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Influencing Discharge Efficiency

Addressing Interdisciplinary Communication, Transportation, and COVID-19 as Barriers

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ABSTRACT

Purpose: At one tertiary, academic medical center, two general medicine units averaged 94% and 97% occupancy causing strain on patient throughput. This project was implemented at these two comparable general medicine units, totaling 64 beds. On each of these units, Pareto analyses on causal factors related to discharge order to exit time (DOTE) were performed. DOTE was defined as the period in minutes from when a provider orders a discharge to when the patient actually exits a room. Prime DOTE reduction opportunities were elicited that highlighted the need to address coordination of hospital discharge transportation; that is, arriving family members averaged 120 and 129 min for the two units, and medicars and ambulances averaged 122 and 156 min, which fell above the established 90-min overall strategic DOTE goal. Coordinating efficient discharges decreases the likelihood of hospital bottlenecking and improves patient satisfaction.

Case Management Setting: The health care team is composed of physician and provider services, nursing, and case management, as well as the patient and family. Team-focused interventions aimed at reducing DOTE included leveraging interdisciplinary communication technology and messaging for efficiency and accuracy within the health care team and proactive scheduling of hospital discharge transportation arrival. Process objectives measured included percentage of the health care team educated and utilization of the discharge suite. Outcome objectives measured included median DOTE times, patient satisfaction, and emergency department boarding volume and times. Significantly, admissions for coronavirus disease-2019 (COVID-19) cases were also rapidly increasing early on during program implementation resulting in one of the two general medicine units to be designated for COVID-19 overflow.

Research Methodology: Using Lean methodology, the project design was formed based on the Institute for Healthcare Improvement's work on improving hospital-wide patient flow and the Agency for Healthcare Research and Quality's (AHRQ) IDEAL patient discharge framework to better achieve the well-known, triple aim. In response to COVID-19 demands, the Plan–Do–Study–Act process was warranted to be able to manage acute changes, using iterative processing.

Results and Implications: This program evaluation study assessed whether a communication training program that taught an interdisciplinary team of case managers, nurses, physicians, and related staff how to reduce DOTE was useful. The program had a material impact on the DOTE metric knowing that the hospital's ultimate strategic goal is to reduce DOTE to 90 min or less. A reduction in discharge time was documented when using weekly data from the hospital's discharge dashboard powered by the Maestro database. More specifically, nurses fully trained in the interdisciplinary communications program aimed to reduce DOTE had significantly lower DOTE outcomes on their discharges compared with untrained staff (i.e., average untrained = 127 min, average trained = 93 min). In addition, the fully trained nurses had 14% more of their discharges fall at or below the 90-min goal compared with untrained staff (i.e., untrained = 40%, trained = 54%). Supplemental research also suggested that the content of the communication training program was very relevant (e.g., empowering families to pick up the patients and using scheduling vs. will-call transportation strategies with patients lowered the DOTE metric). Corollary analyses showed that readmissions were also lowered, and patient satisfaction ratings increased. In addition, the interdisciplinary communications training program can benefit from being updated to include content on how COVID-19 issues adversely impact discharge times since significant relationships between various COVID-19 measures and higher discharge exit times were documented.

Key words: *COVID-19 as a barrier to discharge exit times, discharge to exit time, DOTE, interdisciplinary communications and exit time*

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Improving discharge planning has long been an important goal among professional case managers (Hunter et al., 2013). This is because miscommunications during the discharge planning process, for example, can lead to adverse patient outcomes, patient dissatisfaction, and delays in discharging patients (Patel et al., 2019). Improved communications during discharge planning lead to faster discharges before noon and lower unnecessary readmissions (cf., Hunter et al., 2013, and Patel et al., 2019). The current study extends this line of professional case management research by focusing on the use of improved interdisciplinary communication to remove barriers to faster "discharge order to exit time" or DOTE outcomes. The DOTE metric is defined as the time stamp in minutes as to when a provider ordered a discharge on the electronic record to the point in time when the patient exited the room. A key barrier focused on in this case study was delayed hospital discharge transportation, among other barriers.

More specifically, from July 1 to September 30, 2020, one tertiary, academic medical center in Chicago, Illinois, reported having 94% and 97% census occupancy in two general medicine units. Also, the emergency department or ED median onboarding wait time to be admitted to these general medicine units was 153 min. Of those patients treated by internal medicine providers, 4%–13% of patients were admitted off placement units that typically care for their admitting diagnosis, and 87%–93% of patients were admitted to secondary units. When considering patient experience results from two participating general medicine units (Unit 1 and Unit 2), patients' survey responses ranked in the bottom quartile when asked about satisfaction related to speed of admission, discharge, and overall rating of the hospital stay. In fact, $115,000 of revenue, for these two units alone, may have been forfeited when quantifying potential admissions lost when assuming a direct and causal relationship between the time above the organization's strategic 90-min DOTE goal and ED boarding times. From a macrosystemic perspective, potentially $1.5 million would be forfeited if forecasted across all hospital units due to higher costs associated with other units such as the intensive care units (J. Wielosinski, personal communication, September 14, 2020).

