ADE) that could seriously harm a patient. The literature estimates the cost of a preventable ADE at $4,800 per event based on a 1997 study done by Bates, et al. Some organizations have calculated an ADE cost as high as $10,375.

Following is a financial model for medication reconciliation developed by Steven B. Meisel, PharmD. Dr. Meisel is the Director of Medication Safety at Fairview Health Services in Minneapolis, Minnesota. This model is used with permission.
Fairview’s internal data shows that an effective medication reconciliation process can detect and avert up to 85% of these discrepancies. The time it takes to perform effective medication reconciliation on admission is estimated to be 15 to 30 minutes. With these assumptions in mind, Meisel outlines the following calculations:

<table>
<thead>
<tr>
<th>Number of discrepancies per patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>x Number of patients per year that one person can reconcile</td>
</tr>
<tr>
<td>x Percent of patients with discrepancies that would result in an ADE</td>
</tr>
<tr>
<td>x Percent effectiveness of process</td>
</tr>
<tr>
<td>x Cost of an average ADE</td>
</tr>
<tr>
<td>= Annual gross cost savings</td>
</tr>
<tr>
<td>- Salary of employee</td>
</tr>
<tr>
<td>= Annual net savings</td>
</tr>
</tbody>
</table>

To calculate the net cost savings, subtract the cost of the anticipated resource investment (staff, equipment, information technology) from the gross cost savings. Meisel gives the following conservative model for savings from a medication reconciliation process that uses pharmacy technician resources to reconcile medications on admission to Fairview. Net savings will vary depending on the type of staff that performs medication reconciliation (nurse, pharmacist, pharmacy technician, or physician).
Business case – Example 2

Steve Rough, MS, RPh, Director of Pharmacy at the University of Wisconsin Hospital and Clinics, developed a template to request additional full-time equivalents to perform medication reconciliation on admission to an organization. This template is used with permission. Figure 1.2 is an adaptation of the template based on sample data collection.

\[
\begin{align*}
1.5 \text{ (discrepancies per patient admitted)} \\
\times 6,000 \text{ patients (average of 20 minutes per patient to complete reconciliation)} \\
\times 0.01 \text{ (1\% of admissions experience discrepancies that would result in an ADE)} \\
\times 0.85 \text{ (85\% of discrepancies avoided through med rec process)} \\
\times 2500 \text{ (conservative cost of an ADE)} \\
= 191,250 \text{ annual gross savings} \\
- 45,000 \text{ (salary and benefits of an incremental pharmacy technician)} \\
= 146,250 \text{ annual net savings (325\% return on investment in a new staff member)}
\end{align*}
\]
Table 1: ROI ASSUMPTIONS TABLE
The following assumptions are made about the “model” hospital. These assumptions drive all cost figures in the ROI analysis table below. Each hospital must provide their own information into this assumptions table to derive institution-specific estimates for the ROI analysis. Updating the assumptions table will automatically revised figures in the ROI table.

