

*This article describes the medication reconciliation process applied on hospital discharge of patients to home with home care services within Seton Health System, an integrated health delivery network located in Troy, New York. The project, which was not research based, was characterized by an intensive pharmacotherapeutic medication reconciliation at hospital discharge by the hospital-based pharmacist with continued pharmacist support available to home healthcare nurses collaboratively at the time of start of care and resumption of care. The goal of this process was to identify and resolve medication-related problems and reduce hospital readmissions.*



# A Systems-Based Medication Reconciliation Process

## *With Implications for Home Healthcare*

According to The Joint Commission (2006), medication reconciliation is the process of comparing a patient's medication orders to all of the medications that the patient has been taking. This reconciliation is done to identify and resolve medication discrepancies, which are unintended or unexplained differences among documented medication lists across different sites of care.

Examples of medication discrepancies are omissions, duplications, and dosing errors. The application of intensive pharmacotherapeutics to the medication reconciliation process, in excess of merely identifying discrepancies on a medication list, involves the identification and resolution of medication-related problems, including assessment of adherence to evidence-based

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guidelines and clinical appropriateness of therapy. Importantly, intensive pharmacotherapy is concerned with how the medication treatment of one diagnosis may actually interfere or be compromised by medications prescribed for comorbid diagnoses. Medication reconciliation should be done at every transition of care in which new medications are ordered or existing orders are rewritten, the ultimate goal being a single discrepancy-free medication list shared by all disciplines across all sites of care (a “one source of truth” document).

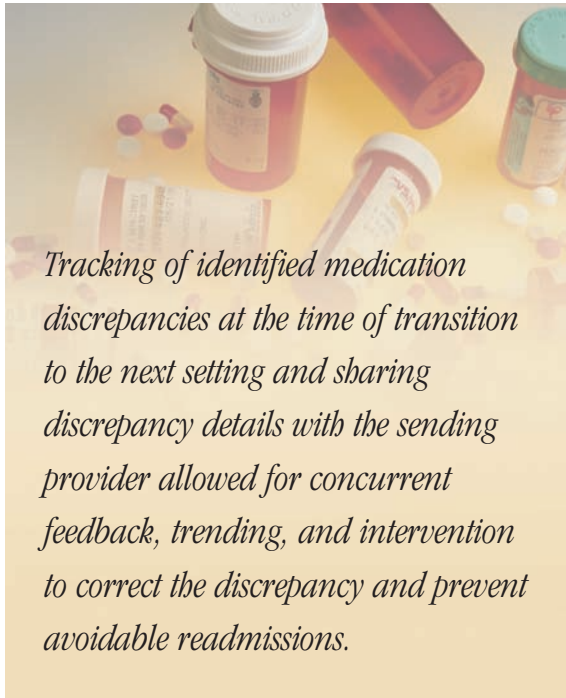
Care transitions present multiple challenges for patients, caregivers, and healthcare providers, including securing the level of collaboration needed to produce a discrepancy-free, therapeutically sound medication list. Unfortunately, medication discrepancies upon hospital discharge are pervasive. A study by Wong et al. (2008) estimated that 70% of patients experience an actual or potential unintended discrepancy at hospital discharge, which can then precipitate an adverse drug event (ADE). Bates et al. (1995, p. 29) define an ADE as “an injury resulting from medical intervention related to a drug.”

ADEs can result in patient harm and are costly. Estimates of preventable ADEs identified within hospitals, nursing homes, and ambulatory care range between 27% and 50% (Bates et al., 1995; Classen et al., 1997; Gandhi, 2003; Gurwitz et al., 2003, 2005). ADEs and issues with medication reconciliation across care settings are major drivers for hospital readmission (Zhang et al., 2009). Identifying and resolving medication discrepancies upon transfer from hospital to home healthcare to prevent ADEs is a major focus of The Joint Commission’s (2011) National Patient Safety Goal on Medication Reconciliation.

Home healthcare nurses are well aware of the effort needed to navigate the complex interventions required when reconciling medications upon patient home care admission or resumption of



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*Tracking of identified medication discrepancies at the time of transition to the next setting and sharing discrepancy details with the sending provider allowed for concurrent feedback, trending, and intervention to correct the discrepancy and prevent avoidable readmissions.*

care. This reconciliation may involve making phone calls to pharmacies and prescribers in an effort to determine an accurate medication regimen. There are few descriptions of pharmacist-home healthcare nurse medication reconciliation collaborations in the literature. A randomized controlled trial using a collaborative medication management process between a clinical pharmacist and home healthcare nurses significantly reduced the incidence of therapeutic duplication in the cohort (Meredith et al., 2002). Setter and colleagues (2009) showed in a study of 220 patients 50 years of age or older that pharmacist-home care nurse collaboration was effective in resolving medication discrepancies for patients transitioning from hospital to home healthcare (discrepancy resolution rate of 67%), but did not result in decreased hospitalizations or healthcare use.

