Using a Discharge Checklist Across the Interprofessional Team to Improve Discharge by Noon Rates

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A Scholarly Practice Project presented to the Graduate Faculty
of the University of Virginia in Candidacy for the Degree of
Doctor of Nursing Practice

School of Nursing

University of Virginia
May, 2018

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Abstract

Delays in patient discharge (DC) from acute care units can disrupt a hospital's ability to transfer patients across settings of care within the healthcare facility, such as the emergency department and intensive care units. Hospitals have begun implementing a goal to improve discharge by noon (DBN) rates on acute care floors in order to open up those beds earlier in the day to enhance throughput. Studies have shown that using a DC checklist to identify and document completion of DC associated tasks able to be completed the afternoon or evening before anticipated day of DC can improve DBN rates. The scholarly project was a pre-intervention/post-intervention comparison project. The purpose of the project was to evaluate whether adding a standardized checklist completed by the interprofessional care team prior to the anticipated day of DC would improve the percentage of patients DBN without increasing the average length of stay or percentage of 30-day hospital readmissions. This project was conducted on two inpatient acute care units specializing in the care of cardiac and vascular patients in an academic medical center located in southeastern United States. The sample consisted of 73 patients discharged by the acute cardiology service. DBN rates in the intervention group improved from 2.3% at baseline to 10.0% post-intervention. No statistically significant differences in the LOS were found between the control (4.35 days) and intervention group (4.27 days). When compared to the control group, the percentage of 30-day hospital readmissions increased in the intervention group, 11.6% to 16.7%. An interprofessional DC checklist may improve DBN rates in patients admitted to an acute cardiac service, yet caution should be taken due to a potential increase in 30-day readmissions.

Keywords: *discharge by noon, interprofessional checklist, length of stay, early discharge*

Acknowledgements

My greatest thanks and appreciations goes out to my wife, Karla, and our son, Wesley. Their love and support served as the motivation to continue working through the hardships and frustrations while reminding me what is most important in life. I also want to thank my parents for their support, especially when they drove from Indiana to Virginia and back – twice! – in order to watch Wesley during the intervention period.

I also want to thank those who served on my project committee: Dr. Cathy Campbell, Chair; Dr. Beth Quatrara, Faculty; and Dr. John Dent, Practice Mentor. Dr. Campbell, thank you for your time, encouragement, and guidance throughout the process. Dr. Quatrara, thank you for filling in for when Dr. Campbell was unavailable during the proposal period and serving as second reader. Dr. Dent, thank you for opening up your team and allowing me to work alongside you and your team to development and implement my project. I want to specifically thank Dr. Virginia Rovnyak for her insights and guidance on data analysis and interpretation.

I want to thank all of the faculty and my peers involved with the ASPIRE program. The tools, tips, and tricks learned served as a lifeline throughout the entire process and greatly aided in my project development. It was also our group discussions on how we were each progressing that reminded me I wasn't alone, and that others were going through it all too, and that we had each other for support whenever needed that helped reduce stress levels.

I also want to thank Brannelly Batman and Joan Tepper for allowing me to do my project on their units.

Finally, I want to thank all the members of the interprofessional team who helped me develop my project and to design and implement the DC checklist to include, but not limited to: Dr. John Dent, Dana Palmer, Margaret Wovkulich, and Caroline Weber.

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to Improve Discharge by Noon Rates

Delays in patient discharge (DC) from acute care inpatient units cause disruptions in a hospitals ability to efficiently move patients through the healthcare setting. Areas affected by discharging delays include, but not limited to: intensive care units (ICUs), post-anesthesia care units (PACUs), and emergency departments (EDs) (Majeed et al., 2012; Khanna, Boyle, Good, & Lind, 2011; Khanna, Boyle, Good, & Lind, 2012). Durvasula et al. (2015) stated, "If hospital discharge is unnecessarily delayed until the afternoon, congestion inevitably ensues with patients remaining in the ED, clinic, and the intensive care unit for prolonged periods" (p. 45).

Background

Many hospitals have set a goal to DC patients in the morning or by noon to improve patient flow (Wertheimer et al., 2014). Some opponents of the discharge by noon, or discharge before noon, (DBN) goal report a possible increase in 30-day readmissions as patients are rushed out unprepared or increases in length of stay (LOS) as patients are kept overnight in order to be discharged by noon the next day (Rajkomar, Valencia, Novelero, Mourad, & Auerback, 2016; Shine, 2015). Despite these concerns, several studies have successfully improved DBN rates while maintaining or improving LOS and 30-day readmission rates (Kane et al., 2016; Patel, Morduchowicz, & Mourad, 2017; Wertheimer et al., 2014).

Discharging patients can be a complicated process with many possible causes for delay. At this institution's target unit, medication reconciliation (MR) of DC prescriptions has been identified as an aspect of the DC process that could become more efficient. MR is required to be completed at all transitions of care by The Joint Commission for hospitals to receive accreditation (The Joint Commission, 2017). MR is complicated and impacts patient care in all

settings as they transition through the healthcare system. (The Agency for Healthcare Research and Quality, 2012). The MR of DC prescriptions is meant to identify medications that have been added, discontinued, or changed during hospitalization compared to medications taken prior to admission (Alper, O'Malley, & Greenwald, 2017). Data collected by a nurse leader demonstrates frequent phone calls and/or pages to providers by nurses performing the DC MR to clarify and/or modify prescriptions. This could cause a potential delay in patient DC as the MR is completed by the nurse after the DC order is placed by the provider on the day of discharge. If the nurse identifies any discrepancies during the MR, the provider must update the prescriptions in the electronic health record (EHR) before the patient can be safely discharged.

Alper, O'Malley, and Greenwald (2017) identify determining an appropriate post-discharge site of care, completing a DC summary, and providing patient education as additional tasks that providers must complete when discharging a patient. If necessary, patients may require durable medical equipment (DME), such as oxygen, following discharge. DME must be ordered and a plan for delivery and set up should be in place prior to patient DC.

A study conducted by Ubbink et al. (2014) evaluated how doctors, nurses, and patients defined relevant DC criteria and each groups expectations of the DC process. They found, "…doctors tended to focus more on the medical condition, nurses on the home situation and DC procedures, and patients on the information they received and their personal situation" (Ubbink et al., 2014, p. 7). Ubbink et al. (2014) also reported that delayed hospital discharges and hospital readmissions related to a premature DC could be prevented by assessing the patient's DC readiness, employing a standard DC policy, and improving the quality of the DC process.

The Agency for Healthcare Research and Quality (AHRQ) (2013) developed the Guide to Patient and Family Engagement in Hospital Quality and Safety to help engage patients in their

health care and work as partners to improve safety quality and safety. Strategy 4 of the AHRQ's program is called IDEAL Discharge Planning and includes the following 5 steps:

> (1) Include the patient and family as full partners in the discharge planning process, (2) Discuss with the patient and family five key areas to prevent problems at home, (3) Educate the patient and family in plain language, (4) Assess how well doctors and nurses explain the diagnosis, condition, and next steps in the patient's care to the patient and family and use teach back. (5) Listen to and honor the patient and family's goals, preferences, observations, and concerns (AHRQ, 2013).

Part of the IDEAL Discharge Planning is a DC checklist that begins with the initial nursing assessment and ends with the DC education and completion of the DC summary by the nurse. The IDEAL Discharge Planning program can help identify patient and safety concerns to help prevent common post-discharge complications such as: adverse drug events, hospital-acquired infections, procedural complications, inadequate preparation of patient and family related to medications, danger signs, and lifestyle changes.

Project Purpose

The purpose of this project was to evaluate whether adding a standardized checklist completed by the interprofessional care team prior to the anticipated day of discharge (DC) would improve the percentage of patients discharged by noon (DBN) without increasing the average length of stay or percentage of 30-day hospital readmissions.

Theoretical Framework

The Model for Improvement (MFI), (Institute for Healthcare Improvement (IHI), 2017) was used as the framework for this project. The MFI consists of two parts (see Figure 1). The first part consists of three fundamental questions: "What are we trying to accomplish? How will

we know that a changes is an improvement? What change can we make that will result in improvement?" (IHI, 2017). The second part uses the Plan-Do-Study-Act cycle to guide testing of a change and to determine its effects (IHI, 2017). The Plan-Do-Study-Act cycle allows for frequent reassessments of how a project or intervention is performing and if it is working as intended. Cycles do not have to have a set duration and can be as short or as long as needed based on what is being evaluated.

This project's answer to the first question was to improve DBN rates. A change would be identified as an improvement if DBN rates improved and the balancing metrics of 30-day hospital readmissions and LOS did not worsen. Implementing a DC checklist was identified as a change that could be implemented that may result in an improvement.

Project Question

Does implementing an interprofessional DC checklist improve DBN rates of patients discharged from an acute cardiology service (ACS) compared to standard care?

Chapter II

Review of Literature

An integrative review of literature was conducted using CINAHL, PubMed, OVID Medline, and Web of Science databases in July 2017. The key terms "discharge before noon" and "discharge checklist" were searched each databases "OR" function. Inclusion criteria were: (a) published after January 1, 2000, (b) evaluated an inpatient acute care setting, (c) addressed patient DC, (d) involved an interprofessional team, and (e) had full text available in English. Exclusion criteria were articles that did not discuss the DC process, DC planning, or were set in behavior health units.

Articles were initially selected using a title review followed by an abstract review to identify those that appeared to meet inclusion criteria. A cursory full-text review was conducted on all articles to ensure they met all inclusion criteria. Further, in-depth full-text review was conducted to assess the methodological quality of the study. An ancestry review of references included in the remaining articles was conducted to identify additional relevant articles. A search of the Cochrane Library was added using the same key terms with no results. An overview of the selection process for the integrative review is given in Figure 2. Major findings for each article are discussed in alphabetical order based on the first author. Gaps and nursing implications are discussed at the end of the section.

Results

Beck and Gosik (2015) performed a prospective quality study with concurrent controls to determine if using Lean Six Sigma (LSS) has an effect on advancing and sustaining earlier patient discharges on a pediatric hospitalist inpatient service compared to all other services. The service line was restructured to balance physician workload needs and patient expectations and

standard work expectations were created to reduce variations in physician work sequences (Beck & Gosik, 2015). The standard work expectations consisted of a daily pre-discharge huddle each afternoon to prepare discharges anticipated for the next day and a DC checklist to be completed at bedside during patient rounds (Beck & Gosik, 2015). Outcomes included in the study were: time of DC order placement; actual patient DC time; proportion of patients DBN and 2:00 p.m.; 7-day, 14-day, and 30-day readmission rates; length of stay; and average daily census. For the intervention group the median time of DC order placement improved from 2:05 p.m. to 10:45 a.m. ($p < .0001$), actual patient DC time improved from 3:48 p.m. to 2:15 p.m. ($p < .0001$), proportion of patients DBN improved from 14% to 27% ($p < .0001$), DC before 2:00 p.m. improved from 30% to 47% ($p < .0001$). The 7-day, 14-day, and 30-day readmission rates had no significant change ($p = .965$, .981, and .703 respectively). The control group had no significant differences for any outcome between the pre-intervention and intervention period. The average daily census and number of patients discharged per day were significantly higher during the intervention period for the intervention group ($p < .0001$, and $< .00001$ respectively) compared to significantly lower average daily census ($p = .002$) and no differences in dischargers per day for the control group ($p = .419$).

Best and Young (2009) discuss the additional challenges involved in the discharge planning of a homeless patient. Best and Young (2009) propose the use of a checklist using the mnemonic “A SAFE DC,” as a conceptual framework for care of the homeless inpatient. The mnemonic stands for: Assess housing situation, Screening and prevention, Address primary care issues, Follow-up care, End-of-life discussions, Discharge instructions (simple and realistic), Communication method after DC (Best & Young, 2009). Best and Young (2009) do not test the checklist. However, it is important to note the various factors that can delay the DC and increase

hospital readmission rates in homeless patients and to include those considerations in the DC planning process.

Durvasula et al. (2015) conducted a pilot study to determine if the implementation of a DC order process and MR completed the night before anticipated DC would improve the percentage of patients discharged before 11:00 a.m. Durvasula et al. (2015) gathered input from 7 clinical services to map the DC process and identify all steps necessary to DC a patient. A DC checklist was developed using a reverse timeline methodology that shifted the time when key steps, such as completion of MR and DC order forms, were completed without creating additional work for providers (Durvasula et al., 2015). The DC checklist was designed to guide the interprofessional care team through the recommended timeline starting at least 3-days prior to DC (Durvasula et al., 2015). Outcomes measured were: percentage of patients discharged before 11:00 a.m., average time of DC, unplanned 30-day readmission rate, and mean length of stay. There was a statistically significant improvement in the percentage of patients discharge before noon (8% to 11%, $p = .02$) (Durvasula et al., 2015). Since the checklist was not mandatory, not all interventions were performed for every DC and 32% ($n = 189$) received no change in the DC process with 0.5% of those meeting the before 11:00 a.m. goal and were used as a control group. Night-before MR only was performed on 40% ($n = 236$) of eligible DCs with 5.5% meeting the DC before 11:00 a.m. goal ($p = < .001$). DC home order before 9:00 a.m. only was performed on 7% ($n = 42$) of eligible DCs with 26.2% meeting the DC before 11:00 a.m. goal ($p < .001$). Night-before MR and DC home order before 09:00 was completed on 21% ($n = 128$) of eligible discharges with 29.7% meeting the DC before 11:00 a.m. goal ($p < .001$). Durvasula et al. (2015) found the average DC time was 3:19 p.m. for discharges who received standard care; 2:12 p.m. for those who received night-before MR only; 12:13 p.m. for those who

received DC home order before 9:00 a.m. only; and 12:06 p.m. for discharges who received both night-before MR and DC home order before 9:00 a.m. Average LOS remained unchanged, 6.0 in the baseline group and 6.4 in the pilot group ($p = .64$) (Durvasula et al., 2015). The 30-day readmission rate improved from 13.8% to 10.3% ($p = .002$) (Durvasula et al., 2015).

Edmondson-Martin et al. (2016) reported the results of a nurse-led quality initiative to improve patient experience by improving DBN rates. A DBN checklist was developed by the interprofessional team and daily DBN rounds were implemented to provide a structured and timely venue for communication to remove barriers to DC (Edmondson-Martin et al., 2016). Additional strategies implemented to improve communication were a shared e-mail that was sent to track updates and night nurses reinforcing the plan with patients and family and notifying the healthcare team of any new events that needed to be addressed (Edmondson-Martin et al., 2016). The baseline DBN was 6%, post project implementation was 16%, and rate at time of abstract submission was 33%. “Six Press Ganey DBN patient satisfaction related metrics were identified: communication about medicine, nurses, discharge, pain, responsiveness of hospital staff, care transitions” (Edmondson-Martin et al., 2016, p. 17). Edmondson-Martin et al. (2017) reported that all nursing sensitive indicators improved for the quarter post implementation on the units where the pilot study was conducted.