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average # of home medications pharmacist documents per patient during pharmacist-performed medication</td>
<td>10</td>
</tr>
<tr>
<td>Average # of home medications documented by other providers per patient as a result of their medication history</td>
<td>8</td>
</tr>
<tr>
<td>Average “additional” medication regimen discrepancies identified when comparing pharmacist medication history</td>
<td>2</td>
</tr>
<tr>
<td>Total average number of medication history discrepancies between pharmacist and other providers (literature)</td>
<td>4</td>
</tr>
<tr>
<td>Number of inpatient admissions per year</td>
<td>20,000</td>
</tr>
<tr>
<td>Potential medication errors per year that can be avoided with improved pharmacist-conduction medication</td>
<td>80,000</td>
</tr>
<tr>
<td>% of avoided medication errors that would be harmful to the patient</td>
<td>0.90%</td>
</tr>
<tr>
<td>Total avoided harmful medication errors per year</td>
<td>720</td>
</tr>
<tr>
<td>Cost of harmful medication error to hospital</td>
<td>$4,655</td>
</tr>
<tr>
<td>Annual savings to hospital as a result of avoided harmful medication errors</td>
<td>$3,351,600</td>
</tr>
<tr>
<td>Time (in minutes) required per admission for pharmacist to complete a medication admission history and perform</td>
<td>15</td>
</tr>
<tr>
<td>Pharmacist hours required per year to perform medication reconciliation</td>
<td>5,000</td>
</tr>
<tr>
<td>Pharmacist FTE required per year to perform medication reconciliation</td>
<td>2.4</td>
</tr>
<tr>
<td>Pharmacist FTE needed to add to budget to staff 2.4 FTEs (benefit time, etc)</td>
<td>3.1</td>
</tr>
<tr>
<td>Pharmacist salary</td>
<td>100,000</td>
</tr>
<tr>
<td>Pharmacist fringe benefit rate</td>
<td>25%</td>
</tr>
<tr>
<td>Total labor cost per pharmacist FTE</td>
<td>$125,000</td>
</tr>
<tr>
<td>Total labor cost for all additional pharmacist medication reconciliation FTEs</td>
<td>$390,625</td>
</tr>
<tr>
<td>Nurse FTE avoided due to pharmacists performing medication histories and reconciliation</td>
<td>3.1</td>
</tr>
<tr>
<td>Nurse salary</td>
<td>$75,000</td>
</tr>
<tr>
<td>Nurse fringe benefit rate</td>
<td>30%</td>
</tr>
<tr>
<td>Total labor cost per nurse FTE</td>
<td>$97,500</td>
</tr>
<tr>
<td>Total nurse labor cost avoided</td>
<td>$304,688</td>
</tr>
</tbody>
</table>

A. Literature demonstrates that 0.9% of medication errors (1 in 100 errors) result in an adverse drug event.
   - 1995:274:29-34


C. Salary rates vary per hospital. This analysis assumes a 5% annual salary increase.
Table 2: Medication Reconciliation Model ROI (NOTE: numbers inserted directly from Table 1)

<table>
<thead>
<tr>
<th></th>
<th>Year 0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Purchase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remodeling - space for new clinical pharmacists</td>
<td>$20,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Capital Expenses</td>
<td>$20,000</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Ongoing Operating Expenses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional pharmacist labor required for medication reconciliation</td>
<td>$390,625</td>
<td>$410,156</td>
<td>$430,664</td>
<td>$452,197</td>
<td>$474,807</td>
<td></td>
</tr>
<tr>
<td>Total Annual Operating Expenses</td>
<td>$390,625</td>
<td>$410,156</td>
<td>$430,664</td>
<td>$452,197</td>
<td>$474,807</td>
<td></td>
</tr>
<tr>
<td>Ongoing Savings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adverse drug event (ADE) treatment costs avoided(^1)</td>
<td>$3,351,600</td>
<td>$3,351,600</td>
<td>$3,351,600</td>
<td>$3,351,600</td>
<td>$3,351,600</td>
<td></td>
</tr>
<tr>
<td>Nurse time savings (time avoided) for other clinical activities(^2)</td>
<td>$304,688</td>
<td>$319,922</td>
<td>$335,919</td>
<td>$352,714</td>
<td>$370,350</td>
<td></td>
</tr>
<tr>
<td>Institution specific sensitivity analysis(^3)</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total Annual Savings Potential</td>
<td>$3,656,288</td>
<td>$3,671,522</td>
<td>$3,687,519</td>
<td>$3,704,314</td>
<td>$3,721,950</td>
<td></td>
</tr>
<tr>
<td>Total Annual Net Savings (Cost)</td>
<td>($20,000)</td>
<td>$3,265,663</td>
<td>$3,261,366</td>
<td>$3,256,855</td>
<td>$3,252,117</td>
<td>$3,247,143</td>
</tr>
<tr>
<td>Cumulative Net Savings (Cost)</td>
<td>($20,000)</td>
<td>$3,245,663</td>
<td>$6,507,029</td>
<td>$9,763,884</td>
<td>$13,015,999</td>
<td>$16,263,142</td>
</tr>
</tbody>
</table>

1. This calculation assumes that 1 per 100 medication errors avoided as a result of pharmacist-performed medication reconciliation would have resulted in a harmful adverse drug event had the error not been intercepted by the pharmacist (see assumptions table for details). Organizations may wish to use a more conservative estimate based on their own analysis.
2. Analysis assumes that nursing time savings will be achieved and savings will be recognized via reallocating nurse time to other valuable patient care services.
3. In addition to the above stated patient safety and nursing time savings benefits, additional benefits may accrue as a result of pharmacist-performed medication reconciliation activities. It is up to each organization to determine whether or not financial savings should be included in the above ROI as a result of these savings. This ROI assumes no financial savings from these benefits.