### **The Collaborative Medication Reconciliation Process**

The focus of this project was to identify and resolve medication-related problems and reduce hospital readmissions through a medication reconciliation collaboration between Seton Home Health Care, a Medicare-certified home healthcare agency (HHA), and Seton Health/St. Mary's

Hospital, a voluntary not-for-profit integrated health delivery network. This medication reconciliation initiative was an integral component to Seton Health System's participation in the Centers for Medicare & Medicaid Services (CMS) Care Transitions Initiative, facilitated by IPRO, the New York Medicare Quality Improvement Organization (QIO).

Seton Home Health Care serves an urban and rural mixed client base with over 42,000 home visits in 2010. Intensive case management was performed by St. Mary's Hospital case managers, the hospital pharmacist, and the Seton Home Health Care hospital liaison on a high-risk readmission target population pre- and posthospital discharge outlined in Figure 1. Seton Home Health Care used dedicated staff consisting of two nurse case managers and two physical therapists to perform all start of care (SOC)/resumption of care (ROC) Outcome and Assessment Information Set (OASIS)-C assessments. Patients diagnosed with heart failure, chronic obstructive pulmonary disease (COPD), pneumonia, and diabetes housed on two nursing units in St. Mary's Hospital and discharged from September 1, 2008, to June 30, 2010, were the targeted population. An interdisciplinary Care Transitions Readmission Committee with representation from the pharmacist, the director of the hospital physician program, the director of case management, the director of palliative care, case managers, and IPRO representatives was established with monthly team meetings conducted to identify and ameliorate communication and care coordination gaps.

The intensive medication reconciliation process outlined in Figure 2 began when the patient was admitted to St. Mary's Hospital. The hospital admitting nurse completed a list of medications the patient was taking at home and entered the information into an electronic database managed by the pharmacy. If the patient being admitted to the hospital was a known Seton Home Health Care patient, the HHA faxed a list of the medications that the patient was taking at home to the hospital pharmacy and the hospital admitting unit. The hospital pharmacist then compared this list to the hospital admitting orders and to the medication list retrieved from the Regional Health Information Organization (RHIO). The RHIO is a secure electronic health information exchange service that provides access to community-wide patient medical data based on patient consent.

