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Satisfaction Data Collected by Email and Smartphone for Emergency Department (ED) Patients: How Do Responders Compare to Non-Responders?

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SATISFACTION DATA COLLECTED BY EMAIL AND SMARTPHONE FOR EMERGENCY DEPARTMENT (ED) PATIENTS: HOW DO RESPONDERS COMPARE TO NON-RESPONDERS?

By

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A doctoral project submitted to the faculty of the Medical University of South Carolina in partial fulfillment of the requirements for the degree Doctor of Health Administration in the College of Health Profession

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ABSTRACT

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SATISFACTION DATA COLLECTED BY EMAIL AND SMARTPHONE FOR EMERGENCY DEPARTMENT (ED) PATIENTS: ARE RESPONDENTS REPRESENTATIVE OF THE ED POPULATION?

By

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Abstract

The University of North Carolina ED developed an electronic survey method (Bivarus) which sends a web-link by email or text to patients. This study evaluated this method by considering differences between the key characteristics (age, gender, disposition, race, ethnicity, and payor classification) of the responders and non-responders to this survey from July to December 2013 (22,750 records). An evaluation of the key characteristics showed no difference related to age and disposition, but differences related to sex, race, ethnicity, and payor classes. This difference could therefore lead to under representation of the patient experience from those populations.

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CHAPTER 1. INTRODUCTION

The Emergency Department (ED) is a unique and challenging environment. The acuity, complexity, and variability inherent in this patient population and clinical environment create a number of operational challenges for ED leaders. The Center for Medicare Services (CMS) recognizes this uniqueness and challenge by stating: "The Emergency Department is a unique environment within the healthcare system, bridging the world of outpatient and inpatient care." Because 28% of all acute patient care visits occur in the ED, this environment is a source of frequent interactions between patients, families, and visitors to the U.S. healthcare system ("Preparing for ED-CAHPS, n.d.). In 2010, according to the Centers for Disease Control and Prevention (CDC), there were a total of 129.8 million ED visits in the United States, which amounts to 42.8 visits per 100 population, or more than 1 visit for every 3 people in the United States (Emergency Department Visits, 2010). In addition to this frequency, the ED is an important link to all other levels of care because, according to the Rand Corporation, most EDs are the source of nearly 50% of the admissions to a hospital (Jacob, 2014). With this being the case, the care in the ED can substantially influence the patient's perception of their overall care at a particular healthcare facility. This perception can be of primary importance in today's age of value-based purchasing.

EDs are also recognized as a high-risk environment in which additional safety factors must be considered. The National Quality Forum identified 6 reasons why EDs have significant risk considerations (Baker, 2009):

1. Multiple individuals involved in the care of a single patient;
2. Patients with high acuity illness or injury;
3. Rapid healthcare decisions under severe time constraints;
4. High volume of patients and unpredictable patient flow;
5. Barriers to communication with patients, families, and other healthcare professionals; and
6. Interactions with multiple types of diagnostic and treatment technology.

With such challenges, EDs can be a particularly challenging environment for achieving high levels of patient satisfaction or patient experience. Now with today's environment of publically reportable measures, patient satisfaction in the ED has taken on increasing importance to hospitals. Hospitals in general, and EDs specifically, often rely on patient satisfaction surveys as a method for assessing patient satisfaction; however, according to the American College of Emergency Physicians (ACEP), ED surveys are plagued with a number of issues impacting the value and acceptance of such methods. These surveys are often paper-based and the issues measured are dated and non-specific as well as having low survey response rates, which adversely impacts both the applicability of the data as well as the receptivity by clinicians for the results (ACEP Emergency Medicine Practice Committee, 2011).

In response to these issues, the ED at the University of North Carolina Hospitals (UNCH) has taken an innovative approach for the capture of such satisfaction data using electronic survey methods. Initial results including increased response rates and real-time data point to improvements over other past paper-based methods. However, the question remains whether this methodology, given its reliance on electronic devices, creates a

cohort that is representative of the entire population. According to the Pew Research Center's Internet and American Life Project, 91% of U.S. adults have cell phones (Rainie, 2013) and 92% access e-mail (Brownlow, 2013), so given this proliferation in personal electronic devices use, our hypothesis is that the cohort of survey respondents will be similar to non-responders in terms of the key characteristics of age, gender, race, ethnicity, ED disposition, and payor status. Yet these surveys show that older adults and the less affluent may not have such access, so a concern remains on whether UNC's data can truly be considered representative of all patients. This study will evaluate whether any bias is present and therefore evaluate the validity of UNCH's electronic ED survey methodology.

Background

Merriam-Webster defines satisfaction as "the act of satisfying a need or desire" (accessed via merriam-webster.com on November 8, 2014); however, patient satisfaction has become so much more than merely meeting basic needs and desires. Today, the term "patient experience" more accurately represents the current focus, because it is more encompassing of the totality of patient perceptions as they interact with the various care teams across the continuum of care ("Defining Patient Experience", n.d.). Most recently, consideration is now being given to thinking about the patient experience as more than an aspect of service but rather an aspect of quality of care (Manary, 2013; Glickman, 2014).

The evaluation of patient experience has become an increasingly important metric in healthcare. Patient satisfaction impacts not only perception and quality but now also impacts the financial status of the hospital and ultimately its overall reputation within a community. This evaluation of satisfaction measures the patient's perception of their

care, and higher levels of measured satisfaction are increasingly being used as a competitive advantage in an effort to direct patient volume to a facility. This importance has increased in the era of Value-Based Purchasing (VBP). According to the National Business Coalition, VBP is a demand-side strategy intended to measure, report, and reward healthcare facilities through differential reimbursement and public reporting, which is anticipated to increase a facility's market share due to consumer selection (Value Based Purchasing: A Definition, n.d.). In VBP, patient satisfaction is measured and available as publically reported data through the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS). These HCAHP scores are 30% of the differential reimbursement for hospitals. Higher performance on these service measures can easily increase or likewise decrease hospital reimbursement by several million dollars, which in today's era of small financial margins can be the difference between financial success or failure for many hospitals. Although not currently being directly measured by HCAHPS, the ED experience is an important consideration of any measurement of patient satisfaction. Soon the advent of ED-CAHPS—newly renamed ED PEC for Patient Experience of Care ("Emergency Department Patient Experiences of Care (EDPEC) Survey," 2014) will bring the ED experience directly into the VBP arena. This survey is predicted for implementation in 2016.

Unfortunately, in the ED environment, there are a number of inherent challenges on both the collection of satisfaction data as well as on ways to improve the patient's perception of their care. Many hospitals currently use paper-based surveys for capturing satisfaction data; in the ED, this approach has been often plagued by a low response rate, impacting validity and acceptance of this data. Furthermore, the elapsed time until

summary data are available from such commercial vendors is often long (weeks to months), making it impossible for managers to respond to patient concerns in a timely fashion. In addition, the standard questions used in such surveys are often nebulous, making it difficult to pinpoint a specific aspect of operations that needs improvement. These problems with commercial patient satisfaction surveys have led to a lack of staff and physician engagement in efforts to improve patients' experience based on satisfaction data (ACEP Emergency Medicine Practice Committee, 2011).

The practice environment of the ED adds to these challenges for obtaining high levels of patient experience. EDs are often stressed by high-volume, high-acuity, and high-complexity situations, which may lead to ED crowding and excessive waits. These competing challenges may lead to emergency medicine and nursing staff not accepting the necessary behaviors and tactics considered best practices for enhancing patient experience. Finally, the literature is often unclear and anecdotal in nature on how to best enhance the patient experience in the ED. These factors add to the difficulties in optimizing patient experience despite the increasing focus and value placed on these considerations.

Theoretical Constructs

At its essence, patient satisfaction is more than a series of performance metrics. Successful efforts to improve patient satisfaction are really about understanding the overall patient experience around their care, and this care is much more than the mechanics of the clinical activities of diagnosis and treatment. Truly successful care is also about the relationships between care provider and patients. Therefore, a focus on the

experiences of caring can have a positive impact on the overall patient experience as well as on the quality of this care.

A relevant conceptual model regarding this care is Relationship-Based Care (RBC). RBC describes that care is comprised of three crucial relationships: the care provider's relationship with patients and families, the care provider's relationship with self, and the care provider's relationship with colleagues. This RBC model can promote total organizational health resulting in positive outcomes in all the critical arenas that measure success: clinical safety and quality, patient and family satisfaction, physician and staff satisfaction, and ultimately a healthy financial bottom line. This model accomplishes this task by promoting that patients and families define caring and healing environments as those in which they are actively involved in their own care - where they feel as though they are seen as whole people and where they have established an individualized relationship with physicians, nurses, and other care providers. Often the nurse-patient relationship represents the foundation of excellent care delivery (Koloroutis, 2004).

These lessons from RBC are congruent with patient satisfaction findings in which patients report that what matters most to them are the interpersonal skills of the hospital staff. Attributes such as attitude, communication, and caring behaviors are most closely correlated with patients' overall satisfaction with care and whether they would recommend an organization to others (Press Ganey, 1997, as cited in Koloroutis, 2004). Patient satisfaction research that measured the effect of an implementation of The Caring Model (Dingman, Williams, Fosbinder, & Warnick, 1999) further validated that a care provider's response to requests and anticipation of needs are most significant to patients

and their families, followed closely by their abilities to calm fears, communicate effectively, inform them about tests and procedures, and show concern. RBC refers to both the philosophical foundation of such a model and its operational relationships. In RBC, the activities of care are organized around the needs and priorities of patients and their families (Felgen, 2004).

Watson's Model of Human Care (1979) similarly focuses on the interpersonal relationship between patient and nurse. In her theory, the patient can only change himself; healing comes from the inside out and the nurse facilitates these changes. Swanson's Middle Range Theory of Caring (1991) builds on Watson's framework and brings caring theory into a pragmatic sphere by describing five caring processes as well as the practices for putting them into action. The first two processes, maintaining belief and knowing, are internal processes of providing care. The last three (being with, doing for, and enabling/informing) are action processes. Maintaining belief refers to the belief in persons and their capacity to make it through life events and transitions. Knowing is the striving to understand an event as it has meaning in the life of the other, while being with is the act of being emotionally present to the other. Doing for is doing what patients would do for themselves if it were possible whereas enabling is facilitating the other's passage through life events (Person, 2004). Research on patient satisfaction finds that what matters most to patients are the interpersonal skills and caring behaviors of the hospital staff; therefore, it is little wonder nursing care is often the most important predictor of overall patient satisfaction with hospital care (Vom Eigen et al., 1999; Evans, Martin, & Winslow, 1998; Varholak & Korwan, 1995, as cited in Koloroutis, 2004).