Other Advantages:
- Reduced litigation expense for hospital.
- Improved pharmacist, nurse and physician satisfaction, resulting in improved staff recruitment and retention.
- Improved physician trust in clinical pharmacists, thus making future targeted pharmacist-lead drug cost reduction efforts more achievable.
- Public relations benefit for the hospital.
- Improved regulatory compliance.

Source: This template was presented by Steve Rough, MS RPh, at the American Society of Health-System Pharmacists Summer Meeting, June 26, 2006. Used with permission.
The same template can be applied to other disciplines (nurses, pharmacy technicians, physicians, etc.) as well as other transitions in care (transfer, discharge). By using published error data or by looking at errors in your own institution, you will be able to calculate the number of harmful medication errors per year that can be avoided by adding dedicated staff to obtain complete and accurate medication histories and perform medication reconciliation.

By applying a dollar amount to each ADE, a gross annual savings can be calculated for the amount of ADEs that can be avoided from effective medication reconciliation on all patients. Next, by plugging in numbers on the count of inpatient admissions, transfers and/or discharges per year and the time of medication reconciliation at the given transition, you would be able to estimate additional full-time equivalents needed. By applying the cost of an FTE for additional staff, you can subtract the cost of the added staff from the annual gross savings of preventing a harmful medication reconciliation error to get the annual net savings of increasing staffing resources for medication reconciliation on every patient.

**Business case – Example 3**

At Northwestern Memorial Hospital in Chicago, two pharmacists participated in a medication reconciliation study of 651 general medicine patients. The time requirements to obtain medication histories and perform medication reconciliation were tracked (see Table 1.1). Information such as this can be helpful to calculate the number of pharmacist FTEs needed if your organization decides to implement a pharmacist medication reconciliation program that involves obtaining medication histories and performing medication reconciliation.
Chapter 1

Educational case studies

Many healthcare providers may be resistant to medication reconciliation not because they don’t want to follow the rules but because they do not see why medication reconciliation is so important. This is where a dose of reality can go a long way: Case studies and/or examples of actual medication discrepancies in your facility serve to define the reality of the problem and the need for remedy.

Examples of medication discrepancies leading to errors in your facility or sample case studies can make the problem real for your audience. The following sample case studies will provide your audience with an opportunity to visualize how clinical processes could fail and lead to patient harm. Additional examples can be found at the Agency for Healthcare Research and Quality (AHRQ) webM&M28, an online Web resource of morbidity and mortality rounds. Cases and commentaries have been published highlighting medication reconciliation. One such case is titled “Reconciling Doses,” with commentary by Frank Federico, RPh, Director of the Institute for Healthcare Improvement.29

<table>
<thead>
<tr>
<th>Time Requirements for Pharmacist-obtained Medication Histories and Reconciliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average time to obtain medication history</td>
</tr>
<tr>
<td>Average time to obtain medication history and provide necessary interventions/ documentation</td>
</tr>
<tr>
<td>Average time for chart review prior to medication history, medication history interview, and necessary interventions/documentation</td>
</tr>
</tbody>
</table>

Based on an evaluation of 651 general medicine patients interviewed by a research pharmacist who obtained a complete medical history and reconciled medications with other documented medication histories and current orders at Northwestern Memorial Hospital in Chicago.
The following sample case studies will be helpful in making the case for medication reconciliation. These examples can be used for morbidity and mortality rounds, online tutorials, presentations, etc. Use these examples “as is,” or use them as a guide for how to present case studies of adverse events that were attributed to a lack of medication reconciliation at your organization.

After completing these case studies, you will be able to describe the roles of each caregiver in the medication reconciliation process, identify when medication reconciliation must be done during a patient’s hospital course, and describe how the completion of medication reconciliation for every patient will decrease medication errors and harm.

**Example 1: Medication reconciliation on admission**

A 40-year-old patient presented with complaints of chronic left upper arm pain and swelling. Patient’s past medical history included: end-stage renal disease (ESRD), multiple deep vein thromboses (DVTs), hypertension (HTN), bone fractures secondary to renal bone disease, anemia, and hypothyroidism. On admission, the physician interviewed the patient to obtain a history and physical. The patient had brought in prescription bottles to the hospital and the physician recorded all the medications and doses. The physician then placed the admitting medication orders.

