REDUCING PREVENTABLE READMISSIONS FOR PATIENTS WITH DIABETES ON THE PARKLAND HOSPITALIST UNITS

By

Huan Ting Chang

DISSERTATION

Presented to the Faculty of the Medical School
The University of Texas Southwestern Medical Center
In Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF MEDICINE WITH DISTINCTION IN QUALITY IMPROVEMENT AND PATIENT SAFETY

The University of Texas Southwestern Medical Center
Dallas, TX

ACKNOWLEDGMENTS

I would like to offer my very great appreciation to Dr. Uma Gunasekaran, Dr. Luigi Meneghini, Kellie Rodriguez, Misty Jones, Carol Gonichelis, and other members of the Parkland Global Diabetes Program, for their patient guidance and unwavering support of this quality improvement work. I would also like to thank Eleanor Phelps and the Office of Quality Improvement, Quality Safety, and Outcomes Education for developing my quality improvement skillset. My grateful thanks also extend to Dr. Gary Reed, Dr. Jerzy Lysikowski, Arthi Devaraj, and Mohsin Ahmad for their generous provision of data and analytical support. Last but not least, I want to thank all the nursing, physician, and dietician staff on floors twelve and thirteen at Parkland for allowing me to shadow and learn the diabetes patient care process from them.

ABSRACT

REDUCING PREVENTABLE READMISSIONS FOR PATIENTS WITH DIABETES ON THE PARKLAND INPATIENT HOSPITALIST UNITS

Huan Ting Chang
The University of Texas Southwestern Medical Center, 2019
Supervising Professor: Uma Gunasekaran, M.D. and Luigi Meneghini, M.D.

Background:
High rates of readmission are detrimental to both the patient and the hospital, and they are associated with decreased patient satisfaction, diminished quality of life, and substandard overall care. Diabetes remains one of the greatest risk factors for 30-day all-cause readmissions.
Local Problem:
Under the Affordable Care Act (ACA), the Centers for Medicare and Medicaid Services (CMS) established the Hospital Readmissions Reduction Program (HRRP), which penalizes hospitals for high readmission rates related to heart failure, COPD, acute myocardial infarction, pneumonia, and stroke. Because diabetes was not a disease scrutinized under the HRRP at the start of the project period, Parkland was not specifically focused on reducing readmissions for patients with diabetes.
Methods:
This quality improvement project utilizes the DMAIC framework. The proper context and measures were defined, and baseline process and outcome measures were obtained. A quality gap analysis was completed, and an FMEA was used to identify the gaps that needed to be addressed. Outcome and process measures were analyzed using chi-squared analysis and segmented control charts, and the balancing measures were analyzed using a continuous control chart.
Interventions:
The first intervention was a rearrangement of the EMR nursing flowsheet drop-down menu used to document inpatient diabetes education to highlight diabetes survival skills first. The second intervention was the creation of the Diabetes Hospital Education and Resource Officer (HERO) Program which provided self-selected nurse champions across each hospital unit to be leaders in diabetes patient-care.
Results:
Nine months after both interventions, there was a significant decrease in the 30-day all-cause readmission rate from the Parkland hospitalist unit by 5%. The documentation rates for insulin administration and hypoglycemia or hyperglycemia education increased significantly five months after the first intervention, and nine months after both interventions when compared to the baseline. Correlation analysis showed that with education, there was a decrease in readmission rates, but the changes were not significant. All three balancing measures remained in control during the project period.
Conclusions:
Changes to the EMR can create an immediate impact while continuous improvements need to be sustained by a leadership program with human factors.

TABLE OF CONTENTS

Chapter 1: Introduction

1. Problem Description

High rates of 30-day preventable readmissions can increase the annual spending of hospitals and induce reimbursement penalties under the Affordable Care Act (ACA) [1]. Readmissions are also associated with lower patient satisfaction, diminished patient quality of life, and substandard inpatient care [2-4]. According to 2 study analyses, patients with diabetes are at a higher risk for 30-day all-cause readmissions due to the complications associated with the disease, and diabetes ranks as one of the top three conditions with the largest number of 30-day all-cause readmissions for Medicaid patients [5 6]. Overall, readmission for patients with uncontrolled diabetes can increase annual hospital spending by at least $2.4 billion dollars on average in the US, and 30% of patients with diabetes have multiple preventable hospitalizations that cost hospitals approximately $23,000 per patient, per year across the nation [7 8]. Thus, to improve patient well-being and reduce hospital spending through the reduction of 30-day all-cause readmissions, it is important to scrutinize the care processes for patients with diabetes.

Parkland Hospital Health System (PHHS) is a large safety-net hospital serving Dallas county residents with over 39,000 inpatient adult discharges annually. Within the PHHS, 17% of inpatient discharges derive from the hospitalist unit; of whom, 43% have diabetes. Despite an abundance of literature pointing to diabetes as a major risk factor for 30-day all-cause readmissions, the Hospital Readmissions Reduction Program (HRRP), created by the Center for Medicaid & Medicare Services (CMS), only tracks 30-day hospital readmission rates for patients with myocardial infarction, pneumonia, stroke, chronic obstructive pulmonary disease, and heart failure. Patients with diabetes have been excluded from the CMS readmissions quality assessment under the Affordable Care Act (ACA) [9]. As a result, readmission rates for patients

with diabetes were not specifically being monitored at Parkland at the start of the project period in 2016, therefore missing potential quality gaps that can affect a significant number of patients.

2. **Available Knowledge**

According to the Healthcare Cost and Utilization Project (HCUP) National Readmissions Database from 2015, the national benchmark 30-day all-cause readmission rate for patients with diabetes is 20.7%[10]. The baseline 30-day all-cause readmission rate for patients with diabetes within the Parkland hospitalist units is 18.7%, reflecting data collected between August 1, 2016 and August 31, 2017. The single-unit to nationwide hospital data comparison and the later-found quality gaps suggest that there are additional opportunities to reduce preventable readmissions for patients with diabetes at Parkland Hospital.

Although diabetes is a chronic illness relying more on self-management and outpatient care, it has been shown that proper inpatient diabetes survival skills education and well-coordinated discharges can significantly reduce readmission rates among patients with diabetes [3 11-13]. The best practices for inpatient diabetes survival skills education in accordance with the American Diabetes Association (ADA) guidelines include teaching patients insulin dosage, type, and self-administration, usage of glucose meters, and the signs, symptoms, blood glucose ranges, and acute treatments associated with hypoglycemia and hyperglycemia [14]. Although many different models for inpatient discharge have been studied, the Project Re-Engineered Discharge (RED) model with its 12-step checklist and teach-back system has been determined by the NIH and Agency for Healthcare Research and Quality (AHRQ) to be the best practice for reducing readmissions[12 13 15].