Problem Statement

The ED at the University of North Carolina Hospitals (UNCH), an 803-bed academic medical center, experienced a number of challenges related to the collection of patient satisfaction data such as previously cited low response rates. This low response rate prevented staff engagement, which adversely impacted the ability to effect organizational change addressing concerns noted from the survey. In response to these challenges inherent with the paper-based survey methodology, UNCH took an innovative electronic-based approach for the capture of such satisfaction data and initial appearances point to improvements over other past methods. This use of e-mails and text messaging via smartphones to collect real-time patient satisfaction data may hold promise for addressing many of the previously mentioned challenges with paper-based satisfaction surveys because electronic systems often have larger response rates and offer advantages such as more real-time and actionable data (Huang, 2006). However, there is a concern that not all patients have or use smartphones, meaning that data collected by electronic messaging may not be representative of all patients' experiences. The reliance on such data for improving patient satisfaction could therefore lead to ineffective or even damaging change effects, especially if smartphone/e-mail data users have substantially different preferences or experiences from other patients.

This study will compare the characteristics of patients who respond to the "real-time" e-mail/smartphone satisfaction surveys to those of the non-responders. The study will use archival data collected by UNCH's ED satisfaction survey database. This electronic survey at UNCH uses an outside vendor known as Bivarus that sends a text or email within 24–48 hours of patient release from the ED with a link to a patient

satisfaction survey. This contact from Bivarus provides a link to a Web-based survey consisting of 10 dynamic questions with responses measured on a 5-point Likert scale. These questions look at various aspects of ED care such as likelihood to recommend, professionalism, and comfort measures, among others (see question bank in appendix). There is also the ability to add free text comments. A more complete description will be given in the Methods chapter.

Research Hypotheses

The goal of this study is to ascertain the appropriateness of using this method as an accurate representation of the overall ED population and, therefore, the generalizability of the results of this survey. The specific research questions is how do responders to an electronic survey compare to non-responders in terms of key characteristics of age, gender, race, ethnicity, ED disposition, and payor classification? The null hypothesis is that no difference is present between responders and non-responders for each characteristic.

Population

The population is all ED patients treated at UNC Hospitals from July 2013 to December 2013. UNCH is an 803-bed academic medical center located in Chapel Hill, NC, which is in central North Carolina. UNCH provides complex quaternary care with focus on transplant, neurosciences, and heart/vascular care. The ED had 70,432 total patient visits in 2013. The ED has adult, low acuity, pediatric, and behavioral health areas. The ED is a receiving center for Orange County EMS but also receives transfers from throughout the state, primarily through their transport service - Carolina Air Care.

UNCH ED functions as an adult and pediatric trauma center, ABA-verified burn center, Comprehensive Stroke Center, and Chest Pain Center with PCI.

Purpose of Study

The purpose of this study is to evaluate a new method for measuring patient satisfaction in the ED. The initial performance of the UNC survey shows value over the previous paper-based method because the response rate from this survey is higher than the previous paper-based survey (30% by text and 25% by email, vs. 5% by paper), the data is more real-time, and, unlike other survey methods, each survey is linked to the visit identification number so as to provide better case evaluation. However, a concern remains regarding the validity of the results. Numerous past studies have shown that electronic surveys may not be representative of the entire group due to disparity in availability of technology (Bowers, 1999; Crawford et al., 2001 as cited in Shannon, Johnson, Searcy, & Lott, (2002); Dillman, 2000; Schmidt, 1997; Tse, 1998, as cited in Yun & Trumbo, 2000). However, other sources have noted that findings from electronic surveys are comparable to print surveys (Bayer et al., 2002). Initially, Bivarus did perform a high-level evaluation showing that the responder group was similar to the entire ED population; however, this evaluation was not detailed or measured specifically for comparing responders to non-responders at the level of multiple characteristics.

Although previous studies have noted disparities between responders and non-responders, the hypothesis of this study is that electronic data collection of patient satisfaction data as used at UNCH's ED results in a representative sample of the entire ED patient population as evidenced by a lack of statistically significant differences among key characteristics between responders and non-responders. These findings could

have important implications because the validation of this method of collecting ED patient satisfaction data would allow more confidence in our current patient satisfaction data but more generally would also validate electronic collection as a method of collection of such data. This study will therefore contribute to our broader understanding of the value and pitfalls that may be associated with this innovative electronic approach to the collection of patient satisfaction data. This is important for three reasons:

1) The ED is a stressful environment for patients, so patients who are satisfied with the ED care provided may experience less stress and therefore have better health outcomes. Better understanding of the patient experience can then impact not only service but also safety and quality.

2) Patient satisfaction scores are a part of the determinants for medical care reimbursements under the Affordable Care Act, and because the ED is the site of multiple patient encounters and a high percentage of hospital admissions, any dissatisfied patients could cost the hospital money in the future. It is therefore an important financial consideration requiring greater understanding of the circumstances leading to a more optimal patient experience.

3) The electronic collection of such data could reduce cost for surveying and could improve the number and quality of data, leading to greater acceptance and clinician engagement.

4) Finally, the validation of electronic survey methodologies given the current wide use of e-mail and smartphones could impact developments within the survey field.

Summation

The key point to this project is to review the value of electronic survey methodologies. The focus will be on validating the appropriateness of using the Bivarus tool in use at UNCH. Ultimately, the success of such efforts can lead to a better patient experience, better patient quality and safety, and improved patient compliance with provider's recommendations. An additional aspect of this paper will consider the current move to improve patient experience. This review will specifically address the challenges as well as suggestions related to improving such efforts in the ED in an effort to provide clarity of focus for improvement on those areas noted by the survey methodology.

CHAPTER 2. LITERATURE REVIEW

There has been a great deal written regarding patient satisfaction and methods for improving this satisfaction. Most articles consider only traditional paper-based surveys or represent single-site case studies. Unfortunately, many articles do not yet provide clarity on what key methods are needed to measure and improve satisfaction. Some patient satisfaction articles have attempted to answer these questions but very few look at alternate methods for collecting this information and provide answers to the question of whether these responses represent an accurate reflection of the patient experience. Additionally, there is a fair amount of research on survey methodology broadly and specifically on the electronic collection of such data. However, much of these reviews were done prior to the broad acceptance and dissemination of e-mail, smartphones, and internet use. This review of the literature will explore the current state of these various considerations. Specifically, it will explore the current state of the satisfaction literature with a focus on patient experience in the Emergency Department (ED) in an effort to provide clarity on important areas of focus. Additionally, it will review the literature regarding electronic survey methodologies with a focus on potential bias from this form of collection. Finally, it will review why people may choose not to respond to surveys.

Satisfaction in Hospitals

As mentioned previously, Caring Theory and models of Relationship-Based Care (RBC) provide a conceptual framework for considering the importance of a positive patient experience. Swanson's structure of caring (1991) provides a reasonable

description of the links between caring processes and patient well-being. The elements of each process in this structure (maintaining belief, knowing, being with, doing for, enabling) lead to actionable interventions that make the theory to practice connection understandable and useful to clinicians. As a practical example, Tonges and Ray (2011) describe the approach used within the Division of Nursing at UNCH to link key behavioral characteristics to Swanson Care Theory. This approach, known as Carolina Care, provides for the key action steps of multi-level rounding, words and ways that work, relationship/service components, and partnerships with support services. Others have also noted that regular leader and staff rounds on patients have been shown to positively affect patient satisfaction and perception of care (Meade, 2006). The intent of this rounding is that patient needs are anticipated and met on a timely basis. The tangible result of this rounding is a more satisfying experience for the patient but also less use of call lights with associated benefits to patient and staff alike. Hourly rounds link to Swanson's caring theory by combining elements of the caring processes (specifically being with and doing for). A number of these communications can also be linked to enabling. The purpose of such exchanges is to inform and explain situations with the goal of enabling patients to be active participants in their care. The relationship components of Carolina Care include moment of caring, no passing zone, and blameless apology. These processes embody being with, and the information shared may contribute to knowing.

An intriguing aspect of caring theory suggests that a nurse caring *about* patients is as important to patient well-being as caring *for* them (Swanson, 1993, cited in Tonges, 2011). Tonges and others (2014) built on her earlier work by describing a seven-step translational process for moving from theory to practice. The elements of this process are

theory, innovation, application, testing, dissemination, evaluation, and sustainment. In this article, the model was used to implement five key strategies based on RBC strategies, which improved satisfaction in a number of areas including the ED. As noted in Tonges' earlier work, these strategies were moment of caring, rounds, words and ways that work, blameless apology, and huddles. Specific to care in the ED, it is noted that this practice environment includes similar stressors as other outpatient environments but is compounded by high acuity, mixed patient populations, and severe crowding. Waits from this crowding and the unexpected have been noted to be key drivers of patient anxiety and dissatisfaction. Also, it has been noticed that many who arrive in EDs have idealized expectations about how quickly they can be seen and treated. It is therefore important to continually emphasize the anticipated timelines for being seen and assessed, having results of tests available, and admitted to an available bed.

Much of the current focus by UNCH and other hospitals on patient satisfaction relates to the Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey. The intent of this national survey administered by Center for Medicare Services (CMS) is to provide a standardized survey instrument and methodology for measuring a patient's perspective on their care because previous efforts did not enable comparisons supporting consumer choice due to having no national standard for comparison. HCAHPS surveys 21 patient perspectives on care in 9 topics. These topics are: Communication with MDs, Communication with nurses, Responsiveness of staff, Pain management, Communication about medications, Discharge information, Cleanliness of hospital environment, Quietness of hospital environment, and Transitions of care. The survey includes 32 questions delivered by one of 4 modes of administration - mail,

telephone, mixed (with mail followed by telephone), and Active Interactive Voice (IVR) response ("CAHPS Hospital Survey", n.d.).

HCAHPS is a component of Value-Based Purchasing (VBP), which is an initiative in the Patient Protection and Affordable Care Act (PPACA) to reimburse hospitals on outcomes instead of by volume, therefore providing bonuses to hospitals for perceived quality care and imposing penalties for low performers. VBP affects both Medicare and Medicaid reimbursement, with a 70% focus on clinical process measures and 30% from patient experience measures. The clinical process measures are scored with outcomes (20%), process of care (20%), and efficiency (20%) ("Value-Based Purchasing", n.d.). Patient experience is measured using 27 questions of the HCAHPS survey (Ewoldt, 2014).