Following the physician-patient interview, a pharmacist interviewed the patient to obtain a medication history. The pharmacist also referenced the patient’s medication bottles previously used by the physician. The following table includes the medication histories from the physician and pharmacist and the admitting medication orders. All medications were documented and ordered as oral medications.
Critical thinking

1) In Case 1, what were the discrepancies between:
   • The physician medication history and the admitting medication orders?
   • The physician and the pharmacist medication histories?
   • The medication histories documented by the physician and pharmacist and the admitting medication orders?

2) If the physician and the pharmacist were both interviewing the same patient and both referenced the patient’s medication bottles, what would cause such discrepancies in the medication histories obtained and the admitting medication orders placed?

Table 1.3 highlights (in italicized font) the differences in the medication histories of
Get Everyone On Board

Medication reconciliation, Second edition

Case 1 analysis
This case highlights the importance of obtaining a complete and accurate history on admission to the hospital and reconciling the home medication list with the admission orders.

When a patient is admitted to the hospital, he or she is often overwhelmed with everything that is going on. Engaging patients in a dialogue about their medication regimen may ensure a more comprehensive medication history than asking “closed-ended” questions. If a patient brings in prescription bottles and/or a medication list, we have a good start to obtaining a complete and accurate medication history, but it should not stop there. It is very important to go over the prescription bottles and/or

<table>
<thead>
<tr>
<th>Physician H&amp;P</th>
<th>Admitting orders</th>
<th>Pharmacist review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prednisone 1mg daily</td>
<td>Prednisone 1mg daily</td>
<td>Prednisone 2mg daily</td>
</tr>
<tr>
<td>Synthroid 0.025mg daily</td>
<td>Synthroid 0.025mg daily</td>
<td>Synthroid 0.1mg daily</td>
</tr>
<tr>
<td>Sirolimus 6mg daily</td>
<td>Sirolimus 5mg daily</td>
<td>Sirolimus 6mg daily</td>
</tr>
<tr>
<td>Warfarin 7.5/5mg daily, alternating schedule</td>
<td>Hold Warfarin</td>
<td>Warfarin 7.5mg MWF, 5mg Tu/Th/S/S</td>
</tr>
<tr>
<td>Nifedipine XL 60mg daily</td>
<td>Nifedipine XL 60mg daily</td>
<td>Nifedipine XL 60 mg twice daily</td>
</tr>
<tr>
<td>Enalapril 10mg daily</td>
<td>Enalapril 10mg daily</td>
<td>Enalapril 10mg daily</td>
</tr>
<tr>
<td>Furosemide 40mg daily</td>
<td>Furosemide 40mg daily</td>
<td>Furosemide 40mg daily</td>
</tr>
<tr>
<td>Calcitriol 0.5mcg daily</td>
<td>Calcitriol 0.5mcg daily</td>
<td>Calcitriol 1mcg in AM and 0.5mcg in PM</td>
</tr>
</tbody>
</table>
medication list with the patient and/or patient's family. It is essential to remember that the bottles or medication list may not be updated to reflect how the patient is currently taking medications.

For example, in the case above, the patient’s medication bottle read “Nifedipine XL 60mg daily,” which the physician documented in the history and physical (H&P) and ordered on admission. When the pharmacist interviewed the patient, he specifically asked the patient if they were still on that same dose of Nifedipine XL. The patient responded that the dose had recently been increased to Nifedipine XL 60mg twice daily—this atypical daily dosing of an extended release product was helping maintain good blood pressure control in this individual patient.

A good rule of thumb is that information about a patient’s medications found in previous medical records, on prescription bottles or on a patient’s own medication list are a great place to start when compiling a medication history, but you must always verify with the patient or the patient’s family that the information is up to date before making any assumptions about what the patient was taking prior to admission.