Garg, Lee, Evans, Chen, and Shieh (2015) described the design, development, and evaluation of an EHR DC checklist in a cluster randomized trial. Phase 1 consisted of an online survey sent to all internal medicine residents to identify current methods of remembering DC tasks, evaluate perceived usefulness of checklists, and assess interest in using an EHR DC checklist along with a noon conference to collect feedback on preferred modality (Garg et al., 2015). Phase 2 consisted of the DC checklist development in phase 3 the checklist was

implemented into the EHR and made available as a "smart-phrase," which once typed would insert the DC checklist into a patient's EHR chart (Garg et al., 2015). Phase 4 consisted randomized trial period where two teams of three residents were randomized each month to use a paper checklist and three teams of three residents were randomized each month to use the EHR checklist (Garg et al., 2015). Online surveys were used to assess usage, satisfaction, work flow integration, usefulness in reminding to complete DC tasks, increasing confidence in patient DC, and increasing the overall efficiency of the DC process (Garg et al., 2015). Measures were self-reported on a scale of 0-100. Thirty-five of the 60 residents in the four-month trial responded to the survey with 23 EHR checklist users and 12 paper checklist users (Garg et al., 2015). Garg et al. (2015) found EHR users reported higher checklist use (28.5 vs 7.67, p = .014), higher perceived integration into workflow (22.6 vs 1.67, p = .014), higher usefulness in reminding to complete tasks (33.7 vs 8.92, p = .014), and greater confidence in DC (25.5 vs 6.67, p = .056) comparted to paper checklist users. "Increasing use of EHR checklist was significantly correlated with increased usefulness of checklist in reminding to complete tasks ($r = .85$, $p < .001$), confidence ($r = .81$, $p < .001$), and efficiency ($r = .87$, $p < .001$)" (Garg et al., 2015, p. 129).

Goodson, DeGuzman, Honeycutt, Summy, and Manly (2014) studied whether a DC brunch for total joint replacement patients improved DBN rates for attendees compared to those who did not attend. A DC brunch had been proven effective for obstetrical patients in the same facility. Only joint replacement patients on isolation precautions were not invited to attend and all patients had the right to refuse (Goodson et al., 2014). Brunch attendees were prioritized to be seen first in the morning and surgeons were responsible for having DC orders written by 9:00 a.m. to facilitate immediate DC after the brunch (Goodson et al., 2014). Brunch was scheduled at 9:00 a.m. on Thursdays and Fridays and lasted for approximately 45 minutes with patients

expected to be discharged over the weekend able to attend on Friday (Goodson et al., 2014). Content included generalized DC instructions along with individualized instructions on medications and follow-up appointments given by the resource nurse and the orthopedic nurse practitioner (Goodson et al., 2014). Outcomes measured were DC time and DBN rates. Patients who attended the brunch had improved mean DC time (11:20 a.m. vs 1:10 p.m., $p < .001$) and improved DBN rates (75.6% vs 38.6%, $p < .001$) when compared to patients who did not attend brunch (Goodson et al., 2014).

Halasyamani et al. (2006) describe the process used by the Society of Hospital Medicine's Hospital (SMH) Quality and Patient Safety committee to develop a DC checklist for hospitalists. The SMH identified the elderly population to be at greater risks for adverse events after DC (Halasyamani et al., 2016). The committee, consisting of care transition researchers, process improvement experts and hospitalists, developed the checklist of processes and elements required for ideal DC of adult patients (Halasyamani et al., 2016). The checklist was presented at the 2005, SMH's Annual Meeting where it was reviewed and revised by 120 hospitalists, nurses, case managers, and pharmacists (Halasyamani et al., 2016). The final checklist included required and optional data elements for discharge summaries, patient instructions, and communication on day of DC to a receiving provider (Halasyamani et al., 2016). Examples of required elements contained on the DC checklist are: key findings and test results, diagnoses, brief hospital course, DC destination, DC medications, follow-up appointments, pending tests, and recommendations from consults (Halasyamani et al., 2016). "Other documents, such as transfer orders for a rehabilitation facility or nursing home, were considered outside the scope of the project" (Halasyamani et al., 2016, p. 357). The final checklist was endorsed by the SMH Quality and Patient Safety committee and the SHM board (Halasyamani et al., 2016).

Hansen, Young, Hinami, Leung, and Williams (2011) conducted a systematic review to describe interventions evaluated in studies aimed at reducing 30-day hospital readmissions. Forty-three articles were included and interventions were categorized into 3 domains; pre-discharge interventions included patient education, MR, DC planning, and scheduling follow-up appointment before DC; post-discharge interventions included follow-up phone calls, patient-activated hotlines, timely communication with ambulatory providers, timely ambulatory provider follow-up, and post-discharge home visits; and bridging interventions included transition coaches, physician continuity across the in- and out-patient setting, and patient-centered DC instructions (Hansen et al., 2011). Twenty-four of the 43 studies (55.8%) tested a single-component intervention, while 12 studies (27.9%) tested a bundle consisting of at least 3 interventions (Hansen et al., 2011). Hansen et al. (2011) found that no single intervention significantly reduced 30-day hospital readmissions, but some studies that included DC bundles did show improvement. Heterogeneity in interventions prevented further data analysis. The authors do not mention any studies that evaluated the use of a DC checklist.

Harun, Finlay, Salek, and Piguet (2016) evaluated whether a DC checklist using a "traffic-light" design was found useful by clinicians caring for dermatology patients. Harun et al. (2016) developed the DC checklist using the Delphi method by 3 of the authors with assistance from 3 colleagues. Eighteen clinicians were included in the evaluation of the checklist and provided feedback using a four-item questionnaire with the option for free-text comments (Harun et al., 2016). Twelve (67%) reported the checklist as useful and 11 (61%) reported they would like to use the checklist in future consultations (Harun et al., 2016). Eighteen (100%) reported the information in the checklist was adequate in guiding decision making with 4 (22%) suggesting slight modifications (Harun et al., 2016). Only 3 clinicians (17%) thought the process

of thinking through the DC decision was made easier using the checklist (Harun et al., 2016). Harun et al. (2016) concluded that the use of a checklist may encourage clinicians to take more care over the DC process and may prevent inappropriate DC.

Kane et al. (2016) applied the Lean management system developed by Toyota as part of their QI project to increase DBN rates. Kane et al. (2016) added twice-daily, weekday multidisciplinary huddles between a consistent senior physician and administrative leaders to the traditional bed meetings. Additionally, nursing leaders would create and distribute a daily report to operations and physician leaders by 6:00 a.m. that helped inform leaders of crowding status and guide decision making (Kane et al., 2016). Nursing directors would round on their units every weekday morning at 8:00 a.m. to review patient eligible for discharge and information was shared during the twice-daily huddles and displayed on a board visible during the morning bed meeting (Kane et al., 2016). To encourage early completion of tasks, each unit had identify 2 patients to discharge before 11:00 a.m. every weekday (Kane et al., 2016). Patients were identified by the charge nurse the afternoon prior and selections were communicated to the multidisciplinary care team (Kane et al., 2016). Kane et al. (2016) reported DBN rates significantly increased by approximately 9% (14% vs 24%, $p < .0005$) and 30-day readmission rates remained unchanged from 11.3% during the baseline period to 11.2% during the intervention.

Khanna, Sier, Boyle, and Zeitz (2016) conducted a retrospective observational study to identify optimal inpatient DC time targets to help hospitals reduce overcrowding, improve patient flow through the emergency department, and balance staff workload. Emergency and inpatient records from a 15 month period were used to reconstruct patient pathways from presentation to DC at South Australia's largest quaternary teaching hospital (Khanna et al.,

2016). A discrete event simulation was used to assess operationally realistic DC scenarios on flow performance (Khanna et al., 2016). Seven scenarios consisting of different percentages of patient discharges completed before several time marks each day were evaluated (Khanna et al., 2016). The hospital had a goal of 60% of discharges before 11:00 a.m., but struggled to achieve a rate of 35% of discharges before 11:00 a.m. (Khanna et al., 2016). Output measures included National Emergency Access Target (NEAT) performance (an Australian ED performance metric), time spent waiting for an inpatient bed, LOS, and occupancy (Khanna et al., 2016). Scenario 4, which had 80% of DC occur 11:00 a.m. resulted in the greatest improvements in NEAT performance (16.2%) and average bed occupancy (-1.5%) when compared to baseline data (Khanna et al., 2016). was second in improving average inpatient LOS (-1.6%), average wait in hours for inpatient bed for ED patients (-24.9%), average wait in hours for inpatient bed for all patients (-23.5%), bed days (-0.7%) and occupancy (0.9%) when compared to baseline data (Khanna et al., 2016). However, scenario 4 was deemed to be operationally unrealistic by clinicians and hospital administrators given the institutions historical struggle to achieve a rate greater than 35% of patients discharged before 11:00 a.m. Scenario 1 had goals of 50% of patients discharged before 10:00 a.m., 80% by 12:00 p.m., and 100% by 2:00 p.m. (Khanna et al., 2016). Scenario 1 was second in improving NEAT performance (16.1%) and was first or tied for first in improving average bed occupancy (-1.5%), average inpatient LOS (-1.7%), average wait in hours for inpatient bed for ED patients (-25.5%), average wait in hours for inpatient bed for all patients (-24.2%), bed days (-0.8%) and occupancy (1%) when compared to baseline data (Khanna et al., 2016). Khanna et al. (2016) reported that the findings provided evidence that discharges earlier in the day improved patient flow, but similar improvements can be gained by spreading discharges throughout the day.

Patel, Morduchowicz, and Mourad (2017) evaluated the use of the Model for Improvement (MFI) as a framework for process improvement to improve DBN rates from a baseline of 10.4% to a goal of greater than 20%. Using the MFI, a needs assessment was conducted and identified four common barriers to early DC: (1) lack of communication between nurses, case managers, and care teams; (2) obtaining home services, equipment, and oxygen early in the morning; (3) arranging transportation earlier in the day; and (4) communicating DC expectations with patients and families (Patel et al., 2017). Interventions implemented pertained to education, process changes, and audit and feedback (Patel et al., 2017). Patel et al (2017) stated, "Key interventions included an educational campaign on the safety implications of reducing emergency department boarding time, an afternoon huddle with MDs and case managers, and a Web-based dashboard to provide real-time DBN audit and feedback" (p. 189). The afternoon huddle, termed "Tee Time", included a DC planning checklist and focused on teeing up patients for early DC the following day (Patel et al., 2017). Patel et al. (2017) reported an improvement in DBN rates (15.7% vs 10.4%) and average DC time (3:18 p.m. vs 3:35 p.m.). There was little change in average LOS (5.88 vs 5.85) and 30-day all-cause readmissions (17.5% vs 17.4%) for the intervention and control groups, respectively (Patel et al., 2017). Patel et al. (2017) noted a more pronounced increase in DBN rates for patients admitted to a skilled nursing facility (33.2% vs 14.0%) compared to patents discharge home (17.5% vs 8.8%).

Rajkomar, Valencia, Novelero, Mourad, and Auerbach (2016) performed a retrospective analysis of data from adult medical-surgical discharges from an academic center to evaluate if DBN is associated with LOS. Rajkomar et al. (2016) had a study population of 27,983 patients with a total of 38,365 hospitalizations and a median LOS of 3.7 days. Rajkomar et al. (2016) reported a DBN rate of 16.9% with elective admissions more likely to be DBN than emergent

admissions (53. 9% vs 31.6%, respectively, $p < .0005$). Rajkomar et al. (2016) stated, "A discharge before noon was associated with a 4.3% increase in LOS (adjusted odds ratio [OR]: 1.043, 95% confidence interval [CI]: 1.003-1.086), adjusting for case mix index (CMI), the service type, discharge on the weekend, discharge disposition, age, sex, ethnicity, race, urgency of admission, payor class, and a full interaction with the date of discharge (in 6-month intervals)" (p. 8161). Rajkomar et al (2016) concluded that observational studies of DBN are challenging because the association between DBN and LOS is potentially bidirectional and therefore flawed as a key metric for throughput efforts.

Shine (2015) wrote a commentary about hospitals implementing DBN metrics to improve hospital throughput. In his commentary, Shine (2015) questions why noon, or any single hour, is chosen as a metric, when national data shows ED occupancy doesn't peak until 8:00 p.m. Shine (2015) noted studies that evaluated morning hospital discharge to improve the issue of ED overcrowding often show improvements in discharge time, but fail to measure the effect on ED crowding and no study had measured ED occupancy before and after instituting an early DC. Shine (2015) discussed the following outcomes as needing to be included in evaluating DBN studies: ED occupancy, LOS, patient satisfaction, nursing/support staff satisfaction, provider satisfaction, readmission rates, and hospital complication rates. Shine (2015) concluded, "Pre-noon DC is rapidly becoming a universal goal, without much evidence that the required effort produces benefit in any hospital outcome."

Tanguturi et al. (2016) sought to reduce readmissions for patients following percutaneous coronary intervention (PCI) through programs to target vulnerabilities pre-discharge, post-discharge, and during re-presentation to the ED. Interventions for the pre-discharge, or inpatient, phase included calculating the readmission risk score before the PCI procedure, RN facilitated

patient education using a video, identification of high-risk patients based on readmission risk summary in the EHR by the case manager, and use of a post-PCI DC checklist by the resident. The post-PCI DC checklist contains 8 tasks to be completed for all PCI patients with 2 additional tasks to be completed for the identified high risk patients (Tanguturi et al., 2016). The study is ongoing, but Tanguturi et al. (2016) report seeing an improvement in readmissions after PCI following the implementation of their initiatives and that if successful, their program could potentially provide evidence-based tactics that can be implemented in other facilities.