Nursing policy and orientation programs at PHHS emphasized the best practice for inpatient diabetes survival skills education at the start of the project period in 2016, but the EPIC

Electronic Medical Record (EMR) did not support the best practice. Nurses were not required by the electronic system to document the education provided to patients, and often times, nurses were far too busy to conduct or document diabetes education without specific physician orders. Furthermore, the EPIC flowsheet for diabetes education documentation contained too many options listed in alphabetical order without an emphasis on specific diabetes survival skills (Figure 1). The baseline nursing documentation rates for inpatient diabetes survival skills education from 2016 were all below 30% for insulin administration, glucose meter usage, and hypoglycemia or hyperglycemia education (Table 1).

Similar to diabetes inpatient education, the discharge model at Parkland as provided by the EPIC EMR did not enforce the best practices delineated by Project RED, and furthermore, discharge procedures were taught individually to nurses and physicians by their respective preceptors, making the discharge protocols highly variable. While the After Visit Summary (AVS) given to the patient at discharge often addressed the critical discharge information specified by Project RED [15], the discharge practice at Parkland and the EPIC EMR documentation system did not enforce the teach-back method or in-person discharge reconciliation for both the floor nurses and the physicians. Even though nurses and physicians were informally trained to begin discharge preparations at the start of admission, the preparations for discharge were often delayed.

3. **Rationale**

From the analysis of Parkland policy, staff training processes, and the EPIC EMR system, it was clear that the best practices for reducing readmissions for patients with diabetes were not being enforced, creating significant quality gaps. Through the use of Failure Mode Effect Analysis (FMEA), the focus was shifted to interventions impacting the quality gaps in nurse-

provided inpatient diabetes survival skills education, especially since the PHHS discharge process already contained 6 of the 12 steps from Project RED. The project team consisted of two inpatient Certified Diabetes Educators and the Director of Diabetes Education from PHHS, so interventions targeting nurse-provided inpatient survival skills education would be more feasible than those aiming to modify the PHHS discharge process. Additionally, it was more difficult to tailor a discharge-focused intervention to solely target diabetes as diabetes was not often the admission diagnosis.

The first intervention involving the EMR update operated under the assumptions that a well-designed documentation system not only provides proof that education was completed, but it also aims to drive and reinforce compliance to the best practice[16 17]. In Project RED, specially trained nurses titled "Discharge Educators" helped sustain the best practices. As the second intervention, nurses with similar expertise, titled Diabetes Hospital Education Resource Officers (HEROs), were trained to help reinforce diabetes education taught by the hospitalist unit nurses and aid in discharge preparation. Theoretically, the deployment of these diabetes nurse champions could increase the sustainability of the best practices [15]. The use of these champions combined with an updated documentation system should increase the overall adherence to best practice for nurse-provided inpatient diabetes survival skills education.

4. Specific Aims

The overarching aim of this project in 2016 was to reduce the 30-day all-cause readmission rates for patients with diabetes from the Parkland hospitalist unit by 10% at the end of the project in January 2019**.** To accomplish this aim, the above mentioned best practices for providing inpatient diabetes survival skills education needed to be implemented, and the unit compliance rate to these best practices needed to be measured. With the interventions, the goal was to also

increase the documentation rate for diabetes survival skills education of all nursing units on the Parkland hospitalist floors by at least 10% at the end of the project. The project aims aligned with the mission of Parkland to deliver patient care focused on quality, safety and service. Reducing 30-day all-cause readmission rates can decrease financial burden for both the patient and the hospital, and ultimately, it can increase patient well-being and patient satisfaction [1-3].

Chapter 2: Methods

1. Context

Approximately 43% of the discharges from PHHS hospitalist units have diabetes while only 9.3% of the U.S. population have diabetes [18]. Since readmission is also dependent upon the patient population, the PHHS hospitalist units may have a high 30-day all-cause readmission rate for patients with diabetes due to the large amount of diabetes patients under their care [19]. The team selected the hospitalist unit at Parkland for the baseline measurement and analysis because the hospitalist units receive more patients with diabetes from the emergency department (ED) than any other department at Parkland. It was believed that focusing on the hospitalist units with more patients with diabetes would create the potential for the greatest impact that could lead to hospital-wide changes.

The Parkland hospitalist units cover two floors, each containing two units. Within each individual hospitalist unit, there is one charge nurse who is responsible for assigning patients to all other floor nurses. Each floor nurse cares for 5 to 6 patients, and they work a 12-hour shift. The morning shift is from 6AM to 6PM while the night shift is from 6PM to 6AM. All of the nurses receive the same orientation for Parkland nursing policies and EPIC EMR usage, and if there are changes made to the EPIC EMR, all nurses are notified via email.

The project leadership team consists of nurses and physicians from the Global Diabetes Program at Parkland, designed to manage diabetes within the PHHS, including the outpatient specialty clinic and the inpatient consult service, as well as provide additional diabetes education to patients through two inpatient certified diabetes nurse educators. The inpatient certified diabetes educators work primarily to educate and upskill hospital nursing staff with regards to proper diabetes management and education, and additionally, they provide education for patients with type I diabetes and other select complex cases. The Director of Diabetes Education from the Global Diabetes Program works with the nursing management at PHHS to develop and further refine the Diabetes HERO Program.

2. Interventions

The first intervention was updating the EPIC EMR system to better reinforce nurse-provided diabetes survival skills education. All nurse-provided inpatient education were documented within the EPIC patient education flowsheet (Figure 2). Within this patient education flowsheet, there was a section called "Diabetic Teaching" that listed all diabetes-related education topics in alphabetical order (Figure 1). To facilitate ease of documentation of diabetes survival skills, all diabetes-related education topics were stratified into categories titled "Diabetes Survival Skills" and "Additional Diabetes Education" (Figure 3). This allowed nurses to more efficiently access inpatient survival skills education documentation. This intervention was implemented on October 4th, 2017.

The second implemented intervention was the Diabetes HERO Program. The program designated one self-selected nurse from each unit across the hospital to serve as a diabetes nurse champion. Each champion must have at minimum 2 years of hospital experience, attend 80% of the monthly Diabetes Nurse Champions Training sessions within the year, and the champion

must implement 5 hours of unit-based peer-to-peer training of other floor nurses each month. Peer-to-peer training involves upskilling floor nurse knowledge on diabetes and enforcing the teaching and documentation of diabetes survival skills. Furthermore, the champions will participate in unit-based audits and PDSA cycles to better improve the sustainability and usage of this program. On March 20th, 2018, the Diabetes HERO Program officially deployed with 37 champions signed up, and the hospitalist units were fully covered.

3. Study of the Intervention

The process measure was the documentation rate for the inpatient diabetes survival skills education. The primary outcome measure was the 30-day all-cause readmission rate for patients with diabetes in the Parkland hospitalist units. The analysis operated under the assumption that documentation of a particular topic under the patient education flowsheet implied that the specific topic had been taught to the patient. The documentation rate for teachings involving insulin, hypoglycemia or hyperglycemia management, and glucose meter usage were examined as separate process measure datasets. Since there were no other hospital-wide quality improvement initiatives occurring during the times of the intervention implementation and the analysis period, changes to the process measure could be better correlated with changes to the outcome measure.