Discharge data gathered showed that sustaining median DOTE times at 90-min or less has not been achieved, which prompted that Pareto analyses of causal factors contributing to discharge delays be performed on the two general medicine units (2019, $n = 63$ [needs analysis phase]; 2020, $n = 40$ [supplemental analysis]). This set of analyses identified hospital discharge transportation arrivals via family (30% and 50%; average 120 and 129 min) and as medicars (i.e., patient transport for less than medical care) or ambulances (20% and 46%; average 122 and 156 min) as the most significant target to focus on to reduce DOTE. In addition, it is practical to begin evaluating the impact that coronavirus disease-2019 (COVID-19) had on DOTE times since COVID-19 could adversely impact discharge times, as it has prompted changes in provider coverage, visitation policies, staff retention, and morale (i.e., feeling forgotten, no longer "heroes"), as some examples (Oliver, 2020).

Purpose

The purpose of improving discharge efficiency is to achieve improved hospital-wide patient flow that alleviates bottlenecking of patient admissions, discharges, and transfers (ADTs); specifically, by successfully decompressing the emergency departments, intensive care units (ICUs), and other perioperative areas. An increased percentage of patients with earlier ADTs in the day would allow for more patients being placed in the most suitable unit based on their diagnoses within the medical center at large (Bozorghadad et al., 2015). Meo et al. (2020) provide data confirming transportation barriers can even cause extended hospitalizations prompting the need to focus on identifying and increasing discharge transportation options for patients (Meo et al., 2020, p. 26). By increasing the availability of general medicine beds earlier in the day, the following gains in operational efficiency are possible: (a) improved patient experience due to decreased admittance and discharge wait times, (b) decreased costs of care related to more efficient turnover of the room for the next patient, and (c) improved quality of care from being admitted to the most appropriate unit for care (Berwick et al., 2008).

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A primary strategy for this quality improvement project was to develop standardized communication processes among the interdisciplinary health care team that leveraged existing tools and that bolstered proactive clinician engagement with patients and families regarding hospital discharge transportation issues and other potential DOTE barriers. The Agency for Healthcare Research and Quality's (AHRQ) IDEAL discharge framework was clearly relevant. Modifications to the discharge process were applied using a collaborative and multifactorial approach. The goals of this approach were intended to promote increased interdisciplinary teamwork surrounding discharge planning and improved health care team communications that would directly reduce DOTE. Of course, every effort was made to also avoid any aspects of the broad intervention with the potential to cause disruptive consequences that require "fire-fighting" to mitigate unanticipated challenges (Centers for Disease Control and Prevention, 2017).

Background/Significance

The Joint Commission and the Centers for Medicare & Medicaid Services (CMS) have established a standard discharge planning process designed to ensure that hospitals skillfully and ethically manage the flow of patients throughout the hospital (El-Eid et al., 2015; Holland, & Hemann, 2011). Leaving discharge throughput unaddressed would place the hospital at risk for the following (Bose et al., 2018; Bozorghadad et al., 2015; El-Eid et al., 2015; Hendy et al., 2012; Majeed, et al., 2012; Press Ganey, 2014; Ragavan et al., 2017):

(a) Increased median length of stay;
(b) Increased patient costs and decreased revenue due to increased cancelled procedures, decreased admission–discharge rates, and deferred emergency department admissions;
(c) Decreased patient and staff satisfaction;
(d) Increased rates of medical complications to patients; and
(e) Increased bed shortages due to unnecessary hospital usage.

The AHRQ supported the strategy of identifying the most likely causes of the specific DOTE problems being encountered. Pareto analyses revealed that the coordination of transportation at discharge was recognized as a major barrier to DOTE and provided focus for improvement efforts (McHugh et al., 2011, p. 14). In addition, the IDEAL framework helps guide discussions and education efforts with patients and families, which is important as patient and family preparedness for discharge has been a top barrier for efficiently discharging patients (AHRQ, 2013; Ragavan et al., 2017).