Verhaegh, Buurman, Veenboer, Rooij, and Geerlings (2014) conducted a study to determine if using a DC bundle consisting of four elements: (1) planning the date of discharge within 48 hours after admission, (2) a discharge checklist for residents and nurses, (3) a personalized patient discharge letter and (4) patient education was associated with a reduction in 30-day hospital readmission rates. Secondary outcomes measured by Verhaegh et al. (2014) included initial hospital LOS, time to readmission, number and duration of readmissions, total number of general practitioner (GP) and ED visits, mortality, overall patient satisfaction of DC process, and time until sending the DC letter to the GP. Significant differences between the pre-test period group (n = 224) and the post-test period group (n = 204) were country of birth, education level, living arrangements, and DC diagnosis. There was statistically significant improvement in the median initial hospitalization LOS from the pre-test to the post-test group (2.75 vs 2.46, p = .04) (Verhaegh et al., 2014). There was no significant improvement from the pre-test to the post-test groups for 30-day unplanned hospital readmissions (12.9% vs 13.2%, p = .83), duration of first readmission (4 vs 1, p = .52), GP visits (52.8% vs 59.0%, p = .26), ED visits (24.9% vs 21.0%, p =.39) (Verhaegh et al., 2014). There were trends toward improvement in time to first readmission (7.1 vs 7.9, p = .06) and 30-day mortality (1.8% vs 0%, p = .06)

(Verhaegh et al., 2014). Verghaegh et al. (2014) found that despite the median number of days for the medical DC to be sent to the GP improving, (14 vs 5, $p < .001$), the mean overall patient satisfaction remain unchanged from pre-test to post-test group (7.5 to 7.4, $p = .49$).

Wertheimer et al. (2014) implemented multiple interventions in order to improve DBN rates on 2 medical units from 7% to an organizational goal of 30%. Wertheimer et al. (2014) conducted a kick-off event, inviting all identified stakeholders and front-line staff. The event included education about the importance of a safe and early DC, clearly defined roles during the DC process, and a DC checklist was created based on discussions during the event (Wertheimer et al., 2014). Wertheimer et al. (2014) implemented additional interprofessional rounds at 3:00 pm to identify potential DCs for the next day. Potential DCs were entered into a DBN website which generated an automated e-mail at 4:30 pm that went to all hospitalists, residents, nurse practitioners, charge nurses, nurse managers, clinical directors, bed management, building services, social workers, and case managers (Wertheimer et al., 2014). Wertheimer el al. (2014) reported that the multidisciplinary team worked through the 13-item, DC checklist at the same 3:00 p.m. huddle that identified potential DCs for the next morning. Wertheimer et al. (2014) reported a statistically significant improvement in DBN in pre-intervention vs post-intervention periods (11% vs 38%, $p = .0002$) and that the average time of DC improved by 1 hour and 31 minutes. The average observed-to-expected LOS, with a statistically significant improvement in median observed-to-expected LOS between the baseline and intervention periods (0.82 vs 0.76, $p = .0001$) (Wertheimer et al., 2014). The change in 30-day readmission rates was not statistically significant with a rate of 14.3% vs 13.1% during the baseline and intervention periods, respectively ($p = .1902$) (Wertheimer et al., 2014). Wertheimer et al. (2014) determined they

were successful in implementing and sustaining improvements in DBN beyond the organizational goal of 30%.

In 2015, Wertheimer et al. evaluated the effect their interprofessional intervention discussed above had on the arrival time and the number of admissions per hour, along with reporting sustainability results since the last article. During the study units had an average occupancy rate of 86.8%, average number of total DCs per day was 9.8, and average absolute length of stay was 5.6 days (Wertheimer et al., 2015). Wertheimer et al. (2015) found the median arrival time of patients to the units as ED admissions grouped by hour of the day moved by 1 hour, from 5:00 p.m. to 4:00 p.m. from the baseline to intervention period, ($p < .01$) and that patients transferred or directly admitted to the units grouped by hour of the day moved by 1 hour, from 5:00 p.m. to 4:00 p.m. ($p < .01$). During the baseline period, the highest density of daily admissions arrived during the 5-hour period from 5:00 p.m. to 10:00 p.m. (42.3%) with a statistically significant improvement during the intervention period where the highest density of daily admissions arrived between 3:00 p.m. to 8:00 p.m. (40%, $p < .01$)(Wertheimer et al., 2015). There was no statistically significant change between the baseline and intervention period on when the highest density of transfers and direct admissions occurred (Wertheimer et al., 2015). The average DBN rate for study units was 35% for the period including the original intervention period and an additional 18 months of additional data, showing sustainment of interventions reported in the prior study.

Summary

There were 8 studies that found improvements in DBN rates, with 6 of those studies also improving mean DC time. All of those studies found improvement, or no change, in the balancing metrics of LOS or 30-day hospital readmission rates. Rajkomar et al. (2016) did find a

4.3% increase in the average length of stay in patients DBN compared to patients discharged after noon. In their systematic review, Hansen et al. (2011) found that studies that used a single intervention to improve 30-day hospital readmission rates were unsuccessful, but studies that used a DC bundle of multiple interventions were able to reduce 30-day hospital readmissions. Opponents of DBN initiatives point out that hospital throughput and ER wait times are rarely evaluated in studies despite being listed as a major reason why patients should be DBN. Khanna et al. (2016) performed simulations in an attempt to determine what percent of patients should be discharged by what time of day exactly and found that having a steady rate of discharges throughout the day was just as effective in reducing ER wait times and improving hospital throughput as having a very large proportion of patients discharged in the morning. Another stated reason for DBN metrics is that patients who are discharged earlier in the day are able to get home and address issues that arise after being discharged earlier during the day when clinics and other health care services are still open. Edmonson-Martin et al. (2016) found improvements in patient satisfaction metrics in addition to their improved DBN rate.

It is possible to improve DBN rates and average time of patient DC without negatively affecting LOS and 30-day hospital readmission rates. Earlier patient DC may or may not improve hospital throughput, but could potentially improve patient satisfaction.

Gaps in Literature

Several of the studies evaluated the use of a DC checklist across several units and even an entire hospital, however, none of the studies speak directly to the use of a DC checklist in cardiology patients. None of the included studies evaluated the implementation of a DC checklist when other aspects of DC bundles, such as interdisciplinary rounds and care coordination meetings, were already in place. Not only is there a lack of studies evaluating the effect of DBN

rates on decreasing ER wait times, studies have not evaluated the effect of DBN rates on reducing the amount of time that patients wait in intensive and intermediate care units after an order for patient transfer has been placed.

Implications for Nursing

Many institutions are implementing metrics for early discharge in order to improve hospital throughput. Few studies have measured the impact of DBN rates on reducing ER wait times and patient flow and no studies measured how improvements in DBN rates of acute care wards affected patient flow in ICUs. Intervention bundles are more effective than single interventions in improving DBN rates. Early identification of patients eligible for DC the next day across the interprofessional care team was often included as part of successful DC bundles. The use of a DC checklist can guide the care team through the DC planning process, serve as a method of communication, ensure all necessary tasks are completed, and identify ownership of tasks. It is possible to improve DBN rates and average time of patient DC without increasing the balancing metrics of average LOS and 30-day readmissions. Some studies found an improvement in LOS and 30-day readmissions showing that DBN metrics can be met while ensuring a safe DC. Some studies had a primary goal of reducing 30-day readmissions through the use of a DC checklists and did not measure DBN rates. For a checklist to be effective it must be perceived as useful and adequate by those using it.

Project Purpose and Rationale

The purpose of this project was to evaluate whether adding a standardized checklist completed by the interprofessional care team prior to the anticipated day of discharge (DC) would improve the percentage of patients discharged by noon (DBN) without increasing the average length of stay or percentage of 30-day hospital readmissions. There have been several

studies that have successfully improved DBN rates by using a DC checklist as part of an intervention bundle. Opponents of DBN metrics argue that hastily discharging a patient may increase 30-day hospital readmission rates and that providers could possibly improve DBN rates by waiting another day to discharge patients who may be ready after noon. Therefore, changes in length of stay and 30-day hospital readmission rates will be measured to serve as balancing measures, based on the concerns stated by the opponents of DBN metrics.

Project Question

Does implementing an interprofessional DC checklist improve DBN rates of patients discharged from an acute cardiology service (ACS) compared to standard care?

Chapter III

Methods

Introduction

A review of the literature demonstrates that an interprofessional process improvement project utilizing a DC checklist could improve discharge by noon rates and average time of discharge without increasing average length of stay or 30-day hospital readmissions.

Project Design

The design of the study was a quasi-experimental two group, pre-intervention/post-intervention performance improvement project (Harris et al., 2006).

Project Purpose

The purpose of this project was to evaluate whether adding a standardized checklist, completed by the interprofessional care team, prior to the anticipated day of discharge (DC) would improve the percentage of patients discharged by noon (DBN) without increasing the average length of stay or percentage of 30-day hospital readmissions.

Definition of Terms

30-Day hospital readmission: A patient readmitted to the hospital as an inpatient within 30 days of previous discharge as an inpatient, regardless of cause for admission.

Card flip: 15:00 weekday meeting between attending, residents, and interns to review patients seen that day, allows for team to address pressing needs and for teaching on educational opportunities.

Care coordination meeting: 11:30 weekday meeting on one of the units where the nurses providing patient care rotate through and present their assigned patients for the day to the

shift manager, case management, social worker, pharm tech, and chaplain who attend the entire meeting. The team discusses overall patient status, pressing needs/concerns, progression towards discharge, and what the providers had discussed during RWH.

Case mix index: A numeric value that serves as a measure of acuity. Calculated after the patient is discharged based on chart review, primary diagnosis, and assigned diagnosis related group. A higher number is correlated with a higher acuity or a "sicker" patient. Mendez, Harrington, Christenson, and Spellberg (2014) explain:

> Although designed as a basis for calculating hospital payments for patient care, and not as an indicator of severity of illness per se, it has become increasingly common practice to normalize a variety of publicly reported quality indicators and costs for disease severity by dividing the indicator or costs by the medical center's individual CMI, allowing comparisons across medical centers.

Discharge time: The time of day that a patient is transferred off the unit following the placement of a DC to home order by a provider. Time of DC is recorded into the patient's chart in the EHR by the shift manager.

Discharge by noon (DBN): Patient is discharged and transferred off the unit between 00:01 a.m. and 11:59 a.m.

Discharge checklist: A checklist of tasks that must be completed for a patient to be discharged that includes a list of all identified tasks and which profession(s) is responsible for completion of each task.

Discharge order placed: The time that the order for patient discharge is signed and made active by the provider.

Length of stay: Time from patient admission or transfer to unit where project is taking place until time of DC.

Interprofessional team: A team composed of various professions working together to achieve a central goal including, but not limited to: medicine, nursing, pharmacy, case management, social work, physical therapy, and occupational therapy.

Meds to Beds: Institution initiative where DC prescriptions are delivered to the patient's bedside by a pharmacy technician prior to patient being transferred off the unit for DC.

Provider: Any Licensed Independent Provider (LIP). This institution recognizes medical doctors (MDs), nurse practitioners (NPs), and physician assistants (PAs) as LIPs.

Rounding with Heart: The interprofessional rounds performed by the Acute Cardiology Service (ACS) that follows a set script of topics and questions to discuss a patient's condition. Discussion takes places outside of the patient's room then moves into the patient's room to include the patient and family into the discussion.

Shift manager: Also called the charge nurse, is an experienced RN responsible for oversight of nursing care provided during the assigned shift.

Smart-phrase: Any easy method of putting already developed, standard text or tables into a note in the EHR. Smart-phrases can be created by an individual and then shared to other EHR users. Smart-phrases can be easily modified by the creator.

Setting

This project took place on two, 28-bed inpatient acute care units specializing in care of cardiac and vascular patients in an academic medical center located in central Virginia.

Current initiatives already in place by the ACS were: interprofessional rounds, pharmacists embedded on the units, "Meds to Beds", and MR of DC prescriptions by shift

managers. One of the units had care coordination meetings every weekday and MR of DC prescriptions completed by the shift manager instead of the nurse providing care to the patient.

Interprofessional rounds were held every weekday starting at 09:30 and included the attending provider, residents, the unit pharmacist(s), social worker(s), case manager(s), patient's primary nurse, and the shift manager. The interprofessional rounds were called "Rounding with Heart" (RWH) and followed a drafted script of questions related to the patient's condition to direct the team's discussion outside and inside the patient's room. The RWH script is shown in Figure 3.

A care coordination meeting was conducted every weekday at 1130 by one of the units in a dedicated meeting space. The shift manager, case management, social worker, pharm tech, and chaplain attended the entire meeting. Nurses providing patient care rotated through and presented their assigned patients for the day; discussing overall patient's status, pressing needs/concerns, progression towards discharge, and what the providers had discussed during RWH. Other members of the care team would add pieces related to their profession to increase overall team awareness on how a patient was progressing towards DC and when the patient is expected for DC. The members discussed what tasks and goals needed to be accomplished for the rest of the day in order to move the patient closer to DC ready.

The pharmacists embedded on each unit had an assigned workspace and were scheduled to work regularly in a given specialty area. The pharmacists advised providers and nurses on medication issues and assisted in performing admission, transfer, and DC MRs on patients identified as being at an increased risk for experiencing an adverse drug event. "Meds to Beds" was a hospital initiative that delivered a patient's DC prescriptions to the patient before they were transferred off the unit for DC. Patients had to agree to receive their medications through

the institution's pharmacy in order to have their prescriptions filled and delivered to the bedside. A pharmacy tech would the medications to the bedside. The pharmacy tech could call a pharmacist to provide education to the patient over the phone if needed.

Trained shift managers – or charge nurses – were experienced registered nurses (RNs) who helped manage the unit during their shift. Shift managers did not take patients during the weekday, but sometimes they would take a small patient load on night shifts and weekends. Shift managers would complete the MR of DC prescriptions after the DC order had been placed in the EHR by a provider.

Approval to perform this project was granted by the each unit's nurse manager via email. Screenshots of the emails are located in Appendix A.

Sample Description

Convenience sampling was conducted to identify the records of patients who met the inclusion/exclusion criteria with the project period. Data were extracted from the EHR records of patients admitted to the Acute Cardiology Service (ACS) on the two cardiac/vascular acute care units. Inclusion criteria were: adult patients admitted or transferred to one of the acute care wards where the project was set, with the acute cardiology service designated as the primary care team. Exclusion criteria were data from patients who were: admitted for less than 24 hours, those discharged outside of project period, those who left against medical advice (AMA), and those who died during hospitalization. Additionally, patients would be excluded from the intervention group if they had been discharged by the ACS as part of the control group in order to maintain independent samples.

Procedures

Checklist development.

The DC checklist was developed with input from a physician leader in the Acute Cardiology Service, nursing leaders, case managers, social workers, and pharmacists. All members of the team were able to review the DC checklist and provide input into its content and format. The DC checklist was incorporated into a smart-phrase in the EHR and shared with the interprofessional team before the intervention period. The contents of the checklist were reviewed on the third day of the intervention period as part of a Plan-Do-Study-Act cycle to determine what improvements could be made to the checklist. Two tasks assigned to social workers were removed from the checklist as the tasks would not delay patient discharge if not done. The final version of the DC checklist is shown in Figure 4.

