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## Implementing & Evaluating a Nurse-Led Educational Intervention for Bone Marrow Transplant Patients in the Acute Care Setting

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Running head: EDUCATIONAL INTERVENTION FOR BMT PATIENTS

Final DNP Project

Implementing and Evaluating a Nurse-Led Educational Intervention for Bone Marrow  
Transplant Patients in the Acute Care Setting

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## EDUCATIONAL INTERVENTION FOR BMT PATIENTS

### Dedication

This project is dedicated to my husband, a bone marrow transplant recipient. My successes in the DNP program and in my professional career would not have been possible without your unconditional love, support, and sacrifice. Thank you for always believing in me. ...And there is no way I could have passed statistics without you—you're the best math tutor!

And, for all the patients I have encountered during my career as an oncology/BMT nurse. Thank you for teaching me how to embrace life, value relationships, and to be grateful for each and every day.

### Acknowledgements

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### Abstract

**Objective:** The Bone Marrow Transplant (BMT) Basics Class is a nurse-led educational program dedicated to preparing patients and their caregivers of the treatment outline and self-care behaviors associated with receiving a BMT. The purpose of this project is to evaluate the effectiveness of this intervention in order to support the needs of the BMT patient and promote patient-centered care.

**Study Design:** Retrospective review to evaluate a quality improvement project.

**Participants & Methods:** As of July 2016, the BMT Basics Class became a standard of care at an NCI-designated academic cancer center in the southeastern United States. Between July 20, 2016 and November 30, 2016, 33 patients who received a BMT attended the class with their caregiver, making them eligible project participants. A retrospective evaluation of CLABSI rates, 30-day readmission rates, length of stay, and patient satisfaction scores was conducted pre- (July 2015 to November 2015) and post- (July 2016 to November 2016) intervention to determine if there were any improvements in quality indicators for the patients who attended the class compared to patients who received a transplant before the class was created.

**Results:** There were no significant statistical differences between the pre- and post-implementation groups for length of stay or patient experience scores. 30-day readmission rate was lower among the post-implementation group (7.69% vs. 2.56%) with fewer patients readmitted for infection. However, there was an increase in CLABSI rate in the post-implementation group.

**Conclusion:** Educational interventions, such as the BMT Basics Class, could provide a patient-centered approach to improving quality of care, when implemented in addition to current evidence-based practice.

## **Implementing and Evaluating a Nurse-Led Educational Intervention for Bone Marrow Transplant Patients in the Acute Care Setting**

Bone marrow transplantation (BMT; also known as hematopoietic stem cell transplantation) is a medical procedure in which healthy progenitor stem cells are used to replace and replenish the defective bone marrow of those with malignant and non-malignant hematologic diseases (Neiss, 2013). It is a potentially life-saving procedure for more than 70 different hematologic diseases, with a disease-free survival rate of over 90 percent (National Marrow Donor Program [NMDP], 2013). Since its beginnings in the late 1950s, BMT has quickly become the standard of care for many hematologic cancers and conditions, with more than 50,000 transplants performed annually, worldwide (NMDP, 2013).

Despite its popularity, BMT is a complex procedure, associated with high risks of infection, graft vs. host disease, and chemotherapy induced organ toxicity, all of which can be life-threatening (Niess, 2013; McAdams & Burgunder, 2013). Additionally, patients who receive BMT undergo a rigorous treatment course that can span months, transitioning between the inpatient and outpatient settings during the many phases of transplant (pre-transplant work up, preparation chemotherapy, inpatient admission/engraftment, and outpatient recovery). Because of the medical complexity and multiple transition points associated with transplant treatment, BMT patients have a higher risk for hospital readmission, medication errors, and safety issues, which can lead to life-threatening issues and prolong recovery (Lattimer, 2011).

### **Background & Significance**

In order to provide coordinated care and ensure seamless transitions through each phase of transplant, it is crucial that BMT patients and their caregivers receive education which outlines treatment timelines, potential risks and benefits of the procedure, and required self-care activities (Niess, 2013; Thomson, Gorospe, Cooke, Giesie, & Johnson, 2015). Adequate

preparation prior to transplant and effective communication throughout the transplant process can assist BMT patients and their caregivers in making informed treatment decisions, improve performance of self-care activities, and reduce feelings of anxiety, stress, and uncertainty (Lattimer, 2011; Thomson, Gorospe, Cooke, Giesie, & Johnson, 2015; Baliouisis, Rennoldson, Dawson, Mills, & das Nair, 2017). Additionally, proper education, preparation, and effective patient-provider communication may reduce readmission rates and length of stay, while improving quality of care, symptom tolerance, and treatment adherence (Cooke, Grant, & Gemmill, 2012; Lattimer, 2011; Baliouisis, et al., 2017). By providing evidence-based BMT education, cancer centers can adopt a patient-centered care approach that empowers patients to participate in treatment decisions and manage their own care. This can lead to fewer adverse events and improve patient outcomes among the BMT population, and is in alignment with standards of care outlined by The Joint Commission and the Foundation for the Accreditation of Cellular Therapy (FACT; The Joint Commission, 2012; FACT, 2015).

Little research exists concerning BMT educational interventions and its potential effects on patient outcomes. Limited evidence was found using the search engines EBSCO Host, CINAHL, PubMed, and Google Scholar. Search terms were expanded to include solid organ transplant patients, as this population often shares many of the same educational concerns as the BMT population. There is evidence that suggests patients desire education that focuses on managing psychosocial issues including restrictions concerning sexual activity, pet care, their ability to work, and child care concerns. Other psychosocial issues such as financial concerns and resources, or managing depression and anxiety were also desired educational topics. Patients also desired information concerning physical issues, like chemotherapy and treatment side effects, dietary changes, self-care activities, and medication management (Cooke, Grant, &

Gemmill, 2012; Myers & Pellion, 2009; Moloney, Cicutto, Hutcheon, & Singer, 2007). Other studies indicate that prior to their BMT, patients did not feel prepared for their transplant. Patients in these studies stated they were not informed of the long-term side effects and how to manage them, the duration of the treatment, or how to effectively cope during the transplant process (Cohen, et al., 2013; Jim et al., 2014; Baliouisis, et al., 2017). This evidence supports the need for formal BMT patient education to address patient demand.

Examples from current evidence-based literature demonstrate there is no standard for BMT patient education delivery or content. Many transplant centers employ various methods of patient teaching, ranging from group discussion and one-on-one teaching to written/audio/visual information and Internet-based teaching (Jim et al., 2013; Wilson, et al., 2012; Gordon, et al., 2010; Davis et al., 2014). Appropriate timing of BMT education also varies from study to study, with interventions offered prior to beginning the transplant process (Stiff et al., 2006), throughout the treatment course (Davis, et al., 2014), and prior to discharge from the hospital and transition to outpatient follow up (Cooke, et al., 2012). While the timing of the intervention varied, the oncology nurse was favored as a key educator during the transplant process (Cooke, et al., 2012; Gordon, et al., 2010).