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Next, by applying Rutherford et al.'s (2017) Driver Diagram for Achieving Hospital-wide Patient Flow, this quality improvement process promoted redesigning the system as the primary driver toward change, improving coordination and efficiency of discharge processes as the secondary driver, and was being performed in the medical units, using proactive discharge planning as a specific change idea (Rutherford et al., 2017, p. 13). When applying evidence-based strategies, however, systematic reviews performed by Landeiro et al. (2017) and Rojas-García et al. (2017) concluded that all strategic interventions and solutions of discharge barriers should be made carefully due to inadvertent variability in program evaluation results and impact analyses, as well as with differences in the quality of program designs.

Environmental Context

This 664-bed academic, medical center has been supportive of quality improvement projects that are in alignment with their mission:

- *Example 1*: "… to improve the health of the individuals and diverse communities we serve through the integration of outstanding patient care, education, research and community partnerships"; and
- *Example 2*: "the interprofessional team at (this medical center) is expected to uphold the organization's core values of *innovation, collaboration, accountability, respect, and excellence* behind decision-making to improve patient outcomes" (Rush University, n.d.).

These salient values guide behaviors that are beneficial to working together as a team and continuously pursuing improvement of health care delivery and outcomes. This time gap reduction or DOTE project was deemed in alignment with the mission, vision, and goals of the organization and was vetted via communication with the health care organization's Doctor of Nursing Practice Project Oversight Committee. In addition, getting average discharge time down to 90 min or less is a strategic initiative.

In addition to the core values of this health care institution, another influential hallmark of the organization is their nursing workforce, which has recently achieved their fifth Magnet designation for

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nursing excellence. With a culture engrained in providing both a safe and a high level of quality care, it is important to make clear that this quality improvement project upholds that a safe, well-planned and time-efficient discharge is preferred to one that is only focused solely on throughput metrics (Hendy et al., 2012). The goal is to discharge efficiently while upholding strong integrity around patient safety.

Project Objectives

The W.K. Kellogg Foundation's or WKKF's (2017) basic logic model helped guide the determination of the project objectives that would be evaluated later in this project. The basic logic model is a linear representation that can help identify dynamic concepts to facilitate planning and evaluation using a linear representation that links: resource-to-activities, activities-to-outputs, outputs-to-outcomes, and outcomes-to-impact long term (WKKF, 2017, p. 25). For example, shortly after the implementation phase was initiated, one of the two units necessitated being designated a COVID-19 overflow unit in response to increased rates of admissions for this patient population. Resources were acutely redistributed, which served as a catalyst to collaboratively developing a more iterative approach. As a result, a more robust and specific data collection set was necessary and was compiled by integrating available data sets.

Outcome Objectives

The primary outcome objective from the organization's perspective measured the mean change in the discharge order-to-exit times as codified on the electronic records. Secondary outcomes for the organizational perspective included:

(a) average midnight census percentage of general medicine bed occupancy,
(b) median ED boarding times, and
(c) ED admission volume.

From the patient experience perspective, the desired outcome objectives included benchmarked percentile scores based on a 1- to 10-point scale where patients: (a) rate the "hospital," (b) rate the "speed of admission," and (c) rate the "speed of discharge." Percentages are calculated by taking the total number of rating values of a 9 or 10, and dividing that by the total sample size. This percentage, known as the "top box scores," coincides with the percentile scores across like academic medical centers.

Process Objectives

The primary process objective was the percentage of providers, nurses, and case managers who were provided education and training on the revamped discharge process. Secondary process objectives included: (a) the number of patients who utilized the discharge suite and (b) the amount of time spent in the discharge suite before leaving campus.

Training Communications Intervention and Research Groups

The interdisciplinary communications program was a core element of this training program and is described in more depth later. From a macroperspective, the quality improvement and skill building goals of this program were to: (1) leverage and emphasize a new, standardized nursing handoff communication tool at the hospital that better coordinates discharge activities (i.e., the IPASS Nursing Handoff Tool); (2) engage earlier with the family about their role in an efficient discharge process, especially in terms of planning for and transporting their patient family member; (3) increase the overall awareness of the health care team about the need for faster, more efficient discharges and their roles in this more efficient discharge process; and finally (4) emphasize teamwork and collaboration among the key stakeholders in the discharge process.