Staff education.

Nursing personnel received training during each unit's October staff meeting. Residents received training during a weekly 1500 meeting that occurred every Monday to train and remind residents how the ACS functioned and how interprofessional rounds were conducted using RWH principles and the RWH script. Pharmacists, social workers, and case managers received on the spot, shoulder-to-shoulder training on the use of the checklist. All interprofessional team members received additional training and reminders usage of the DC checklist as necessary throughout the intervention period.

Checklist implementation and daily workflow.

The DC checklist was implemented and tested during the intervention period on both units during a 12-day consecutive period beginning on a Monday and ending the following Friday. All patients who were admitted with the ACS as the primary care team during the intervention period had the DC checklist implemented. The author of this study was present on

the units during the implementation period of the project and helped with ensuring the DC checklist was initiated as appropriate and reminded staff to use the checklist when appropriate.

A note containing the DC checklist was initiated during the interprofessional rounds, RWH, when a patient was identified as an anticipated DC for the next day. Any member of the interprofessional team could enter the DC checklist into the EHR by starting an Advance Care Planning note using a shared "smart-phrase" to insert the complete DC checklist into the note. During this project, "Unknown" was used as the service on the Advance Care Planning Note containing the DC checklist since interprofessional, interdisciplinary, and other were not in the EHR. A smart-phrase was able to be shared across the interprofessional team and allowed for quick and easy entry of text, lists, or tables into a note. The staff member who initiated the note could sign it as soon as it was initiated, even if the checklist was not entirely complete, to allow for other staff be able to amend the note and initial off on their tasks.

The anticipated date of DC was entered onto the DC checklist as soon as the checklist was initiated. The status of tasks on the checklist were discussed throughout RWH following the script (see Figure 3). Tasks on the checklist that had already been completed during the patient's admission were initialed off as complete at that time. If a task on the checklist was not discussed, the study lead would ask the team about its status to ensure each task was discussed. Team members were encouraged to work on the remaining tasks throughout the day and asked to remember to sign off once the tasks was complete in order to communicate the change status to other members of the team.

The DC checklist was then discussed by the members of the interprofessional team who attended the 11:30 care coordination meeting conducted on one of the units to identify what tasks

were still pending on patients admitted to that unit and to work out a plan on getting them completed.

Providers did not attend the care coordination meeting, but had daily afternoon "card flip and education" session at 15:00 where patients were reviewed. The status of provider tasks on the DC checklist were discussed by the ACS teams and the checklist was updated as necessary. Providers were asked to include discussion of the DC checklist during handoff to the covering team. The author of this proposal reminded staff throughout the day to use the DC checklist to assess what tasks were still needing to be completed and to initial off once they had completed any tasks in order to communicate to other members of the team that the tasks was done.

The DC checklist was reviewed and discussed the morning of the day of anticipated discharge during the 08:30-09:00 ACS provider team huddle that discussed all possible discharges for that day. Residents and interns were encouraged to address tasks still pending prior to RWH by the covering attending. The DC checklist and non-completed tasks were then discussed during RWH for the interprofessional team to determine how to address the pressing issues that may delay DC. The daily workflow of staff is shown in Figure 5.

Data Collection

The control group consisted of ACS patients discharged from both units during an 11-day consecutive period that began on a Tuesday and ended on the Friday of the following week and met all other inclusion/exclusion criteria. Secondly, 10 calendar days after data collection from the control group ended, the DC checklist was implemented on the two units on a Monday. The intervention group consisted of ACS patients discharged from the two units during a similar 11-day consecutive period that began on the Tuesday (the day after the DC checklist was

implemented) and ended on the Friday the following week and who met all other inclusion/exclusion criteria.

During the designated periods for the control group and the intervention group, all patients admitted to both of the acute care wards were added to a patient list within the EHR on a daily basis. A separate patient list was made for the control group and for the intervention group. The patients' charts were not opened in order to add them to the patient lists. The patient lists in the EHR showed where the patient was located, the primary team, admission date and time, discharge date and time, and LOS. Patients' records were judged against the inclusion and exclusion criteria once the patient was discharged. Those who did not meet the criteria for inclusion were removed first, followed by those who were removed for meeting exclusion criteria. This allowed for easy identification of all possible samples without having to open up each patient record and ensured that only data on samples who met inclusion/exclusion criteria was collected from the EHR and placed into the excel spreadsheet used for data collection. The exact numbers of possible samples who the number of samples excluded from the study was not captured.

All collected data were entered into an excel spreadsheet stored on the institution's F:\ drive, protected behind firewalls. The following data were collected: medical record number (MRN), age, gender, race, primary diagnosis, admission source, admitting date with time, time DC order was placed by LIP, discharge date with time, discharge destination, length of stay, 30-day hospital readmission, and case mix index. The spreadsheet is shown in Figure 6.

Data on the control group served as baseline data. Data was extracted from the EHR for the control group after the 12 consecutive day period designated for the control period ended and

before hospital staff were educated and the DC checklist was implemented, with the exception of data on CMI and 30-day readmission rates which were collected after the intervention period.

Data on the intervention group were collected from the EHR throughout the intervention period, with the exception of data on CMI and 30-day readmission rates, which were collected 6 after the end of the implementation period. Data on 30-day readmission rates and CMI were collected on several occasions for 3-months after the intervention period to due to the CMI being calculated after patient discharge and the subsequent chart review required to assign a CMI.

After all data were collected and LOS had been calculated based on admission date and time and the discharge date and time; patients' MRNs, admission date with time, and discharge date were removed from the spreadsheet and imported into SPSS for data analysis. Data collection process is shown in Figure 7.

Outcome Measures

The primary outcome measure was percent of patients discharged before 12:00 p.m., noon. Secondary outcome measures were average time of DC, average time DC order was placed by the provider, average time in minutes from DC order placement to DC, length of stay in days, and percentage of patients with 30-day hospital readmissions.

Data Analysis

Data were analyzed using SPSS® version 24 software (UNICOM, 2016). Descriptive statistics for each group were compared to determine if there were any significant characteristic differences between the control group and intervention group. A two-sided independent samples t- test was performed on age and case mix index. An exact two-sided chi square test was performed on race, gender, primary diagnosis, patient location before admission, source of admission, and disposition.

Outcome measures were analyzed using similar methods to compare the control group and the intervention group. Exact two-sided chi-square tests were used to compare the rates of DBN and 30-day readmission for the two groups. Two-sided independent samples t-tests were used to analyze length of stay, time DC order was placed, time of DC, and time from DC order being placed to time of DC. All tests used $\alpha = 0.05$ to determine level of significance.

Protection of Human Subjects

This project was submitted for Internal Review Board (IRB) approval and was deemed a quality improvement project and determined as exempt. This project was given the study tracking number 20184. The IRB determination notice is shown in Appendix B.

Personally identifiable information (PII), including the MRN and patient age, were collected in order to track 30-day readmission rates. All data, including PII, were stored in an electronic spreadsheet on a secured health system drive, which was protected behind a firewall. The framework of the spreadsheet is shown in Figure 6. Patients' MRNs, admission date with time, and discharge date were removed from the spreadsheet once all data has been collected and length of stay had been calculated to de-identify data prior to importing data over to SPSS® for analysis. Patients were not interviewed. This performance improvement project did not alter any medical and/or nursing interventions beyond the use of the DC checklist to organize completion of tasks that were already performed for patient DC.

Results will be presented in Chapter IV.

Chapter IV

Results

There were 43 patients who cleared the inclusion and exclusion criteria for the control group. There were initially 31 patients who cleared the inclusion and exclusion criteria for the intervention group. However, 1 patient had been discharged by the ACS in the control group and was therefore removed from the intervention group to keep the samples independent, so there were 30 patients in the intervention group for data analysis.

Sample Characteristics

Data analysis determined that the groups were not significantly different based on demographic data, see Table 1. The average age for the control group was 65.26 compared to 67.93 for the intervention group ($p = .479$). Both groups were predominantly white, non-Hispanic with the only other identified race being black or African-American. The control group had 35 (81.4%) white, non-Hispanic patients and 8 (18.6%) black, or African-American, patients and the intervention group had 20 (66.7%) white, non-Hispanic patients and 10 (33.3%) black, or African-American, patients ($p = .176$). There were higher rates of male patients in both groups, with the control group having 24 (55.8%) males and 19 (44.2%) females and the intervention group having 18 (60%) males and 12 (40%) females ($p = .812$). The majority of patients were living at home before being admitted to the hospital for both groups. The patients' locations prior to admission for the control group vs the intervention group by location were: assisted living [1 (2.3%) vs 0 (0%)], home [31 (72.1%) vs 25 (83.3%)], outside hospital [9 (20.9%) vs 5 (16.7%)], and skilled nursing facility [2 (4.7%) vs 0 (0%)], ($p = .678$). Patients' source of admission for the control group vs the intervention group by location were: clinic [1 (2.3%) vs 0 (0%)], emergency department [33 (76.7%) vs 24 (80%)], outside hospital [9 (20.9%) vs 5 (16.7%)], and post-

operative room [0 (0%) vs 1 (3.3%)], (p = .668). Patients' disposition, or setting the patient was discharged to, for the control group vs the intervention group by setting and services were: assisted living [1 (2.3%) vs 0 (0%)], home or self-care [31 (72.1%) vs 18 (60%)], home with home health [7 (16.3%) vs 8 (18.6%)], and skilled nursing facility [4 (9.3%) vs 4 (13.3%)], (p = .564). The average case mix index for the control group was 1.4682 compared to 1.4598 for the intervention group (p = .965).

The primary diagnosis for each patient was collected from the DC summary in the EHR. The LIP would type in the diagnosis into the EHR, meaning that a single diagnosis could be entered in multiple, non-standard formats, such as Heart Failure with Reduced Ejection Fraction also being entered as HFrEF. An attempt was made to group similar diagnosis into broader categories for analysis. However, the control group still had a total of 22 different diagnosis listed and the intervention group had a total of 21 different diagnosis listed. The most frequent diagnosis for the control group were: Non-ST Elevated Myocardial Infarction (n = 7, 16.3%), acute decompensated heart failure (n =7, 16.3%), hypertensive urgency (n = 4, 9.3%), and symptomatic bradycardia (n = 3, 7.0%). The most frequent diagnosis for the intervention group were: Non-ST Elevated Myocardial Infarction (n = 7, 23.3%), acute decompensated heart failure (n = 2, 6.7%), atrial fibrillation with rapid ventricular rate (n = 2, 6.7%), and non-cardiac chest pain (n = 2, 6.7%).

Primary Outcomes

As shown in Table 2, the DBN rate improved from 2.3% for the control group to 10% for the intervention group (p = .299). The proportion of 30-day hospital readmission rates slightly increased from 11.6% in the control group to 16.7% in the intervention group (p = .731). Figure 8 displays the changes in DBN and 30-day hospital readmission rates. The average length of stay

in days remained unchanged between the control group and intervention group (4.35 vs 4.27 respectively, $p = .943$), as shown in Figure 9.

Secondary Outcomes

The average time of DC order placement significantly improved from 13:14 for the control group to 11:58 for the intervention group ($p = .007$). The average time of DC improved from 15:05 to 14:29 for the control group and intervention group, respectively, ($p = .165$). Figure 10 displays the changes in average time of DC order placement and average time of DC. The average time from DC order being placed to time of DC increased from 111.33 minutes for the control group to 150.67 for the intervention group ($p = .033$), as shown in Figure 11.

Chapter V

Discussion

The purpose of this study was to evaluate whether adding a standardized checklist completed by the interprofessional care team prior to the anticipated day of discharge (DC) would improve the percentage of patients discharged by noon (DBN) without increasing the average length of stay or percentage of 30-day hospital readmissions. The primary outcome, proportion of DBN, did not have a statistically significant improvement. The secondary outcomes of LOS and 30-day hospital readmissions used as balancing measures did not have a statisctically significant change. For the three remaining outcomes, there were 2 statistically significant changes and 1 clinically significant change, average time the DC order was placed, average time from placement of DC order placement to time of DC, and the time of DC, respectively.

The statistically significant improvement in the average time the DC order was placed was similar to the improvement in median time of DC order placement reported by Beck and Gosik (2015). Since the DC checklist was not mandatory, it is not possible to directly contribute this improvement to the implementation and usage of the DC checklist. This improvement in getting the DC order placed could be a result of the emphasis placed on discharging patients earlier during the intervention period. It is also possible that this improvement is due to the change in who was the attending provider for the intervention group and the attending provider's push to discharge patients earlier in the day.

The statistically significant increase in the time between when a DC order was placed by the LIP and when the patient was discharged off the ward was an unexpected finding. The average time between DC order placement and time of DC was not reported as being studied by

any of the studies included in the literature review. It is interesting to find that despite an improvement in when the DC order was placed, the time to patient DC got significantly longer. It is unknown whether or not tasks on the checklist were still pending completion when the DC order was placed. It is possible that the RNs, pharmacist, SWs, and CMs who work on getting the patients discharged after the order was placed were unable to work on the discharge process due to attending the interprofessional rounds and care coordination meeting. Another possible cause of the increase could be related to how the patient was being transferred from the hospital to their discharge location, as the patient could be waiting for a transport service or for a friend or family member to get to the hospital to take them home. Further study and evaluation of the daily workflow would be required to correctly identify all possible cause for this increase in order to develop interventions aimed at addressing the issue.

Despite the proportion of DBN not significantly improving, the 36-minute improvement in average time of DC was considered clinically significant. This is similar to the studies by Durvasula et al. (2015), Patel et al. (2017) and Wertheimer et al. (2014) who reported an improvement in average time of DC, while the studies by Beck and Gosik (2015) and Goodson et al. (2014) reported a statistically significant improvement. Improving the average time of DC to 14:29 means that more patients are being discharged home, or to the next healthcare setting, well before the end of the typical business day. This allows more time for the patient to be able to get to the pharmacy or home, where they may encounter questions or problems with medications or discharge instructions, and still have time to call their primary care provider or the cardiology clinic during business hours when help may be available. This improvement is also significant for patients who are in upstream settings in the facility such as the ED, ICU, or

post-anesthesia care unit waiting to be transferred to the ward, which may help improve hospital efficiency.

As stated above, the balancing measures of LOS and 30-day readmission rates did not have a statistically significant change during the intervention period. The slight decrease in LOS from the control group to the intervention group means that it is unlikely that patients were kept an extra night in the hospital in order for them to be discharged before noon the next morning. There is concern that the slight increase in 30-day hospital readmission rates is related to the intervention. Further tests on the data would need to be performed to determine if there was a correlation between time of DC and 30-day hospital readmissions. Additionally, because this study did not track the cause of readmissions, it is possible that any readmission was a planned readmission or related to some other, unknown cause not related to the patient's admission during the study.