Due to the lack of standardization among transplant centers concerning BMT patient education, and the limited research aimed at determining the effects of education on patient outcomes, the purpose of this project is to evaluate the effectiveness of a nurse-led BMT patient and caregiver educational intervention by analyzing quality indicators.

### **Theoretical Framework**

The self-care model was developed using the modeling and role-modeling nursing theory introduced by Erickson, Tomlin, and Swain (Hertz, 2013). Erickson, Tomlin, and Swain suggest

that self-care knowledge, self-care resources, and self-care actions can support holistic health and maintenance of quality of life. Increasing knowledge and access to resources can help the patient develop a sense of autonomy and perform activities that support optimal health (Hertz, 2013).

Patients may not always know what resources are available to them, and they may need information on how to overcome the barriers they may face when dealing with healthcare issues.

If the patient has information about BMT self-care activities and community resources, the patient has the increased ability to perform better self-care actions (medication compliance, smoking cessation, safe food-handling, meticulous hygiene practices, physical activity performance) that will influence their health status during transplant. By increasing patient knowledge and access to community resources, quality of life can be maintained, and the patient can develop a sense of control over their health condition. Integrating this theory within the BMT population led to the creation of a patient and caregiver educational intervention for prospective BMT patients undergoing treatment at a National Cancer Institute (NCI)-designated cancer center in the southeastern United States. Based on the self-care model and current evidence-based literature, a multidisciplinary team composed of nurses, physicians, oncology social workers, oncology pharmacists, and transplant coordinators created a curriculum for educating BMT patients and their caregivers, in hopes of supporting them throughout their transplant journey.

### **The BMT Basics Class**

Prior to July 2016, education for patients considering transplant at UK Markey Cancer Center comprised an informational packet from the transplant coordinator and one-on-one teaching from the transplant physician and nurses in the clinic or inpatient unit. The educational

packet included generalized information about the transplant process, and did not outline specific considerations or patient activity requirements for treatment at Markey Cancer Center.

The BMT Basics Class was designed to offer a wide-range of information about the BMT process and outline how the patient and caregiver can be active participants in the patient's care. However, information was specific to care provided at Markey Cancer Center and based on current hospital policy and procedures. Sessions were divided into autologous transplant patients (for patients who receive stem cells from themselves) and allogeneic transplant classes (for patients who receive stem cells from a donor). Classes were divided by type of transplant, as there are differing treatment considerations for each (i.e.: apheresis for autologous transplant; HLA typing and graft vs. host considerations for allogeneic). Both class types are offered twice monthly for approximately two hours. The class utilized group discussion, lectures, and health literate videos produced by the NMDP. Patient understanding of the class material is evaluated with a teach-back method with a questioning method using a *Jeopardy!*-themed PowerPoint template. To account for patients who may not be able to attend the class due to transportation or scheduling issues, the UK Telemedicine office recorded the class, ensuring each patient receiving a BMT received the information.

A written "BMT Handbook" was also created by the multidisciplinary team and edited by a health literacy writer. This handbook expands on the topics discussed in class in further written detail. Together, these materials provide patients and their caregivers with information about how transplant works, anticipated treatment timeline, self-care activities they should follow during transplant, treatment side effects, and community resources. The table of contents for the handbook, which subsequently became an outline of topics for class discussion, is provided in *Appendix*.

After completing the class, the patient and caregiver receive a list of guidelines to serve as a reminder of self-care activities they will be required to perform during the transplant process at Markey Cancer Center. The BMT handbook serves as a reference throughout the transplant process, providing in-depth written information for preparation considerations, long-term recovery, how to contact the cancer center, definitions of common BMT medical terms, and community resource pamphlets. Patients are encouraged to bring this handbook with them to their hospital stay and their clinic visits, as the book also includes blank notebook pages where patients can write down questions or record pertinent treatment information.

With these resources, the patient and transplant physician can have an informed discussion concerning personal preferences, treatment goals, and psychosocial considerations prior to starting the transplant process. As an additional part of this educational intervention, patients were given thermometers and medication bags upon their discharge from the hospital. Thermometers allowed patients to easily monitor their temperature at home, and the medication bags allowed them to easily transport all of their medications to clinic visits for compliance monitoring.

The BMT Basics Class relies heavily on the preexisting infrastructure of the cancer center. Classes are taught in a conference room equipped with a projector and computer access, and are taught by nurses with at least two years of experience on the BMT unit. Handbook content was created using existing policy and procedures for BMT care, and evidence from the literature. Education specialists employed by the hospital edited the handbook using health literacy principles. Patient videos from NMDP are free and publically available online. Thermometer and medication bags were provided by the Marketing Department. A multidisciplinary committee regularly met to review education materials and program goals. Any

changes in class materials or processes were decided by this committee, which was headed by the BMT Administration Office and Medical Chief of Hematology. Because no additional personnel or equipment were required to implement the program, planning and implementation were relatively feasible.

## **Methods**

### **Study Design and Data Collection**

In order to determine if the BMT Basics Class had any effects on BMT patient outcomes, a retrospective analysis of quality performance indicators (QPI) was conducted. QPI data collected included inpatient infection rates, 30-day readmission rates, inpatient length of stay, and patient satisfaction scores. Together, these QPIs provide a balanced assessment of financial performance (length of stay, 30-day readmission rate), patient satisfaction with care (discharge survey scores), and clinical outcomes (infection rates) for the BMT department (Byrnes, 2014).

QPIs were assessed during a five-month pre-intervention period (July 2015 to November 2015) and compared to post-intervention QPIs during the same five-month period (July 2016 to November 2016). For data consistency and reliability, all QPI information was collected from the University of Kentucky Quality Monitoring and Reporting Office. The Institutional Review Board at the University of Kentucky approved this project. Since de-identified QPI data for this project were obtained retrospectively, a waiver of informed consent was obtained.

### **Setting and Participants**

The University of Kentucky (UK) Markey Cancer Center in Lexington, KY is the only NCI-designated academic cancer center in the state of Kentucky. The Hematology-Oncology/BMT unit is a 27-bed unit dedicated to caring for adult patients, aged 18 and older, with varying hematologic conditions and those who are receiving an allogeneic or autologous

transplant. In 2015, there were 107 total transplants performed and in 2016, a total of 98 transplants were performed (J. Christian, Personal Communication, 31 January 2017).

