Discharge Time Out: An Innovative Nurse-Driven Protocol for Medication Reconciliation

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Hospital discharge can be a stressful time for patients transitioning from acute care into the community. The transition from hospital to home is a complex and potentially dangerous process for patients, and a challenge for health care providers. Although many hospital leaders eagerly try to set standards for discharge practices, others struggle with the need for increased services with fewer resources. Successful transition to home is multifaceted and depends partially on accurate, complete medication reconciliation for patient safety across the continuum of care (Alper, O'Malley, Greenwald, Aronson, & Park, 2014; Corbett, Setter, Daratha, Neumiller, & Wood, 2010; Foust, Naylor, Bixby, & Ratcliffe, 2012; Greenwald et al., 2010).

A retrospective study by Foust and co-authors (2012) found 71.2% (n=141) of hospital discharges had at least one type of medication reconciliation problem; medication discrepancy was the most common error (58.9%, n=83) at time of discharge. Of the 375 discharged patients in a study by Coleman, Smith, Raha, and Min (2005), 53 (14.1%) experienced one or more medication discrepancies, with 49.2% (n=61) of those categorized as system related. Of patients who experienced medication discrepancies, 14.3% (n=7) were rehospitalized within 30 days compared with 6.1% (n=3) who did not experience discrepancies. Among post-hospital adverse events, medications were the most common problem (66%-72%), and nearly all post-hospital adverse drug events (ADEs) involved new medication or dosage change at time of discharge (Forster, Murch, Peterson, Gandhi, & Bates, 2005). Data on ADEs after discharge are limited; however, in one study, ADE occurrence was reported in 35% (n=70) of adults taking more than five medications daily; 84% (n=58) required medical attention and 11% (n=7) required hospitalization (Bayoumi, Howard, Holbrook, & Schabot, 2009).

The Joint Commission has set National Patient Safety Goals (NPSGs) to guide hospitals in using uniformed best practices. Medication reconciliation was introduced in 2005 as NSPG 8. It was revised and reintroduced in 2011 in an effort to recognize and resolve medication discrepancies and minimize the risk of adverse events during care transitions (Myrka et al., 2011). As hospital leaders continually struggle with an effective process to implement the standard, patients are discharged with medication discrepancies that place them at risk for adverse drug events and readmissions (Grimes et al., 2011). The impact of these events on patient welfare, health care costs, and readmissions is significant to the patient and the health care system (Greenwald et al., 2010).

The need to decrease readmissions is a high priority as more U.S. hospitals are being sanctioned for higher rates of rehospitalization (Hines, Yu, & Randall, 2010). Creating accurate medication lists during the transition of care could decrease rehospitalization (Alper et al., 2014). A stronger focus on effective medication reconciliation is necessary to ensure safe transition.
of care and improved patient outcomes.

In April 2012, the nurses at the 500-bed acute care Pennsylvania Hospital (University of Pennsylvania Health System, Philadelphia, PA) developed and implemented an innovative method for the process of discharge medication reconciliation. Based on the existing evidence-based practice approach of the surgical time out (Pennsylvania Patient Safety Reporting System, 2004), the discharge medication reconciliation process was restructured into the discharge time out.

The nurses on the 46-bed medical-surgical and cardiac unit identified discharge time as a crucial component in the medication reconciliation process. Discharge, patients undergo a time-out process during which the nurse completes a checklist to identify discrepancies, such as medication omission, duplication, change in frequency, change in dose, adjustments, new medications not accompanied by a prescription, or omission of core measures. During discharge time out, nurses complete a nurse-to-nurse check of all medications on the discharge document, and compare them to the admission reconciliation and current medications prescribed in the acute care setting. This check identifies all discrepancies on the document and initiates a reconciliation process. Through the implementation of a time out, nurses can ensure patients are discharged to home with the correct medications list, thereby improving the transition in care.

Prior to implementation the time-out process, 86 discharge documents were reviewed over a 3-week period. The chart review, including discharge records January-March 2012, revealed a 77.9% (n=68) discrepancy rate at time of discharge. The data show a 75% reduction in discharge medication discrepancies following implementation of the discharge time-out process. These discrepancies ranged in severity and included omission of medications, wrong medication name, incorrect dosing, absence of core measures (e.g., addition of beta blockers and/or angiotensin-converting enzyme [ACE] inhibitors), and lack of prescriptions. The data to date identify a sustained discrepancy rate at or below 20%. Additionally, implementing the time-out process increased awareness regarding medication discrepancies, leading to an overall improvement in the physicians’ process of reconciling medications at time of discharge.