Strengths and Weaknesses

This project had three strengths: a setting with a strong interprofessional team in place, using the MFI as a framework, and having the DC checklist incorporated into the EHR. The first strength was having a strong interprofessional team already in place, which helped during the project's planning phase and when developing the checklist. No additional meetings had to be scheduled, as discussion on the project and the DC checklist were added to meetings already scheduled for the interprofessional team. Daily discussion about the DC checklist and pending tasks was easily added to the RWH, interprofessional rounds, where the interprofessional team was already accustomed to discussing the patient's status, plan of care, and discharge needs.

The second strength was using the MFI as a framework for the project. Using the MFI and the PDSA cycle allowed for minor changes of the DC checklist to occur during the project

that improved its usefulness by the interprofessional team during the intervention period. The PDSA cycle can also be applied to this project by the interprofessional team to guide future performance improvement projects based on these findings.

The third and final strength was having used an electronic version of the DC checklist in the EHR, instead of a paper handout. Having the DC checklist in the EHR meant that it could be accessed and updated anywhere. Staff did not have to leave their workstation to go to a centralized location in order to document completion of tasks. This possibly improved utilization of the DC checklist while reducing the amount of time it took staff to document on the checklist.

This project had four weaknesses: short duration, checklist as a smart-phrase, setting, and study design. First, the short duration of the project meant a small sample size, which limits the ability to generalize results to a larger population, especially since there was only one racial minority group captured during the project. The short duration also meant that the DC checklist may not have been implemented into the daily workflow as well as it could have been given a longer intervention period, thus limiting its use and effectiveness at improving DBN rates.

The second weakness was using the DC checklist as a smart-phrase instead of as a new type of note. Having the DC checklist as a smart-phrase meant that it could be easily modified without having to work through the informatics department, but it did mean the checklist could not pull information. While a smart-phrase is easy to edit, staff would have to amend a signed note in order to initial off on completed tasks. Several staff mentioned throughout the project period that it felt odd to amend someone else's signed note, which served as a deterrent and decreased staffs' comfort levels with using the checklist. If the DC checklist was implemented into a new type of note, similar to a "Progress Note", it would be possible for it to pull data documented elsewhere in the patient's EHR into the note. This would reduce the need for staff to

double document on completed tasks and could have improved its usefulness to staff during the intervention period.

The third weakness was the setting where the project took place. While the setting was strengthened by having an established interprofessional team, it was also a weakness for this project. Being able to DC a patient before noon relies on staff having time in the morning towards working on discharges. Rounding with heart has proven effective at improving patient satisfaction scores and the quality of discharge education, but is time consuming for all members of the interprofessional team. This is evident in the average time of DC order placement being in the afternoon for both groups, despite a concentrated effort to improve DBN rates in the intervention group. Since this project took place in an academic hospital, DBN is harder to achieve due to the additional teaching rounds that occur between medical students, interns, residents, and their attending physician that take place before interprofessional rounds. It may be possible to redesign the providers' teaching rounds, along with the RWH interprofessional rounds in order to improve DBN rates, but it may come at the expense of modifying programs that have proven highly successful in other areas viewed as having higher priority to the institution. The "Meds to Beds" program in place may have improved or worsened the time between DC order placement and time of DC, but enrollment in the program was not tracked.

Finally, since the design of the study used convenience sampling and the two study groups were not formed by randomization, it is possible that they differed in some way that was not measured.

Implications for Nursing

This project found some evidence that an interprofessional DC checklist aimed at completing certain tasks prior to the day of discharge can improve DBN rates and average time

of DC. Completing tasks like the DC education and DC medication teaching on night shift can save the discharging nurse time the next morning, during an already busy time of day. Having an effective method to document that DC teaching has already occurred may reduce duplication of work, but is dependent on trust between nursing staff that documented teaching was completed and understood by the patient and/or family.

Implications for Advanced Practice Nursing

The implications for the advanced practice nurse vary by role. As an LIP, nurse practitioners can work on ordering DC prescriptions and completing the DC medication reconciliation the day before the patient is expected to be discharge. Nurse practitioners may also be able to improve time of DC by placing the DC order as soon as possible on the day of DC. Clinical nurse specialists can evaluate whether or not projects aimed at improving DBN rates are appropriate and then lead the projects if they are. Clinical nurse specialists can also develop programs aimed at educating all members on the interprofessional team about the importance of early and safe DCs and how they may improve patient satisfaction and hospital efficiency.

Implications for Future Study

Having an interprofessional approach to developing and implementing the project led to a shared goal for the entire healthcare team during the project period. The members from each profession who participated in the development of the project and the DC checklist learned about what each other was responsible for during the DC process and how tasks were regularly completed and documented. It is recommended that any future projects and at improving the DC process continue to use an interprofessional approach.

It is important to fully observe a setting before implementing a project aimed at improving DBN rates and to determine what the final goal of the project is. A goal to DC

patients by noon may not be appropriate if there are already proven tasks or processes that improve patient outcomes, experiences, or satisfaction that occur in during the morning hours. It may be beneficial to observe the daily workflow of staff once a DC order is placed to be able to identify all tasks that can be completed the day before a patient is DC and what tasks must be completed after the order is entered. Projects aimed at improving the time it takes to complete tasks that must be completed after a DC order is placed may help reduce the time between order placement and when the patient is finally transferred off the unit.

Products of the DNP

The results of this project were presented as part of the author's DNP Scholarly Project Report. The presentation was open to any interested individuals. Members of the healthcare team involved in the project and its implementation, along with all other staff who worked on the unit, were invited to attend. The interprofessional team and unit leadership were notified of the data analysis results. The team can use the results for implementing additional Plan-Do-Study-Act cycles in addressing ways to improve DBN rates if desired. The interprofessional team can use the DC checklist as the basis for an interdisciplinary note that had been discussed by the team in previous meetings.

A manuscript detailing the project and its results will be submitted to *MEDSURG Nursing* for publication.

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Appendices

Table 1

Demographic Characteristics

Variable	Control Group N=43		Intervention Group N=30		*p*
	Mean (SD)	N (%)	Mean (SD)	N (%)	
Age	65.26 (16.32)		67.93 (15.05)		.479[1]
Race					.176[2]
African American/Black		8 (18.6)		10 (33.3)	
Caucasian, non-Hispanic		35 (81.4)		20 (66.7)	
Gender					.812[2]
Male		24 (55.8)		18 (60)	
Female		19 (44.2)		12 (40)	
Location before admission					.678[3]
Assisted living		1 (2.3)		0 (0)	
Home		31 (72.1)		25 (83.3)	
OSH		9 (20.9)		5 (16.7)	
Skilled nursing facility		2 (4.7)		0 (0)	
Admission source					.668[3]
Clinic		1 (2.3)		0 (0)	
Emergency department		33 (76.7)		24 (80)	
Outside hospital		9 (20.9)		5 (16.7)	
Post-operative room		0 (0)		1 (3.3)	
Disposition					.564[3]
Assisted living		1 (2.3)		0 (0)	
Home or self-care		31 (72.1)		18 (60)	
Home with home health		7 (16.3)		8 (18.6)	
Skilled nursing facility		4 (9.3)		4 (13.3)	
Case mix index	1.4682 (.7741)[4]		1.4598 (.7455)[5]		.965[1]

Note. SD = standard deviation; OSH = outside hospital.
[1]Independent samples 2-sided t-test. [2]2-Sided chi-square test. [3]Exact 2-sided chi-square test.
[4]N=38. [5]N=27

Table 2

Outcomes

Variable	Control Group N=43 Mean (SD)	Control Group N=43 N (%)	Intervention Group N=30 Mean (SD)	Intervention Group N=30 N (%)	*p*
Discharge before noon					.299[1]
Yes		1 (2.3)		3 (10)	
No		42 (97.7)		27 (90)	
Length of stay in days	4.35 (4.64)		4.27 (4.95)		.943[2]
Median (IQR)	2.74 (3.08)		2.65 (2.71)		
30-day hospital readmission					.731[1]
Yes		5 (11.6)		5 (16.7)	
No		38 (88.4)		25 (83.3)	
Time DC order placed[3]	13:14:03 (1:40:32)		11:58:38 (2:09:51)		.007[2]
Time of DC[3]	15:05:22 (1:34:36)		14:29:18 (2:00:17)		.156[2]
Time from DC order placed to time of DC in minutes	111.33 (66.42)		150.67 (88.08)		.033[2]

Note. SD = standard deviation; IQR = interquartile range; DC = discharge.
[1]Exact 2-sided chi-square test. [2]Independent samples 2-sided t-test. [3]Time in 24-hour format

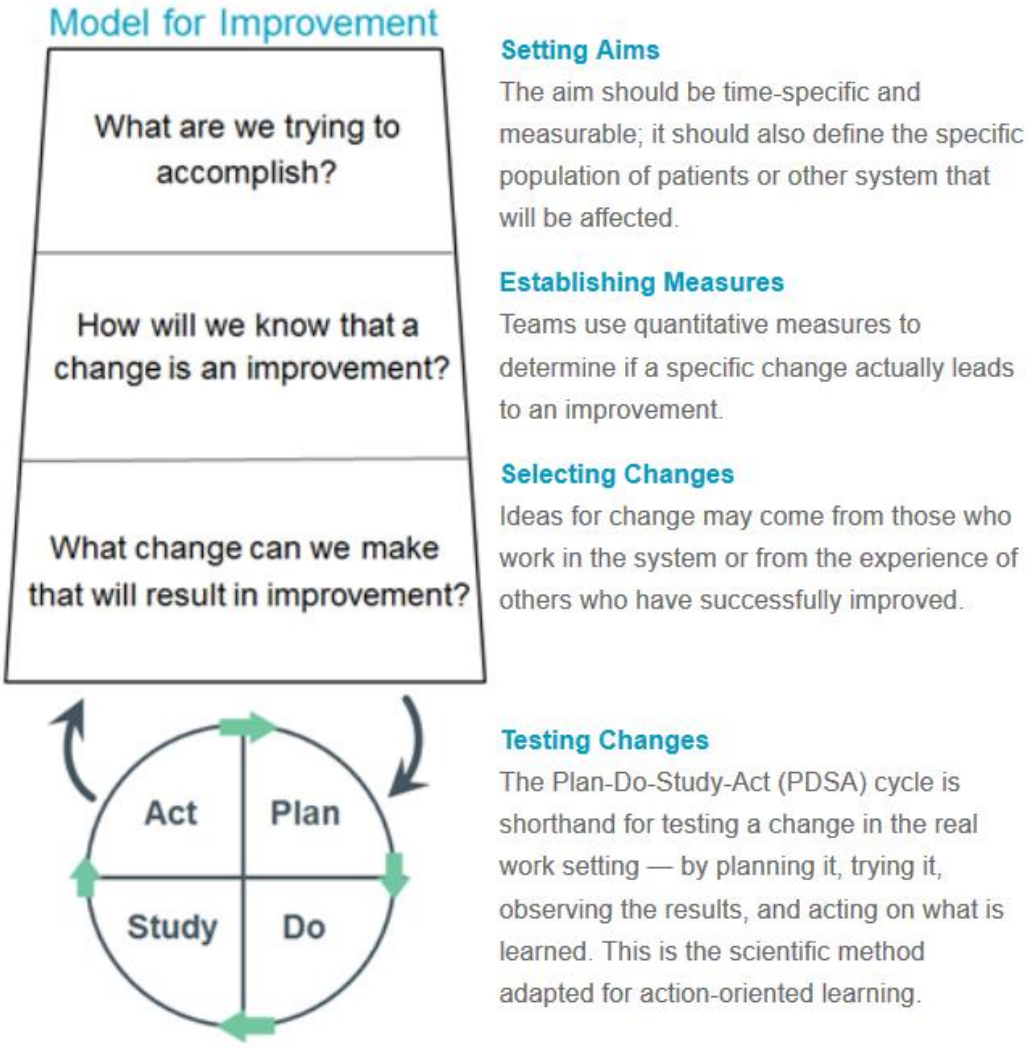


Figure 1. Model for Improvement. Reprinted from "How to Improve," by the Institute for Healthcare Improvement. Copyright 2017 by the Institute for Healthcare Improvement.