There were three primary training groups in this intervention process. The members of these groups generated the DOTE times on the electronic records, which were the primary dependent variable or research metric in this study. These groups were defined as follows:

1. *Group 1: Untrained.* The health care teams in this group did not receive any special orientation or training on DOTE reduction. This control group generated 429 DOTE records.
2. *Group 2: Partial training.* The health care teams in this group might have been exposed to some aspects of the program even though they did not complete full training. Still, some of the professionals in this group could have acquired an increased awareness about the importance of DOTE reduction. This group generated 78 DOTE records.
3. *Group 3: Fully trained.* Finally, these health care teams had key members fully trained on all aspects of the intervention program. This included what has been called "super users" because these professionals became experts in all

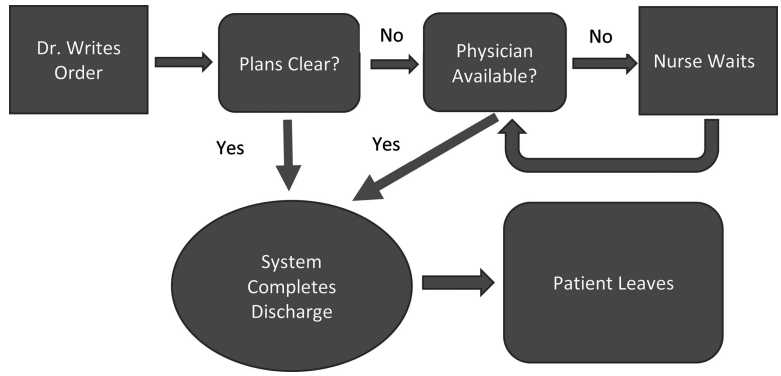

FIGURE 1
A simplified version of the key discharge process flow elements (cf. Allen et al., 2010, p. 18).

intervention content areas and were able to help train program participants. This fully trained experimental group generated 63 DOTE records.

Implementation and Evaluation Frameworks Used

In 2013, May proposed the general theory of implementation (GTI), which served as the framework applied to operationalize the interventional processes impacting a "social system" (i.e., health care team and key stakeholders). The GTI's four driving principles are (see Figures 1–3 and Tables 1–3):

1. *Capability*. The workability and integration opportunities presented by the intervention;
2. *Capacity*. The material resources, social roles, norms, and cognitive resources available;
3. *Potential*. The individual intentions and collective commitment of the health care team; and
4. *Contribution*. The coherence, cognitive participation, collection action, and reflexive monitoring done to implement the intervention.

The GTI is, "one that emphasizes agentic contributions and capability, and the potential and capacity for resource mobilization" (May, 2013, p. 1). Further, an analysis of the GTI was done as part of a systemic review of implementation frameworks, which supported the utilization of this theory, highlighting a "foundation for understanding, designing, predicting, and evaluating dynamic implementation processes" (Moullin et al., 2015, Additional File 2, p. 4).

To help drive evaluation of the multi-interventional program aimed to improve discharge efficiency, the Program Logic Model Development guide, by the WKKF (2017), was applied. Specifically, the key principles of this evaluation framework include: (a) identifying *focus areas*, or what is going to be evaluated, of the project; (b) identifying *audiences* that may have questions; (c) listing the *questions* the audience may have; (d) determining how the *information will be used*; (e) describing the *indicators* that would success; and lastly (f) determining whether the institution has *technical expertise* to collect and analyze the data obtained in relation to outcome indicators of success (WKKF, 2017).

Institutional Review Board Review

Prior to implementation of this project, the institutional review board reviewed the proposal and determined that human rights were protected and that this is deemed a quality improvement project. Data with any patient-specific identifiers were coded

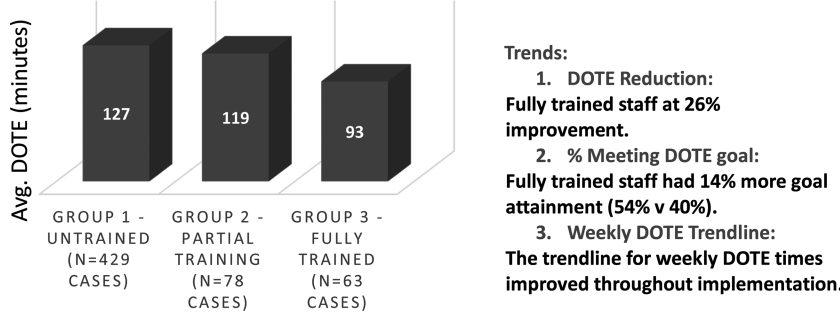

FIGURE 2
Average DOTE score (rounded) and trends by training group.