Currently, HCAHPS is only measuring inpatient care but CMS is releasing measures for the outpatient environment. ED CAHPS, newly renamed ED PEC (Patient Experience of Care), is a proposed survey for standard measurement of the ED patient experience. In this proposed survey, patients discharged from the ED would receive a 7-section survey with total of 63 questions. Admitted patients would continue to receive the traditional HCAHPS plus a few questions on ED ("EDCAHPS", n.d.).

Satisfaction Measures in the ED

One of the areas proving the most challenging for hospitals in providing high levels of satisfaction is the ED. This unit has many challenges impacting the patient's perception of their care including highly variable volume, acuity, and complexity, which often lead to ED crowding. EDs are also increasingly becoming a primary portal of entry for those seeking care, as evidenced by the fact that ED visits increased by 32% between

1996 and 2001 (Baker, 2009). One of the additional challenges relate to the measurement of patient satisfaction. Surveys administered in EDs often suffer from low response rates, with the potential result being skewed data from the dissatisfied few as well as data that may be dated or not useful. These challenges and the importance of high levels of satisfaction have caused many hospitals to focus on ED patient experience. However, it remains unclear what factors actually drive satisfaction in the ED as well as what methods leading to higher levels of satisfaction are supported by more than anecdotal evidence. Although the current literature related to patient experience in the ED is robust, it tends to be site-specific reviews of efforts to improve this satisfaction, which offers less value for broad application.

Stephanie Baker in her work Excellence in the Emergency Department: How to Get Results (2009) relays that patients in the ED have three primary priorities: to be kept informed about delays, to have their pain controlled, and to have their plan of care explained. Furthermore, she states that initial efforts on improving patient satisfaction in the ED is about the wait time, especially decreasing the door to MD time, which offers the additional value of decreasing institutional risk. However, she notes that beyond these single areas of focus, there is the long-term need to hardwire evidence-based leadership principles and practices to gain a true and sustainable system of high service and quality. Her experience with the Studer Group, which provides consultative services related to improving patient satisfaction scores, showed that EDs that earn high marks from patients on service and quality do so by making positive first impressions, giving frequent and timely communication, and ensuring a warm closure with patients.

An additional strategy is the use of discharge phone calls to improve clinical outcomes, increase patient satisfaction, and decrease costly and unnecessary return visits. As support for this statement, Baker (2009) relayed a study consisting of 400 ED patients in which 1 in 5 reported adverse events post-discharge and 48% of these events were deemed to be preventable (Forster, 2003, cited in Baker, 2009). In an August 2005 follow-up study, 71% of the events were evaluated to be significant, with 13% determined to be serious and 16% actually life-threatening events ("Adverse Drug Events Occurring Following Hospital Discharge," 2005, cited in Baker, 2009). Yet despite such significance from these discharge events, 65% of the discharged patients said they did not receive a discussion by care providers on managing their care at home. Similarly, in a February 2003 Annals of Internal Medicine article (Forster, 2003, cited in Baker, 2009), confusion or misunderstanding about discharges was noted as one of the top eight patient dissatisfiers, which frequently may lead to non-compliance with MD discharge orders, particularly around medication administration. The authors of this study noted that it was crucial to manage the first 72 hours after discharge to minimize adverse events and improve outcomes. A 2005 Joint Commission analysis also found that 70% of sentinel events were caused by communication breakdowns with half occurring during hand-offs, which also shows the importance of adequate communication (Baker, 2009).

Baker (2009), similar to Tonges and other authors, highlights rounding as an effective strategy leading to improvements in the patient experience. She highlights a 2006 Studer Alliance for Health Care Research study that revealed that rounding every 1-2 hours on inpatient units significantly reduced patient use of call lights, reduced falls, and improved patient satisfaction (Meade, 2006, cited in Baker, 2009). A corresponding

study published in the *Journal of Emergency Medicine* showed similar benefit in the ED. The *Journal of Emergency Medicine* study reviewed the experience of 32 EDs that implemented leader rounding. In these EDs, the left without being seen rate decreased by 23.4% and the left against medical advice rate decreased by 22.6%. Additionally, falls were noted to have decreased by 58.8% and call light use was decreased by 34.7%. In these hospitals, rounding with individualized patient care—i.e., responding to the top priority of the patient—was deemed to be 33% more effective than a less focused style of rounding. Ultimately these practices lead to increased patient satisfaction by a range of 5 to 20 mean points ("Emergency Department Rounding Study," 2007, cited in Baker, 2009).

As mentioned, the literature on patient experience in the ED is diverse but often limited in focus and objective data. It typically relays only anecdotal experience with limited use for relaying best practice. Although these recommendations have value, it represents case reviews of lower-level evidence with few systematic reviews or meta-analysis. So an effort was made to approach the literature from such a systematic review standpoint to provide greater clarity on this question regarding factors leading to patient satisfaction and what may be the best areas of focus for increasing patient satisfaction. In this review, three databases (PubMed, CINAHL, Cochrane Review) were systematically examined using key words related to patient satisfaction. These key words were: patient experience, patient service, patient satisfaction, customer experience, customer service, and customer satisfaction. Inclusion criteria were articles focused on Emergency Departments in the United States. Repeat citations were eliminated from article list.

Articles were evaluated for stated factors and methods impacting satisfaction. Salient considerations from this review are presented below.

Boudreaux and O'Hea (2004) offered one of the few systematic reviews of the ED patient experience literature. This review of 50 articles discussed practice considerations and thoughts on future research. Through this review, the best predictor of patient satisfaction was noted to be the quality of the relationship with their ED providers. Another significant area of focus relates to perceptions around wait times and the authors recommend this area for future and more exacting research studies.

In another study, Boudreaux et al. (2004) examined the disparate findings between studies of different methodologies related to ED patient satisfaction with the intent of seeking stability of predictors for patient satisfaction. In the study, four time periods were selected over a 17-month period of time, with patients contacted for a phone survey on their experience. The results were then subjected to statistical analysis comparing p-value to odds ratio (OR). Using p-value, six indicators were common predictors (age, perceived wait time before bed placement, wait time before physician evaluation, physician care, discharge instructions, waiting time satisfaction) but using odds ratio showed fewer discrepancies in the data. Under OR, only physician care appeared to have large differences in the relation to overall satisfaction. The authors conclude that generalizing conclusions from cross-sectional and single-site studies were ill-advised.

Boudreaux et al. (2006) in a more recent paper reviewed articles on performance improvement projects targeted to ED patient satisfaction. The author put forth various criteria for inclusion and found 19 articles that met the selection criteria. Three of the

studies found support for multi-component interventions such as the implementation of clinical practice guidelines for presenting complaints and a redesign of ED processes of care. Sixteen studies evaluated single-component interventions. The following interventions had at least one supportive study: using alternate patient assignment to provider teams rather than "zone"-based assignment, enhancing provider communication and customer service skills, incorporating information delivery interventions that target patient expectations, using preformatted charts, and establishing ED-based observation units. There was some evidence supporting a range of performance improvement interventions for improving ED patient satisfaction; however, the author pointed out that further work was needed before evidence-based recommendations could be made regarding which process changes were the most effective.

Welch (2010) reviewed patient satisfaction literature over the past 20 years. This review revealed five major themes related to the ED experience: timeliness of care, empathy, technical competence, information dispensation, and pain management. Timeliness of care spoke to the challenges regarding ED use and ED crowding. It addressed the challenge of perception of urgency, waits especially prior to evaluation, and providing for occupied time. Empathy conveys those aspects related to attitude of staff and efforts such as scripting, which are intended to impact this aspect of care. Technical competence was correlated with positive perceptions of staff. Studies on information dispensation have shown that lack of adequate explanations have a greater impact on satisfaction then wait times and that ED staff overestimate the amount of information that they give patients. Finally, pain management speaks to the challenges associated with adequately addressing this need in the large, mixed population of the ED.

The conclusion of the author was that improvements in patient satisfaction could be accomplished by process redesign, small innovations, and attitudinal change with a focus on these five key areas. This focus involves changes in culture versus capital investment, although the author acknowledges that there are few quick fixes or simple innovations.

Taylor (2004) did a literature review identifying evidence relating to ED patient satisfaction. The various papers were divided into particular factors influencing satisfaction in patients. It was noted that age and race influenced satisfaction in some studies. It was also noted that a triage category was correlated with satisfaction but specifically related to waiting time. The four most frequently identified factors were interpersonal skills, staff attitudes, provision of information, and waiting times. Seven of the reviewed studies suggested that increased information on ED arrival and training courses designed to improve staff attitudes and communication were capable of improving patient satisfaction. Key interventions to improve patient satisfaction from these reviewed studies were those that develop the interpersonal and attitudinal skills of staff, increase the information provided, and reduce the perceived waiting time.

Trout (2000) did a similar review where 16 studies were found associating ED patient satisfaction with various service and patient factors. Most studies were observational and cross-sectional. The author determined that cause-and-effect determination factors responsible for higher levels of satisfaction could not be easily ascertained. However, key themes emerged from the review. These themes were an association with patient information, provider interpersonal factors, and perception of waiting time. The author concluded that future investigations should use a common

definition for overall patient satisfaction, which can be incorporated into future instruments measuring overall ED patient satisfaction.

These systematic reviews have provided some clarity to the question as to areas of focus for improving patient satisfaction. From those mentioned here plus other studies, it is noted that improved communication and teamwork is one area that receives continued attention in the literature. For example, Olthuis and others (2014) performed an ethnographic study looking at ED patient concerns and found that diligence toward patient concerns improved patient/clinician relationships and ultimately the patient experience. As for teamwork, Byczkowski (2013) looked at satisfaction in a pediatric ED and determined that overall satisfaction was best predicted by how well staff worked together followed by concerns related to the wait or inadequate pain management. Another example is where Johnson (2012) looked at what patient experience variables most strongly predicted satisfaction and showed that keeping patients and families informed had more positive effects on satisfaction than any other variable, regardless of increased census and wait times. Wright (2013) looked at nursing's impact on satisfaction and found that nursing interventions with communication and caring behaviors were helpful for patients coping with long wait times and led to improvements in patient satisfaction. Finally, McDonough (2013) noted a correlation between satisfied employees and patient satisfaction and concluded that engaged employees positively impact quality and service.

