RAMPED-UP: The Development and Testing of An Interprofessional Collaboration Model

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Abstract

Background: Interprofessional collaboration (IPC) is an essential component of care delivery needed to achieve optimal patient and system level outcomes within healthcare systems.

Purpose: The purpose of this quality improvement project was to measure the impact of a structured IPC model, called RAMPED-UP, on hospital length of stay (LOS) in the surgical trauma population. The RAMPED-UP model had three components: daily structured IPC rounds; consistent use of an IPC instrument; and documentation on and access to the instrument by the IPC team.

Methods*:* The design was a prospective cohort with a historical comparison group study design. The project was conducted on a 28-bed surgical trauma unit of a Level 1 trauma center. A convenience sample of 195 participants was used. Trauma patients admitted from October to December 2016 constituted the pre-RAMPED-UP group (n=98). The RAMPED-UP group received the IPC model and constituted trauma patients admitted from October to December 2017, (n=96).

Results: The two groups were similar in demographics and were predominantly single, male, with an average age range of 40-45 years. The overall hospital LOS was not statistically significant between groups. The median RAMPED-UP LOS, defined as the number of days the patient received RAMPED-UP rounds, was 3 days. Patients in the RAMPED-UP group were more likely to be discharged home and the discharge-by-noon (DBN) rates were higher by 18.2% (p= 0.005). A statistically significant correlation was found between incentive spirometry (I/S) values and hospital LOS and RAMPED-UP LOS in the RAMPED-UP group, (95% CI: r_s -0.301, P=0.008) and (95% CI: r_s -0.270, P= 0.018).

Conclusion*:* While the implementation of the RAMPED-UP model did not decrease hospital LOS, the model did significantly improve DBN and RAMPED-UP LOS compared to the institutional goal of 6.1days. The RAMPED-UP model bridged the communication gaps among the IPC team, patients and families. Additional exploration of incentive spirometry as a predictor of LOS is warranted. The use of a structured IPC model supports the evidence that patient outcomes can be positively improved with a consistent, structured process that includes essential members of the IPC team and patient and family.

Keywords: length of stay, acute care, critical care; patient care team, multidisciplinary care team, patient care planning, interprofessional collaboration, and instrument.

RAMPED-UP: The Development and Testing of an Interprofessional Collaboration Model

Hospital length of stay (LOS) has significant implications on system level quality outcomes. Prolonged hospital LOS results in increased health care costs and overcrowded emergency department causing negative impact a hospital's operational goals. Subsequently, deficiency in system level quality outcomes can result in less than optimal patient care (Block, 2006).

The paucity of direct, proactive communication can result in delayed discharges and increased hospital LOS. Appropriate discharge for continuity of care requires timely communication and coordination (Terra, 2015). The provision of a timely, safe, and effective disposition requires collaboration among all healthcare disciplines, the patient and family members.

According to the Robert Wood Johnson Foundation (2011), the need for interprofessional collaboration (IPC) in health care is clear and long overdue. Effective IPC should be implemented across the healthcare spectrum to enhance coordination, communication, and ultimately the quality, as well as, patient safety due to the utilization of both individual and collective skills and the cumulative experiences of team members. Given the critical importance of collaboration to optimal system and patient outcomes, this project was undertaken to assess the impact of an IPC model on LOS in a surgical trauma population using a structured instrument. According to Zwarenstein, Goldman, and Reeves (2009), IPC is defined as the process in which different professional groups work together to impact health care outcomes positively (Zwarenstein, Goldman, & Reeves, 2009).

Background

Poor communication contributes to poor collaboration. Poor collaboration poses a significant patient safety risk that stems from flaws in communication, misinterpretation of information and overlooked changes in patient status. Therefore, it is imperative that healthcare professionals relay consistent and accurate information to all members of the team and to the end-user, i.e. the patients and the patients' families, to ensure patient safety (O'Daniel & Rosenstein, 2008). According to The Joint Commission, IPC reduces mistakes, fragmentation, and ultimately optimizes patient outcomes. The notion that collaboration improves communication among healthcare disciplines is not a novel concept. Communication failures were the leading cause of sentinel events from 1995 to 2004 and the primary cause of medication errors, delays in treatment, and wrong-site surgeries, as well as the second most frequently quoted reason for operative and post-operative events (Joint Commission on Accreditation of Healthcare Organizations, 2005). From 2011 through 2013, communication failures continued to rank as one of the top root causes of sentinel events by The Joint Commission. This has led The Joint Commission to mandate hospitals to develop an effective communication process to foster the safety of the patient and the quality of care (Benjamin, Hargrave, & Nether, 2016).

Walker, Kappus, and Hall (2016) state that poor collaboration negatively affects patient throughput, another component of patient safety and care. In 2012, the American Hospital Association reported that communication problems, insufficient information, and lack of discharge planning within 24 hours of admission contributes to poor patient outcomes (Walker, Kappus, & Hall, 2016).

In a prospective hallmark study by Knaus, Draper, Wagner, and Zimmerman, 5,030 adult intensive care patients in 13 tertiary care hospitals were examined for evidence of IPC in relation

to patient outcomes. Mortality rate was the primary outcome. The authors reported that the participating hospitals with effective collaboration demonstrated lower mortality rates. The hospitals with higher IPC between physicians and nurses and strong nursing leadership reported a 41% lower mortality rate than predicted ($p < 0.001$). One hospital with low level of communication among the healthcare team had 58% more deaths than predicted ($p<0.01$). Furthermore, the hospitals with low IPC had no dedicated unit physician to direct admission, discharge, and treatment policy and had no routine discussion or coordination between the physician and nursing staff (Knaus, Draper, Wagner, & Zimmerman, 1986).

In a single center randomized controlled trial, Curley, McEachern and Speroff (1998) tested the effect of interprofessional rounds on an inpatient medical service on the outcomes of LOS, total hospital charges, provider satisfaction and ancillary service efficiency. From a total sample size of 1102 patients, 535 experienced traditional rounding to communicate care and 567 patients were randomized to structured interprofessional team rounds. The results revealed that patients in the IPC group had a mean LOS of 5.46 days versus 6.06 days in the traditional group ($P=0.006$). Additionally, mean total charges in the IPC group were $6,581 compared to the traditional group of $8,090 ($p=0.002$).

These studies by Knaus et al. and Curley et al., support the need for effective IPC as a means of improving patient and system level outcomes. Communication is often not ideal, partly due to the difference in communication styles between nurses and physicians, in part, due to training. Nurses are taught to be more descriptive of clinical situations, whereas physicians learn to be very concise. To bridge the difference between communication styles the use of a standardized communication instrument for interprofessional collaboration is needed. (O'Daniel and Rosenstein, 2008).