**Figure 1.** Patient risk factors for readmission.

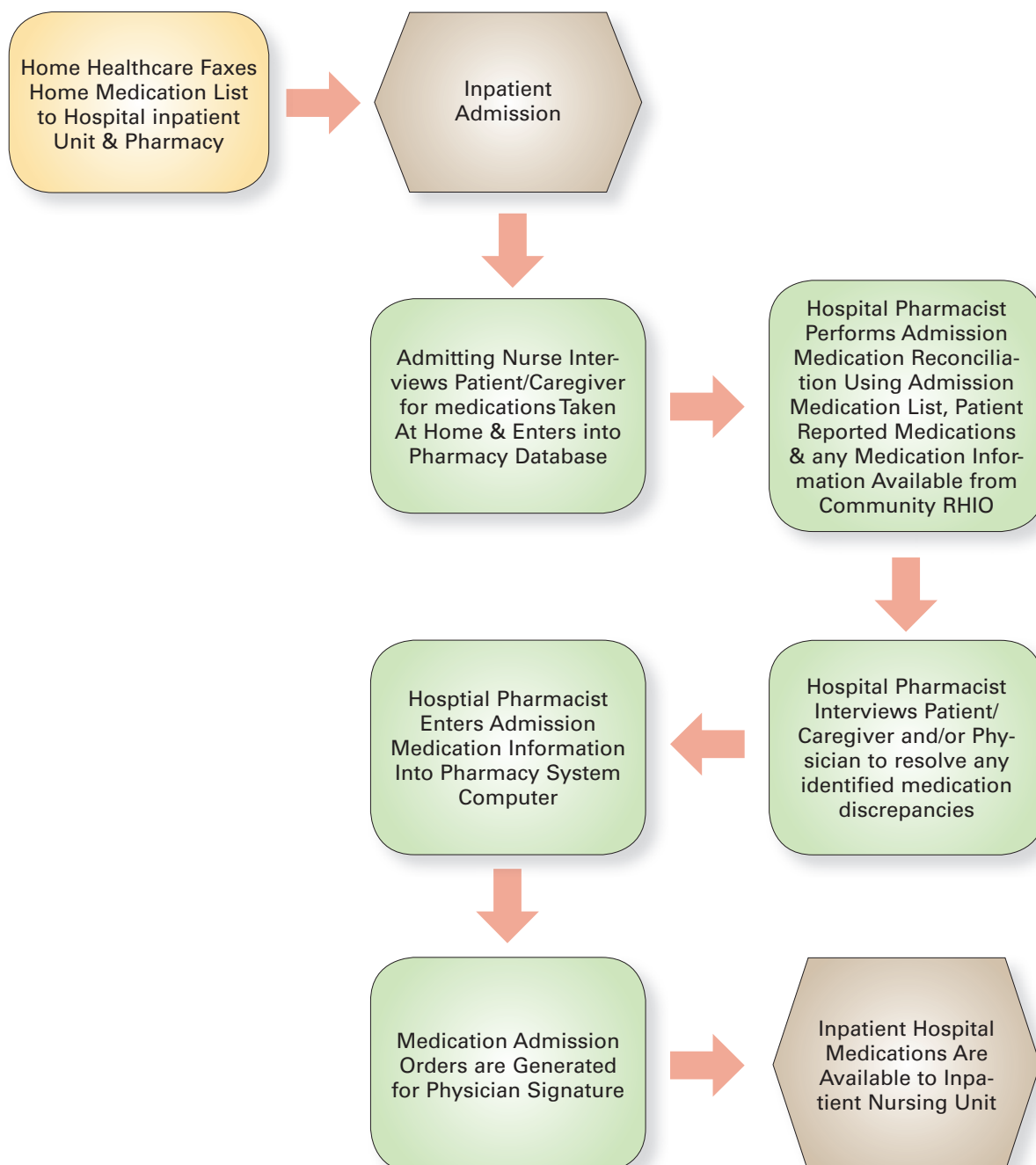
Discharge Criteria		
CHECK ALL THAT APPLY		
Low Risk Discharge	Moderate Risk Discharge	High Risk Discharge
<input type="checkbox"/> Independent in ADL's <input type="checkbox"/> Caregivers in the home and available to assist <input type="checkbox"/> Lives alone with community support <input type="checkbox"/> Independent with management of chronic disease/meds <input type="checkbox"/> Adherent to treatment plan <input type="checkbox"/> Able to direct medical care <input type="checkbox"/> Consistently followed by MD/Practitioner	<input type="checkbox"/> Lives alone with limited community support <input type="checkbox"/> Requires assistance with medications <input type="checkbox"/> Issues of health literacy <input type="checkbox"/> History of mental illness <input type="checkbox"/> Polypharmacy (greater than 7 meds) <input type="checkbox"/> Requires temporary assistance with IADL's and ADL's <input type="checkbox"/> Requires assistance in: <ul style="list-style-type: none"> <li>• Ambulating      • Transferring</li> <li>• Wound Care    • Management of oxygen and/or nebulizer</li> </ul> <hr/> <i>If ≥ 2 then refer to home healthcare agency</i>	<input type="checkbox"/> Lives alone with no community support <input type="checkbox"/> Lives with family that is not actively involved in care <input type="checkbox"/> Clinically complex (multiple co-morbidities, repeat hospitalizations or ED visits, needs considerable assistance to manage or is unable to manage medical needs independently) <input type="checkbox"/> History of falls <input type="checkbox"/> Acute/chronic wound or pressure ulcer <input type="checkbox"/> Incontinent <input type="checkbox"/> Cognitive impairment <input type="checkbox"/> History of mental illness <input type="checkbox"/> CHF and/or COPD and/or diabetes and/or HIV/AIDS <input type="checkbox"/> End stage condition <input type="checkbox"/> Requires considerable assistance in: <ul style="list-style-type: none"> <li>• Transferring</li> <li>• Ambulating</li> <li>• Medication management (greater than 7 meds)</li> <li>• Management of oxygen and/or nebulizer</li> </ul> <hr/> <i>If ≥ 4 then refer to home healthcare agency upon patient admission to hospital</i>
<p style="text-align: center;"><b>Discharge to Community</b></p> <p><i>Refer to home care services (Including patients who reside in Adult Home or Assisted Living Facility)</i></p>	<p>Patient received services from home care prior to hospitalization?</p> <input type="checkbox"/> Yes <input type="checkbox"/> No   If Yes, name of agency:	<hr/> <p style="text-align: center;"><b>Refer to home care services for:</b></p> <p><i>Skilled Nursing</i></p> <ul style="list-style-type: none"> <li>• Observation and assessment</li> <li>• Teaching and training</li> <li>• Performance of skilled treatment or procedure</li> <li>• Management and evaluation of a client care plan</li> </ul> <p style="text-align: center;">AND/OR</p> <ul style="list-style-type: none"> <li>• Physical, occupational and/or speech therapy</li> <li>• medical social work</li> <li>• Home healthcare aide service for personal care and/or therapeutic exercises</li> <li>• Telehealth Care Management</li> </ul>
<p><b>Other Outpatient Referrals</b></p> <p>Services not provided by home care agencies:</p> <input type="checkbox"/> Outpatient mental health <input type="checkbox"/> Medicaid/Public Assistance <input type="checkbox"/> Social Security Office		<p>This material was prepared by IPRO, the Medicare Quality Improvement Organization for New York State, under contract with the Centers for Medicare &amp; Medicaid Services (CMS), and agency of the U.S. Department of Health and Human Services. The contents presented do not necessarily reflect CMS policy. 8SOW-NY-TSK1B-07-11</p>