**Literature Review**

Ovid MEDLINE, CINAHL, Pub Med, and Cochrane Database of Systemic Reviews were searched for the period 2005-June 2012. Search terms included the following: medication reconciliation, medication discrepancies, discharge planning, transitions of care, and patient safety.

In a retrospective cohort study conducted by Unroe and colleagues (2010), a random sample of 2015 was chosen from adult patients admitted to the general medicine, cardiology, or general surgery services of a tertiary care academic teaching hospital. Researchers compared patients’ medication lists from home to discharge and found 96% (n=196) had one or more medication changes from their home regimen, with 1,102 total differences for 205 patients. Cardiovascular drugs were the most frequent class of medication involved in medication discrepancies or differences both at admission (31%) and discharge (27%). Authors concluded medication discrepancies on admission and medication differences at discharge were prevalent for adult patients at the study site. They also suggested a medication reconciliation process has high potential for identifying clinically important discrepancies for all patients.

Corbett and co-authors (2010) presented a descriptive analysis based on data from a larger study testing the effectiveness of a nurse-driven intervention to detect and resolve medication discrepancies related to hospital-to-home transition. The data used for the analysis were drawn from a subsample (intervention arm) of a larger clinical trial. The intervention arm involved nurses specifically identifying and documenting medication discrepancies as part of the study protocol. Study participants had at least one of the following diagnoses: cardiovascular condition, peripheral vascular disease, diabetes mellitus, cerebral vascular accident, or chronic obstructive pulmonary disease. At least one medication discrepancy was found for 94% (n=101) of discharged patients across all medication classes. The average number of medication discrepancies was 3.3 per participant. This study was of interest because the patient population was almost identical to the sample used for the current study, and both involved a nurse-driven intervention.

Foust and colleagues (2012) conducted a secondary analysis of medical records collected during a randomized controlled trial testing a transitional care intervention for older adults with heart failure. All 162 participants were alert and oriented, spoke English, could be reached by telephone, and lived within 30 miles of the study sites. The original study, which was conducted February 1997-January 2001, included 198 discharge documents since some patients were admitted and discharged more than once. Patients were enrolled from one of six academic or community hospitals in the Philadelphia area. An advanced practice registered nurse led the transitional care intervention, which involved collaboration with health care professionals across care sites. A majority of hos-
pital discharges (71.2%) had at least one type of medication reconciliation problem, with an average of 1.3 problems per discharge. The most prevalent reconciliation problem was medication discrepancies (58.9%). Specifically, inconsistent dosages and/or frequencies were the most common type of medication discrepancy (62.7%). Some discharge records contained more than one reconciliation discrepancy. As a critical step in promoting continuity of medication information, findings suggested a hospital medication reconciliation process should be instituted to ensure patient instructions and discharge summaries are consistent. Participants were similar geographically and demographically to patients in the current study. Additionally, results reported by Foust and coauthors supported the important role nurses hold in the discharge process.

Enguidanos, Gibs, and Jamison (2012) noted transition in care has gained attention as data revealed patients are ultimately at risk for errors, problems, and poor communication, indicating discharge is a dangerous time for patients. Medication reconciliation is in place to ensure all patients being discharged receive the correct medications, decreasing the risk of discrepancies and adverse events. However, since medication reconciliation has been implemented, patients continue to be discharged with medication discrepancies, leaving them at risk for adverse events, medication discrepancies, and readmissions (Grimes et al., 2011).

A randomized study by Eggink, Lenderink, Widdershoven, and van den Bent (2010) examined the effect of a pharmacist on reducing medication discrepancies at discharge for 85 patients with heart failure (intervention group n=41, control group n=44). For the intervention group, a clinical pharmacist was involved in the discharge process. The pharmacist reviewed, corrected, and communicated medications with the cardiologist. The pharmacist provided patients with written medication information, and communicated with the primary provider and the community pharmacist. Medication discrepancies were measured within both groups at a 6-week follow-up appointment. In the control group, 68% of participants (n=30) had at least one prescription error or medication discrepancy, compared to 39% of participants (n=16) in the intervention group. Thus the percentage of patients with one or more errors was lowered by almost half by implementing a discharge service with a clinical pharmacist. Generalizability of the findings was limited by the use of only one hospital and one pharmacist.