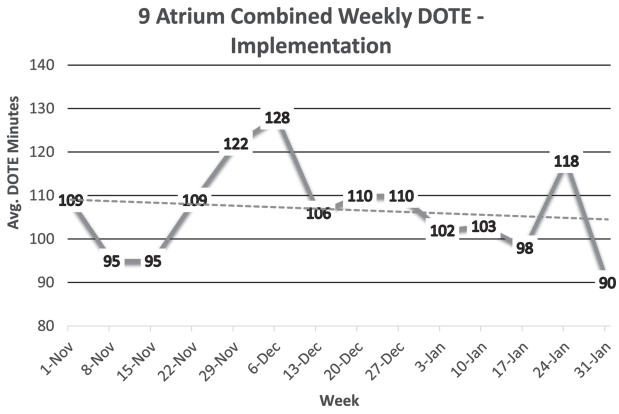

FIGURE 3
Weekly time-series analyses on DOTE Metrics.

for anonymity and password protected for patient confidentiality.

Implementation and Evaluation Methods

This quality improvement program was designed using Lean principles to improve the following discharge barriers: (a) patient and family readiness for discharge arrival; (b) more effective, team-oriented communication methods are needed; and (c) lack of discharge standardization being performed (Ragavan et al., 2017). Using Lean methods constituted using a shared team mindset to reduce the various forms of "waste" in the discharge process, as this can "have a significant and sustainable impact on hospital throughput metrics and flow" (El-Eid et al., 2015, p. 7).

The primary driver to achieve improved patient flow is to "improve the efficiency and coordination of hospital discharge processes and communications by using proactive discharge planning focused on patient's medical readiness criteria for discharge" (Institute for Healthcare Improvement, 2017, p.14). Rutherford et al. shared that "no single initiative or set of unaligned projects will likely be enough to produce system-level results," so deploying multiple improvement strategies to reach goals is important for successfully executing efficient discharges (Rutherford et al., 2017, p. 19). Therefore, multiple communication pathways between the health care team, as well as modified transportation processes, were developed for ambulances, medicars, and the patient's social supports as described. Note that all interventions were implemented with facilitation from superusers and related champions respective of their disciplines and they were educated on the process's modifications for uniformity.

Provider-to-Nurse Communication

In a survey performed within the medical center, providers rated overall communication in discharge planning higher than nurses on a 5-point Likert scale, with 5 being excellent (providers 3.35/5; RNs 2.67/5) and 95% of nurses (n = 35) preferred being notified of a confirmed discharge via direct communication or a phone call with the provider, opposed to 3% that preferred finding out via discharge orders appearing in the electronic medical record. To create a patient-centered approach to discharge planning, the initiative to develop a process where the provider and nurse meet at the bedside was created. This prompted a significant change in current practice as prior to this initiative, the nurse would typically find out about a discharge by acknowledging the order once seen in the electronic medical record and printing the after-visit summary paperwork and any changes the provider would make to postdischarge instructions could either be missed by the nurse, or there may be inaccuracies in the after visit summary (i.e. errors in medication reconciliation) as the provider would not typically review the hardcopy of the after-visit summary being provided to the patient.

The process was developed so that the provider would now coordinate with the nurse to meet at the patient's bedside to review the discharge paperwork, now being printed and reviewed by the provider prior to this meeting—in addition to improving the accuracy of the discharge plan, which is a National Patient Safety Goal of The Joint Commission (Allen et al. (2010). Although this process may take longer at first, the logic of having a clear discharge plan available for the provider team correlates with a timely patient discharge, as opposed to the nurse waiting for the provider to update the after-visit summary or answer provider-specific questions (see Figures 1–3 and Tables 1–3). Process outcomes were also gathered by providers who were sending the medical record of the number of patients discharged with this process to measure for the intervention's effectiveness with the objective outcome being the DOTE time.

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TABLE 1
Percent Meeting DOTE Goal by Training Group

Strategic DOTE Goal	Group 1: Untrained	Group 2: Partial	Group 3: Fully Trained
<90 min	40% (n = 171)	41% (n = 32)	54% (n = 34)
>90 min	60% (n = 258)	59% (n = 46)	46% (n = 29)
Discharge records:	100% (n = 429)	100% (n = 78)	100% (n = 63)

Nurse-to-Nurse Communication

As recommended by the AHRQ: IDEAL patient-centered discharge framework (2013), this intervention is designed to begin both a discussion about and assess discharge needs earlier in the hospitalization. This intervention leveraged the nursing hand-off tool (i.e., IPASS) that improved discharge coordination and efficiency. Working with the information services department to create an easily accessible, online discharge communication tool allowed nurses to easily add prepopulated discharge assessments, such as expected transportation at discharge. By addressing transportation using the IPASS tool, the nurse better engages with the patient regarding the discharge plan early on and continues throughout the hospitalization (AHRQ, 2013). Parenthetically, compliance tracking was difficult to evaluate as the IPASS tool exists as a text field. Still, the objective outcome remains the DOTE times for the unit.