Since its adoption in July 2016, the BMT Basics class has become standard care, and any patient considered for BMT are required by their transplant physician to attend the class as part of their pre-transplant work up. Patients and their caregivers were signed up for the class and given a handbook prior to transplant by their transplant coordinator. As a result, 33 adult patients who received an allogeneic or autologous transplant between July 20, 2016 and November 30, 2016 attended the class. These patients served as a convenience sample on which to base this project. The QPIs for those who attended the BMT Basics Class were compared to QPIs for those who received a transplant prior to the introduction of the intervention.

### **Quality Performance Indicators**

*Infection rate.* During the inpatient phase of transplant, BMT patients have a high susceptibility for infection due to prolonged neutropenia, mucosal barrier injury, and immunosuppressive therapy. These patients also have central venous catheters to aid in the administration of chemotherapy, blood products, and medications, as well as to assist with lab draws and stem cell harvesting. It is estimated that anywhere from 15 to 50% of BMT patients will experience an opportunistic bacterial infection during the engraftment phase of transplant (Chawla, 2015). The use of central venous catheters increases the risk of opportunistic pathogen entry, leading to central line associated bloodstream infections (CLABSIs; Centers for Disease Control and Prevention [CDC], 2000). CLABSI can occur when the central venous catheter becomes infected during insertion or while being managed during treatment. Measures should be taken to prevent central line contamination (California Department for Public Health, 2014) to prevent CLABSI occurrence, prolonged hospitalization, increased healthcare costs, and increased risk for

mortality (CDC, 2017). The University of Kentucky Quality Monitoring and Reporting Office uses the occurrence of CLABSIs to exemplify infection rates among the inpatient BMT population.

During the engraftment phase, most opportunistic pathogens arise from normal flora found on the skin and in the mouth and gut (CDC, 2000). The CDC (2000) recommends patients and their caregivers should be educated about meticulous hand hygiene and daily showering. The routine use of antibacterial soap to decrease the amount of pathogenic organisms that colonize the skin has the potential to reduce the rate of CLABSI. The BMT Basics Class and handbook stress the importance of hand washing, skin care, and oral care throughout the entire transplant process. The class and handbook also highlight how to care for a central line, encouraging the patient and caregiver to keep the dressing dry and intact at all times, and to immediately notify staff if the dressing becomes loose or wet. By educating the patient and their caregivers of the potential risk for infection, and how the adoption of self-care routines such as daily showering and frequent hand washing can reduce their risk, it was hypothesized that infection rates will be lower in the post-implementation group when compared to the pre-implementation group.

*Length of stay.* Length of stay (LOS) refers to how many days the patient spent in the hospital from time of admission until discharge (The University of Texas Medical Branch at Galveston [UTBM Health], 2017). LOS is an important QPI, as it provides information related to healthcare costs. Furthermore, the longer the patient stays in the hospital, the higher the potential for nosocomial infection (UTBM Health, 2017), which can pose a major health risk to the immunocompromised BMT patient. Observed LOS data, in number of days, were obtained from the University of Kentucky Quality Monitoring and Reporting Office. The following procedure

codes were used to pull LOS data: MS-RG 014 Allogeneic Bone Marrow Transplant, MS-RDG 016 Autologous bone marrow transplant w/ CC/MCC and MS-DRG 017 Autologous transplant w/o CC/MCC.

Due to the complex nature of the BMT process, patients often experience longer LOS due to their specialized needs and higher acuity level (UTBM Health, 2017). On average, a BMT patient can have an inpatient hospital stay of four to six weeks, depending on their treatment course, complications, or co-morbidities. However, if the patient receives education on how to reduce their risk for infection during the most vulnerable phase in the transplant process (the engraftment phase and inpatient hospital stay), an improvement in self-care activity performance could have an effect on their recovery time and LOS. Because the educational intervention was created to teach patients how to reduce their risk for infection, it seemed likely that the post-implementation group will have a shorter observed LOS when compared to the pre-implementation group.

*30-Day readmission rate.* Readmission rates can provide reliable information regarding quality of care and financial performance (Bristol & Joshi, 2014). Ineffective communication, inadequate discharge planning, and transitions from inpatient to outpatient care place the BMT patient at risk for readmission during the first 100 days of transplant (Lattimer, 2011; Bristol & Joshi, 2014). Adequately educating the patient and caregiver about the importance of infection prevention, medication compliance and follow-up care, while providing resources and preparing the patient and caregiver to successfully manage their care at home can reduce unplanned readmissions (Bristol & Joshi, 2014; Bell, et al., 2017). Within the oncology community, top reasons for unplanned readmissions include issues with symptom management, infection,

dehydration, and inadequate nutrition (Bell, et al., 2017). The BMT Handbook outlines how patients can manage common symptoms such as nausea, fatigue, and mucositis using evidence-based interventions. It also provides recommendations for remaining physically active and maintaining adequate nutrition before, during, and after transplant.

It was anticipated that readmission rates would be lower after the implementation of the BMT Basics Class. The readmission data derived from the University of Kentucky Quality and Reporting Office only reflects eligible BMT patients who were readmitted to the University of Kentucky Medical Campus. These rates do not take in to account BMT patients who may have been readmitted to an outside hospital during the study time frame. Eligible patients exclude patients who have expired after their first admission, or those patients who return to the clinic for routine procedures, such as chemotherapy, radiation, or dialysis (C. Coldiron, Personal Communication, 23 March 2017).

*Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS)*. Patient satisfaction with care provides information on healthcare quality from the patient perspective (Byrnes, 2014). UK Markey Cancer Center uses the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey to obtain patient satisfaction information. The HCAHPS is a national validated survey tool and is recognized by the Centers for Medicare and Medicare Services (CMS) and the Agency for Healthcare Research and Quality (AHRQ) as a reliable measure for determining patient experience. Topics surveyed relate to communication with healthcare providers, access to information, care coordination/transitions, and hospital environment (AHRQ, 2016). This survey is sent to patients after they are discharged from the hospital, and reflects the patient experience of any patient discharged from the BMT unit at UK

Markey Cancer Center. Only surveys that are returned and completed are included in the overall satisfaction score (Centers for Medicare & Medicaid Services [CMS], 2011). A survey response of “strongly agree”, “always”, “definitely, yes”, or a numerical score of 9 or 10 indicates a positive experience. Negative responses, such as “never”, “sometimes”, “no”, “definitely no”, “probably no”, or a numerical score of 0 to 6 represent negative experience with care (CMS, 2011).