In studies targeted at reducing readmission rates, the length of stay, ED utilization rate, and observational unit utilization rate should all be examined as balancing measures to ensure that they do not increase as the readmission rate changes. Under the HCUP definition of inpatient admissions, patients placed under the care of hospital observational units are not considered inpatient admissions and are thus excluded from readmission counts. Therefore, changes to length of stay in addition to emergency department and observational unit utilization rate were

analyzed to ensure that any changes to the readmission rate did not negatively affect the balancing measures.

4. Measures

To determine if patients were discharged under the care of a hospitalist unit, their discharging department name in the EPIC EMR would be listed as “Thirteen Hosp A”, “Thirteen Hosp B”, “Twelve Hosp Med”, or “Twelve Gen Med”. A patient with diabetes is defined as someone with ICD 10 codes of E08.x, e09.x, e13.x, e10.x, e11.x, or having a hemoglobin A1C value greater than 6.4 anywhere within his or her chart.

The denominator for the baseline readmission data included the total number of patients with a diagnosis of diabetes discharged from the Parkland hospitalist units between August 1, 2016 and August 31, 2017. The numerator for the baseline readmission data consisted of the total number of hospital admissions to the Parkland Hospitalist Unit with at least one subsequent admission to any Parkland unit within 30-days during the period specified by the denominator, excluding ED visits without admission to the hospital, transfers, or stays and admissions from observational units. For the final outcome readmission rate, the admission data time frame was expanded from August 31, 2017 to December 31, 2018. Every qualifying hospital stay in a hospitalist unit is counted as a separate index admission, so a single patient can be counted with multiple index stays during the listed time period. The index stays do not require a “clean period” with no prior hospitalizations.

The documentation rate of nurse-provided inpatient diabetes survival skills education was chosen for the process measure. All nursing flowsheet documentation data were collected for every hospitalist patient with diabetes admitted from January 2016 to December 2018. The flowsheet data were collected as text values of all documented topics recorded throughout the

total duration of an inpatient stay. For the education topics encompassing hypoglycemia or hyperglycemia management, each patient with the diagnosis of diabetes discharged from the Parkland hospitalist units within a specific time frame was used as one count for the denominator, and the numerator consisted of each patient with the keyword "monitoring" documented in the nursing education flowsheet at any time during his or her entire inpatient stay (Figure 2). For insulin administration education, each patient who had been administered insulin during his or her hospital stay on the hospitalist units was counted as one count for the denominator, and the numerator consisted of the number of patients with the keywords "insulin, medication, or lancet" documented in the nursing education flowsheet at any time during their inpatient stay (Figure 2). For glucose meter usage education, each patient with diabetes discharged from the Parkland hospitalist unit with a "diabetes kit" order would be considered as one count for the denominator, and the numerator consisted of the number of patients with the keyword "meter" documented within the nursing education flowsheet at any time during their inpatient stay (Figure 2).

The length of stay, ED utilization rate, and observational unit utilization rate were tracked over time as the balancing measures. There is evidence suggesting that the national decrease in readmission rates have been largely due to an increased usage of observational units to substitute for hospital admissions[20]. Thus, with interventions targeted at reducing readmission rates, efforts must be made to ensure that there is no increase in the length of stay, ED usage, or observational unit stays. Length of stay is defined in the EPIC EMR as the "Hospital Discharge Time" subtracting the "Inpatient Admission Time", and this value will be tracked as a monthly average throughout each year of interest. The denominator for ED and observational unit utilization rate were defined as the total number of Parkland ED, observational unit, and inpatient encounters for

patients with the diagnosis of diabetes within a given time frame. The numerator is the total number of those patients who have been marked with either ED encounters or observational unit encounters without admission to an inpatient service. The balancing data collection time frame would include January 1, 2016 to December 31, 2018.

5. Analysis

Since readmission rates and documentation rates are both categorical data, changes to the outcome and process measures before and after the interventions were compared utilizing chi-squared analysis. The first intervention targeting the EPIC EMR flowsheet was implemented on October 4th, 2017, and the Diabetes HERO Program was implemented on March 20th, 2018, with only five months in between the two interventions. Therefore, the comparison time frame was set at be five months prior to and after each intervention. Furthermore, the baseline outcome and process measures from 2016 would be compared to their changes nine months after both interventions using chi-squared analysis. Lastly, the monthly readmission rates and documentations rates would be plotted on segmented control charts to investigate any changes to mean over time. For each of the three balancing data, continuous control charts would be used to monitor if these remained in control during the project period. Average lengths of stay would be tracked monthly, and ED and observational unit utilization rates would be tracked quarterly.

In order to correlate the process measures with the outcome measures, the two data-sets had to be cross-matched since they contained different patient populations with some crossover. The survival skills education documentation data was first stratified into two groups of patients, those that received education compared to those who did not, for each of the survival skills. Then the education dataset patient identification numbers were cross-matched to the readmission patient identification numbers. The readmissions patient identifications numbers were stratified into

those that had received education compared to those who did not for each of the survival skills. Chi-squared analysis was used to compare the readmission rates between those who had received education and those who had not for each of the survival skills. Only data from the final quarter of 2018 was used due to computer processing limitations.

6. Ethical Considerations

Potential harms that can be brought on by the EPIC EMR changes to the nursing documentation flowsheet and the implementation of the Diabetes HERO Program include increased nursing work-hour burden and increased length of stay for patients due to additional inpatient diabetes education. In order to address the possibility of delayed discharge due to the interventions, patient length of stay was tracked closely. Monthly audits investigating length of stay and discharge timing have been established in the HERO Program to prevent any delay in discharge due to diabetes inpatient survival skills education. The nursing work-hours should not increase since the interventions were focused on items that have been previously delineated in the nursing employee policy. Regardless of these interventions, diabetes survival skills education should be provided for every patient with diabetes.

Chapter 3: Results

Comparing the 30-day all-cause readmission rate changes five months before and after the first intervention showed a statistically insignificant decrease in readmission rate from 15.8% to 14.5% ($p>0.05$). Five months after the implementation of the Diabetes HERO Program, the readmission rate increased to 16.7% from 14.5%, but this increase was also not statistically significant ($p>0.05$) (Table 2). Looking at the segmented control chart for monthly readmission rates (Figure 4), the mean readmission rates after each intervention stayed within two standard deviations of the mean readmission rate during the pre-intervention project period, indicating no

significant changes after each intervention. Comparing the readmission rate nine months after the implementation of both interventions to the baseline readmission rate of 18.7% from the period between August 1, 2016 to August 31, 2017, the readmission rate significantly decreased to 13.3% ($p<0.05$).