The second error occurred when the physician placed an order for sirolimus 5mg daily instead of 6mg daily. This discrepancy was noted when the pharmacist reconciled the medication history to the inpatient orders. Not only is it important to get a complete and accurate medication history, it is important to reconcile that list with inpatient orders to make sure no errors occurred. If this error had gone unnoticed, the patient could have become subtherapeutic on this immunosuppressive medication.
The case example above has other errors:

- During the patient interview, these discrepancies were identified:
  - Synthroid was 0.1mg, not 0.025mg
  - Prednisone was 2mg Daily, not 1mg Daily
  - Calcitriol was 1mcg every morning and 0.5mcg every evening, not 0.5mcg Daily
- Additional potential discrepancies:
  - Warfarin was 5mg Tu/Th/Sat/Sun and 7.5mg MWF, but was held on admission. The potential existed for the patient to go home on a dose of 7.5mg/5mg alternating schedule.

The same concepts apply to the other medication discrepancies found between the physician medication history, the pharmacist medication history, and the admission medication orders.

**Conclusions, case study 1**

- Obtaining a complete and accurate medication history on admission is an important step in making sure a patient’s home medications are documented and ordered appropriately
- There can be multiple information sources to obtain a patients medication history but it is imperative that the information is only used as a starting point and does not replace a conversation with the patient and/or patient’s family to obtain the most up-to-date medication information
- After obtaining the complete and accurate medication history, it is important to compare that information to current inpatient orders to verify that all medications were ordered appropriately
Example 2: Medication reconciliation on discharge

An 87-year-old male with a past medical history of coronary artery disease, heart failure, atrial fibrillation, hypertension and severe mitral regurgitation was holding his warfarin in preparation for a procedure. The patient had the procedure as an outpatient and tolerated the surgery without any complications. The patient was discharged home with written instructions not to take any aspirin or non steroidal anti-inflammatory drugs (NSAIDs) for 10 days after the procedure, but when to restart the warfarin was not specifically addressed.

About 12 days after the procedure, the patient experienced shortness of breath and went to the emergency department (ED). The ED drew an International Normal Ratio (INR) which was 1, and it was then learned that the patient had never resumed his warfarin after the initial procedure. A work-up revealed a pulmonary embolus. The patient was admitted, treated accordingly and after close monitoring, he was discharged from the hospital about two weeks later.

Critical thinking

1. At what point in the hospital stay was medication reconciliation done?
2. When is medication reconciliation required by The Joint Commission?
3. What could have been done differently to prevent this medication error?

Case 2 analysis

On admission for his procedure, a complete medication history was taken and documented in the medical record. The patient had appropriately stopped the warfarin therapy prior to an invasive procedure. On discharge, the process did not work effectively. The patient was instructed not to take aspirin or non-steroidals but no instructions were provided for the other medications. Due to the lack of communication and appropriate documentation, the patient assumed he was to continue to hold his warfarin.
This case highlights the need for medication reconciliation on discharge. Although a medication history was obtained and documented for this patient in the medical record, the lack of discharge medication reconciliation caused this error. This case highlights that it is imperative that patients leave the clinical setting with an updated list of home medications that includes all new prescriptions as well as a detailed list of what previous home medications are to be continued, continued with modifications, or discontinued. This updated list should be given to the patient as well as the next provider of care. In addition to giving a patient an updated medication list, counseling the patient on the changes in the medication regimen will reinforce what changes were made as well as allow the patient and/or patient’s family to ask questions about the new medication regimen.

Conclusions, case study 2

- Medication reconciliation is important at ALL transitions in care.
- An updated home medication list outlining any changes to their preadmission regimen must be given to the patient and communicated with the next provider of care.
- Counseling patients on recent changes made to their home medication list at discharge will increase compliance with medication regimens and decrease harm associated with medication reconciliation failures at discharge.

Example 3: External transfer medication reconciliation

A 49–year-old female with a recent diagnosis of breast cancer was admitted for spinal surgery due to spinal fractures with metastatic disease. The patient did well and was
discharged home. Several days after discharge, the patient presented to a different healthcare facility with fever. Blood cultures came back positive and the patient was started on intravenous antibiotics.

Three days into the hospital stay, the patient requested transfer to the original hospital that did her surgery based on concerns regarding her insurance coverage. At the time of transfer, the patient was afebrile. The patient was transferred to the original hospital, but antibiotics were not continued at that time due to poor communication and handoffs between the two facilities. As the patient was not improving, a close review of the copied chart sent by the transferring facility revealed the antibiotic omission. Antibiotics were resumed accordingly, and the patient improved.