To determine if the educational intervention had an impact on patient experience and satisfaction with care, patient response to communication about medications and discharge instructions were assessed. The BMT Basics Class and handbook provides information concerning common medications used throughout transplant, reasons for the patient to contact their physician after discharge, and what to expect during the recovery phase in the outpatient setting. The handbook defines what is considered a “BMT emergency” (fever, increase in bleeding/bruising, weight lose, unmanageable nausea, vomiting, or pain) and provides phone numbers to promote better communication between patient and provider upon discharge. The handbook also details the outpatient follow up process, describing the importance of clinic visits, medication compliance, and continuation of self-care activities that are crucial during the recovery phase of transplant. Because of the educational intervention, it was thought that patients in the post-implementation group would report higher satisfaction with care as a result of the information provided about medication, discharge instructions, and care transition when compared to the pre-implementation group. The HCAHPS questions assessed for the project include:

- Before giving you any new medication, how often did hospital staff tell you what the medicine was for?

- During this hospital stay, did you get information in writing about what symptoms or health problems to look out for after you left the hospital?
- When I left the hospital, I had a good understanding of the things I was responsible for in managing my health.
- When I left the hospital, I clearly understood the purpose for taking each of my medications.

### **Data Analysis**

#### **Patient demographics**

Descriptive statistics were used to summarize the characteristics of the pre-implementation and post-implementation groups. Variables used to describe these patients included hematologic malignancy, type of transplant, age, gender, and race. Continuous variables (i.e.: age) were represented using mean and standard deviation. All other health related information was presented using frequency distributions.

#### **Quality Performance Indicators**

CLABSI incidence and 30-day readmission rates were compared between the pre-implementation group and post-implementation group to determine if there was any reduction in occurrence. Differences between average LOS were determined using the independent samples t-test. HCAHPS questions that used a 4-point Likert scale (i.e.: tell you what medication was for, good understanding managing health, understood purpose of taking meds) were analyzed using the Mann-Whitney U-test. For these questions, a Likert scale score of 1 indicates “never” or “strongly disagree”, a score of 2 indicates “sometimes” or “disagree”, a score of 3 indicates “usually” or “agree”, and a score of 4 indicates “always” or “strongly agree”. One HCAHPS question was reported by YES/NO categorical data (i.e.: info regarding symptoms/problems to

look for), for which a Chi-squared test was used. A significance level of  $p < 0.05$  was used to determine if any significant statistical differences occurred between the pre-implementation and post-implementation groups. All statistical tests were performed using SPSS version 23.

### Results

There were 33 patients who attended the BMT Basics Class. The average age of the patients who attended the class was 55.1 years (SD= 11.3). Most patients identified as Caucasian (90.9%), slightly more than half were male (57.6%). The most frequent hematologic disease among the patients who attended the class was leukemia (45.4%). More patients received an allogeneic transplant (60.6%) than an autologous transplant (39.4%; see Table 1). This is in comparison to 2015, where the average age of patients was 56.8 (SD=12.2) years. Most identified as male (62.9%) and Caucasian (91.4%). In 2015, more patients received an autologous transplant (54.3%) and were more likely to have multiple myeloma (37.1%) as a reason for transplant (see Table 1).

During the pre-implementation phase (July to November 2015) there were two occurrences of CLABSI among BMT patients. There were six occurrences of CLABSI among BMT patients during the post-implementation phase (July to November 2016; see Figure 1). LOS was analyzed by type of transplant (see Table 2). For autologous patients, the average LOS in 2015 was 19.3 days (SD= 6.76) with a range of 28 days among the pre-implementation group. The average LOS for 2016 was 18.5 days (SD= 3.39) with a range of 11 days for the post-implementation group. There was not a statistical difference between LOS mean for the autologous pre-/post-groups ( $p = .71$ ). For allogeneic patients, the average LOS in 2015 was 35.1 days (SD= 10.53) with a range of 36 days in the pre-implementation group. In 2016, the average LOS was 35.16 days (SD=10.16), with a range of 40 days in the post-implementation group. It is

important to note that for 2016, three out of the 33 patients included in this project did not have LOS data due to lack of data availability for those patients at the time the project was conducted. There was not a statistical difference between the LOS mean for the allogeneic pre-/post- groups ( $p = .99$ ).

In 2015, 39 cases of autologous or allogeneic transplant were eligible readmission cases between July and November 2015. Three of those patients were readmitted within 30 days of their transplant discharge day, as indicated by an IDC9 code for “complication after stem cell transplant”, at a rate of 7.69%. All three patients who were readmitted had received an allogeneic transplant. Two cases were readmitted due to infection/sepsis and one case was readmitted for graft vs. host disease. In 2016, there were 39 eligible cases for readmission between July and November 2016. Only one case was readmitted within 30 days with an IDC9 code for “complication after stem cell transplant”, at a rate of 2.56%. This patient also had received an allogeneic transplant, and was readmitted for graft vs. host disease (see Figure 2). Because aggregate data was collected for the project time frame, additional patients were included in the 30-day readmission data abstracted by the UK Quality Monitoring and Reporting Office ( $N = 39$  vs.  $N = 35$  in the pre-implementation group and  $N = 33$  in the post-implementation group). Because no patient identifiers were used in this project, patients who were not included in the project samples could not be removed from the reported aggregate data, accounting for differences in the sample sizes.

A total of 22 patients out of the 35 BMT patients (62.8%) completed and returned their HCAHPS survey between July and November 2015, and a total of 25 patients out of the 33 BMT patients (75.7%) completed and returned their HAHPS survey between July and November 2016. For both groups, the HCAHPS questions analyzed received mostly positive responses, as

indicated by “always”, “strongly agree”, or “yes” answers, indicating the overall experience of both groups was positive, before and after the implementation of the BMT Basics Class. There were no significant differences between the experience scores of the pre-implementation and post-implementation groups in communication about medicine ( $p = .50$ ; see Figure 3), information about symptoms/problems to report ( $p = .90$ ; see Figure 4), understanding how to manage health when leaving the hospital ( $p = .10$ ; see Figure 5), and understanding the purpose of taking medications ( $p = .92$ ; see Figure 6).

### **Discussion**

The BMT Basics Class was developed in an attempt to educate prospective BMT patients and their caregivers about the transplant process and the self-care activities that should be adopted during transplant. It sought to define terms commonly used during transplant using health literacy principles, and equip patients and their caregivers with the knowledge to be active participants in their care. The author hypothesized that by preparing the patient and their caregivers for their transplant through evidence-based educational efforts, QPI could also be improved. There were no significant differences between the pre-implementation group and the post-implementation group for LOS; however, this might be due to the post-implementation group having more allogeneic patients compared to the pre-implementation group. Patient experience scores remained mostly positive, and the post-implementation group showed a trend of lower 30-day readmission rate (7.69% vs. 2.56%). For allogeneic patients who were readmitted in 2016, there were no cases of readmission due to infection/sepsis within the first 30 days after being discharged from the hospital. This may suggest that standardized education focused on teaching patients and caregivers self-care activities and how to manage care at home played a role in preventing 30-day readmissions due to infection.