An interprofessional collaboration model called RAMPED-UP was developed and tested to examine its impact on hospital LOS and patient level outcomes. The RAMPED-UP model had three components: daily structured patient care rounds that included active participation by all essential disciplines caring for the patient; use of a consistent interactive instrument used during the patient care rounds; documentation on and access to the instrument by all members of the IPC team. The RAMPED-UP acronym stands for:

R: respiratory data

A: activity data

M: medication reconciliation

P: pain, palliative measures, and psychological data

E: enteral feeding data

D: disposition barriers and estimated date of discharge

U: updates of care plan and questions from patient and family

P: prophylaxis and prevention data.

To develop RAMPED-UP, the author engaged a team of experts that included nurses, care coordinators, social workers, trauma division leadership, nursing director, nurse manager, directors of social work and care coordination. Long hospital LOS at the author's practice site had significantly impacted the health system bed capacity and resulted in an estimated loss in revenue of $47 million in 2016. Thus, implementing an IPC model to reduce LOS became a high-level priority.

Review of Literature

An integrative review to identify studies that evaluated the impact of IPC using a structured instrument on LOS was completed. The databases searched included: CINAHL,

Cochrane, Ovid MEDLINE, Joanna Briggs Institute EBP Database (JBI), PubMed and Google Scholar for peer reviewed publications. The keywords used for the search were length of stay, acute care OR critical care, patient care team OR multidisciplinary care team OR patient care planning, interprofessional collaboration, collaboration, and instrument.

All quantitative and qualitative peer reviewed studies that evaluated the impact of IPC, included a structured instrument and evaluated LOS or other patient outcomes and used a structured instrument in the adult inpatient population greater than 18years old were included. Additional criteria included studies written in English and those with available abstract plus full text. Timeframe for review was January 2009 to January 2017. Studies were excluded if the IPC team did not include more than two healthcare disciplines.

Literature Results

A total of 224 reviews from the initial database met the criteria (see Figure 1). The Ovid database search yielded 13 studies using the keywords, "length of stay," "collaboration OR Interdisciplinary Communication," AND "Multidisciplinary OR Patient Care Team OR Adult." The CINAHL database initially yielded 139 results when the keywords, "length of stay," "Acute Care OR Multidisciplinary Care Team," AND "Collaboration" were used. After applying the inclusion criteria, 8 studies were found.

The Collaborative Care model implemented by the ThedaCare Healthcare System included a physician, nurse and pharmacist. The team developed plans including the evaluation of new admissions within 90 minutes and the formulation of discharge plans with the patient's input. The patient progression toward discharge was measured by steps and, if a step was missed, the nurse evaluated the cause and solution was communicated in order to prevent the issue from happening again. After a year of implementation of the Collaborative Care model, the cost per

case decreased by 15 -28%, length of stay dropped by 10-15%, 30-day readmission fell by 8.89%, nursing productivity increased by 11%, and medication reconciliation compliance increased by 100%. Patient satisfaction scores increased to 95% in 2010 compared to 68% in 2006. Decreased nursing staff turnover and increased employee satisfaction scores were also observed (Bielaszka-DuVernay, 2011).

O'Leary et al. (2011) conducted a controlled trial over 24-week to evaluate the impact of structured interprofessional rounds on teamwork and safety, quality of communication and collaboration, LOS and cost across two general medicine units. The units were designated either as a control or intervention unit which used a Structured Interdisciplinary Rounding (SIDR) instrument. Nurses' ratings of level of communication and collaboration with the hospitalist team were noted to be higher in the intervention unit compared to the control unit (80% versus 54%; p= 0.05). Additionally, teamwork and safety were higher on the intervention unit compared to the control unit (median of 85.7% vs 61.6%; p =0.008); the median on patient safety in the intervention unit was 75% compared to 61.1 % in the control unit. Unadjusted cost was lower for the intervention unit as compared to the control unit, ($7,513.23 ± 7,085.10). However, length of stay and cost showed no statistically significant difference between the control and intervention units. In a bivariate analysis, the authors found a significant patient case mix difference in the two groups which could explain a null result (O'Leary, et al., 2011).

After conducting the initial work on the SIDR, O'Leary (2011) performed a retrospective chart review to evaluate the impact of the SIDR on the rate of adverse events on two general medicine telemetry units. Patients' medical records were randomly selected from either the intervention unit performing SIDR or the control unit using traditional rounds. A total of 370 charts were reviewed with185 from each group. The results showed a significantly lower

adjusted rate of total and preventable adverse events for patients on the intervention unit as compared to patients on the control unit. The rate of adverse events in patients on the intervention unit was 3.9 per 100 patient-days compared to 7.2 per 100 patient days on the control unit (O'Leary, et al., 2011).

McKay and Wieck (2014) conducted a controlled trial in four hospitals in a Midwestern healthcare system to evaluate the impact IPC rounding using an instrument called the Clinical Integration Model (CIM) on LOS and cost per case in chronic heart failure patients. Two hospitals were set up as the intervention group to use CIM, while the other 2 used traditional rounding methods. The intervention hospitals reported shorter LOS using Welch's F statistic of F (p=0.001) and significantly lowered costs F (p=0.000) compared to the control group (McKay & Wieck, 2014).

A group of investigators in a single large academic health center in Indiana developed an interprofessional collaboration care model, called accountable care teams (ACTs), to improve patient metrics, such as, LOS, case mix index- adjusted variable direct costs (CMI-adjusted VDC), 30-day readmission rates, patient satisfaction and provider satisfaction scores in a surgical and medical acute care unit. The model incorporated the use of a structured script during patient huddles. These huddles occurred only during the weekdays and focused on safe discharges. Data were collected from August 2012 to December 2013. The result of the implementation demonstrated an overall 0.078 days decrease in LOS and CMI-adjusted VDC reduced by $273.99. Nearly 96% of nurses and physician respondents strongly agreed that the ACT model positively impacted the quality and safety of the care delivered, communication between providers and patients, engagement and job satisfaction. Thirty-day readmission and patient

satisfaction were not significantly impacted by the overall care model (Kara, Johnson, Nicley, Niemeier, & Hui, 2015).