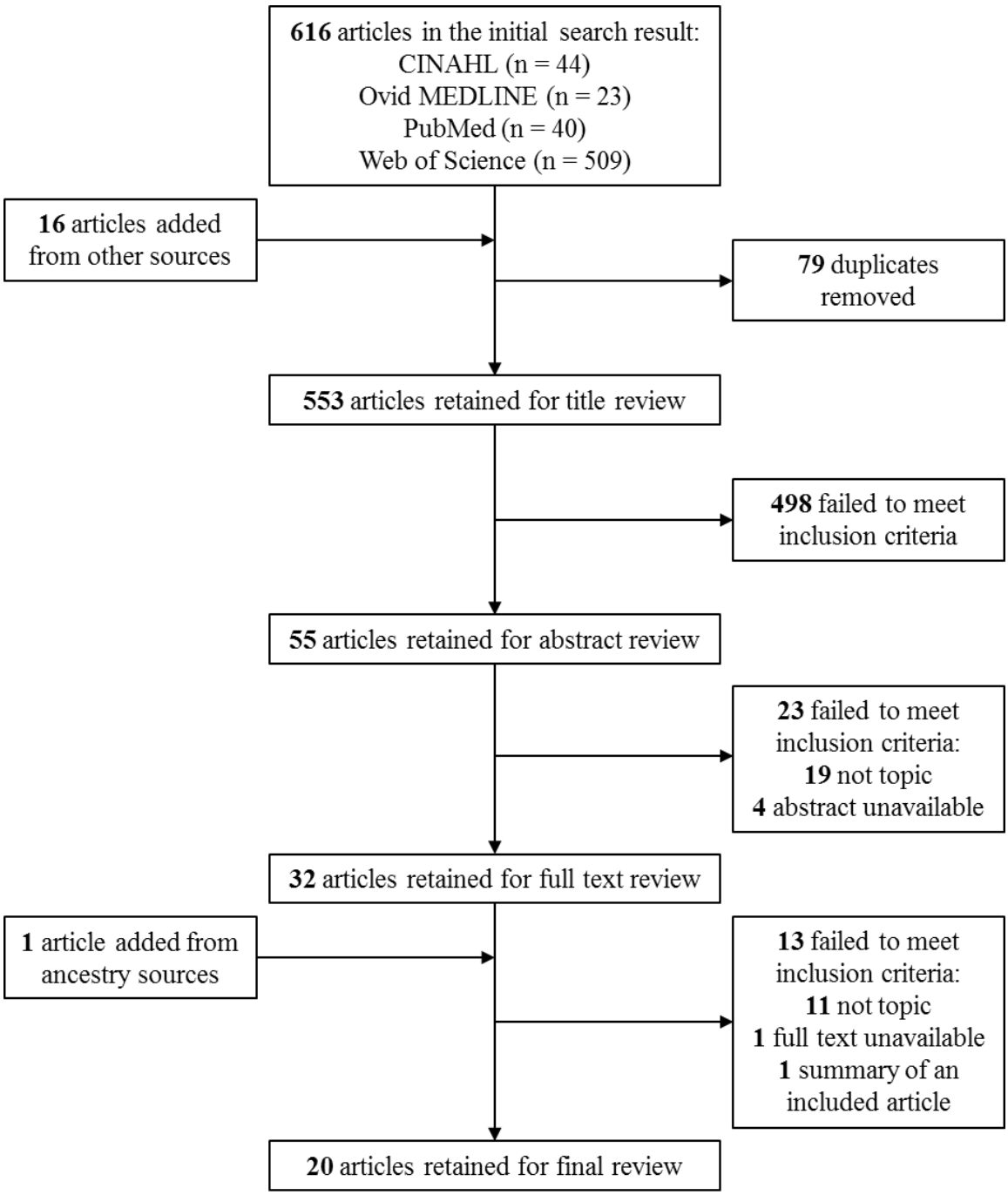
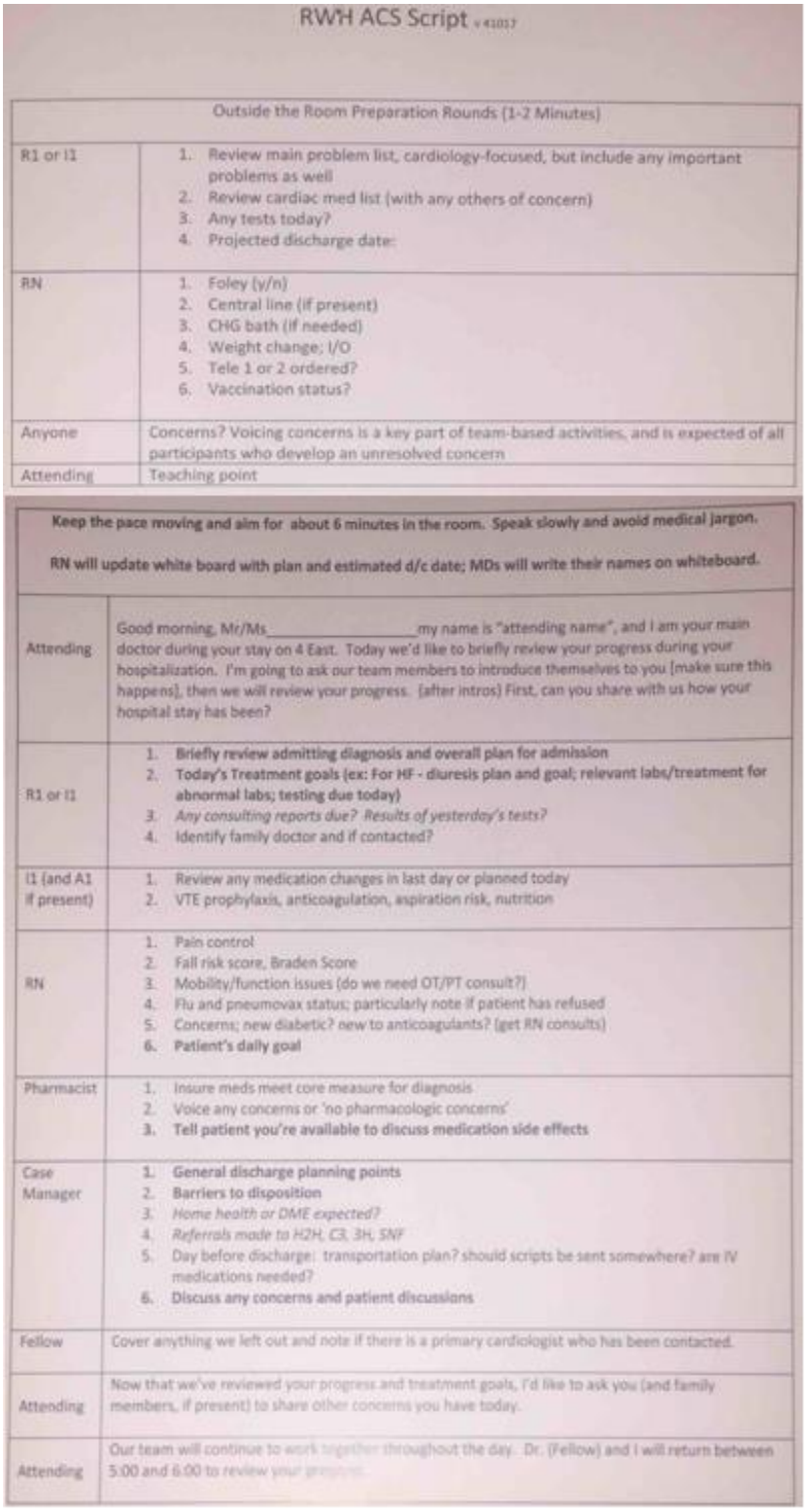


Figure 2. Literature Search Procedure.



RWH ACS Script v 41017

Outside the Room Preparation Rounds (1-2 Minutes)	
R1 or I1	1. Review main problem list, cardiology-focused, but include any important problems as well 2. Review cardiac med list (with any others of concern) 3. Any tests today? 4. Projected discharge date:
RN	1. Foley (y/n) 2. Central line (if present) 3. CHG bath (if needed) 4. Weight change; I/O 5. Tele 1 or 2 ordered? 6. Vaccination status?
Anyone	Concerns? Voicing concerns is a key part of team-based activities, and is expected of all participants who develop an unresolved concern
Attending	Teaching point

Keep the pace moving and aim for about 6 minutes in the room. Speak slowly and avoid medical jargon.

RN will update white board with plan and estimated d/c date; MDs will write their names on whiteboard.

Attending	Good morning, Mr/Ms_____my name is "attending name", and I am your main doctor during your stay on 4 East. Today we'd like to briefly review your progress during your hospitalization. I'm going to ask our team members to introduce themselves to you [make sure this happens], then we will review your progress. (after intros) First, can you share with us how your hospital stay has been?
R1 or I1	1. **Briefly review admitting diagnosis and overall plan for admission** 2. **Today's Treatment goals (ex: For HF - diuresis plan and goal; relevant labs/treatment for abnormal labs; testing due today)** 3. *Any consulting reports due? Results of yesterday's tests?* 4. Identify family doctor and if contacted?
I1 (and A1 if present)	1. Review any medication changes in last day or planned today 2. VTE prophylaxis, anticoagulation, aspiration risk, nutrition
RN	1. Pain control 2. Fall risk score, Braden Score 3. Mobility/function issues (do we need OT/PT consult?) 4. Flu and pneumovax status; particularly note if patient has refused 5. Concerns; new diabetic? new to anticoagulants? (get RN consults) 6. **Patient's daily goal**
Pharmacist	1. Insure meds meet core measure for diagnosis 2. Voice any concerns or 'no pharmacologic concerns' 3. **Tell patient you're available to discuss medication side effects**
Case Manager	1. **General discharge planning points** 2. **Barriers to disposition** 3. *Home health or DME expected?* 4. *Referrals made to H2H, C3, 3H, SNF* 5. Day before discharge: transportation plan? should scripts be sent somewhere? are IV medications needed? 6. **Discuss any concerns and patient discussions**
Fellow	Cover anything we left out and note if there is a primary cardiologist who has been contacted.
Attending	Now that we've reviewed your progress and treatment goals, I'd like to ask you (and family members, if present) to share other concerns you have today.
Attending	Our team will continue to work together throughout the day. Dr. (Fellow) and I will return between 5:00 and 6:00 to review your progress

Figure 3. Rounding with Heart Script.

Discharge Before Noon Checklist

Anticipated Date of Discharge: _____
Discharge Destination Needed: _____

Task Owner	Discharge Task	Completed by (initials) or n/a:
LIP	Home health attestation	_____
	DME ordered	_____
	DC Prescriptions ordered	_____
	MD DC summary initiated	_____
Pharmacy or RN	DC prescription education Discussed:_____	_____
RN	RN DC education prepared	_____
CM	All DME arranged	_____
	Home care/services arranged (if necessary)	_____
	Transportation arranged	_____

Note. n/a = not applicable; LIP = licensed independent practitioner; DME = durable medical equipment; DC = discharge; MD = medical doctor; RN = registered nurse; CM = case manager.

Figure 4. Discharge Before Noon Checklist.

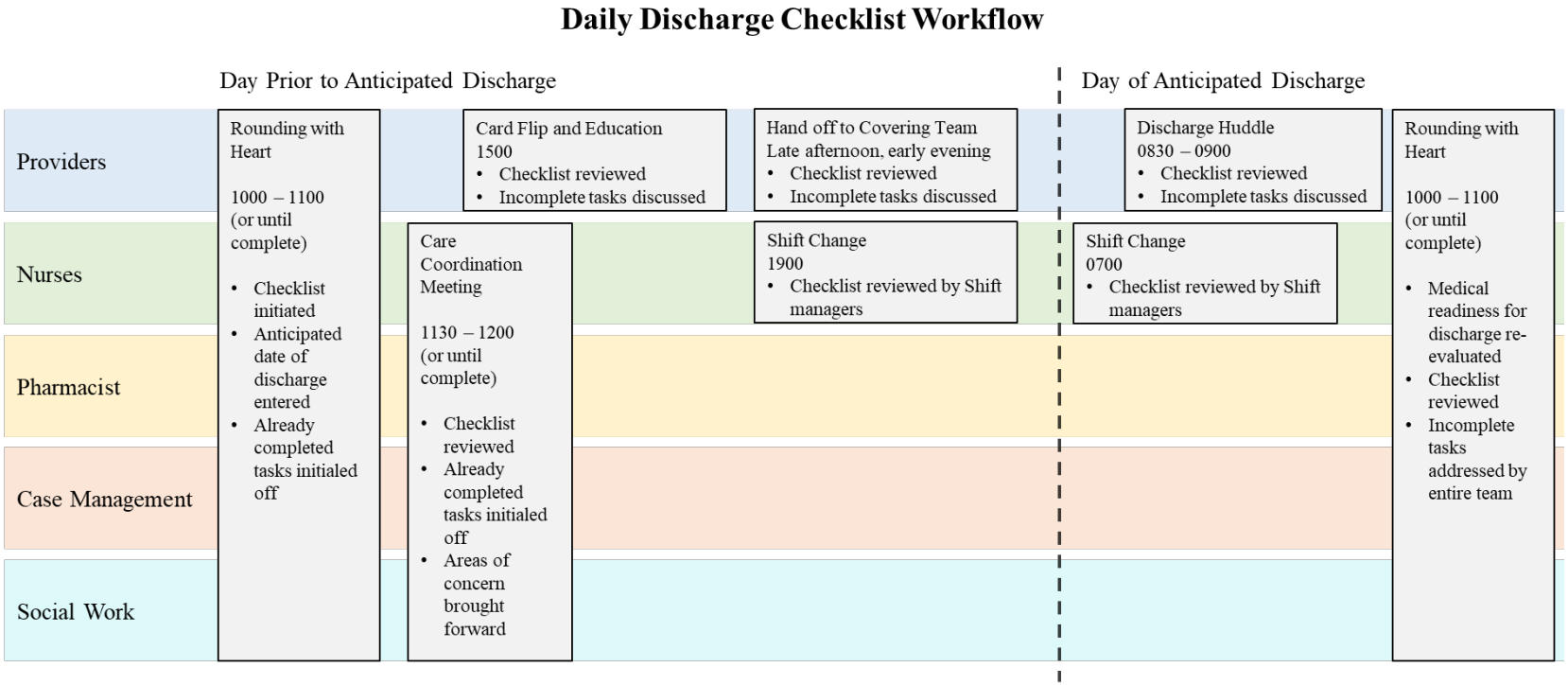


Figure 5. Daily Discharge Checklist Workflow.

MRN	Age	Gender	Race	Primary Diagnosis	Location Before Admission	Admission Source	Admitting Date/Time	Discharge Date/Time	Discharge Destination	LOS	DC Order Placed	CMI	30-day readmission

Figure 6. Excel Spreadsheet for Data Collection. MRN = medical record number; LOS = length of stay; DC = discharge; CMI = case mix index.