The pre-implementation group and the post-implementation group did not differ with regard to experience scores largely because of limited variability between the two groups, as the majority of responses were positive based on the CMS grading scale. However, a lower readmission rate in congruence with maintaining high patient satisfaction is in alignment with value-based care. Value of care provided dictates how healthcare providers and hospitals are reimbursed and incentivized under the Affordable Care Act, and lower readmission rates can reduce healthcare spending and improve quality of care provided (CMS, 2016; Bell, et al., 2017).

CLABSI rate was hypothesized to be lower after the implementation of the BMT Basics Class. CLABSI rates actually increased among the post-implementation group. This could be attributed to the increase of allogeneic patients in the post-implementation group, who are more prone to infection. It is also important to note that CLABSI rate can be influenced by a multitude of factors, such as changes in hospital policies concerning insertion bundles and maintenance care. There may have been a change in hospital personnel between the two groups, which could change how CLABSI rate was monitored or prevented. Additionally, the CDC (2016) amended the CLABSI definition to include central line infections due to gut translocation secondary to mucosal barrier injury. This amendment was made in 2016, and may demonstrate the increase in CLABSI among the post-implementation group due to changes in classifications. Gut translocation due to mucosal barrier injury is a common occurrence among BMT patients who receive high doses of chemotherapy, and cannot be influenced by improved patient and caregiver education efforts.

While some studies have addressed how patient and caregiver education can impact care within the BMT population, most focus on the design of the education program. Few have considered how an educational intervention can affect QPIs. Thompson and colleagues (2015)

found similar results in a study that sought to improve care transitions for the BMT patient through standardized patient teaching. By implementing standardized, patient-centered education across the transplant trajectory, patients experienced fewer days of inpatient bed occupancy, had increased patient satisfaction, and had lower readmission rates after the implementation of the education program (Thomson, Gorospe, Cooke, Giesie, & Johnson, 2015).

Even though this quality improvement project provides no statistically significant differences between the pre-implementation and post-implementation groups, it outlines the feasibility of developing, implementing, and evaluating a formal educational intervention for BMT patients and their caregivers. This work contributes to the limited evidence concerning BMT patient education. The BMT Basics Class could serve as a model for other BMT programs looking to improve the quality of care at their respective institutions.

### **Limitations**

The study was conducted within a single university hospital setting, and only reflects the engraftment phase of transplant (first 30 days), which limits generalization. The sample size was small, non-randomized, and patients included in the pre-implementation phase were not the same patients in the post-implementation phase, and therefore cannot be treated as equal. Additionally, there were more allogeneic patients in the post-implementation group than in the pre-implementation group, making it hard to compare QPIs between the groups. Another limitation of the study was the inability to assess individual patient outcomes. The aggregate quality data analyzed was de-identified and reflective of the entire BMT unit. Additionally, aggregate QPI data availability was affected by the timeframe of the study, as the class was implemented in the middle of July, and some patients who attended the class did not have data available if they were discharged after November 2016. The QPIs analyzed have the potential to be influenced by a

multitude of factors (e.g.: co-morbidity index, central line care hospital policy, differences in healthcare personnel and patients between the groups, number of survey completions), and readmission rates only showed those patients who were readmitted to the project's institution, and did not include readmission to other hospitals. These factors make it difficult to infer the true impact of the educational intervention.

Despite the limitations, this project evaluation supports the use of an educational intervention as a supplemental intervention for improving quality outcomes within the BMT population. Future research should include studies conducted at multiple BMT centers, using larger sample sizes, and analyzing outcomes that can be contributed to the use of a patient-centered educational intervention. Other outcomes to consider include performing a cost-benefit analysis or by measuring quality of life, anxiety, and self-efficacy. Lastly, future studies should assess individual patient outcomes across the entire transplant trajectory from preparation, to engraftment, and throughout long-term recovery in the outpatient setting.

### **Nursing Implications**

Nurses were continually identified throughout current evidence-based literature as an important part of patient education due to their unique role within the BMT process (Cooke, Grant, & Gemmill, 2012; Gordon, Caicedo, Ladner, Reddy, & Abecassis, 2010; Cohen, Jenkins, Holston, & Carlson, 2013; Thomson, Gorospe, Cooke, Giesie, & Johnson, 2015). Because nurses work closely with patients and their caregivers throughout all phases of the transplant process, they can continually assess for patient and caregiver understanding, and identify opportunities for enhanced learning and communication.

BMT nurses played a key role in the development and implementation of this educational intervention. After identifying a need for improved patient education to assist with self-care

activity and medication compliance, nurses working on the BMT unit formed a multidisciplinary committee to create education materials. The nurses also served as class instructors for the BMT Basics Class, which helped patients and their caregivers develop a rapport with members of the healthcare team that would provide their BMT care. This project suggests that a nurse-led educational intervention may have an impact on the quality of care provided, when combined with current, evidence-based practice.

Using a multidisciplinary team to create education materials is crucial to providing comprehensive BMT education. Due to the complex needs of the BMT patient, dietary/nutritional staff, social services, physical therapy, pharmacy, pastoral care, and psychology/integrative care should be involved in any BMT educational intervention. Collaboration with supportive services was integral in the development of the BMT Basics Class topics and Handbook content.

### **Conclusion**

The findings of this project showed a trend of lower readmission rates and positive patient experience among BMT patients who attended a patient-centered, evidence-based educational intervention when compared to BMT patients who did not receive such an intervention. This is consistent with the concepts of the self-care model and a study conducted by Thomson, Gorospe, Cooke, Giesie, and Johnson (2015), which showed similar outcomes. Additional exploration is required substantiate the impact of an educational intervention on patient outcomes and quality of care within the BMT population. Nevertheless, a program like the BMT Basics Class is a feasible way to improve care coordination for the BMT patient, and provide a patient-centered approach to influence quality performance outcomes.