Looking at five months before and after the first intervention, the documentation rate of insulin administration education significantly increased from 41.5% to 47.9% ($p<0.05$). Within the same time frame, the documentation rate of glucose meter usage education decreased significantly from 11.4% to 8.82% ($p<0.01$). Lastly, the documentation rate for hypoglycemia or hyperglycemia education significantly increased from 9.6% to 31.9% ($p<0.01$). Looking at five months before and after the second intervention, the documentation rate of insulin administration education increased from 47.9% to 49.4%, but the increase was also not statistically significant ($p>0.05$). Within the same time frame, the documentation rate of glucose meter usage education increased from 8.82% to 9.08%, but this change was also not statistically significant ($p>0.05$). The documentation rate for hypoglycemia or hyperglycemia education increased from 31.9% to 33.3% in this time frame, but this change was not statistically significant ($p>0.05$) (Table 2). The segmented control charts for both monthly documentation rates of insulin administration and glucose meter usage education (Figures 5 and 6) showed that the mean documentation rates after each intervention stayed within two standard deviations of the mean documentation rate during the pre-intervention project period, indicating there were no significant changes after each intervention. However, looking at the segmented control chart for monthly hypoglycemia or hyperglycemia education documentation rates (Figure 7), the mean documentation rates after each intervention lied outside two standard deviations of the pre-intervention mean documentation rate, indicating a significant increase in hypoglycemia or hyperglycemia

education documentation rates after each intervention. Comparing the survival skills education documentation rates nine months after both interventions to the previously established baseline from 2016, both insulin administration and hypoglycemia or hyperglycemia education documentation rates increased significantly, from 27.7% to 50% and from 5.73% to 35.6%, respectively ($p<0.01$). However, glucose meter usage education documentation rate decreased from 7.8 to 7.7%, but this change was not significant ($p>0.5$) (Table 1).

Lastly, readmission data stratified by education showed only insignificant decreases in readmission rates for those that received education when compared to those who did not (Table 3). The three balancing measures remained in control during the project period. Specifically, the average monthly length of stay (Figure 8), the quarterly ED utilization rates (Figure 9), and observational unit utilization rates (Figure 10) all stayed within three standard deviations from their respective aggregate means.

Chapter 4: Discussion

1. Summary

There were no significant changes to the readmission rates five months before and after each of the two interventions, but based on the aggregate readmission rates, there was a significant decrease in readmission rates nine months following the second intervention when compared to the baseline. The documentation rate for both insulin administration and hypoglycemia or hyperglycemia education increased five months following both interventions, but the change was only significant after the EMR update (Table 2). Additionally, the documentation rates for both of these survival skills showed a significant increase nine months after both interventions when compared to the baseline (Table 1). The glucose meter usage education rates only showed a significant decrease five months after the first intervention (Table 2). There were no significant

changes to the glucose meter usage education documentation rates when either comparing five months before and after the second intervention or comparing nine months after both interventions to the baseline. The readmission rates trended toward decreasing with each survival skill education, but none of these changes were significant (Table 3). Throughout the project period, all of the balancing measures stayed within the control limits (Figures 8, 9, and 10).

The initial aim of reducing readmission rates by 10% was not achieved, but the readmission rates significantly decreased nine months after both interventions when compared to the baseline. The hypoglycemia or hyperglycemia education documentation rate increased by over 10%, which achieved one of the original aims. Even though only one aim of the project had been reached, the outcome measure changed significantly in the proper direction. Monthly PDSA cycles and data audit had been built into the Diabetes HERO Program, allowing ample opportunities for continuous improvement.

2. Interpretation

The immediate nature of the first intervention was most likely the reason behind the significant increase in documentation rates for insulin administration and hypoglycemia or hyperglycemia education. All nurses were immediately notified of the change, and the rearranged flowsheet did not allow alternative ways of documentation. Before the first intervention, only two choices at the bottom of the drop-down menu allowed for documentation of hypoglycemia or hyperglycemia education (Figure 1). However, the new survival skills drop-down menu prioritized these items, which probably contributed to the dramatically increased documentation rate.

Meanwhile, the diabetes nurse champions were still undergoing training during the first two months of the HERO Program deployment. No in-unit changes or peer-to-peer education were

being conducted until May of 2018, so significant changes five months after the intervention would not be expected. However, comparing the baseline readmission rate and the baseline documentation rates for insulin administration and hypoglycemia or hyperglycemia education to nine months after both interventions, there were significant changes, signifying that with human factors involved in an intervention, more time was needed for a significant change to occur.

There could have been multiple reasons for the lack of change in documentation rate of glucose meter education. After the first intervention, only one option for meter teaching was included in the flowsheet (Figure 3). Thus, glucose meter teaching could be more easily overlooked than other survival skill education. Furthermore, glucose meters were often given to the patient near the time of discharge, leading to increased risk of neglected education, and if patients already knew how to use the glucose meter, then nurses could have deferred education.

Previous studies on the impact of inpatient education on reducing readmissions for chronic diseases depended on an experimental model with a control group that did not receive any inpatient education[3 11]. Since the project was designed to be a quality improvement initiative, there were no control patient populations. Similar to previous studies, however, the analysis treated readmissions as categorical data and compared the readmission rates using chi-squared analysis. The preliminary report correlating the outcome measure to the process measures showed that while patients who received inpatient survival skills education had lower readmission rates compared to those who received no education, this difference was not significant. Nevertheless, with more data from other time periods incorporated into the analysis, a more significant change could be confirmed.

Overall, the project interventions had no significant impact on the balancing measures. Average monthly lengths of stay remained in control throughout the project period. ED

utilization rate and observational unit utilization rate also remained in control throughout the project period.

3. Limitations

The readmission rates used in this project reflected only the hospitalist units. A hospital-wide data analysis would provide more generalizable results, and unit-to-unit comparison could be made. Because the first intervention existed by itself for only five months before the implementation of the second intervention, the impact of the EMR change by itself could not be tracked beyond those five months. As the data-pull process becomes more automated, the diabetes nurse champions can conduct in-person audits to monitor for teach-back and patient competency.

Due to the limited computing power available, only the final quarter of 2018 was used to correlate the process to outcome measures. To provide a better portrayal of how education affected readmission rates, a larger data-set analysis is required. With the current analysis method, cross-matching only patient identification numbers implies that if the patient has ever received education during any admission to the hospitalist units, then they will be identified as having received education in the past.

4. Conclusions

The pattern of change in survival skills education documentation rate indicates that EMR changes can have a more immediate effect on process measures. The significant decrease in readmission rates nine months after both interventions signify that the introduction of the HERO Program, with its human factors and training periods, takes longer than five months to have an impact. Thus, this project shows that an EMR update can initiate a change, but a leadership program with human factors and continuous audit is needed to sustain and improve the change.

Led by the director of the Global Diabetes Program at Parkland and two inpatient certified diabetes educators, the HERO Program has strong leadership available to continuously refine the intervention through monthly audits and PDSA cycles. If the Diabetes HERO Program continues to improve and positively impact readmissions, then it can potentially be mirrored as a model for inpatient education regarding other chronic diseases.