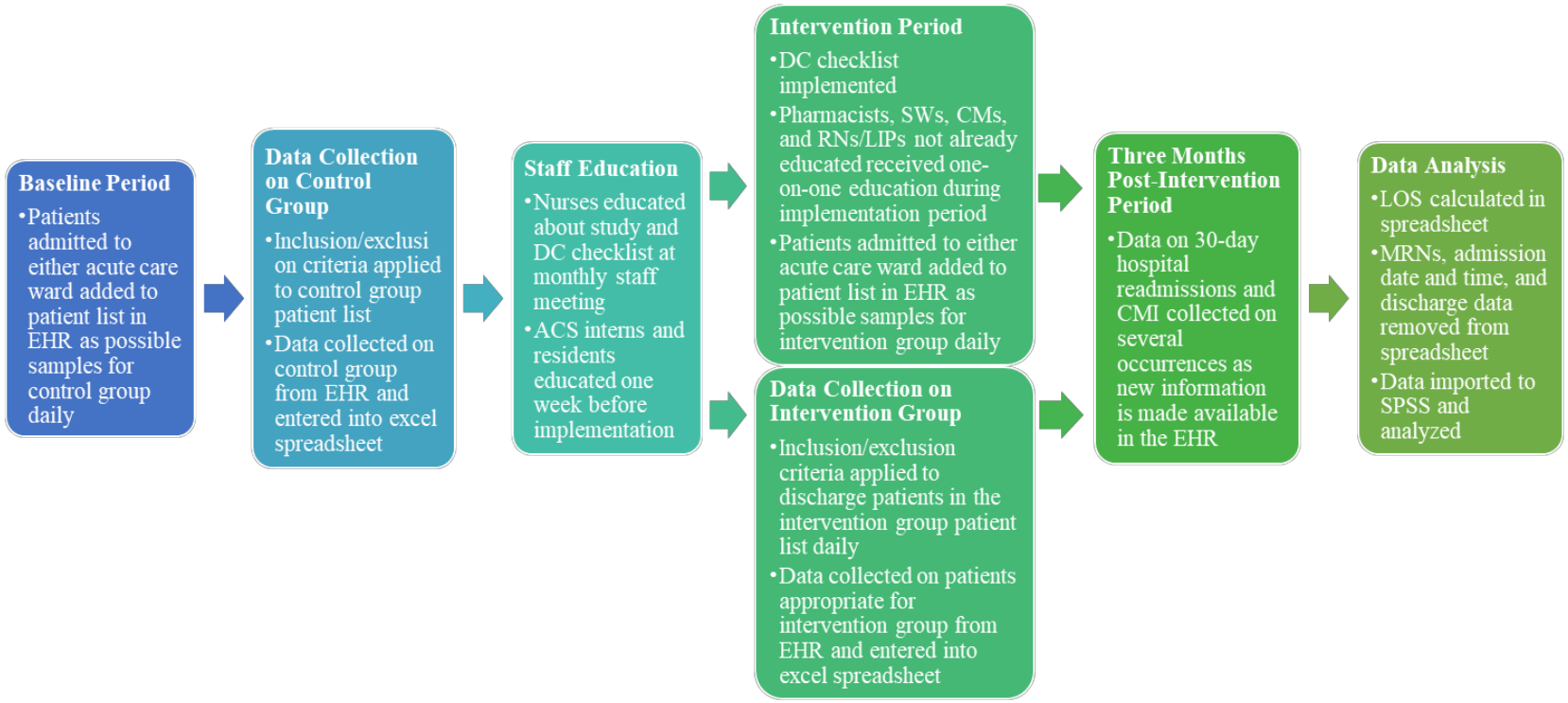


Figure 7. Data Collection Process. EHR = electronic health record; DC = discharge; ACS = acute cardiology service; SWs = social workers, CMs = case managers; RNs = registered nurses; LIPs = licensed independent practitioners; CMI = case mix index; MRNs = medical record numbers.

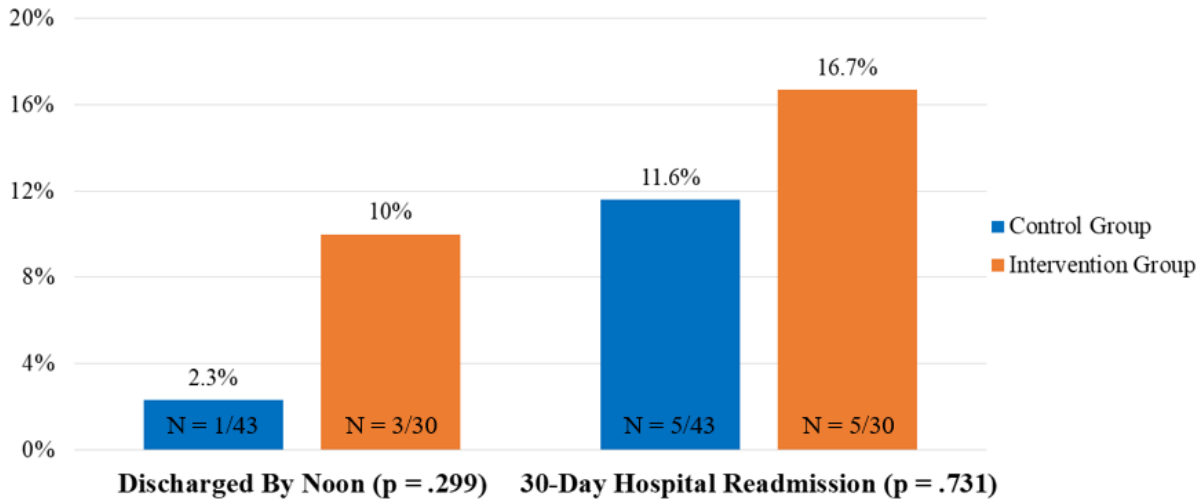


Figure 8. Changes in Discharge by Noon and 30-Day Hospital Readmission Rates.

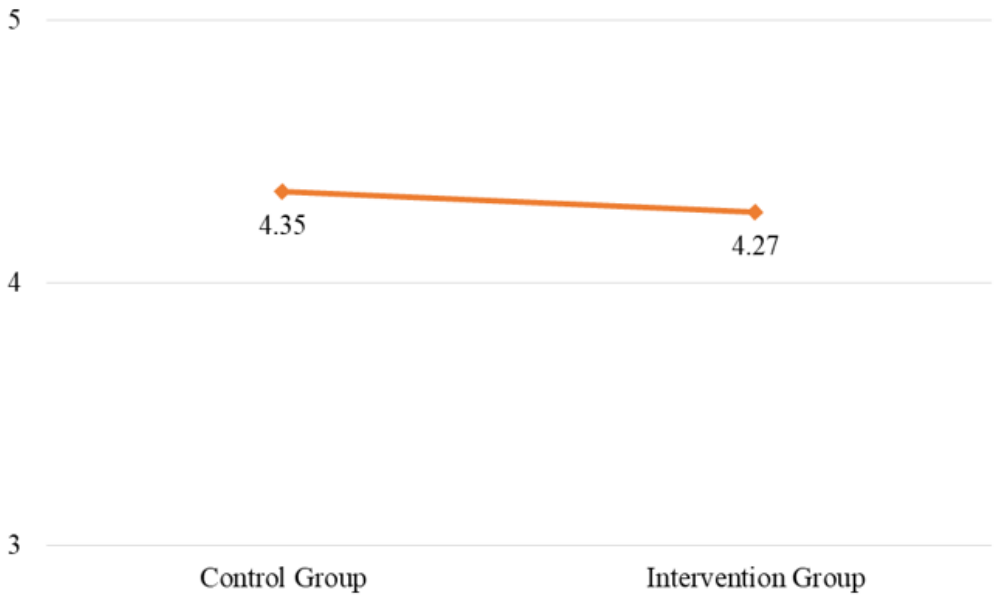


Figure 9. Change in Mean Length of Stay in Days

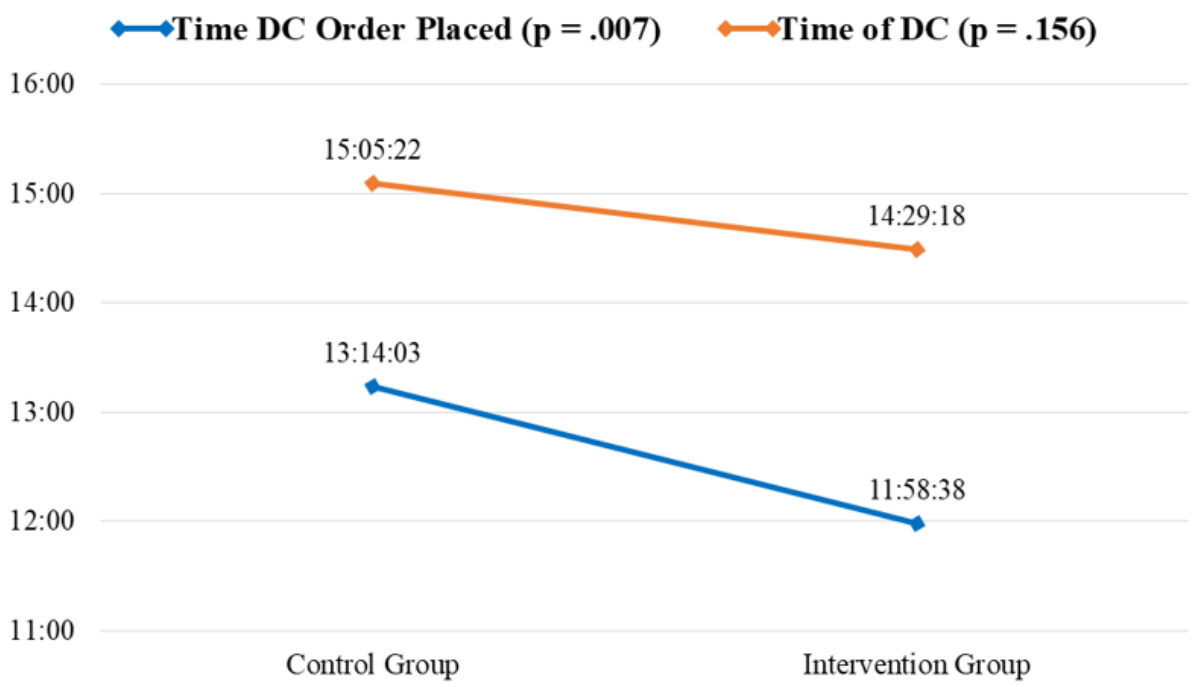


Figure 10. Changes in Mean Time Discharge Order Placed and Time of Discharge. DC = discharge.

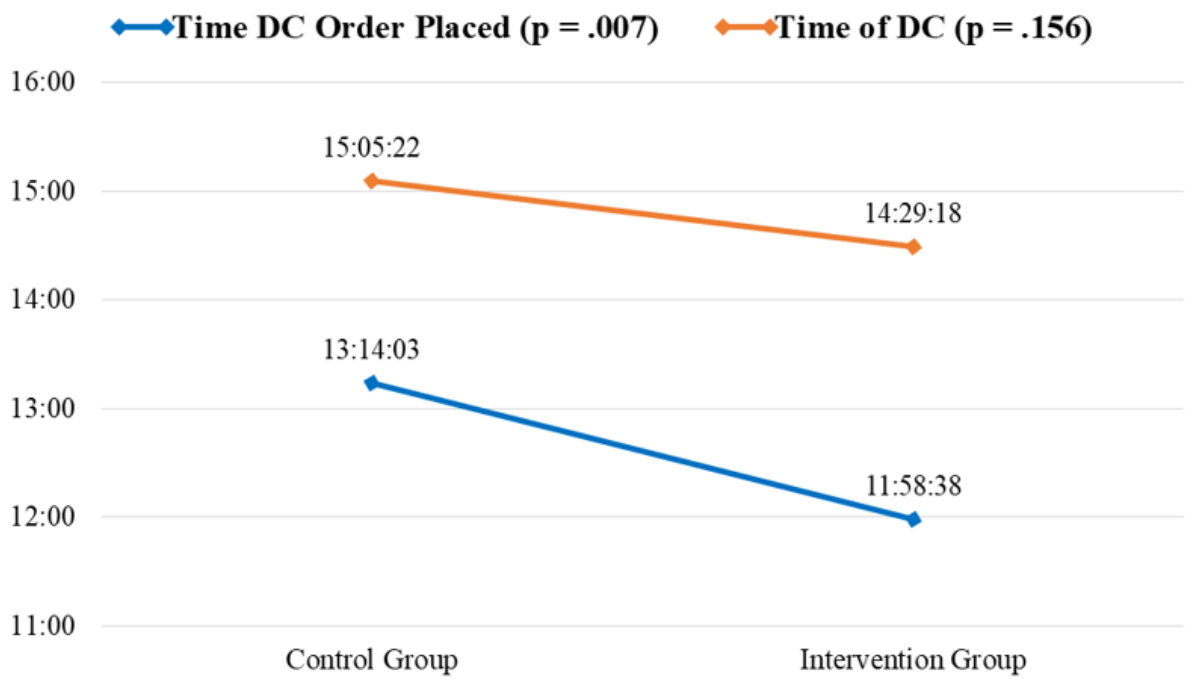


Figure 11. Change in Mean Time from Discharge Order Placed to Time of Discharge. DC = discharge.

Appendix A

Approval Notices from Head Nurses of 4 East and 4 Central

Batman, A. Brannelly *HS <ABT5S@hscmail.mcc.virginia.edu> Jun 16

to me

I approve of Jarrett conducting his project on 4 east.

Thanks,
Brannelly

Dear Jarrett,

This letter confirms that the staff on 4 Central are in full support as you proceed with your clinical research involving admitted acute cardiology patients.

Please let me know when you anticipate beginning so we can plan to communicate your needs to our clinicians in advance. Please also know I am happy to assist in any way.

Joan Tepper, MSRN

4 Central Nurse Manager

Appendix B

Internal Review Board Determination Notice

FOR IRB-HSR OFFICE USE ONLY

☒ **Project is determined to NOT meet the criteria of Research with Human Subjects or a Clinical Investigation** and therefore is not subject to IRB-HSR Review.
NOTE: *Project team is required to follow other requirements described in this form, and UVa policies to protect the data. See Appendix B: Privacy Plan.*

UVa Study Tracking # 20184_

☒ Your project was determined to be QI-Improvement Project. Remember if you decide to publish that you must be careful to publish as QI and NOT as research.

☐ Please provide this signed form to School of Medicine Office of Grants and Contracts and/or Medical Center Procurement if your project has external funding or plans to share identifiable health information outside of UVa. See the following link for additional info: http://www.procurement.virginia.edu/pagebusinessadd

☐ **Project is determined to be Human Subjects Research or a Clinical Investigation** and must be submitted to the IRB-HSR for review and approval prior to implementation. Please go the Protocol Builder to create your submission. https://www.irb.virginia.edu/

Name of IRB Staff: Joanna Faulconer	***Date: October 5, 2017***

Appendix C

MEDSURG Nursing Journal Author Guidelines

MEDSURG Nursing, the official journal of the Academy of Medical-Surgical Nurses, is a scholarly journal dedicated to advancing evidence-based medical-surgical nursing practice, clinical research, and professional development. The journal's goal is to enhance the knowledge and skills of medical-surgical nurses to promote health, prevent and manage disease, and improve the health status of patients and their families. Unless clearly specified, the views expressed in articles, editorials, and letters published in *MEDSURG Nursing* represent the opinions of the authors and do not reflect the official policies of AMSN.

The journal accepts original articles: case studies, letters, descriptions of clinical care, and research. Query letters are welcome, but not required. Material must be original and never published before. Material is submitted for review with the understanding that it is not being submitted to any other journal simultaneously.

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Using a Discharge Checklist Across the Interprofessional Team to Improve Discharge by Noon Rates Manuscript Draft

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Abstract: The Model for Improvement was used as a framework to guide a performance improvement project aimed at improving discharge by noon rates in acute cardiology service patients on two, acute care units. Results and recommendations for future practice are discussed.

Sidebar

Literature Review

- Congestion related to delayed patient discharges (DC), causes patients to remain in emergency departments, clinics, and intensive care units for prolonged periods (Durvasula et al., 2015)
- Hospitals have set a goal to DC patients in the morning or by noon to improve patient flow (Wertheimer et al., 2014)
- Doctors, nurses, and patients have different expectations about the DC process and when a patient is ready for DC (Ubbink et al., 2014)
- Assessing patients' DC readiness, employing a standard DC policy, and improved coordination of the DC process prevents delayed DCs (Ubbink et al., 2014)

CQI Model

The project used the Model for Improvement (MFI), with its three fundamental questions, and was divided into a control period and an intervention period.