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**Table 1.** *Patient Characteristics of Pre-/Post-Implementation Groups*

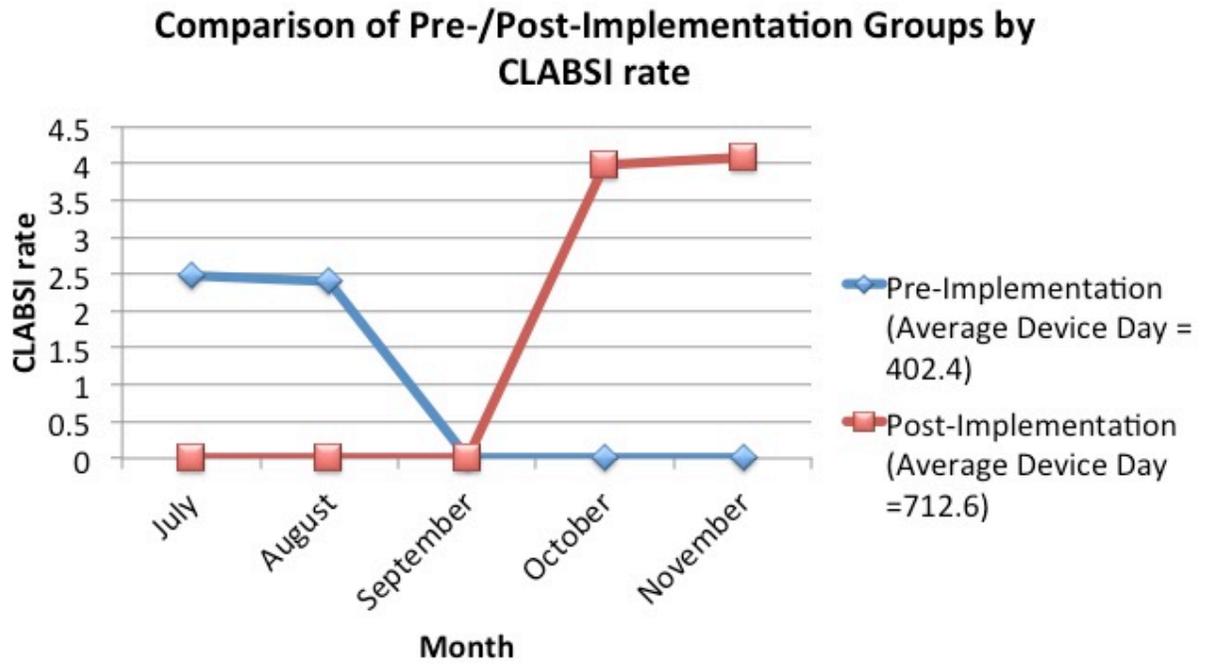
<b>Characteristic</b>	<b>Pre-Implementation Group Mean± SD (N=35)</b>	<b>Post-Implementation Group Mean± SD (N=33)</b>
Age (years)	56.8±12.1	55.1±11.3
<b>Hematologic Disease, N (%)</b>	<b>Pre-Implementation Group (N=35)</b>	<b>Post Implementation Group (N=33)</b>
Leukemia	5 (14.3)	15 (45.4)
Lymphoma	10 (28.6)	6 (18.2)
MDS	6 (17.1)	3 (9.1)
Multiple Myeloma	13 (37.1)	9 (27.3)
Myelofibrosis	1 (2.9)	0 (0)
<b>Type of Transplant, N (%)</b>		
Allogeneic	16 (45.7)	20 (60.6)
Autologous	19 (54.3)	13 (39.4)
<b>Race, N (%)</b>		
Caucasian	32 (91.4)	30 (90.9)
African-American	2 (5.7)	3 (9.1)
Asian	1 (2.9)	0 (0)
<b>Gender, N (%)</b>		
Male	22 (62.9%)	19 (57.6)

SD, Standard deviation; MDS, myelodysplastic syndrome

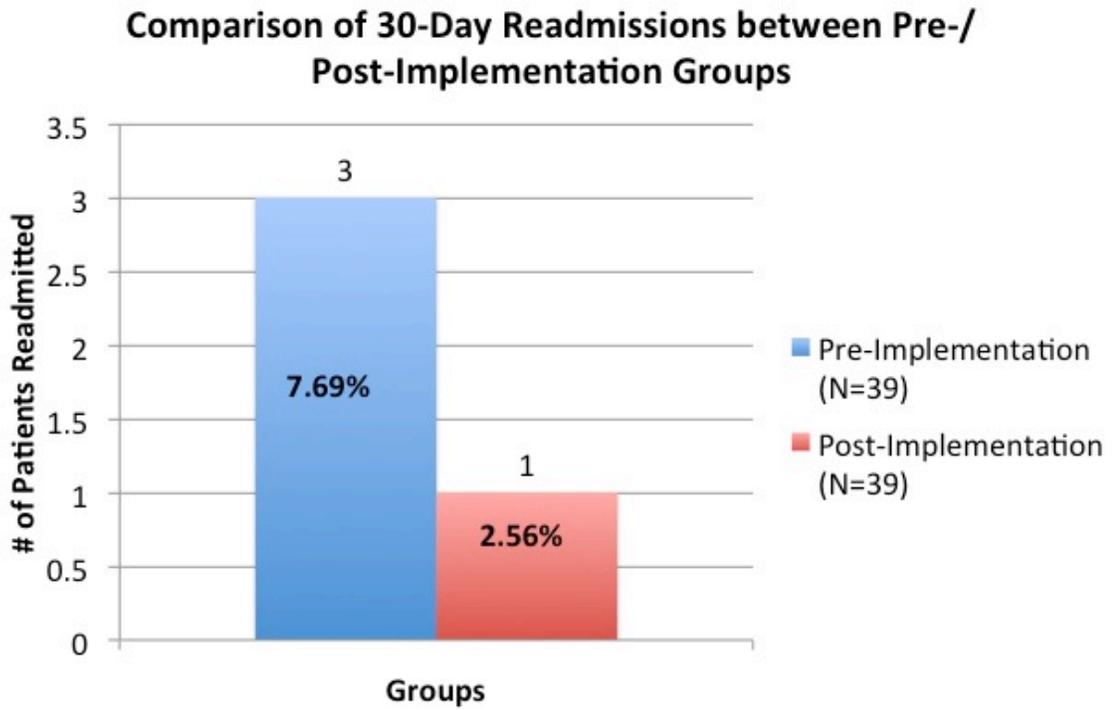
**Table 2.** Comparison of Pre-/Post-Implementation Group by Mean LOS based on Transplant Type

	<b>Autologous Transplant p=0.71</b>	<b>Allogeneic Transplant p=0.99</b>
<b>Pre-implementation, (Mean± SD)</b>	19.2 days ± 6.76 Range= 13-41 days N= 19	35.13 days ± 10.53 Range= 23-59 days N= 16
<b>Post-implementation, (Mean± SD)</b>	18.45 days ± 3.38 Range= 14-25 days N= 11	35.16 days ± 10.16 Range= 19-59 days N= 19