**Critical thinking**

1. Would medication reconciliation have prevented this error? If so, how?
2. What is the process at your organization for external transfer patients and would it have been able to prevent a similar event from occurring?
3. What disciplines are expected to reconcile medications for external transfer patients at your organization?

**Case 3 analysis**

External transfer situations can be extremely complex. Any time patients are transferred from another institution or a different level of care within the same institution, they are at risk for medication errors. There is so much information in the medical record on each patient that it can be very time-consuming and difficult to identify exactly what medications a patient was receiving at another institution.

The previous case highlights the need for a complete review of the patient’s medication regimen at the outside institution as well as a careful check that no medications were omitted from the patient’s care plan at the new care setting.
Depending on how an organization addresses external transfer patients, a physician, nurse, and/or pharmacist must pay very close attention to all medications the patient was taking at the outside institution and taking at home compared to what is ordered in the new care setting.

Conclusions, case study 3

- External transfer is a vulnerable process for medication error
- Thorough review of a patient’s medications given at an outside institution is crucial in order to make decisions about what medications need to be ordered at the new care setting
- Medication reconciliation is an essential process for external transfer patients to ensure the patient’s medications at the outside hospital are ordered appropriately at the new care setting
- A process can be established so that physicians, nurses and/or pharmacists can help ensure that all medications are reviewed and ordered appropriately for external transfer patients

Lessons Learned in Making the Case

- Organizations may be experiencing "change fatigue" with the many initiatives and new technologies being implemented; a strong case must be made to senior leadership to make medication reconciliation an organizational priority.
- Communicate to ALL staff the importance of medication reconciliation so it is not perceived as "just another task.
- Engage senior leadership early and educate them about medication reconciliation and the impact on patient safety.
Creating a business case for medication reconciliation may help increase resources to counteract the additional workload that medication reconciliation has on an organization.

Use external and/or internal medication reconciliation data and/or case studies to reinforce the importance of medication reconciliation and the impact on patient safety.

Defining the Problem

Now that you have obtained leadership buy-in for an organizational focus on medication reconciliation and have the attention of staff regarding the need for a standardized, consistent process from a workload and patient safety perspective, the next step is to define the problem to help develop and implement a solution. The Institute for Healthcare Improvement (IHI) is an example of one organization that has done a tremendous amount of work defining patient safety problems and developing workable solutions, including for medication reconciliation.

In the book titled *Escape Fire*, Donald Berwick, President and CEO of the Institute for Healthcare Improvement, described five preconditions that give us a chance at “sensemaking.” The first precondition he identifies is the toughest: “We need to face reality.” Although Dr. Berwick was referring to the healthcare system as a whole, a process like medication reconciliation faces the same challenges.

Understanding your current process is crucial to understanding what works and what needs to be improved. Finding problems within your current system can be an eye-opening experience, but you must have the end goal in mind. By defining the problem and identifying the best and worst about the current system, you will be able to create a solution that is more efficient and improves patient safety.
There are several methods that can be used to improve your process such as FMEA, DMAIC, Lean Principles, and the Model for Improvement methodologies for quality improvement. We will highlight a few of these; the concepts can be applied to understand your current medication reconciliation process and improve medication reconciliation at your organization.

**Failure Mode and Effects Analysis**

The purpose of an FMEA is to describe the prospective analysis of a process to ensure:

- “All” that could potentially go wrong with a process has been recognized, and
- Actions are taken to prevent or mitigate failures

An FMEA is a systematic method of identifying and preventing product and process problems before they occur. FMEAs are focused on preventing defects, enhancing safety, and increasing customer satisfaction. Ideally, FMEAs are conducted in the product design or process development stages, although conducting a FMEA on existing products and processes may also yield significant benefits.

An FMEA is a team effort. To fully understand a process you need all disciplines involved in that process to participate in the analysis. The purpose of the FMEA team is to bring a variety of experiences and perspectives to the project so that every step in the process can be fully understood. Including frontline personnel is essential to understanding the process.