Source: IPRO. Permission for use granted.

The RHIO database contains information from hospitals, physician practices, health plans, and pharmacies. The pharmacist then performed a comprehensive therapeutic review that included evaluation of laboratory data, diagnosis information, and application of evidence-based guide-

lines to confirm the drugs were appropriate for the patient. If any medication discrepancies or therapeutic concerns were identified, the pharmacist interviewed the patient and then spoke directly with the prescribing physician to resolve the issue.

**Figure 2.** Hospital admission medication reconciliation process.

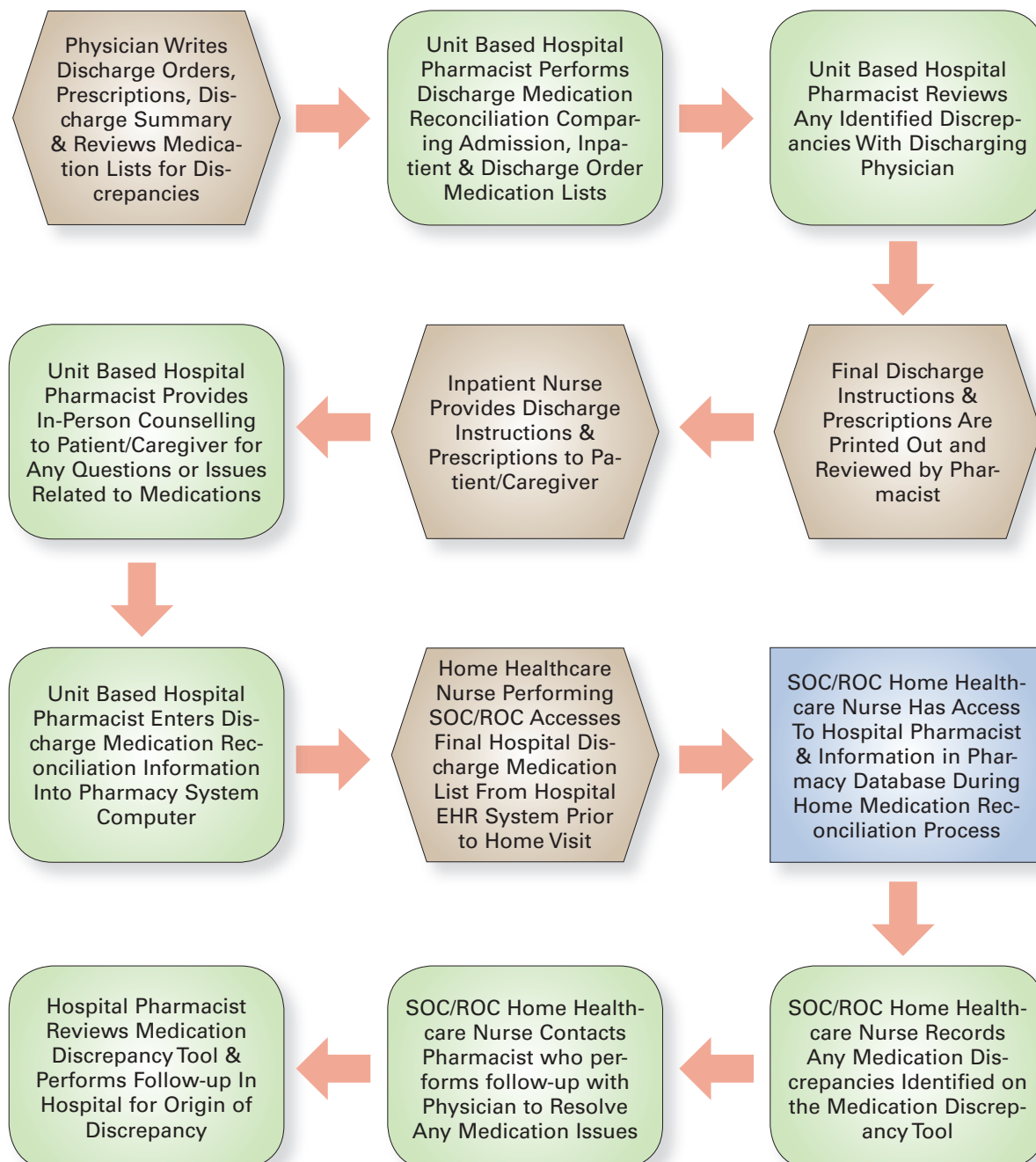


Source: Seton Health System. Permission for use granted.

As outlined in Figure 3, at the time of hospital discharge the attending physician wrote prescriptions for posthospital care and completed the discharge summary, and compared the home medication list provided by Seton Home Health Care upon hospital admission with the patient

self-reported list obtained by the hospital and the list of the active medications the patient took while in the hospital. The hospital pharmacist then reviewed these documents and prescriptions as a second confirmation that they were correct before the hospital nurse provided them

**Figure 3.** Hospital to home healthcare discharge medication reconciliation process.



Source: Seton Health System. Permission for use granted.

to the patient or the patient's family. The pharmacist entered any resultant medication interventions into the pharmacy computer system. If the patient had questions about the medications, the pharmacist provided in-person discharge counseling before hospital discharge.

Prior to the SOC/ROC visit, the home healthcare nurse accessed the patient's final discharge medication list from the hospital electronic health record system. At the time of the home visit, the home healthcare nurse had access to the hospital pharmacist who can retrieve the patient's hospital medication reconciliation performed at discharge to address any medication-related questions or issues the nurse identified within the home setting. Any discrepancies found by the home healthcare nurse are communicated to the hospital pharmacist who communicates with the physician to resolve the identified discrepancy and the home healthcare nurse documented the discrepancy on the Medication Discrepancy Tool (MDT) (Figure 4; see Box 1 for a list of Web resources). This tool was developed by Smith et