For the next step, an EPIC EMR data technician and analyst are needed on the team to provide monthly or quarterly data audits. Currently, the HERO nurses are using manual chart review, which is highly inconsistent and time consuming in practice, to audit diabetes survival skills education documentation. With a permanent data scientist onboard to automate the chart review data collection process, the nurses can use their time for more in-person audits and education, and hopefully, the diabetes survival skills documentation data can be stratified temporally by shifts. That way, the most direct correlation between diabetes inpatient education and changes to readmission rates can be formed. Once the data collection and effects on readmission have been established, inferences can be made to estimate the amount of money saved by the hospital, and furthermore, and additional outcome measures, such as patient satisfaction, glycemic control, or patient competency, can be evaluated.

References

1. Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. *New England Journal of Medicine* 2009;360(14):1418-28.
2. Boulding W, Glickman SW, Manary MP, et al. Relationship between patient satisfaction with inpatient care and hospital readmission within 30 days. *Am J Manag Care* 2011;17(1):41-8. [published Online First: 2011/02/26]
3. Rich MW, Beckham V, Wittenberg C, et al. A multidisciplinary intervention to prevent the readmission of elderly patients with congestive heart failure. *N Engl J Med* 1995;333(18):1190-5. doi: 10.1056/NEJM199511023331806 [published Online First: 1995/11/02]

4. Ashton CM, Kuykendall DH, Johnson ML, et al. The association between the quality of inpatient care and early readmission. *Annals of internal medicine* 1995;122(6):415-21.
5. Hines AL, Barrett ML, Jiang HJ, et al. Conditions with the largest number of adult hospital readmissions by payer, 2011. 2014
6. Rubin DJ. Hospital readmission of patients with diabetes. *Curr Diab Rep* 2015;15(4):17. doi: 10.1007/s11892-015-0584-7
7. Kim S. Burden of hospitalizations primarily due to uncontrolled diabetes implications of inadequate primary health care in the United States. *Diabetes care* 2007;30(5):1281-82.
8. Jiang HJ, Stryer D, Friedman B, et al. Multiple hospitalizations for patients with diabetes. *Diabetes care* 2003;26(5):1421-26.
9. Berenson RA, Paulus RA, Kalman NS. Medicare's readmissions-reduction program—a positive alternative. *New England Journal of Medicine* 2012;366(15):1364-66.
10. Healthcare Cost and Utilization Project (HCUP) National Readmissions Database. Rockville, MD: Agency for Healthcare Research and Quality 2015.
11. Healy SJ, Black D, Harris C, et al. Inpatient diabetes education is associated with less frequent hospital readmission among patients with poor glycemic control. *Diabetes care* 2013;36(10):2960-67.
12. Jack B, Greenwald J, Forsythe S, et al. Developing the tools to administer a comprehensive hospital discharge program: the ReEngineered Discharge (RED) program. 2008
13. Berkowitz RE, Fang Z, Helfand BK, et al. Project ReEngineered Discharge (RED) lowers hospital readmissions of patients discharged from a skilled nursing facility. *Journal of the American Medical Directors Association* 2013;14(10):736-40.
14. Clement S, Braithwaite SS, Magee MF, et al. Management of diabetes and hyperglycemia in hospitals. *Diabetes care* 2004;27(2):553-91.
15. Quality AfHRa. Tool 3: How to Deliver Re-Engineered Discharge at Your Hospital 2013 [Available from: http://www.ahrq.gov/professionals/systems/hospital/red/toolkit/redtool3.html accessed 7/25/2016 2016.
16. Robles J. The effect of the electronic medical record on nurses' work. *Creat Nurs* 2009;15(1):31-5. [published Online First: 2009/04/07]
17. Cutugno C, Hozak M, Fitzsimmons DL, et al. Documentation of Preventive Nursing Measures in the Elderly Trauma Patient: Potential financial Impact and the Health Record. *Nurs Econ* 2015;33(4):219-26. [published Online First: 2015/10/20]
18. News K. It Takes a Community to Fight Type 2 Diabetes, Parkland Expert Says 2015 [Available from: http://keranews.org/post/it-takes-community-fight-type-2-diabetes-parkland-expert-says accessed 7/26/2016 2016.
19. Benbassat J, Taragin M. Hospital readmissions as a measure of quality of health care: advantages and limitations. *Archives of internal medicine* 2000;160(8):1074-81.
20. Noel-Miller C, Lind K. Is observation status substituting for hospital readmission. *Health Affairs Blog* 2015

Figures

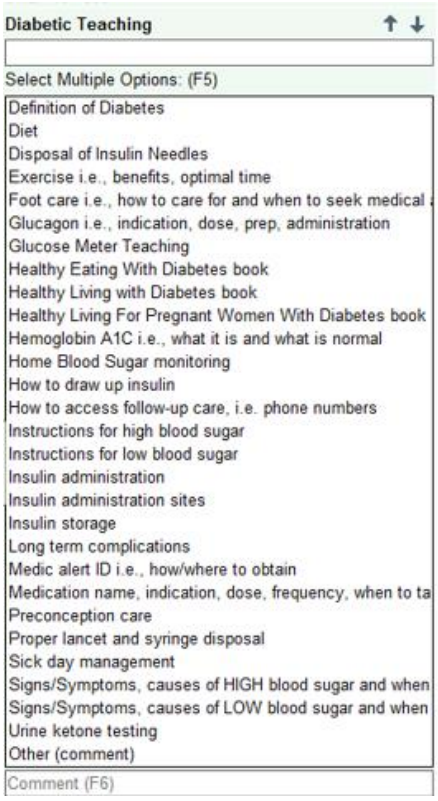

Figure 1. "Diabetic Teaching" Topics Listed in Alphabetical Order

	7/26/16	7/27/16		7/28/16
	2300	0730	1300	1100
Referrals Initiated				
Patient Education				
Discipline	Nursing	Nursing	PICC	
Teaching Method	Explanation / ...	Explanation / ...	Explanation / ...	
Taught to Whom	Patient	Patient	Patient;Other (...	
Learning Readiness	Ready, interest...	Ready, interest...	Ready, interest...	
Topic	poc, safety	POC	midline insertio...	
Topic Selections	Yes	Yes		
Safety Teaching Topics	Fall Precaution...	Fall Precautions		
Fall Prevention	Re-educate on ...	Re-educate on ...		
Infection Prevention	Handwashing;I...	Handwashing		
Admission Education				
Plan of Care	Plan of care re...	Plan of care re...		
Visitation	For needs outs...	For needs outs...		
Diagnosis/Disease Process	Treatment Plan	Treatment Plan		
Monitoring/Interventions	CBGs;Drains (...	CBGs;Drain...		
Wound Care	Infection (signs...	Skin assessm...		
Skin Prevention	Pressure Ulcer...	Pressure Ulcer...		
Respiratory	Deep Breath &...	Deep Breath &...		
Pain Assessment/Reassessment	Pain Scale;Pai...	PCA Pump Op...		
Self Administration	PCA dilaudid	PCA Dilaudid		
Meds	norco, robaxin,...	Norco		
Activity	Ambulation	Chair		
Diet/Nutrition	Diet Type	Diet Type		
Diabetic Teaching	Diet	Diet		

Figure 2. Patient Education Flowsheet with "Diabetic Teaching" Highlighted in the Last Row