An additional study involved collaboration between a pharmacist and a home care nurse in which 490 medication discrepancies were identified (Setter et al., 2009). Authors reported resolving 67% of medication discrepancies. They concluded a pharmacist-nurse collaborative process to identify and resolve medication discrepancies during patient transitions from acute care to home health care led to a significant reduction in medication discrepancy resolution. Although pharmacist-nurse collaboration during medication discrepancy resolution shows considerable benefit, financial challenges facing health care organizations may not allow for pharmacist involvement in the discharge process. More research needs to be conducted to examine if a nurse-led intervention can decrease medication discrepancies similarly.

A small study by Enguidanos and coauthors (2012) used a nurse practitioner (NP) during the patients’ transition from hospital to home and reported reduced patient risks along with improved patient satisfaction. The study sample included 100 patients with heart failure who had been prescribed at least seven medications, and had a previous 30-day readmission and a deficit in activities of daily living. The NP’s responsibility was to assure patients had clear instructions, knowledge of prescriptions, and an understanding of medications and medication changes. Study findings suggested using an NP at the point of transition may extend the reach of the primary care physician in enhancing patient outcomes through improved nursing support at a high-risk period, transitioning from hospital to home.

Interventions used by the NP during the study are within a registered nurse’s scope of practice and can impact discharges by providing critical information for patient’s safe transition in care from hospital to home. The findings concur with Coleman, Parry, Chalmers, and Min (2006), who reported decreased hospitalizations as well as improved knowledge and ability to adhere to their medication regimens for patients who were part of the transition intervention. Additional research has shown accurate medication information is important for safe transition (Alper et al., 2014; Corbett et al., 2010; Greenwald et al., 2010), but the impact of a nursing intervention on patients’ discharge medication regimen has not been determined.

In a consensus statement, Greenwald and coauthors (2010) stressed patient safety and reduction of adverse drug events in relation to medication reconciliation. The authors developed a 10-step process for medication reconciliation and included examples of ways to overcome potential barriers. The identified barriers included the definition of what constitutes a medication, who is ultimately responsible for obtaining the patient’s medication information, the multiple steps of reconciliation, and management of multiple providers who alter the patient’s medication but are uncomfortable reconciling medications outside their areas of expertise. Authors stressed the need for a systematic, comprehensive review of a patient’s current medications to ensure a correct list that reflects added, changed, or discontinued medications. They also indicated an accurate list of medications should be available to the patient, caregiver, and all providers involved in the patient’s care, especially when a transition in care occurs.

In keeping with the Institute for Healthcare Improvement, Green-
The discharge time-out process was modeled after the operative time-out process used to ensure patient safety prior to a surgical procedure.

Wald and colleagues (2010) identified three steps in the medication reconciliation process: verification, clarification, and reconciliation. They conceded medication reconciliation processes may vary by organization; however, essential steps remain the same and need to occur each time a patient transfers to a new setting or level of care. This study assisted in the development of a discharge time-out checklist to ensure all medications are verified and clarified, and discrepancies reconciled at the time of patient discharge.

Vogelsmeier, Pepper, Odera, and Weir (2012) conducted a qualitative study of health care providers’ views on medication reconciliation. What does medication reconciliation mean? Who is liable for medication reconciliation? Focus groups were attended by 13 physicians, 19 registered nurses, and 16 pharmacists from three inpatient Veterans Administration facilities (two urban academic, one rural nonacademic) in the United States. Physicians considered medication reconciliation as another task that could be completed by nurses. Nurses were skeptical about patients’ actual medications, and pharmacists were concerned about safety challenges related to medication management and achievement of therapeutic patient goals. While medication management is a considerable safety challenge, effective management ensures a patient actually is taking the prescribed medication in the correct dosages and at the correct times. Medication management also includes evaluation of the current medication regimen for achieving therapeutic patient goals. Participants agreed medication reconciliation plays an integral role in medication management and safety. Nurses and pharmacists agreed medication reconciliation documentation is ultimately the physician’s responsibility as the prescriber. All three groups of health care professionals agreed they have a role in medication reconciliation and they should know their patients’ medications. While participants were aware of medication reconciliation as a patient safety issue affected by multiple disciplines, no recommendations were offered to ensure the process was completed in a concise manner with patient safety as the primary concern. Translating the intent of medication reconciliation into effective practice requires acknowledgment of health care professionals’ diverse perspectives on the independent, joint, and overlapping functions of medication management.