Another common area of focus is post-discharge contact with patients. Guss (2014) looked at the impact on satisfaction by follow-up calls and noted that patients who received follow-up phone calls were more likely to have a favorable impression of the

ED. Similarly, Patel (2013) noted that patient satisfaction was higher when they had contact post-discharge by either e-mail or phone.

Another area of focus is pain management. Todd (2010) performed a randomized phone survey assessing ED patient's experience regarding pain management. Results of a multivariate model showed that recurrent pain, pain relief, and wait time each predicted patient satisfaction or dis-satisfaction, depending on if these factors were positively addressed. Similarly, Schwartz (2014) used logistic regression to show that the receipt of analgesic medications was associated with lower satisfaction scores. Downey (2010) also showed a correlation between pain reduction and numerous customer service indicators related to satisfaction.

Many experts cite that one of the key challenges and therefore a needed area of focus relates to patient throughput and reducing wait times. Jensen performed a study quoted by Press Ganey were the experience of >1.5 million patients who were treated in 1,656 EDs between Jan. 1 and Dec. 31, 2007, were evaluated. This study noted that patient satisfaction by time in ED <1 hour wait was 89.2 raw score, 1-2 hours was 88.6, but with additional waits the raw score fell precipitously to only 74.9 if wait >6 hours. (Jensen, n.d.). As additional support to this fact, Bastani (2014) reviewed a particular program enhancing throughput - i.e., scribes - and noted an impact on patient satisfaction as throughput improved. Tekwani (2013) also noted in his study that crowding was significantly associated with lower patient satisfaction. Bursch and others (1993) noted that timeliness of care has a strong correlation to patient satisfaction. Others have also noted that timeliness of care strongly correlates to higher patient satisfaction (Thompson, Yarnold, & Williams,1996). Boudreaux et al. (2004) noted that wait time to be treated by

a physician as having the most powerful association with satisfaction. Katz (2013) also found an association between satisfaction and subsequent return visits to the ED. He noted that personal care and perceived wait times were significantly associated with a patient's likelihood to return to the same ED. Collis (2010) performed a systemic review and noted diverse areas impacted by crowding and confirmed adverse impact on patient experience.

Not all common techniques for improving satisfaction were routinely validated, however. As an example, Baker and others (2009) have highlighted that hourly rounds is a common technique to positively impact patient's perception of their experience because it is used to ensure that the patient remains informed with basic needs met. Emerson (2014) evaluated this technique and showed that such rounding did not measurably impact patient satisfaction. However, one of the purposes of rounding is the relaying of information and Tran (2002) did show that providing information to an ED patient every 15 minutes improved the patient's perceived length of stay, efficiency, and clinical skills of the emergency physician. It was also noted that the perceived length of stay was shorter (92.6 min vs. 105.5 min in control group). This approach was also supported in a study that showed that the provision of clinically based information improved patients' perceived length of stay (Meade, Bursell, & Ketelsen, 2006). Another study noted that with rounding, patient needs are anticipated and met on a timely basis, resulting in a more satisfying experience for the patient and less use of call lights (Setia & Meader, 2009). White (2005) also noted that providing information increased ED patient satisfaction, in particular, through a process of the standardized use of a dry erase board and/or brochure outlining the ED process. Another study noted that providing information on ED function

lead to patients rating the ED higher, especially in the areas of MD skill and concern and responding that they would use the ED again (Krishel et al., 1993).

This review of the literature revealed the following thematic categories: communication and teamwork, waits and throughput, and pain management. Communication and teamwork were the most commonly cited theme, with waits and throughput as the second most common, followed by pain management. As previously mentioned, a focus on high levels of patient satisfaction has become a critical skill set needed by ED administrators and leaders. As with most interventions in health care, it is important to move beyond anecdotal approaches to those that lead to evidence-based decision making. These results suggest that interventions in the ED that focus on communication to patients and effectiveness of the team may lead to improved patient satisfaction.

Service and Safety

As mentioned, this focus on patient satisfaction is more than providing positive patient perception of their care. Challenges with communication can likewise lead to issues with quality and risk. Medical care in EDs is at particularly high risk for medical errors due to system issues and complex patient needs and is negatively impacted when compounded with communication problems. As an example, a study of 62 EDs found adverse event rates of 4.1 per 100 visits, with 37% considered preventable (Glickman, 2014). Glickman noted that most institutions rely on voluntary reporting of errors; however, these approaches may grossly underreport adverse events by as much as 90%. He noted that because providers develop workarounds for systemic problems, certain

types of errors might only be visible to patients, such as communication issues, care coordination, and discharge instructions that highlight the value of patient-derived feedback. Similarly, Jha et al. (2008) found that overall satisfaction with care is positively correlated with clinical adherence to treatment guidelines. Furthermore, it was noted that patient-reported measures were more strongly correlated with better outcomes and better capture the patient's evaluation of care. Communication with nurses and MDs was noted to be more sensitive to this evaluation of care rather than non-care aspects such as room and meals. Therefore, the conclusion is that satisfaction is tied theoretically and empirically to quality. Patient experience measures don't simply reflect clinical adherence but also represent a different dimension of quality. Increased patient engagement leads to lower resource use and increased patient satisfaction and is consistently correlated with outcome measures such as mortality and readmissions. Also, factors influencing patient experience scores found that nursing care and communications were more predictive than interactions with physicians. Theory and available evidence suggest that patient satisfaction measures are robust, distinct indicators of quality (Manary, Boulding, Staelin, & Glickman, 2013).

Satisfaction Survey Response Rates

As noted previously, low response rates are one of the key issues impacting views on the validity of patient satisfaction surveys. This low response rates draws questions on the appropriateness of using such data for compensation and comparison of performance. One comparison study (Boscardin, 2013) reviewed patient satisfaction survey data for outpatient facilities at an academic medical center. The study compared the demographic profiles of respondents and non-respondents to a survey used in the ambulatory care

environment to explore the impact of nonresponse. The associations between respondent characteristics and satisfaction ratings were reviewed on three aspects of the care process (communication, service delivery, likelihood of recommending to others). These aspects were assessed using both bivariate and multivariate linear regression, with weighted analyses used to examine the impact of nonresponse. The sample size was large (15,549 patients) with a strong response rate (32%). Bivariate analyses showed a difference in satisfaction ratings by age, language, and insurance type, because a greater portion of the respondents were elderly, female, and English speakers. Multivariate analysis showed contradictory results across all variables. On the basis of the weighted averages, mean satisfaction ratings were inconsistent for language and age; however, overall satisfaction ratings for each dimension were minimally affected. Nonresponse rates and satisfaction ratings differed by age, language, and insurance type. The author's assumption was that non-respondents within each demographic group had similar satisfaction ratings as respondents. In their conclusion, nonresponse levels appear to have minimal effects on overall satisfaction ratings.

Electronic Data Collection of Satisfaction Responses

The role of adapting to available technology is one consideration related to this study on the value of the methodology used by Bivarus. Increasingly, the Internet is considered to be an efficient method for assessing aspects of health care from the patients' perception. Internet surveys offer potential benefits such as time efficiency, reduced effort, and lower costs, but these benefits should be balanced against possible weaknesses regarding accessibility by some groups. This possible weakness is a key consideration on the value of the Bivarus survey because it asks whether there would be a

selection bias related to using technology as the sole method of collecting information on satisfaction. As the Internet was developing into an increasing part of our daily lives, several authors explored this benefit and explored the impact that bias might have on these surveys. Bayer and others (2002) found that electronic surveys were comparable to print surveys, but concerns remain and there is still not consensus on the value and limitations of this type of survey methodology. In an effort to provide clarity on this subject, a literature review was performed on electronic survey methodology by a key word search using the article database at UNC libraries. The key words were: survey methodology/methods, electronic survey methodology/methods, and E-survey methodology/methods.

Bradley (2003) reviewed paper-based surveys and described that many inherent problems make this method of data collection difficult and time consuming. Some of the inherent problems include low response rates (Fox et al., 1988, cited in Bradley, 2003), long response times (Oppenheim, 1992, cited in Bradley, 2003), illegible and incomplete data and expensiveness (McCoy & Marks, 2001, cited in Bradley, 2003), and data entry errors. Bradley noted that in the past most electronic surveys were conducted and submitted via e-mail, but with the growing popularity of the Internet, Web-based surveys have emerged to be the methodology of choice by some researchers. Although his paper did cite others (Cobanoglu et al., 2000; Dillman, 2000) who caution that not all members of a population have access to the Internet, the author noted that this may have been a valid concern in 2000 but is not perceived as being an issue today (2015).

Bradley's paper notes some of the potential value of electronic survey methods, but Schuldt (1994) looked at one particular aspect around responsiveness. He noted that a

good portion of the previous research has been focused on improving response rates for mail surveys because this method typically has the poorest response rate of the four traditional methods: telephone, personal interview, mall intercept, and mail. This author cited numerous historical studies having bearing on the question of value of electronic survey methodology. Havice (1990) studied the noncontact and refusal rates for electronic telephone surveys and found little difference between rates for an electronic survey versus a personal telephone survey. Similarly, he relayed that Kiesler and Sproull (1986) studied the response effects associated with electronic surveys vs. paper surveys and found a higher response rate for the paper survey (75% vs. 67%) but a faster response time for the electronic survey (9.6 days vs. 10.8). Sproull (1986) compared electronic mail with face-to-face interviews as a data collection method in a Fortune 500 manufacturer. Participation rates were 73% for electronic mail and 87% for interviews. Data collection, however, was twice as fast with electronic mail as with interviews. Parker (1992) reported on AT&T's use of e-mail to gather data from its employees who were working overseas. One hundred employees had e-mail addresses and, therefore, were sent the survey via this method. Forty employees did not have e-mail addresses and were sent the survey via company mail pouch. The response rate for e-mail was much higher (68% vs. 38%). These studies show that electronic surveys are faster and have comparable rates even in an era before wide access to home computers and the Internet.

Boyer et al. (1996) examined the use of electronic surveys and compared them to traditional mail surveys. The authors found that when administered in an organized setting the response rates to an electronic survey were good and that the survey turnaround time was lessened relative to a paper survey. They determined that there were

fewer incomplete responses to an electronic survey format than to paper surveys. They also found that although responses in the two media were similar, paper and electronic responses could not be used interchangeably (Kiesler & Sproull, 1986, cited in Boyer, 1996). However, this work was done in a drastically different era, prior to the extensive use of networked computers that is prevalent today, so their findings need to be interpreted carefully given the radical changes that have occurred in recent years.