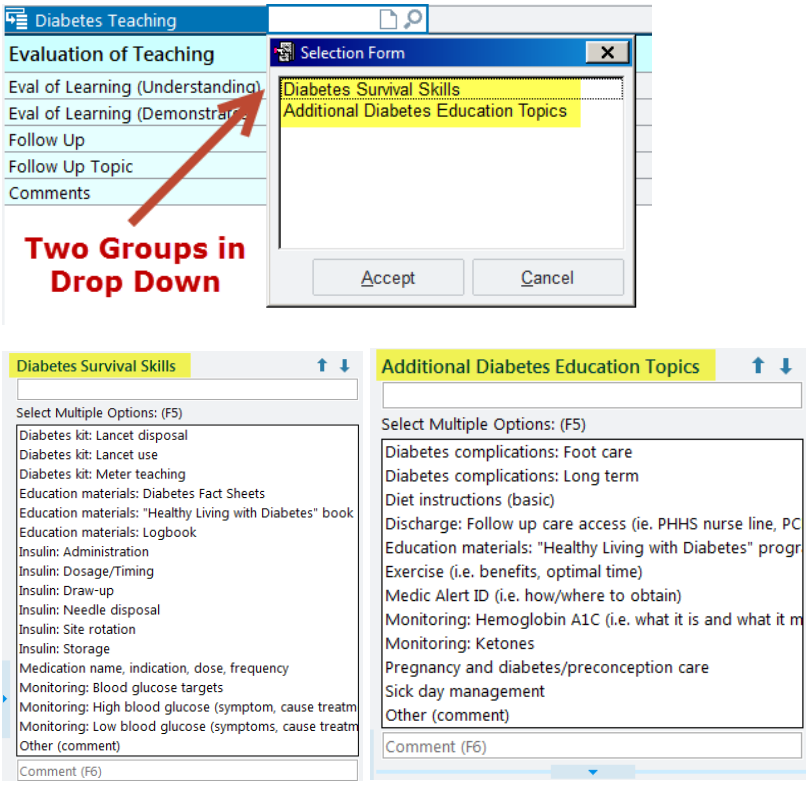

Figure 3. Diabetes Teaching Topics Stratified into Two Groups

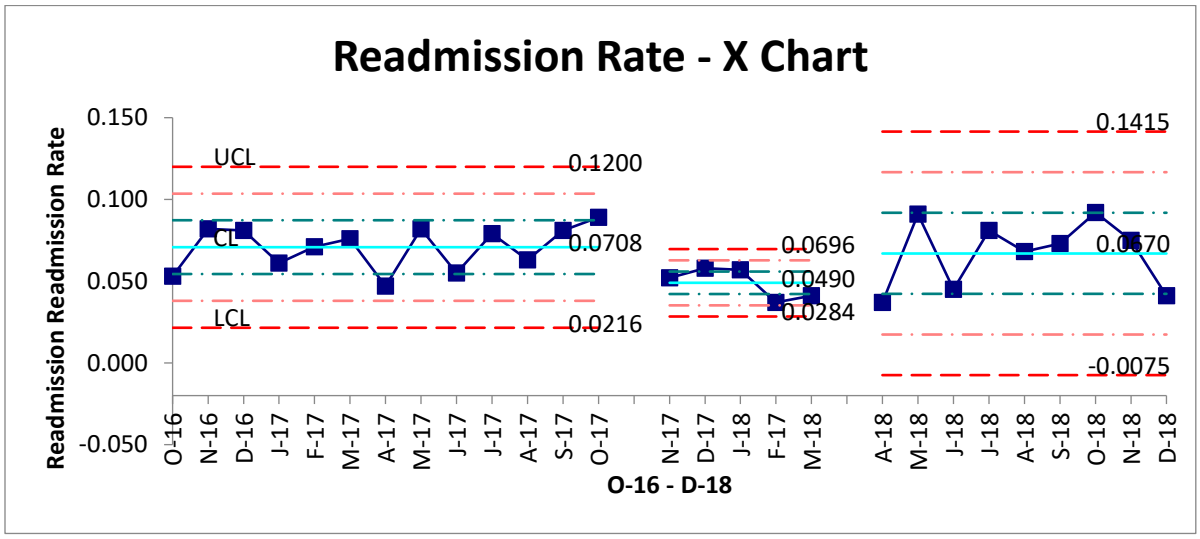

Figure 4. Control Chart for Monthly 30-Day All-Cause Readmission Rates

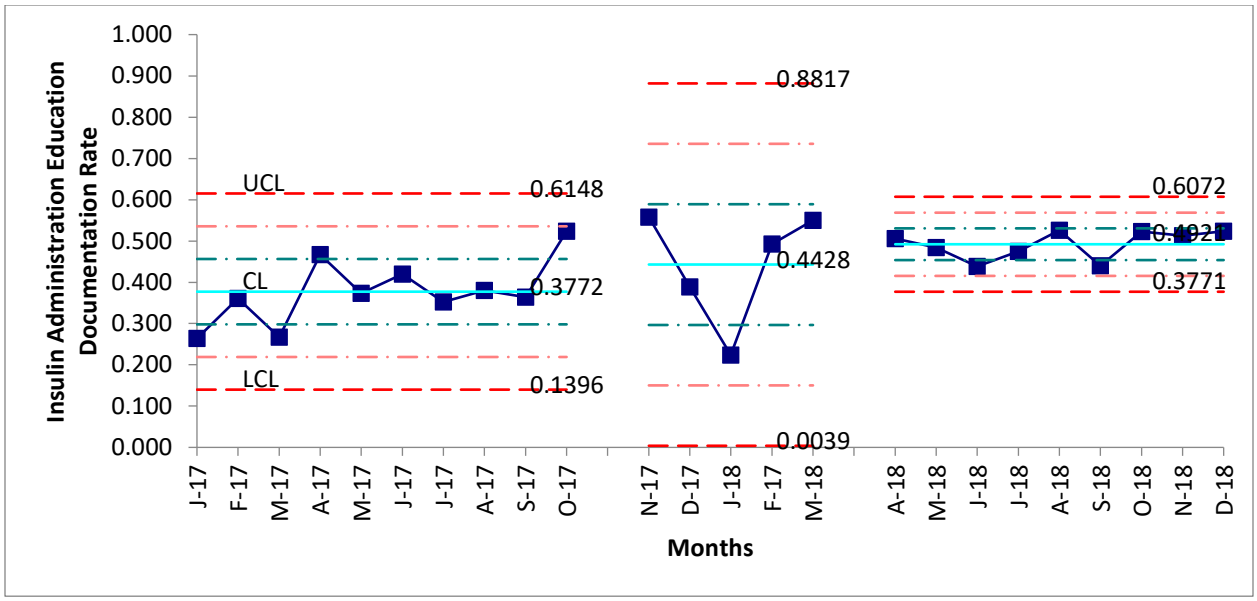

Figure 5. Control Chart for Monthly Insulin Administration Education Documentation Rates