An FMEA team leader needs to be appointed to coordinate the team efforts. The leader is responsible for setting up and facilitating meetings, keeping the team on track, and ensuring the team has the necessary resources. It is also important to involve all stakeholders in the process from the beginning so they become fully invested in not only defining the problem but making sure the recommended actions are implemented.
**FMEA presentations and tools**

The “FMEA Overview” PowerPoint presentation, included on the accompanying CD-ROM, introduces the evolution of the FMEA process as well as key goals and definitions used in a FMEA process. This may be a helpful presentation to give when you have an audience that has never been involved in an FMEA and needs to be educated on where FMEA originated and what is involved.

The “Application of FMEA to Medication Reconciliation” PowerPoint presentation on the CD-ROM applies the concepts of a FMEA to medication reconciliation. This presentation shows how one hospital used the FMEA methodology to address the current medication reconciliation process upon admission.

Figure 1.3 and Figure 1.4 provide some common tools used in collecting data and calculating FMEA results.

<table>
<thead>
<tr>
<th><strong>Figure 1.3</strong></th>
<th><strong>SAMPLE FMEA DATA COLLECTION TOOL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process:</strong></td>
<td><strong>FMEA start date:</strong></td>
</tr>
<tr>
<td><strong>Team Leader:</strong></td>
<td><strong>Target Completion date:</strong></td>
</tr>
<tr>
<td><strong>Core Team:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Item/Function (Process and Subprocess)</strong></td>
<td><strong>Potential failure mode(s)</strong></td>
</tr>
<tr>
<td><strong>Potential effect(s) of failure</strong></td>
<td><strong>Severity</strong></td>
</tr>
<tr>
<td><strong>Potential course(s) of failure</strong></td>
<td><strong>Occurrence</strong></td>
</tr>
<tr>
<td><strong>Current process/design controls</strong></td>
<td><strong>Detection</strong></td>
</tr>
<tr>
<td><strong>RPN</strong></td>
<td><strong>Recommendation action(s)</strong></td>
</tr>
</tbody>
</table>

---

**Figure 1.3** Sample FMEA data collection tool

**Figure 1.4**
Sample FMEA Final Report

Background: Insert information that explains why the FMEA team was brought together.

Goal: Insert the goals the FMEA team developed at the beginning of the project.

Objectives: Insert the objectives of the FMEA.

FMEA Team: The multidisciplinary FMEA team consisted of members from the following disciplines (insert team members, examples below):

- Staff nurse
- Physician
- Staff pharmacist
- Nurse director/manager
- Pharmacy director/manager
- FMEA team leader
- Quality manager

The team met every _____ over the course of ____ months in order to perform the FMEA analysis. The team was responsible for brainstorming and identifying the failure modes and risk analysis as well as recommended risk reduction methods. At the initial meeting, the team leader/s educated the team about the FMEA purpose and process. In addition, the team leaders recorded and facilitated accurate documentation of all suggestions made by the team members during the FMEA process meetings.
Methodology:
The team evaluated each process and sub process of the ________ process. They analyzed the ways each process could potentially fail to perform its intended function and their potential effects; as well as, the safeguards that act to prevent these failures from occurring. The following are sample questions that were used:

- What is the intended function?
- What are the possible failures?
- What would the effect be if the failure did occur?
- What mechanism or cause might produce a failure?
- What current controls are provided to prevent the failure or to compensate for it?

Analysis:
The team identified the severity, occurrence and detection ratings for each failure mode. After they brainstormed each failure mode, the team used their clinical judgment when they assigned their ratings using a (1-10 or 1-5) linear scale. This process yielded a risk priority number (RPN). They first rated the severity of the failure mode. The severity was rated based on using a high acuity patient as an example who was receiving high risk medications. The occurrence ratings were assigned based on frequency of occurrence. The team focused its attention to potential failure having an RPN greater than _____. This is ____% of a possible (1000 or 125, based on linear scale used) RPN score, thus trimming the least potentially harmful ____% events, for improved focus.