Case Manager-to-Nurse Communication

Discharge planning and having access to real-time information is important, as rapid changes may adversely impact the most desired discharge plan. This intervention leverages the electronic medical record to pull case manager (CM) assessments to the nurse's patient list. These columns include: (a) discharge order entered, (b) estimated discharge date (EDD), (c) discharge disposition, (d) discharge suite eligibility status, and (e) and the CM "To-Do" narrative. This is captured in real time based on updates entered and provides nursing with real-time information that impacts the discharge plan. Studies show that predicting the day of discharge in general medicine services is difficult and, therefore, an additional element of this CM-to-RN communication process promotes a yellow indicator in the EDD column if the date has been not updated within the last 24 hr, and green once updated. Updates occur from daily multidisciplinary team rounds focused on targeting milestones to forecast the EDD. Similar to the nurse-to-nurse communication model, tracking compliance for this process is difficult.

TABLE 2
Overall Statistical Outcomes for DOTE Minutes for Discharges—Weekdays Only (n = 508)

Factor Analyzed	Wait Time (min): More Time	Wait Time (min): Less Time	Time Change With Intervention Direction	Test and Significance Directional t Test
Rush discharge suite				
Unused vs. used	Unused M = 120; SD = 76, n = 469	Used M = 95; SD = 49, n = 39	21% lower	t =2.0 p < .025
Transportation				
Superior vs. family	Superior M = 144; SD = 86, n = 101	Family M = 116; SD = 67, n= 315	19% lower	t = 3.4 p < .01
Medicar: will call vs. scheduled	Will call M = 116; SD = 71, n= 39	Scheduled M = 138; SD = 69, n= 13	16% higher	t = 0.95 p < NS
Ambulance: will call vs. scheduled	Will call M = 183; SD = 96, n= 27	Scheduled M = 153; SD = 85, n= 22	17% lower	t = 1.2 p < NS
Superior pick-up: Non peak vs. peak time[a]	Nonpeak M = 120; SD = 76, n= 469	During Peak M = 95; SD = 49, n= 39	14% lower	t = 1.2 p < NS
COVID-19				
Diagnosis of COVID-19 vs. other diagnosis	COVID+ M = 130; SD = 72, n=129	Other diagnosis M = 114; SD = 74, n= 379	14% lower	t = 2.1 p < .025
Unit COVID vs. non-COVID	COVID+ M = 125; SD = 78, n= 256	Non-COVID M = 111; SD = 69, n= 252	12% lower	t =2.0 p < .025
Age ≥65 vs. <65	≥65 M = 125; SD = 73, n = 190	<65 M = 114; SD = 75 n= 318	10% lower	t = 1.62 p < .06

Note. COVID-19 = coronavirus disease-2019; NS, not significant.
[a]Peak time = 13:00–19:00.

TABLE 3
Key Business and Clinical Outcomes

Outcome	Preintervention	Postintervention	Directionality
Occupancy	94%–97%	92%–95%	Improved
Readmissions	56–68 patients	54–58 patients	Improved
Patient experience	56%–79% top box	77%–93% top box	Improved
ED boarding volume	307 down to 252 patients	277 up to 293 patients	Improved
ED boarding minutes	109–269	183–145	Improved
Discharge suite usage	3.8–8.5 average/week	3.0–4.3 average/week	Worsened (COVID)

Note. ED = emergency department.

Nurse-to-Patient and Family Communication

The AHRQ (AHRQ, 2013) IDEAL discharge framework provides an evidence-based practice guide for patient and family engagement that specifically focuses on transitioning patients from the hospital to home. This guide ensures that an inclusively patient- and family-centered approach is used to improve both quality and patient satisfaction (Buckler et al., 2015). Proactive planning is promoted in this intervention along with education about the discharge process and availability of organizational resources, such as providing information on the benefits of using the discharge suite and how to contact the nurse to pick the patient up if needed. Patients generally feel rushed and unprepared to go home from the hospital, and early and continuous education that addresses patients' discharge needs is essential. Process outcomes include utilization of the discharge suite, and the outcome objectives include patient experience and DOTE times.

Family Members and Other Social Supports as the Method of Discharge Transportation Home

Case managers typically assess for the patient's expected mode of transportation at discharge and provide this information within their progress notes. By sharing the tracking of the discharge mode of transportation home with the nurse in the IPASS tool, the hospital discharge transportation strategy can be validated, and discrepancies with information received can be discussed at multidisciplinary rounds. The direction is to be able to target a specific family member and not leave planning of hospital discharge transportation too late in the hospitalization. This takes experience to navigate through the other patient needs while still being able to address discharge planning. Using the IDEAL framework and including the patient and family as integral members of the same health care team should reduce DOTE time with families. Moreover, having the goal of a safe and efficient discharge should help to strengthen the communication pathways and contribute to family members arriving earlier to the medical center founded on increased understanding of the discharge process, resources available, and the importance of proactive discharge planning that includes the family (AHRQ, 2013).