Quality Indicator with Operational Definitions & Data Collection Methods

- Proportion of patients discharged by noon (DBN). The percentage of all discharges where the patient is discharged and transferred off the unit between 00:01 a.m. and 11:59 a.m.
- Data was collected from electronic health records of all adult patients discharged from the acute care wards, with the acute cardiology service as the discharging/primary care team during the designated control and intervention periods. Exclusion criteria were data from patients who were: admitted for less than 24 hours, discharged outside of project period, those who left against medical advice, and those who died during hospitalization.

Clinical Setting/Patient Population

Two, 28-bed, acute care wards specializing in cardiac and vascular patients in a large academic hospital in the southeastern United States.

Program Objectives

MFI Question 1: What are we trying to accomplish? Improve DBN rates.

MFI Question 2: How will we know that a change is an improvement? DBN rates improve and 30-day hospital readmission rates and length of stay do not worsen.

MFI Question 3: What change can we make that will result in improvement? Implement a discharge checklist.

Manuscript

Introduction

Delays in patient discharge (DC) from acute care inpatient units cause disruptions in a hospital's ability to efficiently move patients through the healthcare setting. Areas affected by discharging delays include, but not limited to: intensive care units (ICUs), post-anesthesia care units (PACUs), and emergency departments (EDs) (Majeed et al., 2012; Khanna, Boyle, Good, & Lind, 2011; Khanna, Boyle, Good, & Lind, 2012). Durvasula et al. (2015) stated, "If hospital discharge is unnecessarily delayed until the afternoon, congestion inevitably ensues with patients remaining in the ED, clinic, and the intensive care unit for prolonged periods" (p. 45).

Discharging patients can be a complicated process with many possible causes for delay. Alper, O'Malley, and Greenwald (2017) identified determining an appropriate post-discharge site of care, completing a DC summary, and providing patient education as additional tasks that providers must complete when discharging a patient. If necessary, patients may require durable medical equipment (DME), such as oxygen, following discharge. DME must be ordered and a plan for delivery and set up should be in place prior to patient DC. Ubbink et al. (2014) reported

that delayed hospital discharges and hospital readmissions related to a premature DC could be prevented by assessing the patient's DC readiness, employing a standard DC policy, and improving the quality of the DC process.

Many hospitals have set a goal to DC patients in the morning or by noon to improve patient flow (Wertheimer et al., 2014). Some opponents of the discharge by noon (DBN) goal report a possible increase in 30-day readmissions as patients are rushed out unprepared or increases in length of stay (LOS) as patients are kept overnight in order to be discharged by noon the next day (Rajkomar, Valencia, Novelero, Mourad, & Auerback, 2016; Shine, 2015). Despite these concerns, several studies have successfully improved DBN rates while maintaining or improving LOS and 30-day readmission rates (Kane et al., 2016; Patel, Morduchowicz, & Mourad, 2017; Wertheimer et al., 2014).

Project Site and Reason for Change

A nurse leader had identified medication reconciliation (MR) of DC prescriptions as an inefficient aspect of the DC process. Data collected by the nurse leader demonstrated frequent phone calls and/or pages to providers by nurses performing the DC MR to clarify and/or modify prescriptions, which caused delays in patient DC. An interprofessional team consisting of nurses, pharmacists, social workers, case managers, and physicians from the acute cardiology service was brought together to discuss possible methods to improve the DC process.

The purpose of this project was to evaluate whether adding a standardized checklist, completed by the interprofessional care team, prior to the anticipated day of DC, would improve DBN rates without increasing average length of stay or 30-day hospital readmission rates.

Program

A literature review was conducted to identify possible interventions for a project aimed at improving the MR of DC prescriptions by nurses. The literature review found that checklists including tasks required for DC that could be completed before the anticipated day of DC had proven to make patient DC more efficient as evident by the checklists improving DBN rates in settings where they were implemented. This finding was taken to the interprofessional team and they agreed that a DC checklist, that included certain tasks required by each profession for a patient to be safely discharged, may make the all areas of the DC process, not just the MR of DC prescriptions, more efficient.

A DC checklist was developed with input from physicians, nurses, social workers, case managers, and pharmacists through email correspondence and several meetings. The final version of the DC checklist is shown in Figure 1. It was determined, for this project, that the DC checklist would be entered into the patient's electronic chart as a "smart-phrase" when the patient was identified as being an anticipated DC the next day during the morning interprofessional rounds.

Staff received training about the importance of early DC and the DC checklist at staff meetings after the control period and before the intervention period. Staff were also trained on the use of the DC checklist during the intervention period through shoulder-to-shoulder training as necessary.

The design of the project was a quasi-experimental two group, pre-intervention/post-intervention performance improvement project (Harris et al., 2006). The primary outcome measure was percent of patients discharged before 12:00 p.m., noon. Secondary outcome measures were average time of DC, average time DC order was placed by the provider, average

time in minutes from DC order placement to DC, length of stay in days, and percentage of patients with 30-day hospital readmissions.

Data on the control group served as baseline data. Data was extracted from the EHR for the control group after the 12 consecutive day period designated for the control period ended and before hospital staff were educated and the DC checklist was implemented, with the exception of data on CMI and 30-day readmission rates which were collected after the intervention period. Data on the intervention group were collected from the EHR throughout the intervention period, with the exception of data on CMI and 30-day readmission rates, which were collected 6 weeks after the end of the intervention period. Data on 30-day readmission rates and CMI were collected on several occasions for 3-months after the intervention period to due to the CMI being calculated after patient discharge and the subsequent chart review required to assign a CMI.

Evaluation and Action Plan

Data were analyzed using SPSS version 24. The findings, along with recommendations for future implementation and/or revision, were given to the interprofessional team for their consideration.

Results and Limitations

There were 43 patients who cleared the inclusion and exclusion criteria for the control group. There were initially 31 patients who cleared the inclusion and exclusion criteria for the intervention group. However, 1 patient had been discharged by the ACS in the control group and was therefore removed from the intervention group to keep the samples independent, leaving 30 patients in the intervention group for data analysis. Data analysis determined that the groups were not significantly different based on collected demographic data, see Table 1.

As shown in Table 2, the DBN rate improved from 2.3% for the control group to 10% for the intervention group (p = .299). The proportion of 30-day hospital readmission rates slightly increased from 11.6% in the control group to 16.7% in the intervention group (p = .731). The average length of stay in days remained unchanged between the control group and intervention group (4.35 vs 4.27 respectively, p = .943). The average time of DC order placement significantly improved from 13:14 for the control group to 11:58 for the intervention group (p = .007). The average time of DC improved from 15:05 to 14:29 for the control group and intervention group, respectively, (p = .165). The average time from DC order being placed to time of DC increased from 111.33 minutes for the control group to 150.67 for the intervention group (p = *.033).*

This project had three major limitations: short duration, checklist as a smart-phrase, and the setting. First, the short duration of the project meant a small sample size, which limits the ability to generalize results to a larger population, especially since there was only one racial minority group captured during the project. The short duration also meant that the DC checklist may not have been implemented into the daily workflow as well as it could have been given a longer intervention period, thus limiting its use and effectiveness at improving DBN rates.

The second limitation was using the DC checklist as a smart-phrase instead of as a new type of note. Having the DC checklist as a smart-phrase meant that it could be easily modified without having to work through the informatics department, but it did mean the checklist could not pull information. While a smart-phrase was easy to edit, staff had to amend a signed note in order to initial off on completed tasks. Several staff mentioned throughout the project period that it felt odd to amend someone else's signed note, which served as a deterrent and decreased staffs' comfort levels with using the checklist.

The third limitation was the setting where the project took place. While the setting was strengthened by having an established interprofessional team, it was also a weakness for this project. Being able to DC a patient before noon relies on staff having time in the morning towards working on discharges. The interprofessional team had already developed and implemented a project that organized rounds by following a script. That project has proven effective at improving patient satisfaction scores and the quality of discharge education, but it is time consuming for all members of the interprofessional team. This is evident in the average time of DC order placement being in the afternoon for both groups, despite a concentrated effort to improve DBN rates in the intervention group. Since this project took place in an academic hospital, DBN is harder to achieve due to the additional teaching rounds that occur between medical students, interns, residents, and their attending physician that take place before interprofessional rounds.

Lessons Learned

Despite the proportion of DBN not significantly improving, the 36-minute improvement in average time of DC was considered clinically significant. This is similar to the studies by Durvasula et al. (2015), Patel et al. (2017) and Wertheimer et al. (2014) who reported an improvement in average time of DC, while the studies by Beck and Gosik (2015) and Goodson et al. (2014) reported a statistically significant improvement. Improving the average time of DC to 14:29 means that more patients are being discharged home, or to the next healthcare setting, well before the end of the typical business day. This allows more time for the patient to be able to get to the pharmacy or home, where they may encounter questions or problems with medications or discharge instructions, and still have time to call their primary care provider or the cardiology clinic during business hours when help may be available. This improvement is

also significant for patients who are in upstream settings in the facility such as the ED, ICU, or post-anesthesia care unit waiting to be transferred to the ward, which may help improve hospital efficiency.

The balancing measures of LOS and 30-day readmission rates did not have a statistically significant change during the intervention period. The slight decrease in LOS from the control group to the intervention group means that it is unlikely that patients were kept an extra night in the hospital in order for them to be discharged before noon the next morning. There is concern that the slight increase in 30-day hospital readmission rates is related to the intervention. Further tests on the data would need to be performed to determine if there was a correlation between time of DC and 30-day hospital readmissions. Additionally, because this study did not track the cause of readmissions, it is possible that any readmission was a planned readmission or related to some other, unknown cause not related to the patient's admission during the study.

Nursing Implications

This project found some evidence that an interprofessional DC checklist aimed at completing certain tasks prior to the day of discharge can improve DBN rates and average time of DC. Completing tasks like the DC education and DC medication teaching on night shift can save the discharging nurse time the next morning, during an already busy time of day. Having an effective method to document that DC teaching has already occurred may reduce duplication of work, but is dependent on trust between nursing staff that documented teaching was completed and understood by the patient and/or family.

Conclusion

The Model for Improvement served as an effective framework for designing and implementing this project. Despite not improving the proportion of DBN, the project did

improve the average time of DC without significantly increasing LOS or 30-day hospital readmission rates. The significant increase in time from DC order placement to time of DC may show that staff are unable to begin working on discharging patients in the morning due to the time it takes to perform the scripted, interprofessional rounds, but future study would be required to determine if this is true or not.

It is important to fully observe a setting before implementing a project aimed at improving DBN rates and to determine what the final goal of the project is before implementation. A goal to DC patients by noon may not be appropriate if there are already proven interventions or processes that improve patient outcomes, experiences, or satisfaction that occur in during the morning hours. It may be beneficial to observe the daily workflow of staff once a DC order is placed to be able to identify all tasks that can be completed the day before a patient is DC and what tasks must be completed after the order is entered. Projects aimed at improving the time it takes to complete tasks that must be completed after a DC order is placed may help reduce the time between order placement and when the patient is finally transferred off the unit.

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Appendices

Table 1

Demographic Characteristics

Variable	Control Group N=43		Intervention Group N=30		
	Mean (SD)	N (%)	Mean (SD)	N (%)	*p*
Age	65.26 (16.32)		67.93 (15.05)		.479[1]
Race					.176[2]
African American/Black		8 (18.6)		10 (33.3)	
Caucasian, non-Hispanic		35 (81.4)		20 (66.7)	
Gender					.812[2]
Male		24 (55.8)		18 (60)	
Female		19 (44.2)		12 (40)	
Location before admission					.678[3]
Assisted living		1 (2.3)		0 (0)	
Home		31 (72.1)		25 (83.3)	
OSH		9 (20.9)		5 (16.7)	
Skilled nursing facility		2 (4.7)		0 (0)	
Admission source					.668[3]
Clinic		1 (2.3)		0 (0)	
Emergency department		33 (76.7)		24 (80)	
Outside hospital		9 (20.9)		5 (16.7)	
Post-operative room		0 (0)		1 (3.3)	
Disposition					.564[3]
Assisted living		1 (2.3)		0 (0)	
Home or self-care		31 (72.1)		18 (60)	
Home with home health		7 (16.3)		8 (18.6)	
Skilled nursing facility		4 (9.3)		4 (13.3)	
Case mix index	1.4682 (.7741)[4]		1.4598 (.7455)[5]		.965[1]

Note. SD = standard deviation; OSH = outside hospital.
[1]Independent samples 2-sided t-test. [2]2-Sided chi-square test. [3]Exact 2-sided chi-square test.
[4]N=38. [5]N=27

Table 2

Outcomes

Variable	Control Group N=43		Intervention Group N=30		*p*
	Mean (SD)	N (%)	Mean (SD)	N (%)	
Discharge before noon					.299[1]
Yes		1 (2.3)		3 (10)	
No		42 (97.7)		27 (90)	
Length of stay in days	4.35 (4.64)		4.27 (4.95)		.943[2]
Median (IQR)	2.74 (3.08)		2.65 (2.71)		
30-day hospital readmission					.731[1]
Yes		5 (11.6)		5 (16.7)	
No		38 (88.4)		25 (83.3)	
Time DC order placed[3]	13:14:03 (1:40:32)		11:58:38 (2:09:51)		.007[2]
Time of DC[3]	15:05:22 (1:34:36)		14:29:18 (2:00:17)		.156[2]
Time from DC order placed to time of DC in minutes	111.33 (66.42)		150.67 (88.08)		.033[2]

Note. SD = standard deviation; IQR = interquartile range; DC = discharge.
[1]Exact 2-sided chi-square test. [2]Independent samples 2-sided t-test. [3]Time in 24-hour format

Discharge By Noon Checklist

Anticipated Date of Discharge: _____
Discharge Destination Needed: _____

Task Owner	Discharge Task	Completed by (initials) or n/a:
LIP	Home health attestation	_____
	DME ordered	_____
	DC Prescriptions ordered	_____
	MD DC summary initiated	_____
Pharmacy or RN	DC prescription education Discussed:_____	_____
RN	RN DC education prepared	_____
CM	All DME arranged	_____
	Home care/services arranged (if necessary)	_____
	Transportation arranged	_____

Note. n/a = not applicable; LIP = licensed independent practitioner; DME = durable medical equipment; DC = discharge; MD = medical doctor; RN = registered nurse; CM = case manager.

Figure 1. Discharge by Noon Checklist.