al. (2004) within the Care Transitions Program: Health Care Services for Improving Quality and Safety During Care Handoffs Initiative. The MDT captures information on the medication name, the discrepancy, if discrepancy is patient- or system-related, and the actions taken to resolve the discrepancy. Medication discrepancies are aggregated and shared with the hospital and pharmacy to address opportunities for system improvement.

An example of the complexity involved with medication reconciliation for patients transitioning from hospital to home care involves an 86-year-old patient with a history of COPD, uncontrolled diabetes, peripheral vascular disease, and prostate cancer who was discharged from the hospital following admission for COPD exacerbation. On admission to Seton Home Health Care, the nurse noted that the patient had several boxes of medications, which the patient identified as being filled by two different pharmacies. While reviewing these home medications with the list of prescribed medications on the hospital discharge instructions, the patient revealed to the nurse that he had forgotten to tell the hospital staff about some of the home medications he was taking upon admission. The home healthcare nurse called the St. Mary's Hospital pharmacist and primary physician and relayed that the patient had Asmanex and Foradil inhalers at home

in addition to separate vials of ipratropium and albuterol for nebulizer treatments. In collaborative discussion, between the pharmacist, physician, and home healthcare nurse, the patient's Advair that was ordered at time of hospital discharge was discontinued. Additionally, the patient was instructed on new dosages of Asmanex and Foradil. Finally, he was instructed not to fill his Duoneb prescription but rather to take the equivalent separate vials of ipratropium and albuterol.

The home healthcare nurse also identified, that on admission, this patient had incorrectly reported his dose of gabapentin and metoprolol that he was taking prior to hospitalization. In discussion with the pharmacist and physician, the in-hospital dosage was confirmed and the gabapentin was increased to prehospitalization dose while the metoprolol was ordered to remain at the discharged dose. The patient was educated on these changes, written directions were provided and the patient was able to verbalize the correct dosages. This example demonstrates the importance of collaborative medication reconciliation required to effectively resolve medication discrepancies.