New Process for Ordering a Medicar or Ambulance

Current practice has the case manager place the medicar/ambulance on will-call or on-call without a timeframe as to when they will be needed; if patients end up not discharging, the ambulance is often left on will-call and not cancelled, leading to further delays (CHA, 2014). In the new process, when the patient's discharge order is confirmed, the case manager will message the nurse to coordinate an arrival time to schedule the transportation arrival. Exceptions to will-call usage include weekend usage and after 17:00 if there is uncertainty for the discharge taking place that night. This aligns more closely with the 90-min DOTE goal and is designed to improve the response time it takes for medicar/ambulance transports to arrive on scene to pick up patients who are medically ready.

Data Collection and Synthesis

To centralize the data being analyzed, a "discharge dashboard" was developed to track progress of outcome and process objectives. In response to the transformation of a unit into one that is a designated COVID-19 overflow, data synthesis of the patient electronic medical record, discharge suite utilization metrics, and the comprehensive data dashboard was performed. Reviewing the progress notes in the electronic medical record provided data on qualitative entry that is not currently being captured via a reportable means (i.e., method of discharge transportation). The discharge suite metrics allowed for a measurable impact of how this process contributes opening up general medicine beds. The Maestro database provides DOTE times and information such as treated diagnosis (i.e., COVID-19). Data were scrubbed and quality checked prior to the performed analyses to promote reliable evaluation of this project.

Results

Analysis of the Implementation of the Training Intervention

A major set of analyses examined whether the communications training intervention was effective. Inspection of Figure 2 reveals that the average DOTE score for the untrained Group 1 of nurses and team members, as reflected in the record review of discharges, was 127 min. The average DOTE score for the trained Group 3 was 93 min. The partially trained group fell in-between at 119 min. These between-group differences were statistically significant ($F = 5.37$, $p < .05$). Group 3, the fully trained group, consisted of the six superusers along with other RNs and professionals who were trained in full on January 15, 2021, and who then completed a discharge after their training. Group 3 was responsible for 63 discharge records. To put the Figure 2 results in perspective, the fully trained nurses averaged a 26% improvement in average DOTE time reductions compared with the untrained staff. In addition, the results in Table 1 reveal that the fully trained staff met the 90-min DOTE goal 14% more often than the untrained staff (i.e., 54% vs. 40%).

Time-Series Weekly DOTE Metrics for 9 Atrium

Figure 3 presents the combined weekly DOTE scores for the units participating in this study. A review of Figure 3 reveals the real-world dashboard results during the COVID-19 pandemic. Still, despite the research disruption that COVID-19 created, and the difficulties in getting nurses' and others' attention to participate in this study, the overall trendline in Figure 2 was trending downward to 90 min at the end of January. This downward moving trendline, coupled with the promising results in Figure 2 and Table 1, suggests that the current intervention had some marginal impact on the DOTE metric and is worthy of additional research.

Confirming Relevance of Topics Covered in Training

The results in Table 2 examined whether or not the topics emphasized in the communication training intervention were indeed associated with discharge time and therefore were fully warranted to be included in the intervention training. Although COVID-19 risk management prevented the full aggregation of groups in discharge suites, the results in Table 2 did reveal that the patients who utilized the discharged suite, while not a large sample, did indeed have lower discharge times than patients who did not use the discharge suite (i.e., $M = 119.8$ min vs. $M = 94.7$ min; $p < .025$, one-tailed).

In addition, patients who benefitted from family transportation were discharge significantly sooner than patients who relied on ambulances or medicars (i.e., $M = 143.5$ min vs. $M = 115.8$ min; $p < .01$, one-tailed). The focus on families during the training intervention is therefore clearly warranted. There were no other statistically significant findings with the transportation variables, although ambulances who relied on will-call had higher average discharge times than patients who had scheduled ambulances ($M = 182.9$ min vs. $M = 152.5$ min; a 19.3% lower mean). Research with larger samples sizes is warranted, and training that still emphasizes the use of scheduling over will-call strategies seems prudent.

Exploratory COVID-19 Analyses

Exploratory results in Table 2 revealed that future training communication interventions need to focus on COVID-19-related delays in exit times. For example, patients with a COVID-19 diagnosis had a 14% higher discharge times on average. Patients treated in a COVID-designated unit had a 12.1% longer discharge time than the non-COVID-19 unit. Also, geriatric patients who are 65 years or older had a 9.9% longer discharge time. All three of these COVID-19 related measures were either statistically significant or marginally significant. Reasons for these findings are hypothesized later.