Pape, Thiessen, Jakobsen and Hansen (2013) performed a case control study comparing the impact of new IPC rounds on hospital LOS in patients undergoing elective total hip or total knee replacements in a regional hospital in Denmark. Seventy-five patients were in the comparison group and 88 patients in the intervention group. The IPC team included nurses, surgeons, physical and occupational therapists. The team used a checklist and met every Tuesday and Friday mornings for 30minutes. Length of stay in the total hip replacement patients decreased from a mean of 4.1 days to 2.7 days (p=0.05) in the after group. There was no significant difference in LOS in the total knee replacement patients from a mean of 3.8 days to 3.5 days (p= 0.45) in the after group. The explanation for why LOS improvement did not take place in the total knee replacement patients was unclear but the authors concluded inadequate pain management may have contributed population (Pape, Thiessen, Jakobsen, & Hansen, 2013)

Mercedes, Fairman, Hogan, Thomas & Slyer (2016), in a quantitative systematic review, evaluated the effectiveness of structured IPC rounds using a structured communication instrument on LOS, patients' and staff satisfaction in acute care inpatient units. A total of 8 studies were included in the review, three quasi-experimental and five descriptive. Five studies examined the impact of IPC on LOS and three demonstrated a decrease or a downward trend in LOS. One study showed no statistical significance (p=0.1), and one demonstrated an increase in LOS (p=0.03). Six studies revealed an increase in staff satisfaction (p<0.05) and one study showed an increase in patient satisfaction after implementation of IPC. Two studies evaluated patient satisfaction, with one study that demonstrated no change (p=0.76) the other showed an increased trend at 12 months. The authors recommended the use of a structured communication

instrument as one means to facilitate communication and collaboration among the IPC team. The authors called for more rigorous research across diversified patient populations to further evaluate the use of IPC on LOS and patient satisfaction (Mercedes, Fairman, Hogan, Thomas, & Slyer, 2016).

A Cochrane review on IPC by Zwarenstein, Goldman and Reeves (2009) evaluated the impact of practice-based IPC interventions using a validated IPC instrument versus no IPC interventions or alternative on primary outcomes. The authors defined the practice-based IPC interventions as utilizing a routine communication tool, meeting, or checklist to improve IPC. Primary outcomes included patient satisfaction, provider's productivity and LOS. Five studies met the inclusion criteria. Two of the studies measured interprofessional rounds, while the other two measured interprofessional meetings (completed on a monthly or weekly basis) and the last study examined an external interprofessional audit. The review showed that practice-based IPC instruments can potentially improve health care processes and outcomes. In the two studies that assessed the impact of interprofessional rounds on LOS and patient charges, one demonstrated an impact on LOS and total charges with the IPC group as compared to the control group. The other study did not show a statistically significant reduction in LOS between the IPC group and control group. Regarding the utilization of respiratory therapy, there were 91.7% appropriate orders for respiratory therapy consults compared to 73.6% in the control group. There was limited evidence to support that IPC rounds improved patient satisfaction. Limitations of this review included the small number of studies, small sample sizes, and the lack of randomized controlled trials. According to the authors, it was difficult to draw a generalized conclusion on IPC in part due to the diversity of interventions, settings, and process of collaboration (Zwarenstein, Goldman, & Reeves, 2009).

Theoretical Framework

To effectively evaluate the impact of an IPC model on LOS, the Donabedian conceptual model of quality improvement was used to provide a systematic methodology on how to convey the issue, the process of implementation, and evaluation. The Donabedian model is composed of three components: Structure, Process, and Outcome (SPO) (Figure 3). The structure component refers to the characteristics of the interprofessional team, elements of collaboration and organizational culture. The process component designates the activities that constitute the delivery of health care, thus formation of an IPC team and creation of the RAMPED-UP instrument defined the process that constituted the framework. The outcomes denote the changes in individuals, systems or populations that can be attributed to healthcare delivery (Block, 2006). The outcomes component with the use of IPC model is based on what the team or the organization deem as a priority for quality improvement, thus the outcome component for RAMPED-UP was primarily LOS. The IPC model, RAMPED-UP, was developed to better coordinate care delivery and to measure its impact on hospital LOS in trauma patients.

Methods

A prospective cohort with a historical control study design was used to develop and test the effect of the RAMPED-UP model on hospital LOS and patient level outcomes. The primary study question was: Will the use of RAMPED-UP model decrease LOS in surgical trauma patients? The study design was chosen to demonstrate the temporal relations of RAMPED-UP on LOS. The pre-RAMPED-UP group included surgical trauma patients admitted to the surgical trauma service from October to December 2016. The RAMPED-UP group included patients admitted to the surgical trauma service who received the RAMPED-UP intervention from October to December 2017.

The RAMPED-UP model had three components. First, the RAMPED-UP rounds consisted of a daily structured patient care rounds that included active participation of all essential disciplines caring for the patient. The process involved the IPC team convening to discuss the patient care needs and discharge readiness of individual patients during the time the RAMPED-UP instrument was reviewed and documentation completed. The second component included the use of a consistent interactive instrument (RAMPED-UP instrument) during the RAMPED-UP rounds. The third component was the documentation and access to the instrument by all members of the IPC team. The IPC team was made up of advance practice providers, nurses, trauma surgeons, surgical residents, social workers, care coordinators, physical therapy and occupational therapy.

RAMPED-UP: Key Elements

The development of the RAMPED-UP instrument was formed base on the literature and institutional-specific features associated with increased LOS. For example, incentive spirometry and pain were included in the RAMPED-UP instrument due to anecdotal experience that inadequate pulmonary physiotherapy and pain control were associated with morbidity in the trauma patients at the author's clinical site. Since the majority of trauma injuries have some component of thoracic injuries, the failure to aggressively assess pain and some component of vital capacity increase the risk of pulmonary complications. As noted by Carver, Milia, Somberg, Brasel & Jasmeet (2015), patients with rib fractures and less than 30% vital capacity had significant pulmonary complications.

Procedure

The study procedures took place in 5 phases: assessment, development, pilot, intervention, and post analysis. The assessment phase of the RAMPED-UP model included

retrospective chart review. Demographics data, LOS and discharge information were collected on the surgical trauma population admitted and discharged from October to December 2016 from the surgical trauma unit. The developmental phase included the development of the RAMPED-UP taskforce to address the issue of LOS in the trauma population, and design of the RAMPED-UP instrument by the author. During the pilot phase, all nursing staff on the surgical trauma unit and essential interprofessional team members were educated about the RAMPED-UP mode. The RAMPED-UP model was implemented during the intervention phase that occurred from October to December 2017. The data analysis was conducted during the final analysis phase from January through February 2018.