### Project Outcomes

Tracking of identified medication discrepancies at the time of transition to the next setting and sharing discrepancy details with the sending provider allowed for concurrent feedback, trending, and intervention to correct the discrepancy and prevent avoidable readmissions. Pharmacotherapeutic intervention upon hospital discharge to home healthcare data was collected by the St. Mary's Hospital pharmacy from November 12, 2009, to February 28, 2010. During this period, there were 392 hospital discharges to home healthcare. Pharmacotherapeutic interventions were performed for 254 of the 392 patients (64.8%). The most common interventions were instances requiring evidence-based or best-practice clinical guideline compliance (17%), followed by resolution of duplication of therapy or incompatibility or omission of therapy (10%). Frequently encountered medication-related problems (Table 1) were inadequate or inappropriate anticoagulant management (11%), presence of heart failure diagnosis without order for a diuretic (4%), and lack of prescribed rescue (short-acting) b-agonist inhaler (6%). An economic internal hospital report, based on the

**Figure 4.** Medication discrepancy tool.

Medication Discrepancy Tool (MDT)
<b>MDT is designed to facilitate reconciliation of medication regimen across settings and prescribers</b>
<b>Medication Discrepancy Event Description:</b> <i>Complete one form for each discrepancy</i>
<b>Causes and Contributing Factors :: Check all that apply</b>
<i>Italicized text suggests patient's perspective and/or intended meaning</i>
<p><b>Patient Level</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Adverse Drug Reaction or side effects</li> <li><input type="checkbox"/> Intolerance</li> <li><input type="checkbox"/> Didn't fill prescription</li> <li><input type="checkbox"/> Didn't need prescription</li> <li><input type="checkbox"/> Money/financial barriers</li> <li><input type="checkbox"/> Intentional non-adherence <i>"I was told to take this but I choose not to."</i></li> <li><input type="checkbox"/> Non-intentional non-adherence (ie: Knowledge deficit) <i>"I don't understand how to take this medication."</i></li> <li><input type="checkbox"/> Performance deficit <i>"Maybe someone showed me, but I can't demonstrate to you that I can."</i></li> </ul> <p><b>System Level</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Prescribed with known allergies/intolerances</li> <li><input type="checkbox"/> Conflicting information from different informational sources. <i>For example, discharge instructions indicate one thing and pill bottle says another.</i></li> <li><input type="checkbox"/> Confusion between brand &amp; generic names</li> <li><input type="checkbox"/> Discharge instructions incomplete/inaccurate/illegible <i>Either the patient cannot make out the hand-writing or the information is not written in lay terms.</i></li> <li><input type="checkbox"/> Duplication. <i>Taking multiple drugs with the same action without any rationale.</i></li> <li><input type="checkbox"/> Incorrect dosage</li> <li><input type="checkbox"/> Incorrect quantity</li> <li><input type="checkbox"/> Incorrect label</li> <li><input type="checkbox"/> Cognitive impairment not recognized</li> <li><input type="checkbox"/> No caregiver/need for assistance not recognized</li> <li><input type="checkbox"/> Sight/dexterity limitations not recognized</li> </ul>
<b>Resolution :: Check all that apply</b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> Discussed potential benefits and harm that may result from non-adherence</li> <li><input type="checkbox"/> Encouraged patient to call PCP/specialist about problem</li> <li><input type="checkbox"/> Encouraged patient to schedule an appointment with PCP/specialist to discuss problem at next visit</li> <li><input type="checkbox"/> Encouraged patient to talk to pharmacist about problem</li> <li><input type="checkbox"/> Addressed performance/knowledge deficit</li> <li><input type="checkbox"/> Provided resource information to facilitate adherence</li> <li><input type="checkbox"/> Other _____</li> </ul>

Source: Eric Coleman, MD, MPH, <http://www.caretransitions.org>. Permission for use granted.



**Table 1. Common Therapeutic Problems Identified at Discharge**

- Inadequate or Inappropriate anticoagulation management: **11%**
- Heart failure patient with no diuretic: **4%**
- Chronic obstructive pulmonary disease patient with no rescue Inhaler: **6%**

Source: Seton Health System. Permission for use granted.