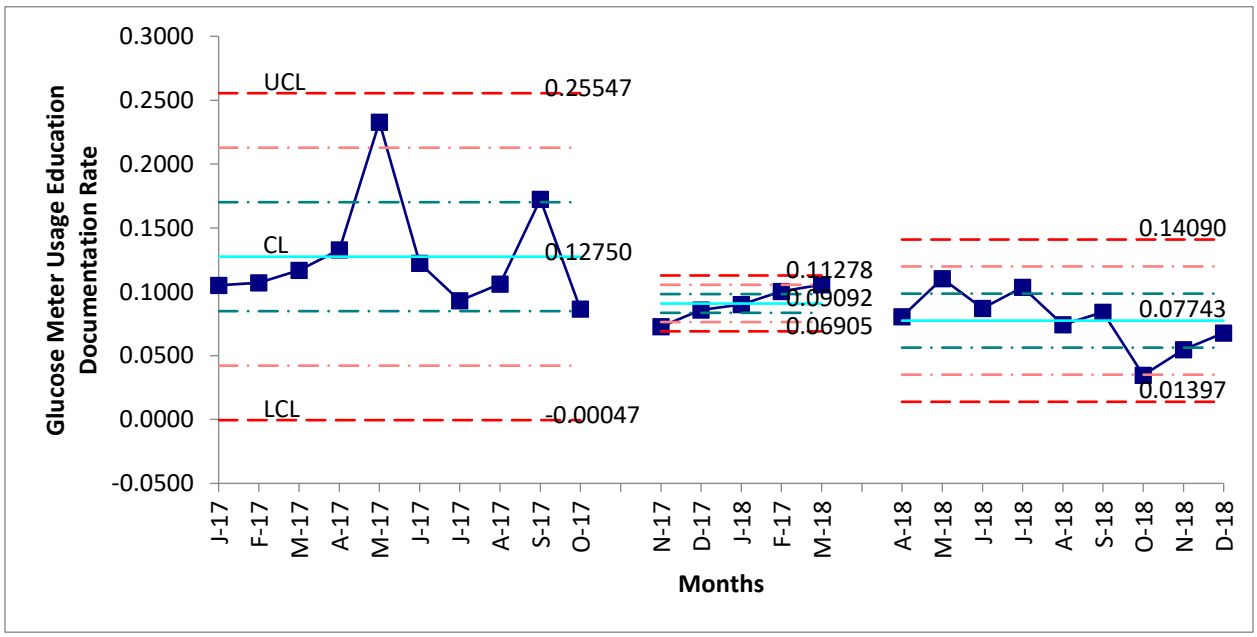

Figure 6. Control Chart for Monthly Glucose Meter Usage Education Documentation Rates

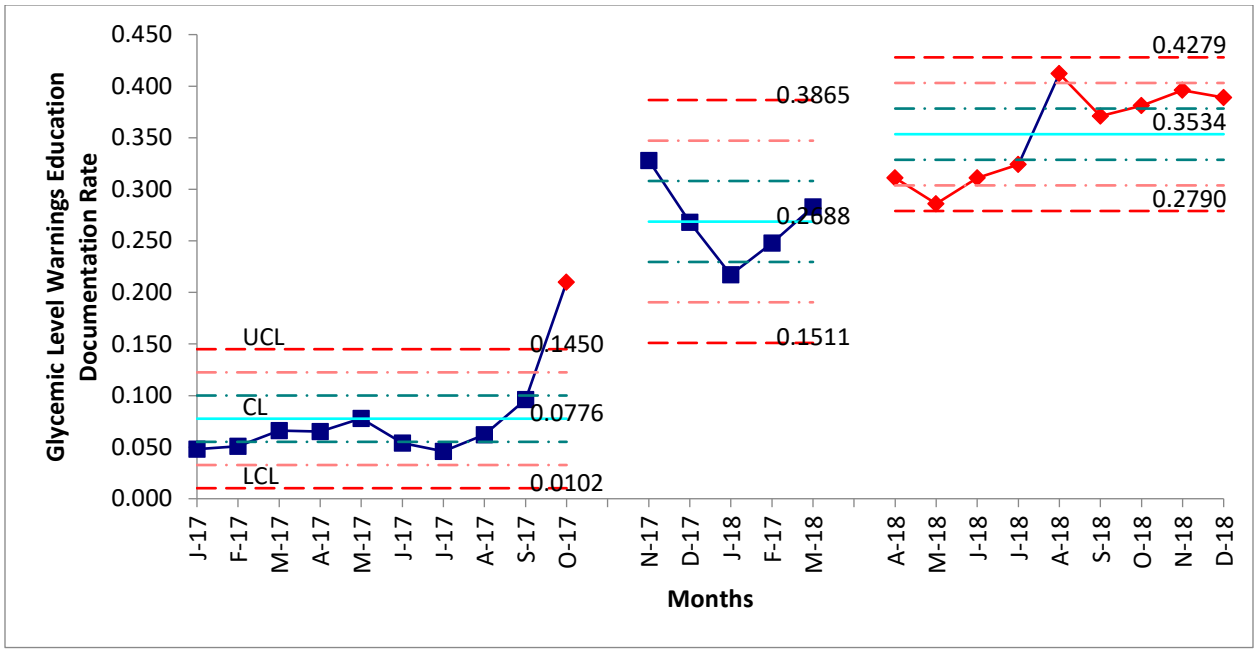

Figure 7. Control Chart for Monthly Hypoglycemia or Hyperglycemia Education Documentation Rates