Below is a description of how the RAMPED-UP model was implemented on a daily basis:

1. The night shift nurse started a new data sheet on each trauma patient at midnight and filled out as much information as possible.
2. During nursing sign-out, the day and night shift nurse used the information on the instrument for shift report and updated patient data, as needed.
3. RAMPED-UP rounds occurred every morning at 08:30 including weekends. Rounds began with the presentation of the patient's assessment and plan of care by the advanced practice provider, or a surgical resident.
4. The team conducted the next step at the patient's bedside to incorporate the patient's input. The bedside nurse presented the content on the RAMPED-UP instrument. The other disciplines contributed patient data as appropriate.

5. At the end of RAMPED-UP rounds, the plan was formulated and written down on the RAMPED-UP instrument by the nurse. The nurse then reviewed the whole plan with the patient and family.
6. The RAMPED-UP instrument was kept by the patient's white board for easy access by all the IPC members and to add new information. Upon patient discharge, the completed RAMPED-UP instrument was stored in a secure place for author retrieval.

Setting

The study took place on a 28-bed surgical trauma unit at an academic tertiary center. Annually, the surgical trauma service provides care for nearly 3,800 patients with penetrating and blunt traumatic injuries. Patients were admitted to either the intensive care unit or the progressive care unit based on severity of injuries and other confounding factors. An integrative provider team consisting of Advanced Practice Providers (APPs)--nurse practitioners and physician assistants—as well as general surgery residents and the trauma surgeon manage the patients.

Sample

The practice site institutional review board (IRB) deemed this study as quality improvement, thus, full IRB review was not required. A convenience sample size of 100 participants was targeted for each group Inclusion criteria included patients admitted to the surgical trauma unit over the age of 18 years and admitted to the surgical trauma service as their primary episode. Patient's initial level of care was described in the demographics of the population, being either intensive or progressive level of care. Excluded from the study were surgical trauma patients discharged to the palliative service, deceased, discharged against medical advice or readmitted.

Definition of Terms

RAMPED-UP Model: an interprofessional collaboration process designed to engage all disciplines to plan patient care around the common goal of safe, patient care progression and safe disposition. A related goal was to improve collaboration and communication among interprofessional team members. The IPC team was made up of advanced practice providers, nurses, trauma surgeons, surgical residents, social workers, care coordinators, physical therapy and occupational therapy.

RAMPED-UP rounds the process through which healthcare providers convene to discuss the patient care needs and discharge readiness of individual patients and during which the RAMPED-UP instrument was reviewed and documentation completed.

Injury Severity Score (ISS) an anatomical scoring system that provides an overall score for severity of injury in trauma patients. An abbreviated injury scale (AIS) is assigned to one of the six body regions and the calculated total results of the AIS produces the ISS. (Baker, O'Neil, Haddon, & Long, 1974)

Overall LOS as defined by the author's practice site measured in days but taken out to the hour. It was calculated by subtracting the discharge date/time from the admit date/time. For patients admitted through the ED, admit date and time began upon unit admission.

RAMPED-UP LOS: the number of days the patient received RAMPED-UP rounds while on the surgical trauma unit as calculated by the author.

CMS-LOS: A pre-determined LOS established by the Center for Medicare and Medicaid Services based on the average length of stay experienced by a patient within a chosen DRG.

Study Variables:

The study variables included LOS as the primary outcome. Completion rate of the RAMPED-UP instrument and participation rate of disciplines during RAMPED-UP rounds were

also studied. These disciplines were considered essential to daily rounds: nurses; providers (MD/APP); social workers (SW); care coordinators (CC); physical therapists (PT) and occupational therapists (OT). Secondary variables were discharge by noon, RAMPED-UP LOS and average incentive spirometry values by patient. Demographic variables of gender; age; race; marital status; injury severity score (ISS); initial disposition (intensive care vs. progressive care); and final disposition were tracked.

Measures

Data were extracted from the institutional Enterprise Analytic and Trauma database. Collecting information on initial level of care was imperative to this study to determine if it impacted the overall LOS. The timestamp on changes in the level of care between the ICU and progressive care were not captured in databases making it impossible to isolate patient's time in intensive care vs progressive care in the pre-RAMPED-UP group. For the RAMPED-UP group, the author was able to manually isolate LOS for time in which the patient received the RAMPED-UP intervention from the overall hospital LOS.

Completion rate of the RAMPED-UP instrument and participation rates by essential disciplines were calculated. Completion rate was measured by auditing the RAMPED-UP instrument for each patient, at time of discharge, for completion. Participation rate was determined by the number of disciplines present during rounds. Bedside nurses were responsible for checking which disciplines were present for RAMPED-UP rounds.

The study author created an excel spread sheet to track all study variables. These included patient identifier; gender; age; race; marital status; DRG; injury severity score; admission date and time; initial disposition (ICU or progressive care); discharge date and time; discharge by noon; overall LOS; CMS LOS; RAMPED UP LOS; number of consults; consults (physical

therapist and occupational therapist, pain service, substance abuse and psychology); disciplines present on RAMPED-UP rounds; and average incentive spirometry.

Data Analysis:

Data were recorded on an excel spreadsheet and inputted to SPSS version 24 .0 for data analysis. Demographic data were analyzed on the pre-RAMPED-UP and RAMPED-UP group using descriptive statistics. T- test and Chi-square were used to measure homogeneity between the two groups on demographic data, overall LOS, CMS predicted LOS and injury severity score. A Spearman correlation was done to determine the correlation between incentive spirometry values, overall LOS and RAMPED-UP LOS in the RAMPED-UP group. Statistical significance was set at a p-value ≤ 0.05. The confidence interval was estimated at 95%. Completion rate of the RAMPED-UP instrument was the number of completed instruments divided by the number of days each patient received the RAMPED-UP intervention. This number was converted to a percentage and calculated by the author. The instrument was considered complete if 80% of the day's RAMPED-UP content was completed. The participation rate was calculated by counting each discipline identified on the patient's RAMPED-UP instrument as being present during the RAMPED-UP rounds. The total discipline participation rate per patient was added and divided by the number of patient RAMPED-UP days and multiplied by 100%. This process was completed for all 96 patients in the RAMPED-UP group.

Results

Characteristics of the Pre-RAMPED-UP and RAMPED-UP Groups

The author aimed for a convenience sample of 100 patients in each group, however, after a second review of the data, four patients were eliminated from the RAMPED-UP group and one from the Pre-RAMPED-UP group due to violation to inclusion criteria. Final sample size was 98

patients in the Pre-RAMPED-UP group and 96 patients in the RAMPED-UP group. Both groups were similar in age, gender, race and marital status. The age between the two groups had a normal distribution, analyzed using the mean. There were more men and whites (non-Hispanics) in both groups. The ISS measures in both groups were skewed. The median for the pre-RAMPED-UP group was 12 compared to the RAMPED-UP group with a median of 9. Patient demographics illustrated in Table 1.