**Table 2. Medication Discrepancy Causes and Contributing Factors**

System- and Patient-Level Definitions	
Patient-Level Discrepancies	System-Level Medication Discrepancies
1. Adverse drug reaction or side effect	1. Prescribed with known allergy/intolerance
2. Intolerance	2. Discharge instructions incomplete/inaccurate/illegible
3. Did not fill prescription	3. Duplication (taking multiple drugs with the same action without rationale)
4. Patient feels they do not need prescription	4. Incorrect label
5. Money/financial barriers	5. Incorrect dosage
6. Intentional nonadherence (I was told to take this medication but I choose not to)	6. Incorrect quantity
7. Nonintentional nonadherence (e.g., knowledge deficit: I don't understand how to take this medication)	7. Cognitive impairment not recognized
8. Performance deficit (e.g., maybe someone showed me but I can't demonstrate that I can)	8. No caregiver/need for assistance recognized
	9. Slight/dexterity limitations not recognized

Source: Coleman Medication Discrepancy Tool (MDT). <http://www.caretransitions.org>. Eric Coleman, MD, MPH. Permission for use granted.

costs associated with Medicare Diagnostic Related Group length-of-stay data and drug therapy, analyzed the savings achieved by intensive pharmacotherapeutics as they related to decreased hospital readmissions. This report was the basis for determining an average savings of \$363 per pharmacotherapeutic intervention.

Patient-level and system-level medication discrepancies were collected by Seton Home Health Care via the MDT (definitions detailed in Table 2) for the target population on the two dedicated nursing units previously described. These data were collected during a time frame independent from that of the hospital discharge to home healthcare data previously reported, which includes intensive pharmacotherapeutic medication reconciliation applied for all hospital discharges to home healthcare. Medication discrepancies decreased from 81% in the first 6 months of 2009 to 65% for the first 6 months of 2010 (Table 3). System-level discrepancies decreased from 84% to 56% for the same time period.

Seton Home Health Care has seen a decrease in its Outcome-Based Quality Improvement (OBQI) Acute Care Hospitalization rate from 34% in 2005 to 28% for the most current available data time period of January 2010 to October 2010, as reflected in Figure 5. The OBQI data are representative of all patients served by the agency. Although direct correlation between the intervention and readmission was not measured, the outcome is encouraging.

### Clinical and Operational Implications for Practice

The positive outcomes arising from this project are due to several factors. These include the medication reconciliation process enhanced by the intensive pharmacotherapeutic intervention used by the St. Mary's Hospital pharmacy across all transitions for all patients, the integrated nature of the health delivery system, the shared vision of Seton Home Health Care and the hospital regarding patient safety, and the collaborative team approach supported by the Care Transitions and Readmission Committee. Using the hospital pharmacist for medication discrepancy interventions upon home healthcare SOC/ROC is a unique adaptation to the home care process, and pharmacist communication directly with prescribers to resolve medication-related problems allows the home healthcare nurse to focus on other patient needs.

In the absence of intensive pharmacotherapeutics, treatment across all comorbid diagnoses would not have been maximized, potentially introducing ADEs that could contribute to future hospitalization. St. Mary's econometric data reveal that the savings generated by clinical pharmacist intervention is in excess of pharmacist staffing costs by \$100,000 per year, primarily through hospital length-of-stay reduction. Over a 6-month period prior to initiation of this project, the hospital pharmacy demonstrated decreased hospital drug and health delivery costs of over \$250,000 through optimized therapeutics

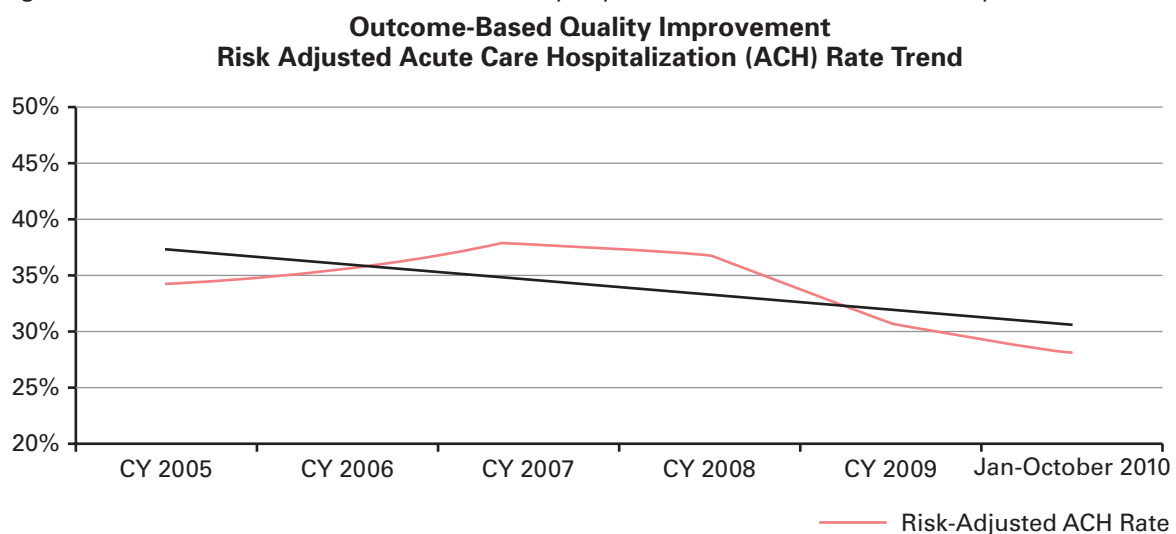
and adherence to established best practices resulting in decreased length of stay and decreased readmissions by 32% (Goss et al., 2010). These data provided the basis for replicability for Seton Home Health Care and St. Mary's Hospital collaboration. These savings demonstrate that utilization of pharmacists should not be discounted on the basis that the pharmacist's time "costs too much." In fact, this project shows that significant savings and improved outcomes are realizable when clinical pharmacy services are applied in an integrated and collaborative manner.