Cook (2000) provided a meta-analysis and noted that despite the advantage of higher response rates, the real concern of response representativeness is more important than response rate in survey research. The author noted that response rate is only important if it has bearing on representativeness because research has shown that surveys with very low response rates can be more accurate than surveys with much higher responses. As an example, Web-based polls have been noted for their potential to reach very large audiences inexpensively and to secure rapid replies but with concerns regarding sampling and response bias (Kehoe & Pitkow, 1996, and Schmidt, 1997, cited in Cook, 2000).

Janssen (2007) reviewed the growing body of literature addressing design issues and providing laundry lists of costs and benefits associated with electronic survey techniques (Lazar & Preece, 1999; Schmidt, 1997; and Stanton, 1998, cited in Janssen, 2007). Perhaps the three most common reasons for choosing an e-survey over traditional paper approaches are decreased costs, faster response times, and increased response rates (Lazar & Preece, 1999; Oppermann, 1995; and Saris, 1991, cited in Janssen, 2007); although research over the past 15 years has been mixed on the realization of these benefits (Kiesler & Sproull, 1986; Mehta & Sivadas, 1995; Sproull, 1986; Tse, Tse, Yin,

Ting, Yi, Yee, & Hong, 1995, cited in Janssen, 2007). Regarding reliability, researchers have found a strong degree of measurement equivalence between computer-based and paper-based formats (Davis, 1999; Richman, Kiesler, Weisband, & Drasgow, 1999, cited in Janssen, 2007). However, concerning validity, Cook and Campbell (1979, cited in Jansen, 2007) noted that selection is a threat to validity when an effect may be attributed to the differences between the kinds of people in each group. These points bearing on sampling and generalizability are important ones when considering the use of e-surveys. Web- and e-mail-based surveys are similar in that they provide a short turnaround time and can reach a large number of potential respondents quickly. In addition, such surveys can easily take advantage of advancing technology to provide multiple-question formats, direct database connectivity, data quality checking, customized instrument delivery, and guaranteed confidentiality, all of which can serve to improve the reliability of the data. Yet the drawbacks can be serious, depending on the targeted population and goal of the research project, because they involve time-consuming development, limited access to potential users (only those with Internet access), potential technological problems, and the possibility of poor security threatening the validity of the study. In addition, Janssen (2007) noted that self-selected Web surveys are likely to result in biased samples and provide little to no control over the sample.

Yun and Trumbo (2000) also felt that new survey methodologies could generate problems involving sampling, response consistency, and participant motivation. These authors also explored the past literature on electronic survey methods. In their review, they cited Tse (1998), who summarized six advantages of using e-mail surveys compared to traditional mail methods: e-mail is cheaper, it eliminates tedious mail processes, it is

faster in transmission, it is less likely to be ignored as junk mail, it encourages respondents to reply, and it can be construed as environmentally friendly. Tse described these elements as major advantages of electronic surveys for a minimal cost. A number of researchers have suggested that e-mail surveys cost less than mail surveys (Bachmann & Elfrink, 1996; Kiesler & Sproull, 1986; Parker, 1992; Schaefer, 1998; Sproull, 1986, cited in Yon, 2000), but representativeness and response rate are voiced as a concern (Dillman, 2000; Schaefer & Dillman, 1998; Swoboda et al., 1997; Tse, 1998, cited in Yon, 2000). Tse described this aspect as a legitimate concern, especially considering that many survey populations are geographically and demographically diverse. Specifically, he expressed concern that e-mail sampling is necessarily limited to e-mail users. Other works cited by Yon (2000) expressed concerns that e-mail respondents over-represent the middle- to upper-class respondent (Mehta, 1995). Whereas Schmidt (1997) points out that the population of Web users is biased toward young males of above average socio-economic and educational status, Yon (2000) cited a key consideration by McPhee and Lieb reporting that recent Internet demographics reveal that the female population of the Web has increased from 30% in 1995 to 46% in 1999. This normalization of the gender ratio on the Web is of critical importance. These demographics also report similar normalization in terms of age because an older generation is increasingly connected to the 'Net. As support of this statement using data from December 1999, 20% of the online population was between age 45 and 64, which represented a 1.2 % increase from the previous year (Media Metrix, 2000).

Most relevant to our question of comparing Bivarus to other methods, Zuidgeest (2011) did a study comparing an Internet-based questionnaire with a traditional paper

questionnaire with respect to differences that could point to bias. The author noted that respondents from these two survey methods did not differ in age, gender, level of education, or self-reported physical and psychological health (all Ps > .05). The postal surveys were returned 20 days earlier than the Internet-based survey (median 12 and 32 days, respectively; P < .001), but the response rate did not differ significantly (256/400, 64.0%, versus 242/400, 60.5%, respectively; P = .30). The costs were lower for the Internet survey as well as having fewer missing items (3.4% versus 4.4%, P = .002) and fewer invalid answers (3.2% versus 6.2%, P < .001). Within the Internet survey, 52.9% of the respondents filled out the questionnaire online. The author did note that respondents who filled out the questionnaire online were significantly younger (P < .001), were more often highly educated (P = .002), and reported better psychological health (P = .02). In comparison, respondents to the paper questionnaire rated the nurses more positively. The author concluded that Internet-based surveys were an effective alternative to postal surveys and yield comparable response rates and groups of respondents at lower costs. It is important to note that respondents to either survey did not rate quality of care differently. The authors recommended using Internet or mixed-mode surveys instead of postal surveys, especially when investigating younger or more highly educated populations.

Huang (2006) again noted the advantages to electronic surveys, which have reported comparable or higher completeness and quality of responses (Truell, 2003, cited in Huang, 2006). Furthermore, he noted that well-designed Web surveys can be less expensive, easier to use, faster, better received by participants, and actually more accurate than their print equivalent format (Morrel-Samuels, 2003, cited in Huang, 2006).

However, he noted a new concern in that although the use of Web surveys is currently so popular, it is still limited in the generalization of results (Pitkow & Recker, 1995; Pitkow, 1997, cited in Huang, 2006). He noticed that the major concern in Web surveys lies in the validity of the data collection from the sampling that is represented predominantly by an Internet population rather than a general group from a survey sample (Ilieva et al., 2002, cited in Huang, 2006). Huang's paper acknowledges that printed surveys and Web surveys can attract distinctively different respondents. The typical Web survey user has private access to a computer, shows greater responsibility, and is better paid. In these circumstances, when a company offers both print and Web surveys, it might cause self-selection bias that means higher-level respondents tend to respond to the Web survey while lower-level employees stay with the paper survey. Such a difference might skew survey results (Morrel-Samuels, 2003, cited in Huang, 2006).

As to the quality of response data, the variation of data among survey modes is an issue for both the electronic survey and the multi-mode approach. Some researchers provide evidence that the quality of the e-mail survey is somewhat different from the paper survey, specifically that e-mail surveys have more non-response items (Bachmann & Elfrink, 1996; Sproull, 1986, cited in Yum, 2000), but other researchers argue that there is minimal difference between these approaches (King & Miles, 1995; Tse, 1998, cited in Yum, 2000) and that e-mail methods generate fewer non-response items than a paper version does (Schaefer & Dillman, 1998, cited in Yum, 2000). When it comes to the quality of open-ended responses, a number of researchers have reported that respondents write lengthier and more self-disclosing comments on e-mail open-ended questionnaires than they do on mail survey questionnaires (Bachmann & Elfrink, 1996;

Kiesler & Sproull, 1986; Locke & Gilbert, 1995; Schaefer & Dillman, 1998; Sproull, 1986, cited in Yum, 2000). For example, Yum cited that Schaefer (1998) attained a four-fold increase in length of open-ended responses using electronic methods, and Lock and Gilbert's (1995) study showed greater self-disclosure in electronic returns. This might be due to the speed of typing over handwriting (Bachmann & Elfrink, 1996, cited in Yum, 2000), but no study has carefully investigated this question.

One other point to consider with electronic surveys is the social desirability effect, which is the tendency of answering questions in a way that is viewed favorably. On this point, there is some disagreement. Some researchers report that computerized surveys increase socially desirable answers and reduce respondents' self-disclosure (Davis & Cowles, 1989; Lautenschlager & Flaherty, 1990; Schuldberg, 1988, cited in Yum, 2000), but other researchers claim that the computerized survey produces less socially desirable responses on closed-ended questionnaires (Kiesler & Sproull, 1986; Sproull, 1986, cited in Yum, 2000). Furthermore, some researchers propose that computerized surveys can induce more interest and greater awareness in respondents (Booth-Kewley et al., 1992; Kiesler & Sproull, 1986; Kiesler, Siegel, & McGuire, 1984; Kiesler, Subrow, Moses, & Geller, 1985; Martin & Nagao, 1989, cited in Yum, 2000). For example, Yum cited Kiesler and Sproull (1986) who explained that electronic survey respondents are more likely to be self-absorbed and uninhibited when they complete a survey by computer and may concentrate more on the questionnaire.

ED Electronic Surveys

The articles mentioned here broadly frame the historical context of values and concerns from electronic survey methods. There have been a limited few articles

specifically addressing electronic surveys related to EDs. Most applicable to our study is a study by Green and others (2011) that looked at a similar real-time patient satisfaction tool used in an ED. These authors again stated the challenges with conventional patient satisfaction surveying techniques, which are limited by poor response rates, patient memory decay, selection bias, delay to results, and poor specificity to the emergency department. Their conclusion was that implementing a real-time patient satisfaction survey is economically feasible, more informative, and significantly more expedient than previous methodology. The instantaneous availability of results was particularly important, allowing providers and staff opportunities to intervene and mitigate problems quickly and efficiently. The authors concluded that a new method for immediate intervention has far-reaching implications for patient care, service recovery, and risk management but did not speak to limitations related to selection bias.