Initial disposition from emergency room to Intensive Care Unit (ICU) was higher in the RAMPED-UP group than the pre-RAMPED-UP group. The CMS predetermined LOS was tracked, with a median of 5 days in both groups. Forty-eight patients in the pre-RAMPED-UP group had a predetermined CMS-LOS of less than five days compared to thirty-eight patients in the RAMPED-UP - group. CMS- LOS data was missing for 23 patients in the RAMPED-UP group.

RAMPED-UP Outcomes

An independent sample 2-sided T-test was used to analyze the impact of the RAMPED-UP model on LOS. The median overall LOS for the pre-RAMPED-UP -group was 5.0 (IQR, 8.0), as compared to median overall LOS of 5.5 (IQR 7.3) in the RAMPED-UP group (p=0.830). The range of LOS for the pre-RAMPED-UP group was from 0.37 days to 39.35 days compared to 0.3 days to 45.6 days in the RAMPED-UP group. The author's practice site established a goal for LOS less than 6.1 days for the entire health system. Using this benchmark, patients in the pre-RAMPED-UP group and RAMPED-UP group were placed in two categories, LOS less than 6.1 and greater than 6.1. Using the exact 2-sided Chi-square test for categorical variables, there was no statistical significance between the two groups based on these categories as 57 patients in the pre-RAMPED-UP group had LOS less than 6.1 days as compared to 50 patients in the

RAMPED-UP group. The median RAMPED-UP LOS for patients that received the RAMPED-UP model after extrapolating the intensive care unit LOS was 3 (IQR 4). These findings are presented in Table 2.

Discharge by noon (DBN) was 16.2 percent in the pre-RAMPED-UP group compared to 34.4% in the RAMPED-UP group. This difference was statistically significant (p =0.005). Final disposition to home without additional service was higher in the RAMPED-UP (68.8%) as compared to the pre-RAMPED-UP group (59%). Approximately fifteen percent of the RAMPED-UP -group discharged to home required home health support services. There was no overall statistical significance in the final disposition between the two groups. The median incentive spirometry level was 1750ml for the patients in the RAMPED-UP group. Incentive spirometry was not recorded prior to the implementation of RAMPED-UP model.

RAMPED-UP Rounds Characteristics

Every patient on the Trauma Service in the progressive care surgical trauma unit received the RAMPED-UP intervention as the standard of practice. Participation by each discipline is shown in Table 3. Physical and occupational therapists were the only disciplines that did not participate in the RAMPED-UP rounds. The completion rate of the RAMPED-UP instrument was 76%.

Relationship between Incentive Spirometry and LOS

Additional analysis was completed to determine if there was a correlation between incentive spirometry values and overall LOS and the RAMPED-UP LOS in the RAMPED-UP group. The median incentive spirometry value was significantly higher in the group with LOS less than 6.1 days as compared to the group with LOS > 6.1 days. Overall, the group with LOS less than 6.1 days had a higher range in the level of incentive spirometry as noted in Table 4. In

assessing correlation using spearman rho correlation non-parametric test, there was a medium, negative correlation between the incentive spirometry and overall LOS, (rho = -0.301, n= 77, p= 0.008). Assessing the correlation between incentive spirometry and RAMPED-UP LOS, likewise it demonstrated a low, negative, correlation (rho= -0.270, n=77, p=0.018). Nineteen patients in the RAMPED-UP group did not have incentive spirometry recorded. Out of the 19-missing data, three patients had a tracheostomy tube so were unable to use incentive spirometry, four patients had altered mental status due to traumatic brain injury making it impossible to follow the instructions on the incentive spirometry, six had a positive delirium score, and six patients refused to use the incentive spirometry.

DISCUSSION

Implementation of the RAMPED-UP model of interprofessional collaboration did not decrease hospital LOS but did have a positive impact on RAMPED-UP LOS and did show incidental correlation between incentive spirometry values and LOS. The RAMPED-UP LOS had the greatest dose effect of IPC as this was the period in which the patient was on the surgical trauma unit and received RAMPED-UP rounds every day. Thus, this concentrated impact of all disciplines reviewing the plan of care among the team and with the patient could explain the improved LOS, discharge by noon, and increase in home services. While randomized controlled trials are lacking, some evidence and expert opinion supports the critical role of IPC in optimizing system level outcomes such as LOS. The RAMPED-UP model adds to the evidence that an IPC model can help systems meet the discharge by noon benchmark and that consistent participation of essential disciplines in daily rounds impacts disposition destination. The high percentage of patients in the RAMPED-UP group who were initially admitted to the ICU as compared to the pre-RAMPED-UP group, may indicate the potential positive impact of starting

RAMPED-UP rounds on every trauma patient from day of admission at any level of care, i.e. intensive care or progressive care.

The social work (SW) and care coordination (CC) collaboration with the medical team likely contributed to the increased number of patient s discharged to home with home health services. Prior to RAMPED-UP rounds, a barrier to the throughput process was the lack of knowledge needed to determine what services could be provided in the outpatient setting. The early collaboration from SW and CC contributed to discussion during RAMPED-UP rounds about safe dispositions. SW and CC engaged the patient and family into that discussion to facilitate the appropriate discharge needs. Communication among the IPC team was interchangeable which enhanced the teamwork and efficacy of the patient care needs and throughput process. As noted by O'Daniel and Rosenstein (2008), having a standardized communication instrument for IPC bridges the differences between the various disciplines' communication styles.

Although collaboration among the nursing staff was not directly assessed, many team members reported that the RAMPED-UP model enhanced communication and efficiency of workflow between the provider teams, IPC and the nursing staff. The work of O'Leary et al. (2011) work on IPC showed a positive influence of IPC on collaboration among nursing staff and provider team when a structured IPC model existed. In the context of how it improved their workflow, nurses became knowledgeable of the overall care management and had sufficient information to educate patients and families of the care plan. The nurse's ability to advocate for patients was heightened and embraced by the IPC team because the RAMPED-UP model was structured to engage and provide autonomy for the bedside nurses.

Discharge by noon was not a primary or secondary outcome of this project. However, this was an important benchmark for the author's practice site and so was tracked in the two databases used in the study. There was a significant increase in discharge by noon in the RAMPED-UP group as compared to the pre-RAMPED-UP group. Multiple studies cite the significant impact of late discharges on LOS, patient satisfaction scores and impact on overall patient throughput process. This has been associated with negative impact on operative cases, crowded emergency departments, extensive patient waits times, duplication and additional handoffs, and treatment delays which result in adverse outcomes, poor clinical outcomes and higher cost (Jweinat, et al., 2013). Patel, Morduchowicz &Mourad (2017) demonstrated the impact of employing an interprofessional collaboration team and systematic framework of intervention on a medicine service to improve discharge by noon from 10.4 % to an average of 19.7% over a 2-year span. The impact of the RAMPED-UP model on discharge by noon adds to the evidence.