**Improvement Needs/Group Oversight**

Despite the existence of a process for medication reconciliation, nurse leaders at the University of Pennsylvania Health System identified problems with the accuracy of information given to patients at discharge. Discrepancies during the discharge medication reconciliation became more evident with introduction of an electronic medical record. Although medication reconciliation occurred at the time of hospital admission, discharge reconciliation was performed by the physician staff and often was incomplete. Because patients received care from several providers, the task of discharge medication reconciliation was challenging. A retrospective review of medical charts over a 3-week period found 77.9% (n=86) of discharge documents contained some discrepancy on the Admission and Discharge Medication Reconciliation form. Discrepancies were identified as medication omissions, change in doses not accompanied by a prescription, and omission of core measures (e.g., use of beta blockers and ACE inhibitors for patients with heart failure). Discrepancies could be identified only on admission, with no assurance they had been addressed at discharge.

A review of current policies and procedures found no policies to ensure adherence to medication reconciliation at discharge. Resident physicians wrote the discharge document. However, the discharge resident often differed from the admission medical resident. Thus, no system existed to ensure accuracy of the discharge document.

The purpose of this quality improvement project was to improve accuracy of medication reconciliation at the time of discharge. Evidence supported accurate medication reconciliation as a successful mechanism in the reduction of ADE’s due to medication discrepancies (Greenwald et al., 2010). The objective was to introduce a medication reconciliation time out that would improve the accuracy of discharge medication reconciliation. The discharge time-out process was modeled after the operative time-out process used to ensure patient safety prior to a surgical procedure (Oszvald, Vatter, Byhahn, Seifert, & Guresir, 2012). Similarly, the goal of the discharge time-out project was to ensure the patient discharged to home would be taking the right medication at the correct dose, and had the necessary prescriptions to obtain the medication.

**Continuous Quality Improvement Model**

The team used the Six Sigma Define, Measure, Analyze, Improve, and Control (DMAIC) methodology to guide improvement of an existing process. This well-established methodology consists of five phases (Lynch, Bertolino, & Cloutier, 2003) (see Figure 1). A retrospective review of random charts was completed January-March 2012, prior to planning and implementation of the discharge time out. Of 86 charts...
Evaluated, 67 (77.9%) had discrepancies that were never reconciled.

Evaluation and Action Plan

The next step was to educate staff on harmful effects of medication discrepancy and benefits of having an accurate medication document at discharge. Two charge nurses on the unit were educated by the nurse manager on completing the time out, and the charge nurses in turn educated the nursing staff. Educating 42 nurses on the unit was completed in 1 week. Adherence was tracked by the nurse manager through the checklist and reported to the unit monthly.

The operating room time-out process was adapted to the patient discharge and emerged as the discharge time out. Two nurses were required to review the discharge document. The primary nurse caring for the patient compared the discharge list to the electronic medical record to identify differences between the discharge medications and medications taken at the time

![Figure 1: DMAIC Model](image)

**Define**
- Define the problem: Medication reconciliation at time of discharge.
- The project goal was to reduce the number of discrepancies.

**Measure**
- Measure key aspects of the current process: Data were collected to determine the number of medication discrepancies prior to the intervention.

**Analyze**
- Analyze the data: Data were evaluated to identify underlying or potential causes for the discrepancies identified.

**Improve**
- Improve or optimize the current process: A discharge time-out process was developed to provide a double check, by the nurse, of the discharge orders focusing on medication reconciliation.

**Control**
- Control the future state of the intervention to ensure continuity of the process.
- The process is monitored continuously, with data collected and evaluated for the number of discrepancies.

Source: Aveta Business Institute, 2014
of admission. A second nurse compared the discharge document against the admission medication reconciliation. Together, the nurses reconciled discrepancies. The nurses underwent a week of training on how to complete the checklist and the process. The nurse manager met with small groups of nurses to introduce the discharge time-out checklist, providing instructions on its completion. A review of the medication reconciliation process during patient transitions in care was discussed, with the focus on patient safety as a result of an accurate, complete medication reconciliation record.