Broadwater-Hollifield (2014) explored the question of selection bias in their review of a Web-based Emergency Department patient satisfaction survey and noted that it may introduce potential bias. Their review reported that 87% of participants reported that they have some means of regularly accessing the Internet. Additionally 85% of patients who self-identified their race as Caucasian reported Internet access versus only 8.9% of individuals who identified as Hispanic. Of those reporting an education level including some college or higher, 69% had Internet access while of those with a high school education level or lower, only 31% had access to the Internet. Similarly, the authors noted significant differences in Internet access based on household income. Those reporting an income of greater than $22,000/year had a 58% rate of Internet access while only 25% of those with a household income less than $22,000/year reported access

to the Internet. Of patients less than 40 years of age, 54% had access to the Internet while of those between the ages of 40 and 56 years, 24% had access to the Internet, and 23% of those over age 56 years had access to the Internet. 11% of patients with Internet access stated they obtain this access at a public library. The authors concluded that a Web-based format for the distribution of patient satisfaction surveys in the ED might underrepresent females, minorities, patients without college education, those with lower income, and patients older than 40 years. Their information may provide guidance in interpreting results of Web-based patient satisfaction surveys and the authors suggest the need for multiple sampling method–evaluated results using descriptive and comparative statistics.

Survey Non-Response

A number of studies have reviewed factors that potentially influence response rates from surveys. These factors are survey length, issue salience, and both pre- or post-notification. In regards to survey length, several studies have shown that survey length did not influence response (Brown, 1965; Bruvold & Comer, 1988; Mason et al., 1961, cited in Sheehan, 2001) while others have shown that length does negatively impact response rate (Heberlien & Baumgarter, 1978; Steele, Schwendig, & Kilpatrick, 1992; Yammarino, Skinner, & Childers, 1991; Tomasokovic-Dewey et al., 1994, cited in Sheehan, 2001).

Issue salience refers to the association of importance that one places on the survey and has been noted to influence response rates (Bean & Roszkowski, 1995, cited in Sheehan, 2001). Several studies have shown a strong positive correlation regarding response rates (Sheehan & McMilan, 1999; Watt, 1999; Martin, 1994; Roberson & Sundstrom, 1998, cited in Sheehan, 2001). Bean and Roskowski (1995, cited in Sheehan,

2001) showed that salience exhibited more influence on response rate than length of the survey.

Both pre- and post-notification has been shown to potentially influence response rates but, similar to survey length, has conflicted correlation. Several studies have shown an expected positive impact on response rate by pre-notification (Fox, Crask, & Kim, 1988; Hagett & Mitchell, 1994; Hanuk & Berenson, 1975, cited in Sheehan, 2001) while others showed little to no effect (Heberlein & Baumgartner, 1978, cited in Sheehan, 2001) and Jobber and Sanderson (1983, cited in Sheehan, 2001) actually showed that pre-notification decreased response rate. The evidence of post- notification efforts seems to be more clear. Several authors have shown positive impact with post-notification (Comer & Kelly, 1982; Jobber, 1986; Murphy et al., 1990, 1991; Yammarino, Skinner, & Childers, 1991, cited in Sheehan, 2001). Sheehan and Hay (1997, cited in Sheehan, 2001) showed that a reminder message could increase response rate in e-mail surveys by 25%.

Conclusion

The main point from this literature review is that multiple factors impact both low levels of satisfaction as well as tactics to improve the patient experience. Chief among these interventions are those that focus on communication and teamwork, however other considerations around wait times—particularly time to being seen by the physician—are important considerations. Although providing an optimal patient experience is an important outcome that can be financially beneficial to the hospital in the VBP environment, viewing the patient experience as an aspect of quality and risk management may be the most valuable approach.

As to survey methodology, the two data collection techniques offer comparable results but there are important differences at a more detailed level. Electronic surveying can represent a less costly method providing benefits of a greater response rate as well as more detailed information. There are some limitations in that there is no evidence to indicate that electronic surveys help reduce the tendency of respondents to fall into a pattern where their responses become fairly repetitive. Past and more recent research continues to point to concerns regarding a selection bias, especially among the older adult, less educated and lower socio-economic demographics, and some ethnic groups such as Latinos.

Although the evidence is conflicting, numerous authors have shown that factors such as survey length and issue salience may impact response rates. Notification efforts both pre- and post-survey may also positively impact survey response rates. Perhaps most interestingly, Sheehan (2001) also reviewed response rates to e-mail surveys over 15 years (1986-2000) and noted that survey response rates have actually decreased over this period of time, which she noted may point to the decreasing novelty of the electronic survey methodology.

In conclusion, electronic surveys offer a viable alternative to printed surveys, but researchers must carefully consider their goals and objectives as well as these limitations. As with any survey, careful design and implementation can prevent or ameliorate these potential problems. There is a place in the literature for looking more specifically at this potential selection bias through the use of descriptive and comparative statistics. In the next chapter, we will review the methods for reviewing the data in the Bivarus database

so that we can compare and contrast key characteristics between responders and non-responders.

CHAPTER 3. METHODOLOGY

The objective of this study is to evaluate the effectiveness of a new smartphone-based survey tool for collecting information regarding Emergency Department (ED) visits. This survey tool is within an electronic collection system known as Bivarus, which is a proprietary system created by physicians within the UNCH Department of Emergency Medicine. Anecdotally, Bivarus appears to provide a higher response rate, more timely feedback, and a more rich set of feedback, however the question remains whether it is an accurate representation of the ED population or is there a selection bias related to the type of patients who have access to or use such technology?

Bivarus uses a cloud-based platform technology to contact patients by text or email within 24-48 hours after the ED visit to administer a brief 10-item survey as well as offer the opportunity for text comment. These 10 questions come from a 100-question bank that assesses care on 10 dimensions: Processes of care and efficiency, Institutional ethos, Comfort, Transitions of care and care coordination, Patient-centered care, other members of team, and overall patient experience (see question bank in appendix). Patient responses are collected in a Health Information Protection and Affordability Act (HIPAA)-compliant environment. The survey is developed dynamically using a Bayesian survey algorithm that takes into account the surveyor's priorities (managerial weight assigned to each domain and question). This methodology ensures efficiency of survey response while minimizing response burden (Glickman et al., 2014).

This study will compare and contrast the key characteristics between Bivarus responders and non-responders. These key characteristics are age, gender, race, ethnicity, ED disposition (admit versus discharge), and payor classification. These data elements will be abstracted from the Bivarus database and compared to the same key characteristics from a similar sample from the database on non-responders to the ED satisfaction survey. This data will be de-identified with each group to be evaluated to see if the responder characteristics are similar to the ED non-responder population so as to determine whether survey results are applicable to the ED as a whole. Additional considerations are to compare characteristics of those who respond by e-mail versus smartphone. A determination will be made as to whether any difference between the groups is statistically significant.

Study Design

This study is a cross-sectional design using secondary data from the Bivarus database and provides an opportunity for univariate analysis of the key characteristics for each group. The objective of this study is to review whether this new method of evaluating patient satisfaction using smartphone technology is effective in being a representative sample of Emergency Department (ED) patients. To accomplish this review, key characteristics of the responder group will be compared to non-responders. The goal is to ascertain the appropriateness of using this method as an accurate representation of the overall ED population and the generalization of these results. The research questions is how do responders to an electronic survey compare to non-responders in terms of key characteristics of age, gender, race, ethnicity, ED disposition,

and payor classification? The null hypothesis for question 1 is that no difference is present between responders and non-responders related to each characteristic.

Operational Definitions

Bivarus – the proprietary system used for the acquisition and retention of patient satisfaction data at the ED at UNCH.

Responder – individuals who provide e-mail or text contact information then respond to Bivarus survey.

Non-responder – there are four classifications of non-responders:

1. Individuals with email or cell phone contacts but who do not respond back to the survey.
2. Individuals who provide email or cell phone contact but this contact is returned as undeliverable.
3. Individuals who chose to opt out of the survey.
4. Individuals without email or cell phone contacts.

This study will only evaluate the first classification.

Payor classification – financial payment classes for all ED patients. This study will classify as commercial, Medicare, Medicaid, or self-pay.

ED disposition – is the final disposition after evaluation and treatment. Possible dispositions are discharge to home or nursing home or admitted to the hospital either as inpatient or outpatient.

Data Set Description

Population is all patients visiting UNCH ED. The sample was drawn from the 35,125 ED patients treated at UNC Hospitals from July 2013 to December 2013. As

previously noted, UNCH is a large academic medical center located in central North Carolina that provides complex quaternary care. This sample consists of adults as well as pediatric patients or families. Patient population may be those who arrive to the ED ambulatory, via EMS, or on transfer from another facility.

As to the specification of the variables of this study, responders and non-responders data was exclusively from the Bivarus database, which is maintained external to UNCH on company servers. This study compared the following key characteristics: age, gender, race, ethnicity, ED disposition, and payor classification. An additional classification was comparing email to text response.

Data Analysis

Each characteristic was classified according to responder and non-responder groups. Descriptive data elements were reviewed for variation. The patient characteristics were compared using parametric measures and descriptive statistics. Parametric measures evaluated for age were mean, median, range, and standard deviation. Additionally, a generalized linear model will be used to model the binary response data response for age. Each key characteristic was compared between responder and non-responder classifications. Univariate variables were compared using two sample t-test. Categorical variable differences were compared using chi-square tests derived from contingency table analyses. Additionally, the responses themselves were compared to see if there is any difference in satisfaction between the groups.

Limitations

The primary limitation of this study is access to data for other classifications of non-responders. Data from those who do not provide an e-mail or text contact at

registration are not retained by the Bivarus system. Evaluating this group would provide a better evaluation of bias related to those without access to such technology. An additional limitation is the single-site nature of this analysis because Bivarus is a company with limited customers. It is therefore difficult to consider broad acceptances of the results of this study until comparison can be made with other sites.

Protection of Human Subjects

The research proposal was submitted to Institution Review Board (IRB) at the Medical University of South Carolina (MUSC) and received exempt status because no personal health information (PHI) is in the data set. The IRB at MUSC will serve as the primary review board. This project is a student project with oversight by Dr. James Zoller, faculty at MUSC and committee chair for this doctoral project. Because the research is using UNC patient population and data, a proposal was also submitted to UNC IRB as a secondary IRB contingent on MUSC's IRB approval. Submission at UNC includes an initial step of review and approval by the UNCH Nursing Research Council. UNC IRB is relying on MUSC review and determination as exempt.