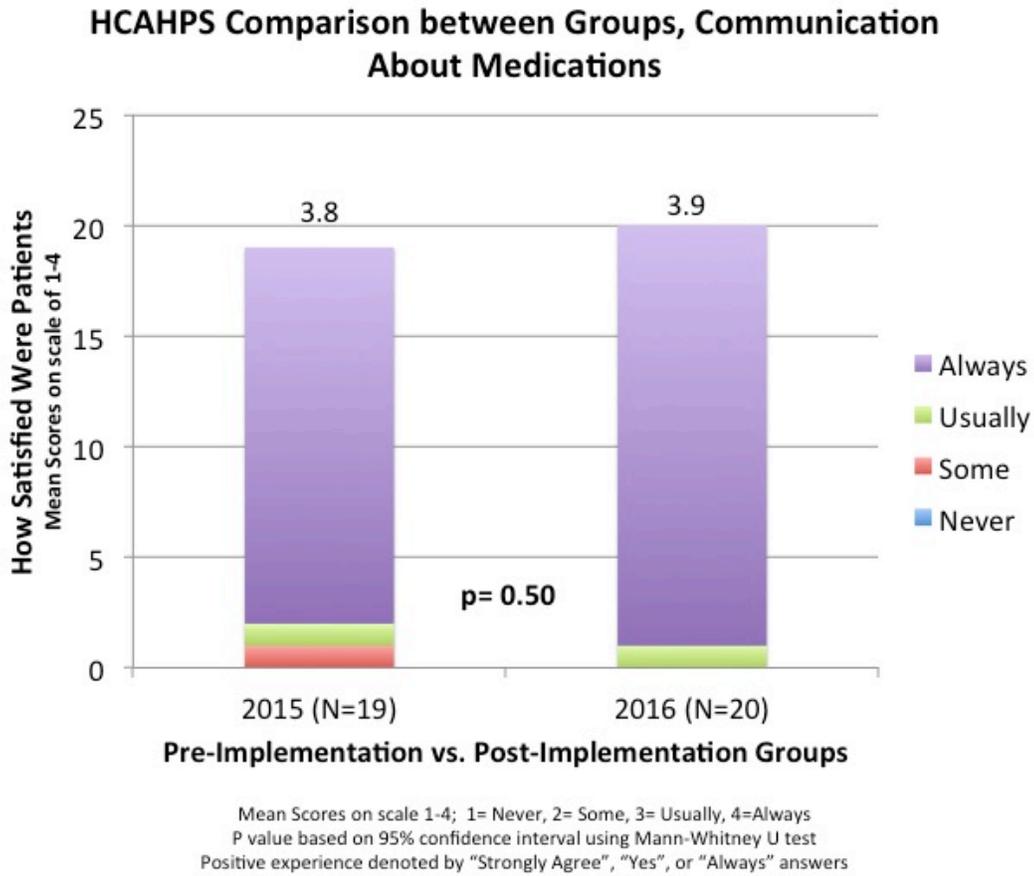
LOS, Length of Stay; SD, standard deviation; p-value based on 95% confidence interval using independent samples t-test



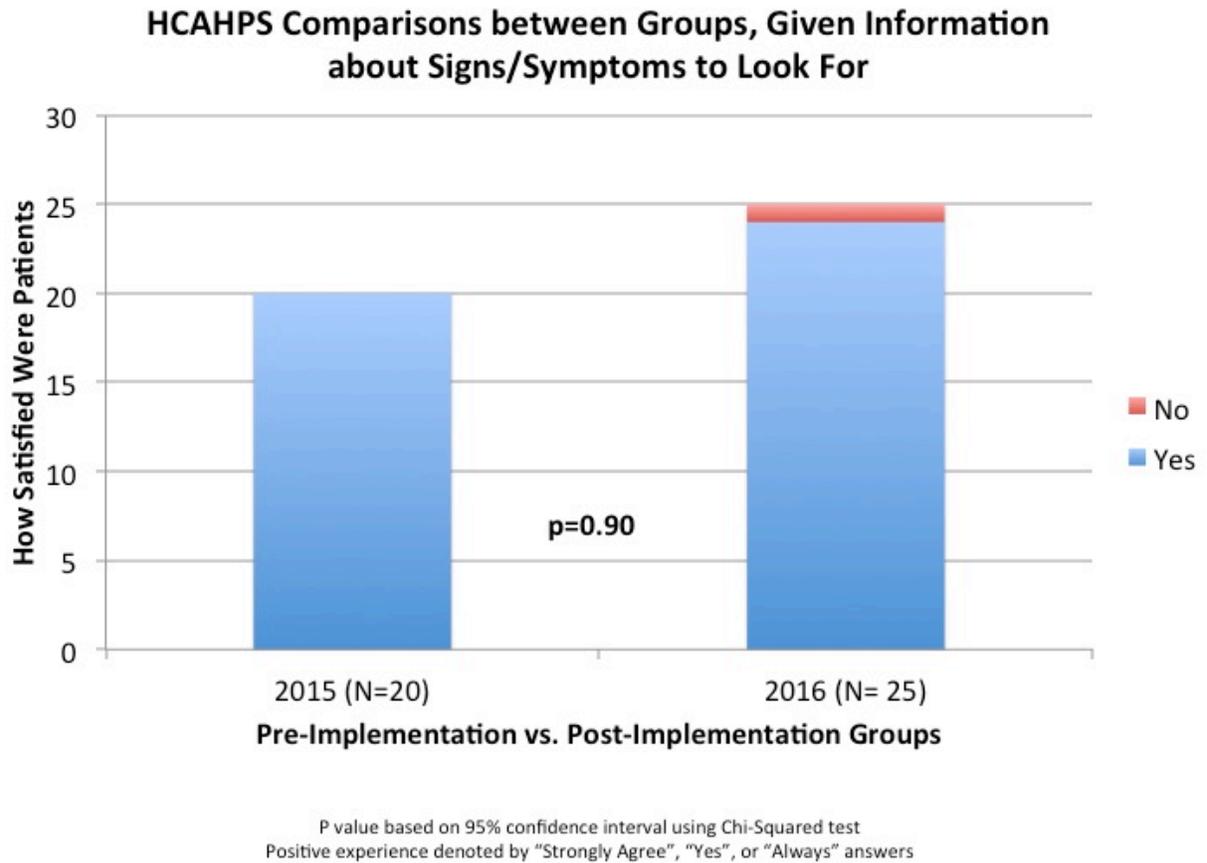
**Figure 1.** Comparison of Pre-/Post-Implementation Groups by CLABSI rate