A checklist with the patient identification label was used to ensure the completion of each time out. The information reviewed at each discharge was the accuracy of the medication list on the discharge document, indication of core measures being completed, and amount of time needed to complete the discharge time out. This information was documented on the checklist by the nurses.

Discrepancies were divided into three categories: incorrect medication dosage, failure to provide a prescription for new prescriptions, and omission of any core measures. Nurses also assessed the amount of time needed to resolve discrepancies and if the patient had appropriate follow-up care arranged. Completion of a full time out ensured the patient was discharged with the necessary tools for a successful transition to home. The focus on discharge medications ensured the patient's care was individualized and any changes had been made before returning home. When discrepancies were identified, the physician was notified and a nurse-to-physician reconciliation was performed. Corrections were made as needed.

After implementation of the discharge time-out process, the number of discrepancies decreased (see Table 1). This decrease was sustained for over 20 months. After 20 months of data collection with a sustained discrepancy percentage at or below 20%, the discharge time-out process and subsequent improvement in medication reconciliation were enculturated into the unit practice. After December 2013, no further data were collected (see Figure 2).

Results and Limitations

The percentage of charts demonstrating completion of the discharge time-out process has been relatively stable throughout the year, averaging 56% (see Figure 3). The goal was to increase the percentage of charts demonstrating completion of the discharge time-out process to 100% in the year following implementation.

The proportion of charts with
discrepancies before and after initiation of the discharge time-out intervention was calculated and compared, with results decreasing from 0.7791 (January-March) to 0.2142 (April-December) (see Table 1). The z-ratio for the significance of the difference between two independent proportions was calculated (Lowry, 2013). The Z-score of 11.588 was associated with a two-tailed p<0.0002, demonstrating statistical significance in the percentage of charts with discrepancies before implementation of the discharge time-out process compared to the percentage after the process was initiated (see Table 1 and Figure 4).

Data showed definite advantages to using a nurse-led protocol for discharge medication reconciliation. A statistically significant difference was found in medication reconciliation before and after implementation of the new process. Nurses recognized a need to increase compliance to 100% of discharge charts. The time-out process will be moved to the bedside and completed with a physician in attendance, with additional evaluation to determine further impact on medication discrepancies. Research is necessary to conclude whether the decrease of discrepancies was due to the awareness brought about by the time-out process or the use of nurses in validating medication accuracy.

While nurses in this project initially thought the discharge time-out process would take considerable time, awareness of medication reconciliation improved discharge practices by physicians and actually saved time spent making multiple telephone calls. Nurses described the time-out process as a win-win for patient safety and time management.

### Nursing Implications

Although medication reconciliation has been at the forefront of National Patient Safety Goals for a nearly decade (The Joint Commission, 2015a), hospital leaders continue to struggle with implementation. Medication reconciliation at time of discharge impacts medication management and safe patient transitions in care (The Joint Commission, 2015b). Development of a financially feasible, sustainable standardized process is essential for the patient’s crucial transition from hospital to home. The discharge time-out practice can be replicated easily in most health care settings and does not require additional resources. The body of evidence supporting a standardized time-out practice in the operating room can be transferred to the medical-surgical patient care environment.

### Conclusion

One recommendation in the Institute of Medicine’s *Future of Nursing* (Institute of Medicine, 2011) called for nurses to lead and disseminate collaborative improvement efforts. Health care organizations, nursing education programs, and professional nursing organizations were asked to expand opportunities for nurses to lead and direct initiatives and research to improve outcomes by transforming practice and the systems in which they practice. The discharge time-out process empowered nurses to take a more active role in discharging their patients, and thus fostered a more collaborative relationship between nurses and physicians. 

### Table 1.

<table>
<thead>
<tr>
<th>Period</th>
<th>Pre-Intervention Period</th>
<th>Post-Intervention Period</th>
</tr>
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<tbody>
<tr>
<td>Number of charts evaluated</td>
<td>January-March 2012</td>
<td>April-December 2012</td>
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<tr>
<td>Number of charts with discrepancies</td>
<td>86</td>
<td>239</td>
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<td>Proportion of charts with discrepancies</td>
<td>0.7791</td>
<td>0.2142</td>
</tr>
<tr>
<td>Z score</td>
<td>11.588</td>
<td>Probability (two-tail)</td>
</tr>
</tbody>
</table>

p<0.0002

### References


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ADDITIONAL READINGS