CHAPTER 4. RESULTS

The objective of this study is to evaluate the effectiveness of a new smartphone-based survey tool, Bivarus, for collecting information on the patient experience regarding Emergency Department visits at the University of North Carolina hospitals. More specifically, the study compares and contrasts the key characteristics between Bivarus responders and non-responders. Responders are those who responded to the survey while non-responders are those who received notification of the survey but chose not to respond. The key characteristics being compared are age, gender, race, ethnicity, disposition, and payor class, responses were also compared by whether they were returned via e-mail versus smartphone. This cross-sectional study using secondary data from the Bivarus database provides an opportunity for univariate analysis of the key characteristics for each group.

The goal of this study is to ascertain the appropriateness of using this method as an accurate representation of the overall ED population. The specific research questions is how do responders to an electronic survey compare to non-responders in terms of key characteristics of age, gender, race, ethnicity, ED disposition, and payor classification? The null hypothesis is that no difference is present between responders and non-responders related to each characteristic.

Results

The overall description of the data set is that it consisted of 22,750 total records, which is a 64.77% sample from the 35,125 total ED patients seen from July 2013 through

December 2013. This sample consisted of the entirety of available records in the Bivarus database for the study period. Each record represents a patient visit with data retained in the Bivarus database. Within this number, 3,469 records were in the responder classification, meaning they had responded to the survey, and 19,281 were in the non-responder classification, meaning that the patient did not respond to text or e-mail link to the survey. This result represents a 15.25% response rate among the eligible responders. The sample number compares to the actual ED visits during this time (35,125), revealing that 64.77% of ED patients had provided either an e-mail or cell number at registration. Of this group, 9.87% responded to the Bivarus survey. The mean age of responders was 39.66 with a median age of 38. First quartile was 22 years of age and third quartile was 56 years old, with a range from 0 years to 114 years old (Table 1).

Table 1. Age

	Min	1st Quartile	Median	Mean	3rd Quartile	Max
Non-response	0	22	38	39.45	55	114
Response	0	23	41	40.85	59	99

The overall standard deviation for the dataset was 22.96 years of age, with 23.39 years for responders and 22.87 for non-responders. It should be noted that minor ages (<18) could be assumed to be completed by guardian. It should also be noted that the maximum age for non-response group may have been derived from a default birthdate being input, however this aspect cannot be verified due to the absence of birth date in the dataset. It should be noted that a review of an age density plot showed minimal volume of ages greater than 90.

The disposition (admit versus discharge) status of the records was 4,584 admitted patients versus 10,752 discharged from the ED, which represents a 29.9% admission rate within the Bivarus database. This is representative of UNCH ED's typical admission rate. The response rate for the admitted data set was 16.16% (n=3843) with 83.84% (n=741) non-responders, as compared to the discharged data set of 15.42% responders (n=1658) with 84.58% non-responders (n=9094) (Table 2).

Table 2. Disposition

	Non-responders (%, n)	Responders (%, n)
Total	85.57% (6344)	14.43% (1070)
Admitted	83.84% (3843)	16.16% (741)
Discharged	84.58% (9094)	15.42% (1658)

Gender distribution of the data set was 10,434 male responders with a 16.3% response rate versus 12,316 female responders with a 14.01% response rate (Table 3).

Table 3. Gender

	Non-response (%, n)	Response (%, n)
Female	83.7% (10,309)	16.3% (2007)
Male	85.99% (8972)	14.01% (1462)

Race distribution showed 12,072 Caucasian patients in the data set with a 19.52% response rate, as compared to 6,511 African-Americans who had a 9.74% response rate. Asian race classification had 310 patients with a 20.32% response rate, with the remainder falling into other or unknown race classifications (Table 4).

Table 4. Race

	Non-response (%, n)	Response (%, n)
African-America	90.26% (5877)	9.74% (634)
Asian	79.68% (247)	20.32% (63)
Caucasian	80.48% (9716)	19.52% (2356)
Native America	87.50% (77)	12.50% (11)
Other	89.97% (2722)	10.03% (304)
Unknown	86.39% (641)	13.61% (101)

A review of ethnicity (Hispanic versus non-Hispanic) showed 2,166 Hispanic patients in the data set who had an 8.13% response rate, as compared to 15,064 non-Hispanic patients with a 16.08% response rate (Table 5).

Table 5. Ethnicity

	Non-response (%, n)	Response (%, n)
Total	85.20% (3581)	14.80% (622)
Hispanic	91.87% (1990)	8.13% (176)
Non-Hispanic	83.92% (12,642)	16.08% (2422)
Unknown	81.09% (1068)	18.91% (249)

An evaluation by payor classification showed 16,359 patients with a commercial payor source who had a 15.83% response rate, as compared to 4,739 Medicare patients (15.11% response rate) and 797 Medicaid patients (8.91% response rate). Self-pay consisted of 656 patients (8.69% response rate), with the remainder being in classifications such as Workers Comp (n=154; 22.08% response rate) or Department of Corrections contract or other small "n" classifications (Table 6).

Table 6. Payor Classification

	Non-response (%, n)	Response (%, n)
Commercial	84.17% (13,769)	15.83% (2590)
Medicaid	91.09% (726)	8.91% (71)
Medicare	84.89% (4023)	15.11% (716)
Other	98% (44)	2% (1)
Self pay	91.31% (599)	8.69% (57)
Workers comp	77.92% (120)	22.08% (34)

This study also reviewed notification method compared to responders and found that 12,141 were notified by text message to cell phone, 19 notified by e-mail only, and 10,590 notified by both text and e-mail. Those notified by text only had 4.09% response

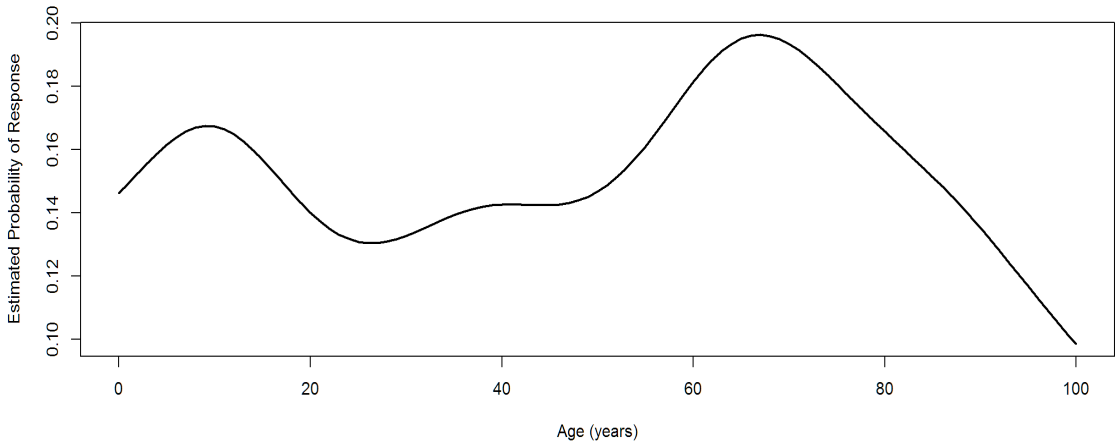
rate, e-mail only had 10.53% response rate, and those notified by both e-mail and text had a 28.05% response rate (Table 7).

Table 7. Method of Notification

	Non-response (%, n)	Response (%, n)
Cell	95.91% (11,644)	4.09% (497)
Email	89.47% (17)	10.53% (2)
Email & cell	71.95% (7620)	28.05% (2970)

Each characteristic was then evaluated to determine probability of response as a function of each independent variable. First, a generalized linear model was used to model the probability of responding to the survey as a smooth function of age. This model showed the effect of age was significant related to probability of response ($p = 2.15 \times 10^{-11}$). Specifically, two interesting spikes were noted for responders. Responders age 20 and below were more likely to respond to the survey, but the greatest probability of response was the age group between 60 and 80 (Figure 1). In addition, age was compared between the responders and non-responders using the Welch two-sample t-test and showed a statistically significant difference between responders and non-responders (p-value = 0.001156). Although there was a statistical difference in the mean age between the responder and non-responder grouping, the relatively small difference was not determined to be practically significant (95% CI for difference using u_{nr}-u_r (-2.24;-0.056)).

Figure 1. Modeling Probability of Response as a Function of Age



Disposition was compared using the two-sample test for equal proportions. This evaluation showed no statistically significant difference between the probability of response for those admitted versus those who had been discharged ($p = 0.2553$). Gender was also evaluated by the two-sample test for equal proportions and revealed a statistically significant difference that females were more likely to respond to the Bivarus survey ($p = 1.969 \times 10^{-6}$). Race was evaluated by Pearson's chi-squared test of independence and showed a relationship between race and response status ($p = 2.2 \times 10^{-6}$). Further evaluation shows that the response rate of Caucasians was 19.52% and of Asians was 20.32% while the response rate of African-Americans was 9.74%. Ethnicity was compared by the two-sample test for equal proportions and showed that non-Hispanics were more likely to respond ($p < 2.2 \times 10^{-16}$).

The payor classes were also compared using Pearson's chi-squared test of independence and revealed a relationship between payor classification and response status ($p = 1.59 \times 10^{-11}$). Notably, the response rate for commerical payors and Medicare were 15.83% and 15.11%, respectively, while the response rate for Medicaid and self-pay

were 8.91% and 8.69%, respectively. Finally, an evaluation of the method of notification was reviewed. Those notified by text only had a 4.09% response rate and those notified by only e-mail represented a 10.53% response rate, whereas those notified by both e-mail and text had a 28.05% response rate (two-sample test of equal proportions $p < 2.2 \times 10^{-16}$). That is, patients notified by text and e-mail have a significantly higher probability of responding to the survey relative to those only texted (95% CI (23%, 25%)).

In regards to the specific research questions, the evaluation of key characteristics (age, gender, race, ethnicity, ED disposition, and payor classification) showed no difference related to age and disposition, but there were differences related to gender, race, ethnicity, and payor classification. Specific to each characteristic:

- The null hypothesis for age was that the mean age of responders was equal to the mean age of non-responders. The p-value for this test was 0.001156, so the null hypothesis was *not* rejected.
- The null hypothesis for disposition was that the probability of responding for admitted patients was equal to those discharged. The p-value is 0.2553, so the null was *not* rejected.
- The null hypothesis for gender is that the probability of responding is equal for males and females. The p-value is 1.969×10^{-6}, therefore the null hypothesis was rejected.
- The null hypothesis is that there is no relationship between race and probability of response. The p-value is 2.2×10^{-16}, so the null hypothesis was rejected.