The author found no prior study evaluating the effect of IPC and incentive spirometry use on LOS. Based on the correlation found between incentive spirometry and RAMPED-UP LOS in the RAMPED-UP group, further research is warranted. Additional study could provide some evidence on identifying and predicting patient's LOS and final disposition based on pulmonary status as reflected by incentive spirometry values. Noticeably, the study by Valenza-Demet, Valenza, Cabrera-Martos, Torres-Sanchez, & Revelles-Moyano (2014), evaluated the impact of physiotherapy on patient outcomes and noted a decrease in LOS with the patient's that underwent a physiotherapy program. LOS decreased significantly by (26.7±8.8days) in the intervention group compared to the control group (38.6 ±10.7 days) with a (p=0.014). Patients' initial disposition from the emergency room revealed no statistical significance between the two

groups, but the pre-RAMPED-UP-group had fewer patients admitted to the intensive care unit, with the majority of patients admitted to the progressive care unit for initial care.

Strengths and Weaknesses of the Design:

The strengths described in this project included the use of a validated theoretical framework to guide the implementation of the study. Secondly, the study suggests that an IPC model promotes communication and collaboration among the IPC team. Thirdly, the potential to decrease LOS has significant implications on overall system and patient level outcomes. Lastly, this study contributes to gaps in the study of impact of structured IPC models on LOS in the surgical trauma population.

Several limitations of the study must be acknowledged. First, due to the study design, it was impossible to identify all factors that may have influenced LOS. Secondly, the lack of randomization, limited its strength to contribute to the gap in research on evaluating the impact of IPC on patient outcomes, specifically, LOS. As noted by, Zwarenstein, Goldman and Reeves (2009), in the areas of IPC, larger randomized control trials are warranted to make a concrete recommendation on the role on patient outcomes. Thirdly, the study was done in a single-center health system with a non-validated instrument. Additionally, the inability to isolate initial site of care from overall hospital LOS in the pre-RAMPED-UP group made it difficult to compare it to the RAMPED-UP LOS in the RAMPED-UP group. This information could have enabled the author to make generalization of the effect on the two groups. An important limitation includes the time limits of this study. The intervention was implemented over a 10-week period, and a longer intervention phase could have provided more robust hospital LOS outcome data.

Lastly, the study did not directly evaluate the impact of IPC on collaboration between the various disciplines. As described, physical therapy and occupational therapy opted not to fully

participate in the RAMPED-UP rounds, raising the notion regarding which disciplines in the IPC truly influence LOS. Multiple sources from the medical literature on IPC and LOS demonstrate various structure and disciplines they consider as IPC; some support the need of adding a pharmacist to the IPC team. As noted by Mekonnen, McLachlan & Brien (2016), in a systematic meta-analysis review, having a pharmacist-led medication reconciliation impacted readmission rates. It will be necessary to duplicate this study in other tertiary medical centers to provide validity of the components of the RAMPED-UP model, specifically, which disciplines are essential to the process of IPC.

Finally, missing data impacted result. There was significant nursing turnover leading to an increased number of novice nurses who were onboarded during the intervention phase. The high turnover rate potentially contributed to the 25% of instrument incompletion rate. The author established a 2-hour simulation session for 4 weeks to compensate for new nurses that missed the initial pilot phase. The second challenge involved the trauma database process of inputting data information was not real-time, creating a lag time and missing data for the injury severity score (ISS) and CMS LOS for the RAMPED-UP group.

Conclusion:

While the implementation of the RAMPED-UP model did not decrease hospital LOS, the model did significantly improve DBN and RAMPED-UP LOS compared to the institutional goal of 6.1days. The RAMPED-UP model, anecdotally, bridged communication gaps among the IPC team, patients and families. The further exploration of the incidental finding that there was a clinically significant correlation between incentive spirometry and LOS in the RAMPED-UP group is warranted. The use of a structured IPC model supports the evidence that patient outcomes

can be positively improved with a consistent, structured process that includes essential members of the IPC team and patient and family.

Nursing Implications:

Nursing involvement in the IPC team has significant impact on system and patient outcomes. As stated by Gausvik, Lautar, Miller, Pallerla and Schlaudecker, participation by the bedside nurse can increase their understanding of the plan of care, their ability to communicate more with the patient and family about the plan of care, and their ability to address all fears and worries of their patients during rounds. This in turn, improves nursing satisfaction and decreases turnover (Gausvik, Lautar, Miller, Pallerla, & Schlaudecker, 2015). The RAMPED-UP model, while not decreasing hospital LOS, did result in shorter LOS than the system's benchmark and improved DBN, another critical benchmark. Finally, the author and the surgical trauma team members experienced enhanced collaboration and communication that had the potential to enhance safer discharges and, ultimately, more optimal patient outcomes.

Products of the Capstone

1. The use of the RAMPED-UP become the standard of care for all surgical units at the current institution
2. On the system level: enhanced throughput process, decreased ER LOS, decrease LOS and DBN, decreased Ambulance diversion and cost saving
3. On the patient level: safe discharge, with more patients discharged to home.
4. Abstract submission or poster presentation and publication to the following organizations and journals:
    a. Journal of Trauma and Acute Care Surgery (Publication)
    b. Society of Trauma Nurse Conference (Journal of Trauma Nursing)

c. American Association of Critical Care Nurses National Teaching Institute
d. Doctor of Nursing Practice Inc., National DNP Conference (*Journal of Doctoral Nursing Practice)*
e. Society of Critical Care Medicine Congress (Critical Care Journal)

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Figure:

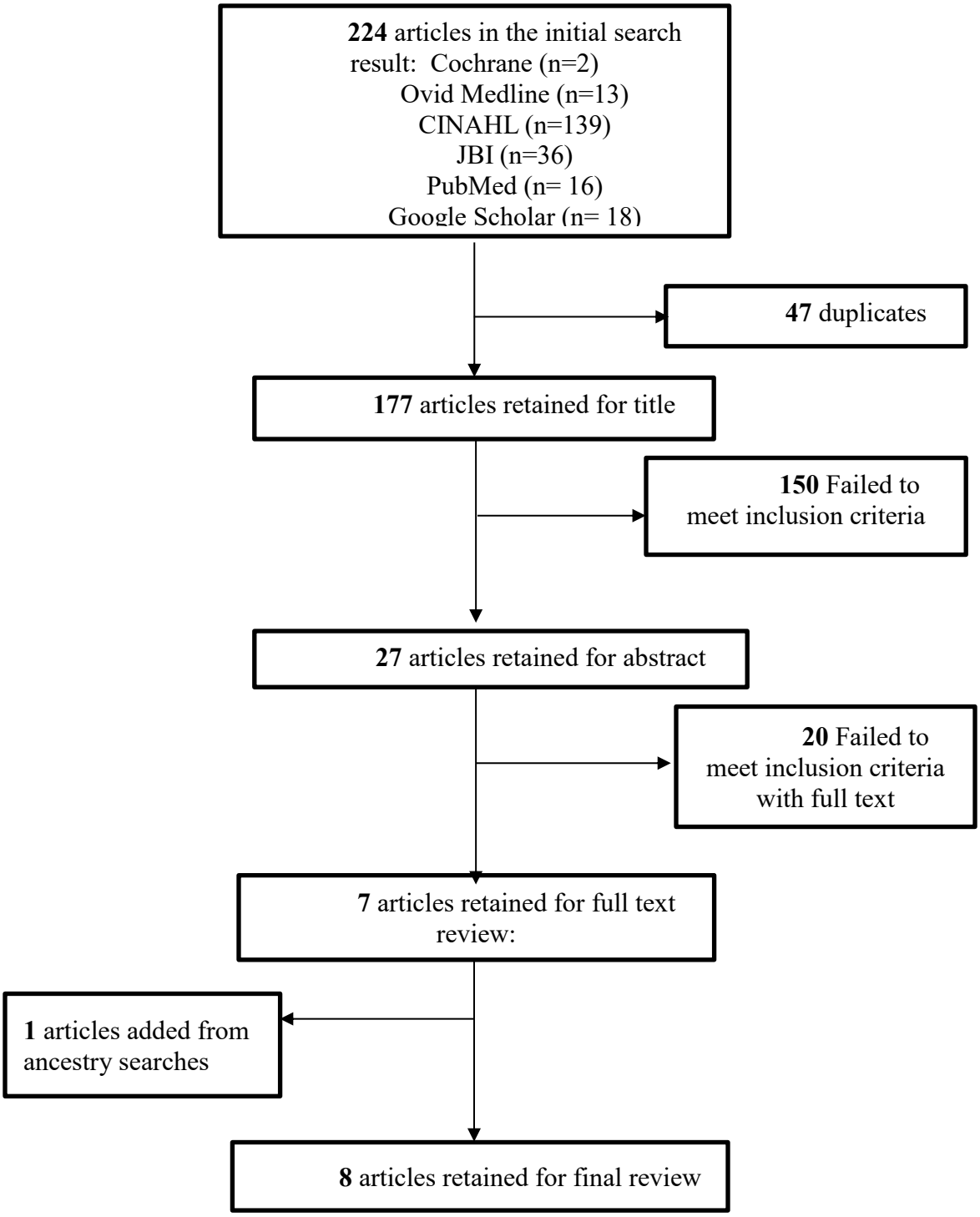

Figure 1. *Literature Search Procedure*

Figure:

	Room _____		PATIENT INFORMATION
		Date _____	Date _____
R	**Respiratory**	IS ml (range)	IS ml (range)
	RT Consult needed?	O2 Sats	O2 Sats
A	**Activity**		
	Consult needed?		
	PT Recs		
	OT Recs		
	Mobility		
M	**Medications**		
	Reconciliation:		
	current / home		
P	**Pain / Palliative /**		
	Psych / Sub. Abuse		
	Consult needed?		
E	**Enteral Feeding /**		
	Diet N/V		
	Bowel regimen		
D	**Disposition**		
	Est. D/C date: _____		
	Change in level of care?		
	Going home on DVT proph?		
	Dischg Scripts?		
	Barriers/concerns for discharge		
U	**Updates**	**Pt/Family updated on care plan, injuries, discharge plans**	
	Questions from Pt or family		
P	**Prophylaxis / Prevention**	DVT GI (PPI)	DVT GI (PPI)
		Foley Drains	Foley Drains
		IV	IV
		Skin/Wound	Skin/Wound
	Plan of Care		
	Present in rounds (circle):	**RN MD APP PT SW Care Cordin**	**RN MD APP PT SW Care Cordin**

Figure 2. *RAMPED-UP Instrument*

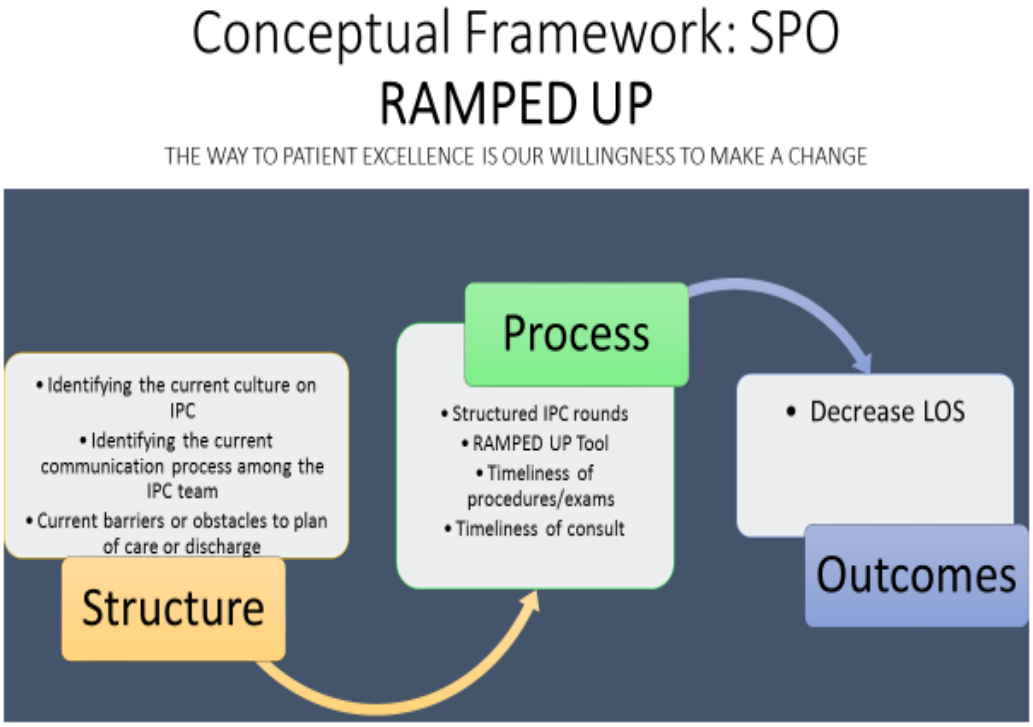

Figure 3: *Conceptual Framework*

Figure

Taskforce Charter	
Taskforce Name: M9C Surgery Trauma Inter-professional Practice Taskforce	
Chair: Levi Procter, MD / Kwame Akuamoah-Boateng, NP	**Co-Chair:** Kimberli Tate, MSN, RN, PCCN
Executive Sponsors: Michel Aboutanos, MD / Nancy New, RN	
Facilitator: Kimberli Tate	
Meeting Day/Time: Wednesdays 3:30PM	
Original Charter Date: 03/08/2017	

Purpose: Interdisciplinary Departmental Taskforce designed to review/assess
To enhance patient care outcomes for patients on the Surgery Trauma Unit and improve care processes. To assure that care is safe, timely, effective, efficient, equitable, and patient centered.