**Table 3.** Home Healthcare Medication Discrepancy Comparison

Findings	Baseline Measurement Period 01/01/09-06/30/09	Remeasurement Period 01/01/10-06/30/10
Total number of patients screened for medication discrepancies	36	31
Total number of patients identified with medication discrepancies	29	20
Total number of medication discrepancies identified	67	43
Average number of medication discrepancies per patient	2.31	2.15
Percentage of patients with medication discrepancies identified	81% (29/36)	65% (20/31)
Percentage of system-level medication discrepancies identified	84% (56/67)	56% (24/43)

Source: Seton Health System. Permission for use granted.

**Figure 5.** Home Healthcare Outcome-Based Quality Improvement (OBQI). Acute care hospitalization trend.



Source: Seton Home Health Care. Permission for use granted.

The Seton home healthcare nurses report that the medication reconciliation process is more streamlined with this new process, requiring fewer phone calls to physicians to resolve discrepancies. Anecdotally, the home care nurses have also voiced increased satisfaction with the process and with increased access to the pharmacist for cross-setting medication reconciliation. St. Mary's Hospital pharmacy is enabled to collaborate directly with the home healthcare nurse to foster open communication and education on common medication discrepancies and drug interactions.

The commitment by the Seton Health System team to effect interdisciplinary communication and change implementation allowed dynamic process changes. One of the strengths of the team's approach was its adaptability on a cross-setting level, and to respond to varying needs. One example of this adaptability that contrasts with hospital medication reconciliation process when applied to the home healthcare setting is

### Box 1. Medication Reconciliation Resources on the Web

#### Medication Reconciliation Toolkit (MATCH)

<http://www.nmh.org/nm/for+physicians+match>

Northwestern Memorial Hospital, Northwestern University Feinberg School of Medicine, and The Joint Commission developed a comprehensive, multidisciplinary team medication reconciliation initiative funded by the Agency for Healthcare Research and Quality (AHRQ). The toolkit includes:

- Making the business case
- Assembling the team
- Designing the process
- Implementation
- Education and training
- Assessment and process evaluation
- Resources for patients

#### The Care Transitions Program

<http://www.caretransitions.org/>

The Medication Discrepancy Tool (MDT)

- Tool for identifying and characterizing medication discrepancies that arise when patients are making the transition between sites of care.

the necessary inclusion of communication with the community pharmacist to resolve discrepancies. For this organization, we believe an "off-the-shelf" solution would not have worked given the diverse settings in which the process takes place, the complexity of the process, and consideration for the time involved while maintaining the accuracy of this information.

This project allowed participants flexibility, placing limits on its reproducibility, while providing outcomes that encourage initiatives in novel pharmacist-home care nurse medication reconciliation collaborations. ■

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*The analyses on which this publication is based were performed under Contract Number HHSM-500-2008-NY9THC, funded by the Centers for Medicare & Medicaid Services, an agency of the U.S. Department of Health and Human Services. The content of this publication does not necessarily reflect the views or policies of the Department of Health and Human Services, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. government. The authors assume full responsibility for the accuracy and completeness of the ideas presented.*

*The authors have no significant ties, financial or otherwise, to any company that might have an interest in the publication of this educational activity.*

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DOI:10.1097/NHH.0b013e31823454e5

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