- The null hypothesis for ethnicity is that the probability of response for Hispanic and non-Hispanic is equal. The p-value is 2.2×10^{-16}, therefore, the null hypothesis was rejected.
- The null hypothesis for payor class is that there is no relationship between payor class and probability of response. The p-value is 1.587×10^{-11}, so the null hypothesis was rejected.

The null hypothesis was that no statistical difference is present between responders and non-responders. This evaluation was rejected this null hypothesis, thereby showing that a statistical difference is present related to gender, race, ethnicity, and payor classification.

CHAPTER 5. CONCLUSION

The objective of this study was to evaluate the effectiveness of a new smartphone-based survey tool, Bivarus, for collecting information on the Emergency Department (ED) patient experience at the University of North Carolina hospitals (UNCH). Secondary objectives were to review the literature for clarity as to areas of focus for patient satisfaction, the value of electronic survey methodology, and methods for the improvement of response rates. This study compared and contrasted the key characteristics between Bivarus responders and those choosing to not respond to the survey. The key characteristics compared were age, gender, race, ethnicity, disposition status, and payor classification and we also compared response by e-mail versus smartphone. The intent was to determine if the sampled population could be considered descriptive of the overall population or whether there was a potential bias favoring those with access to and use of technology.

Discussion

The overall description of the data set showed an ample sampling of records (22,750 total records with 3,469 responders and 19,281 non-responders). The 15.25% response rate among the eligible responders was lower than previously considered from past reviews of the Bivarus data (8.8% paper-based response rate vs. 27.8% Bivarus response rate). This number compared to the actual ED visits during this time (35,125) showed that a sample of 64.77% of ED patients were being surveyed, representing a substantial sampling methodology. However the fact that only 9.87% of the eligible

patients actually responded is concerning. Although this number is an increase over the experience with paper-based survey methods, it is less than previously thought and not substantially different from previous paper-based methods. The decreased cost of surveying and better access to near real-time data are still valuable aspects to the Bivarus method. The response rate difference may relate to this particular sample given the difference with previous samples.

Age showed a statistically significant difference between responders and non-responders. Although there was a statistical difference in the mean age between the responder and non-responder grouping, the relatively small difference was not determined to be practically significant. Additional evaluation of responder's age was performed by the review of modeling probability as a function of age. This evaluation showed the effect of age was significant related to probability of response. Not surprisingly, responders age 20 and below were shown to be more likely to respond to the survey, but the greatest probability of response was actually the age group between 60 to 80. This result is different than expected - Zuidgeest (2011) and Brownlow (2013) showed less use by older adults - and may point to greater access, use, and comfort with technology in the older adult than shown by past studies.

Comparison by disposition status showed no substantial difference between responders and non-responders who had been admitted vs. discharged (16.16% vs. 15.42%, respectively). This outcome is somewhat different than previous opinions that admitted patients may be either too ill or too distracted to respond to a near–real-time survey and lends credence to surveys being performed closer to the date of service.

Gender distribution of the data set showed a greater number of female to male responders, which represented a statistically significant difference of females being more likely to respond to the Bivarus survey (16.3% vs. 14.01%, respectively; $p = 1.969 \times 10^{-6}$). This result would seem to point to progress as to gender access and use of technology than previously described by Schmidt (1997) and Yon (2000).

Race distribution showed a greater number and response by Caucasian and Asian patients (19.52% and 20.32%, respectively) as compared to African Americans (9.74%). Also, a review of ethnicity (Hispanic versus non-Hispanic) showed greater number (176 Hispanics vs. 2,422 non-Hispanic) and response rate (8.13% Hispanic vs. 15.08% non-Hispanic) by non-Hispanics. Statistical evaluation showed a relationship between race and ethnicity in the likelihood of responding. This result is similar to previous results noted by Broadwater-Hollifield (2014), where Hispanic groups could be under-represented by an electronic survey. The Bivarus survey is sent out in Spanish if non-English speaking and it is calibrated to a 5^{th} grade reading level but a question remains regarding literacy and its impact on response rates.

An evaluation by payor classification showed greater number and response rate by those with a commercial or Workers Comp payor source (15.83% and 22.08%, respectively). Response rate by Medicare recipients was stronger than expected (15.11%), once again showing fewer concerns with access to technology by the older adult. However the response rate by Medicaid recipients (8.91% response rate) and self-pay (8.69% response rate) could point to Broadwater-Hollifield's concern related to under-representation by lower socio-economic groups.

Finally, the evaluation of the method of notification showed that notification by both e-mail and text substantially improved response rates (cell 4.09%, e-mail 10.53%, both 28.05%). This outcome again shows the value of mixed-modal surveys and post-notification for improving responsiveness (Sheehan, 2001; Zuidgeest, 2011).

Conclusions

The goal of this study was to ascertain the appropriateness of using the Bivarus survey method as an accurate representation of the overall ED population. The specific research questions was how do responders to an electronic survey compare to non-responders in terms of key characteristics of age, gender, race, ethnicity, ED disposition, and payor classification? The null hypothesis is that no difference is present between responders and non-responders related to each characteristic.

In regards to these research questions, the evaluation of key characteristics (age, gender, race, ethnicity, ED disposition, and payor classification) showed no difference related to age and disposition, but differences related to gender, race, ethnicity, and payor classification. The null hypothesis was that no statistical difference is present between responders and non-responders. This evaluation rejected this null hypothesis thereby showing that a relationship is present except for age and disposition.

This study also intended to provide clarity on methods for improving ED patient satisfaction, the value and limitations related to electronic surveys, and methods for improving response rates. The patient satisfaction literature review revealed several thematic categories related to ED patient satisfaction (communication & teamwork, waits & throughput, and pain management) with communication and teamwork being the most commonly cited theme. These results suggest that interventions in the ED that focus on

communication to patients and effectiveness of the team may lead to improved patient satisfaction.

This study and the literature review showed correlation with previous studies related to electronic survey methodology. The previous experience with Bivarus as well as review of the literature seemed to show value related to electronic survey methods with decreased costs, faster responses, and increased response rates and comments (Janssen, 2007; Tse, 1998). However this study shows that questions remain related to representativeness and, therefore, the generalizability of results (Janssen, 2007; Yum & Trumbo, 2000) given the difference found with gender, race, ethnicity, and payor classification. The findings of this study showed that younger age groups, females, and those of greater socio-economic means are more likely to respond, potentially under-representing minorities and those of lower socio-economic groups. It is not known if these groups were equally under-represented by paper-based surveys. Users of ED patient satisfaction survey data should consider this aspect when interpreting results of any patient satisfaction survey. This study also showed that a mixed-mode notification has substantial impacts on response rates.

Limitations

As noted, the primary limitation of this study is access to data for other classifications of non-responders. Data from those who do not provide an e-mail or text contact at registration are not retained by the Bivarus system. Evaluating this group would provide a better evaluation of bias related to those without access to such technology. As mentioned, the absence of an equal baseline measurement from UNC's paper-based survey is an important limitation. An additional limitation is the single-site

nature of this analysis, because Bivarus is a company with limited customers. It is therefore difficult to consider broad acceptances of the results of this study until validated by comparison with other sites. Finally, it should be noted that there may be other factors influencing the results of these studies, but this study was limited by the availability of data.

Areas for Further Study

An important area for future research are other non-responder classifications, especially those without access to technology. This type of review would either require a change in the data retention policy by the Bivarus system or a prospective review and was therefore beyond the scope of this study.

The results of this study have shown that additional focus is needed on the evaluation of the results from minorities and lower socio-economic groups. Other methods have developed methods to account for non-response when deriving estimates from survey data by estimating the probability of response for each respondent. Traditional sampling makes use of the probability of inclusion in the sample as determined by the sampling design to weight each observation by the inverse of the probability. A similar approach to account for non-response could be to estimate the probability of response and weight each observation by the inverse of the probability. A future study focused on modeling the probability of response and calculating the associated non-response weights would benefit Bivarus when deriving insights from this data.

Another interesting area would be evaluating responders and non-responders according to triage level and comparing to disposition, which may show impact of actual

and perceived acuity. As mentioned, this Bivarus review is a single-site review. Because Bivarus is deployed more widely, comparison of the UNCH ED to other EDs would have value. Additionally, Bivarus is currently being deployed in other outpatient settings such as gastrointestinal and dermatology clinics at UNCH. Comparing the ED to the responders from other outpatient areas could be an interesting comparison. It would also be interesting to evaluate results from the pediatric population since survey completion is by parents or guardians.

Summary

This study and associated literature review has shown that multiple factors impact both low levels of satisfaction as well as the tactics to improve the patient experience. It has shown that interventions that focus on communication and teamwork may have the greatest value.

As to survey methodology, the two data collection techniques offer comparable results, but there are important differences at a more detailed level. Electronic surveying can represent a less costly method providing benefits of a greater response rate as well as more detailed information; however past research continues to point to concerns regarding a selection bias, especially among the older adult, less educated and lower socio-economic demographics, and some ethnic groups such as Hispanic groups. This study validates the concern of lower socio-economic and minorities being under-represented but showed that the use of technology by females and the older adult has increased.

Although the evidence is conflicting, numerous authors have shown that factors such as survey length and issue salience may impact response rates. The past response

rates noted by the briefer Bivarus survey would seem to validate this point of view, but the sample from this study draws this conclusion into question. Results from this study again showed the value of mixed-modal and post-notification efforts having a positive impact on survey response rates.

Although providing an optimal patient experience is an important outcome that can be financially beneficial to the hospital in the Value Based Purchasing (VBP) environment, viewing the patient experience as an aspect of quality and risk management may be the most valuable approach. This approach is the current area of emphasis by Bivarus. Such patient experience measures therefore also represent a different dimension of quality.

In conclusion, electronic surveys seem to offer a viable alternative to printed surveys because this method can be less costly, more easily deployed, provide faster responses, and potentially increase response rates. These benefits can lead to a more responsive system, especially for management of quality and risk. This study has shown greater than expected response by females and older adults and did not show any statistically significant difference when considering age and patient disposition.

Yet in contrast, concerns remain over potential representativeness and bias. This study showed a relationship between race, ethnicity, and payor classes and the likelihood of responding to the survey. This difference could lead to under-representation of these populations. Such results show that sampling and acquisition bias related to access and use of technology remains an important consideration. A broader evaluation of all non-responder categories and comparison across multiple sites should be an important focus for future research.

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