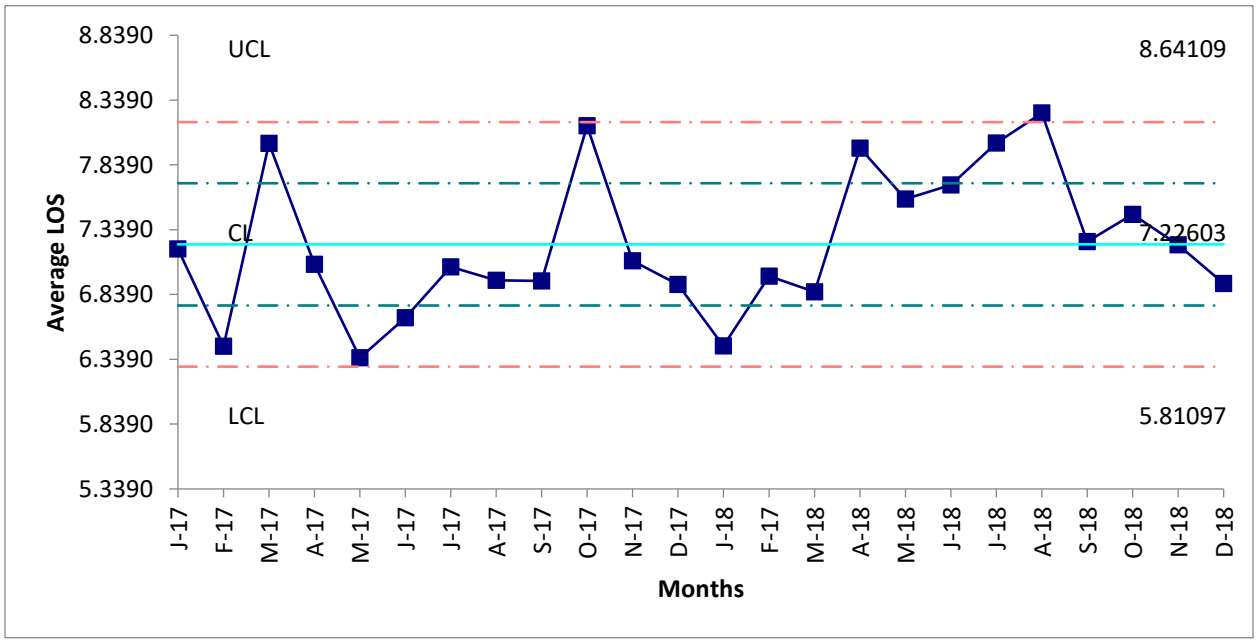

Figure 8. Control Chart for Monthly Average Lengths of Stay

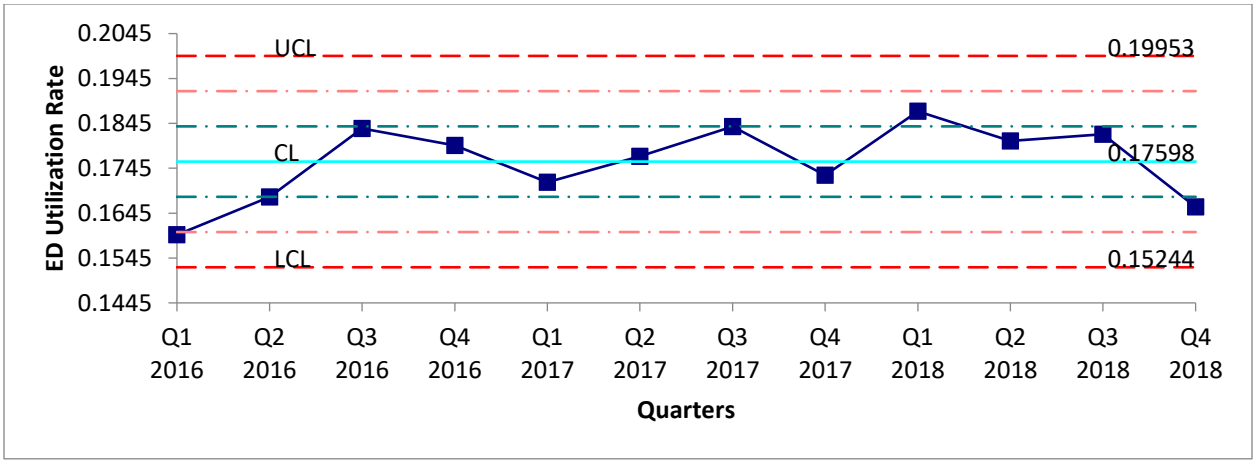

Figure 9. Control Chart for Quarterly ED Utilization Rates

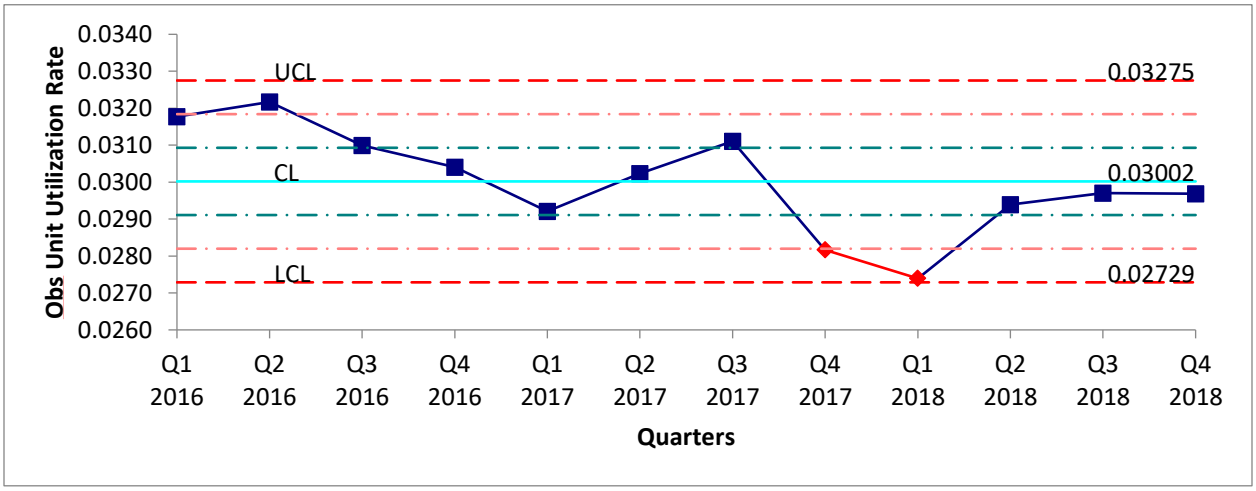

Figure 10. Control Chart for Quarterly Observational Unit Utilization Rates

Survival Skills	Baseline	Post Intervention	Significance (P-Value)
Insulin Administration	27.7%	50%	S (P<0.01)
Glycemic Level Warnings	5.73%	35.6%	S (P<0.01)
Glucose Meter Usage	7.8%	7.7%	NS (P>0.5)

Table 1. Changes in Diabetes Survival Skills Documentation Rate Nine Months After Both Interventions

Survival Skills	Intervention	5 Months Before	5 Months After	Significant (P-Value)
Insulin Administration	EMR Change	41.5%	47.9%	S (P<0.05)
	HERO	47.9%	49.4%	NS (P>0.5)
Glycemic Level Warnings	EMR Change	9.6%	31.9%	S (P<0.01)
	HERO	31.9%	33.3%	NS (P>0.1)
Glucose Meter Usage	EMR Change	11.4%	8.82%	S (P<0.01)
	HERO	8.82%	9.08%	NS (P>0.5)

Table 2. Changes in Diabetes Survival Skills Documentation Rate Before and After Each Intervention

Survival Skills	Without Education	With Education	Significance (P-Value)
Insulin Administration	16.8%	15.7%	NS (P>0.5)
Glycemic Level Warnings	13.1%	12.8%	NS (P>0.5)
Glucose Meter Usage	16.4%	14.4%	NS (P>0.3)

Table 3. Change in Readmission Rate Stratified by Diabetes Survival Skills Education

Vitae

Tim (Huan Ting) Chang (April 22, 1993-present) is a fourth year medical student from the class of 2019 at UT Southwestern Medical Center. He will be completing his residency training in the field of pediatrics, and he wishes to pursue a fellowship in child protection and child abuse pediatrics. He holds a special interest in quality improvement work, and he wishes to continuously apply and refine his QI skillset in residency and beyond.

Permanent Address: 5515 Regency Drive

Sugar Land, Texas 77479