Business Outcome Analyses

Table 3 briefly summarizes, at a macrolevel, the business and patient outcomes that resulted from before this program was implemented (preintervention) compared with the full postintervention phase. These analyses are more qualitative in nature, and reflect that for the two units analyzed, and despite the pandemic, improvements were noted in the following areas: occupancy, readmissions, patient experience, ED boarding volume, and ED boarding minutes. The discharge suite showed no improvement, primarily because the use of this suite was extremely limited due to COVID-19 social distancing restrictions. These results are consistent with the DOTE findings.

Discussion

Interpretation of Findings

The obtained results reveal that an intervention that focuses on improving the team-oriented, interdisciplinary communication between professionals involved with discharge planning can have a material impact on the reduction of DOTE. When comparing the fully trained nurses and team members to the untrained nurses and team members, a significant reduction in

the DOTE metric was obtained (i.e., average DOTE = 127 min for untrained staff vs. 93 min for fully trained staff). Moreover, 14% more of the fully trained staff met the DOTE goal of 90 min or less. In addition, the time-series analysis, while highly variable due to the COVID-19 pandemic, revealed a slight downward trend with the average weekly DOTE metric over the weeks. This trend is consistent with the effectiveness of training on DOTE reductions.

Supplemental analyses supported the position that the content in the communications training material was pertinent. For example, the use of a discharge suite should lead to faster discharge times, especially when restrictions to such suites are loosened or even lifted as the pandemic subsides. Focusing intently on the family's picking up the patients appears to be a good strategy because the discharge times were significantly lower, on average, when family members picked up the patients compared with when the patients relied on ambulances or medicars. In addition, although still a bit inconclusive, the emphasis on the use of scheduled ambulances makes sense over a will-call strategy with ambulances.

Analysis of Deviations or Changes

A major deviation was that the medicar data were less clear than the ambulance data in terms of the will-call versus scheduling distinction. In addition, the program evaluation findings were more sophisticated than the dashboard findings. This is because the dashboard was never designed to present a category of outcomes that are 90 min or less. The health care organization probably needs to rely on more sophisticated program evaluation research methods, as it attempts to get at or below a 90-min discharge threshold as opposed to relying solely on dashboard analytics with outdated categories.

Discussion of Strengths and Limitations

Finally, a major strength is that this program provided research evidence that COVID-19's impact on discharge time needs to be addressed in any future training program aimed at reducing discharge times. This is especially true for those units that are designated as COVID-only units. Parenthetically, some hypothesized causes for the impact of COVID-19 on higher discharge times include:

1. the delays that protective gear protocols might have caused;
2. implementing new biosafety protocols and processes that slowed down the discharge during the pandemic; and
3. the need to better educate family members and transportation contractors on how to best operate in a timely during a pandemic.

A potential limitation is that more intensive and comprehensive training interventions might have yielded more powerful reductions in discharge time. Yet from a practitioner perspective, it was difficult to access staff during the middle of a pandemic when the staff is more focused on COVID-19 biosafety, testing, vaccines, and treatment. Future research is therefore warranted in this area.

Sustainability Plan

This plan can be continued in a number of ways. For example, additional program evaluation data can be collected to better ascertain the impact of COVID-19 on discharge times. In fact, the interdisciplinary training communications program can be updated to include a section on how to avoid lengthy delays in DOTE time with COVID-19 patients. This program can also gradually be expanded beyond the two units utilized. Finally, this study can be used to inform the managers of the hospital's discharge time dashboard to update their categories to reflect the 90-min goal.

Conclusion

This program assessed whether an interdisciplinary communications training program had a material impact on DOTE times knowing that the hospital's goal is to reduce the average discharge time to 90 min or less. The trained staff had a significantly lower average DOTE time than the untrained staff (i.e., 93 min vs. 127 min). In addition, a 14% impact in the predicted direction was documented when comparing the fully trained participants to the untrained staff in terms of hitting the "less than or equal to 90 min DOTE goal." Supplemental research suggests that the content of the training program was

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relevant. That is, the emphasis on the use of a patient discharge suite, empowering families to pick up patients, and using scheduling vs. will-call strategies with patients who rely on ambulances makes sense. In addition, the communications training program can benefit from being updated to include content on how COVID-19 issues adversely impact discharge times. Some possible reasons for COVID-19's impact on higher DOTE metrics were hypothesized. This preliminary program evaluation proved promising, and the study can be extended and replicated across other units.

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