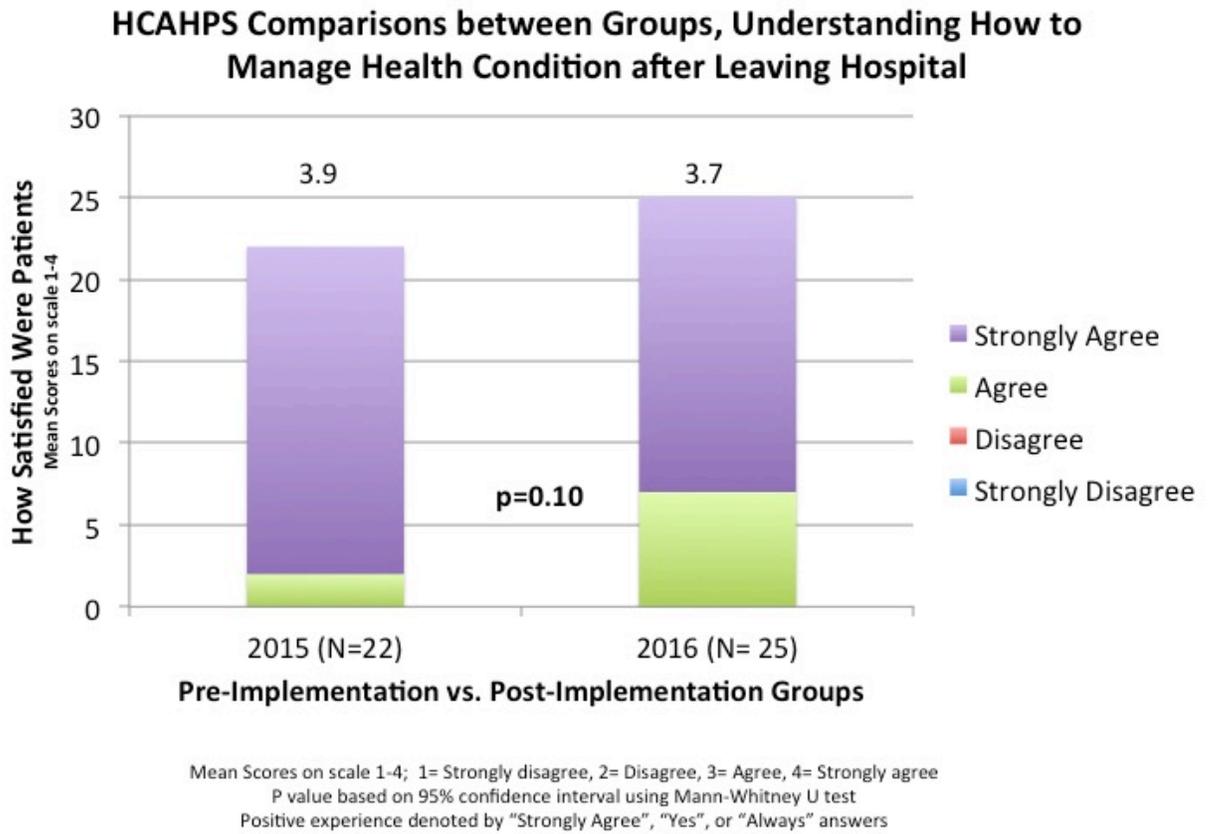
**Figure 2.** 30-Day Readmissions Among Allogeneic and Autologous Transplant Patients, 2015 vs. 2016



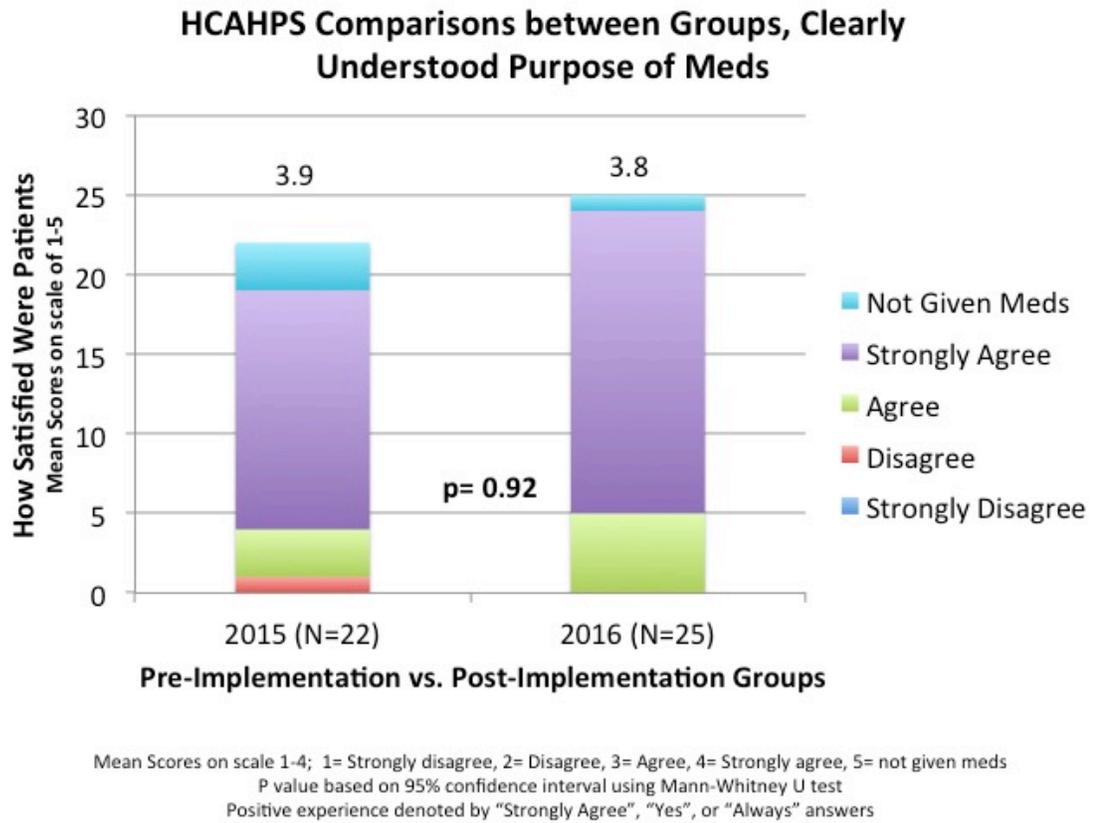
**Figure 3.** Comparison of Pre-/Post-Implementation Group HCAHPS Scores; Before giving you any new medication, how often did hospital staff tell you what the medicine was for?



**Figure 4.** Comparison of Pre-/Post-Implementation Group HCAHPS Scores; During this hospital stay, did you get information in writing about what symptoms or health problems to look out for after you left the hospital?



**Figure 5.** Comparison of Pre-/Post-Implementation Group HCAHPS Scores; When I left the hospital, I had a good understanding of the things I was responsible for in managing my health.



**Figure 6.** Comparison of Pre-/Post-Implementation Group HCAHPS Scores; When I left the hospital, I clearly understood the purpose for taking each of my medications.

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