Sample FMEA Final Report (cont.)
following were sample questions and rankings used for the severity, occurrence and detection ratings:

**Risk priority numbers (example of 1-5 linear scale, insert definition of rating scale used in FMEA):**

<table>
<thead>
<tr>
<th>Severity</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Failure does not reach patient</td>
</tr>
<tr>
<td>2.</td>
<td>Failure reaches patient</td>
</tr>
<tr>
<td>3.</td>
<td>Failure requires monitoring</td>
</tr>
<tr>
<td>4.</td>
<td>Failure requires intervention</td>
</tr>
<tr>
<td>5.</td>
<td>Failure results in death</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occurrence</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>(1) failure per year</td>
</tr>
<tr>
<td>2.</td>
<td>(1) failure per quarter</td>
</tr>
<tr>
<td>3.</td>
<td>(1) failure per month</td>
</tr>
<tr>
<td>4.</td>
<td>(1) failure per week</td>
</tr>
<tr>
<td>5.</td>
<td>(1) failure per day</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Detection</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>100% of the time</td>
</tr>
<tr>
<td>2.</td>
<td>Almost always</td>
</tr>
<tr>
<td>3.</td>
<td>75% of the time</td>
</tr>
<tr>
<td>4.</td>
<td>50% of the time</td>
</tr>
<tr>
<td>5.</td>
<td>Not detectable</td>
</tr>
</tbody>
</table>
One organization’s FMEA results may not apply to other organizations; that is why it is important to conduct your own FMEA to get a better understanding of the current medication reconciliation process at your own organization.

*It is important to understand that every organization will have different FMEA results.*

**The Model for Improvement**

The Model for Improvement, developed by Associates in Process Improvement, is a simple yet powerful tool for accelerating improvement. The model is not meant to replace change models that organizations may already be using, but rather to accelerate improvement. It has been used successfully by hundreds of healthcare organizations in many countries to improve many processes and outcomes.
The model has two parts:

- Three fundamental questions, which can be addressed in any order.
- The Plan-Do-Study-Act (PDSA) cycle\textsuperscript{33} to test and implement changes in real work settings. The PDSA cycle guides the test of a change to determine if the change is an improvement.

The steps included in the Model for Improvement include:

1. **Team formation**
   Teams may vary in size and composition, but including the right people on a process improvement team is crucial for a successful improvement effort.

2. **Setting goals**
   Improvement requires setting goals. Goals should be time-specific and measurable; and it is important to define the specific population of patient that will be affected.

3. **Establishing measures**
   Measurement is a critical part of testing your changes—teams must use quantitative measures to determine if a specific change actually leads to improvement.

4. **Selecting change**
   All improvement requires making changes, but not all changes will result in improvement. Organizations must identify the changes that are most likely to result in improvement.

5. **Testing change**
   The PDSA cycle is shorthand for testing a change in the real-work setting. See the sample worksheet in Figure 1.5, which includes steps for:
What is the goal of this project? _____________________________________________
_________________________________________________________________________
Describe your first (or next) test of change: ______________________________________
_________________________________________________________________________
Person(s) responsible: _____________________________________________________
When will this be done? ___________________________________________________
Where? _________________________________________________________________

**Plan**

What tasks must be done to set up this test of change?
Person(s) responsible: ____________________________________________________
When will this be done? ___________________________________________________
Where? _________________________________________________________________
What will happen when the test is carried out? ________________________________
_________________________________________________________________________
Measures to determine if prediction succeeds: _________________________________

**Do**

What actually happened when the test was run? _______________________________
_________________________________________________________________________

**Study**

Describe the measured results: How did they compare to predictions? __________
_________________________________________________________________________

**Act**

What modifications to the plan must be made for the next cycle? ________________
_________________________________________________________________________
• planning a change
• predicting what will happen
• trying it
• observing and measuring the results
• acting on what is learned

This is the scientific method used for action-oriented learning.

6. Implementation

After testing a change on a small scale and learning from each test, and refining the change through several cycles, your team can implement changes on an entire pilot population or perhaps on an entire unit.

7. Change on a wider scale

After successful change implementation for a pilot population or an entire unit, the team can spread the change to other departments of the organization or to additional organizations.

Lessons Learned in Defining the Problem

• Do not underestimate the scope of medication reconciliation. It includes ALL physicians, nurses and pharmacists for EVERY patient at EVERY transition of care

• Next to computrized prescriber order entry (CPOE), medication reconciliation may well be the most difficult and widespread process you will have to implement at your organization

• Be willing to look at the current failures in your system to define the areas that need improvement

• Stakeholders must be identified and involved in the improvement process from
the beginning stages of defining the problem

- Including the right people on a process improvement team is crucial to a successful improvement effort

- Disciplined use of methodology and tools is fundamental to successful changes

## Endnotes


32. *The Improvement Guide: A Practical Approach to Enhancing...*