Scope:
This taskforce is empowered to recommend, facilitate and implement changes to Trauma Surgery practice on the Surgery Trauma Unit.

Reporting Structure:

Taskforce voting members:		
Rebecca Dennis	Emily Callihan	Beth Broering
Beth Torres	James Whelan	Nancy New
Yolanda Guthrie	Javon Cox	Toshika Taylor
Chrystal McIver	Lindsey Grizzard	Alex Pasi
Kimberli Tate	Peter Herbst	Carie Tingler
Christopher Thomas	Kwame Akuamoah-Boateng	Cassandra Serio
Diane Lawson		
Ex-officio members:		
Non-voting members:		
Virginia Austin		

Internal resources/Subject Matter Experts:		

External resources:		
CMS (Centers for Medicare and Medicaid Services)	Press Ganey	

Figure 4: Interprofessional Collaboration Charter

Table 1. Demographic Characteristics

Variable	Pre-RAMPED-UP Group n=99		RAMPED-UP Group n=96		*p*
		n (%)		n (%)	
Age (years) Mean (SD)	46.7 (19.1)		44.5 (18.9)		0.413[3]
Injury Severity Score (ISS) Median (IQR[1])	12.0 (10.0)		9.0 (12.0)		0.267[3]
Missing		5 (5.1)		12 (12.5)	
Gender					0.625[4]
Male		75 (75.8)		69 (71.9)	
Female		24 (24.2)		27 (28.1)	
Race /Ethnicity					0.723[5]
White, non-Hispanic		50 (50.5)		54 (56.3)	
African American/Black		45 (45.5)		38 (39.6)	
Other/Unknown		4 (4.0)		4 (4.2)	
Marital Status					0.190[5]
Married		23 (23.2)		30 (31.3)	
Single, Never Married		58 (58.6)		56 (58.3)	
Divorced/Separated		10 (10.1)		3 (3.1)	
Widowed		8 (8.1)		7 (7.3)	
Initial Level of Care					0.391[4]
ICU Admission		46 (46.5)		51 (53.1)	
Progressive Care Admission		53 (53.5)		45 (46.9)	
CMS_LOS[2] (days) Median (IQR)	5.1 (4.6)		5.0 (4.8)		0.893 [3]
≤ 5.0		48 (48.5)		38 (39.6)	
5.1 – 10.0		32 (32.3)		22 (22.9)	
10.1 – 15.0		17 (17.2)		12 (12.5)	
15.1-20.0		0 (0.0)		0 (0.0)	
20.1-25.0		0 (0.0)		0 (0.0)	
≥ 25.1		2 (2.0)		1(1.0)	
Missing		0 (0.0)		23 (24.0)	

[1]Inter-Quartile Range; [2] Center for Medicare and Medicaid Service estimated pre-determine length of stay, based on the patient's Diagnosis-Related Group (DRG); [3] Independent samples 2-sided T- test; [4] 2-sided Chi-square tests; [5] Exact 2-sided Chi-square tests;

Table 2: Patient Outcomes by Group

Variable	Pre- RAMPED-UP Group n=99		RAMPED-UP Group n=96		*p*
	Median (IQR)	**n (%)**	**Median (IQR)**	**n (%)**	
Total Hospital LOS	5.0 (8.0)		5.5 (7.4)		0.830[2]
LOS Goal of 6.1					0.531[3]
Less than 6.1		57 (57.6)		50 (52.1)	
Greater than 6.1		42 (42.4)		46 (47.9)	
RAMPED UP LOS (days) [1]			3 (4.0)		
Discharge by Noon					0.005[3]
Yes		16 (16.2)		33 (34.4)	
No		83 (83.8)		63 (65.6)	
Final Disposition					0.141[4]
Home		59 (59.6)		66 (68.8)	
Skilled Nursing Facility		15 (15.2)		8 (8.3)	
Rehab		14 (14.1)		6 (6.3)	
Law Enforcement		1 (1.0)		1 (1.0)	
Home Health		10 (10.1)		15 (15.6)	
Incentive Spirometry			1750 (1000.0)		
Unreported Value				19 (19.8)	

[1]RAMPED UP Length of Stay, based on the patient's admission on the intermediate/acute care ward [2] Independent samples 2-sided T-test [3]2-sided Chi-square test [4]Exact 2-sided Chi-square test

Table 3: RAMPED-UP Rounds Characteristics

Variable	Ramped Up Rounds per patient n=418
	n (%)
Completion rate on RAMPED-UP Instrument	316 (75.0)
Providers Participation Rate per Discipline	
MD/APP[1]	96 (100.0)
Nurse	96 (100.0)
Social Worker/Care Coordinator	96 (100.0)
Physical Therapy/Occupational Therapy	0.00%

[1] MD-Medical Doctor/Advance Practice Provider

Table 4: RAMPED-UP Group Incentive Spirometry Characteristics

Variable	LOS < 6.1 days n=50		LOS >6.1 days n=46	
	Median (IQR)	n (%)	Median (IQR)	n (%)
Incentive Spirometry (ml)	2000 (875)		1500 (1000)	
Min. I/S[1]		1000		750
Max. I/S		5000		3500
Recorded I/S		33 (66.0)		44 (95.7)
Not Recorded[3]		17 (34.0)		2 (4.3)

[1] I/S: Incentive Spirometry; [2]Not recorded- patients that had a tracheostomy, altered mental status or refused to participate.

Table 5: Relationship between Incentive Spirometry and LOS

	Average Incentive Spirometry n=77	*p*
Overall LOS	-0.301	.008[1]
RAMPED-UP LOS	-0.270	.018[1]

[1] Spearman's rho 2-sided (nonparametric correlations)