



Beyond HCAHPS: Analysis of patients' comments provides an expanded view of their hospital experiences

Andrew S. Gallan
Florida Atlantic University

Rakesh Niraj
Case Western Reserve University

Awanindra Singh
TheMathCompany

Follow this and additional works at: <https://pxjournal.org/journal>



Part of the [Business Analytics Commons](#), [Data Science Commons](#), [Marketing Commons](#), and the [Quality Improvement Commons](#)

Recommended Citation

Gallan AS, Niraj R, Singh A. Beyond HCAHPS: Analysis of patients' comments provides an expanded view of their hospital experiences. *Patient Experience Journal*. 2022; 9(1):159-168. doi: 10.35680/2372-0247.1641.

This Research is brought to you for free and open access by Patient Experience Journal. It has been accepted for inclusion in Patient Experience Journal by an authorized editor of Patient Experience Journal.

Beyond HCAHPS: Analysis of patients' comments provides an expanded view of their hospital experiences

Cover Page Footnote

We wish to thank our partner organization for providing their HCAHPS and vendor data for our analysis. This article is associated with the Policy & Measurement lens of The Beryl Institute Experience Framework (<https://www.theberylinstitute.org/ExperienceFramework>). You can access other resources related to this lens including additional PXJ articles here: http://bit.ly/PX_PolicyMeasure

Beyond HCAHPS: Analysis of patients' comments provides an expanded view of their hospital experiences

Andrew S. Gallan, *Florida Atlantic University, agallan@fau.edu*

Rakesh Niraj, *Case Western Reserve University, rkn10@case.edu*

Awanindra Singh, *TheMathCompany, aks172@case.edu*

Abstract

An important concern for health care professionals is that standardized patient surveys may not fully capture all the topics that are important to patients. As a result, health care professionals may not have a complete picture of what their patients experience. The purpose of this research is to utilize a state-of-the-art Natural Language Processing technique to make sense of patients' solicited, unstructured comments to gain a deeper and broader understanding of their experiences in the hospital. We analyzed a large dataset of inpatient survey responses (48,592 patients generating 65,998 comments) by a patient experience survey vendor for an eleven-hospital health care system in a large Midwest US city. Comments were first analyzed by Top2Vec algorithm in Python and more than 650 groupings of comments were then reduced into 20 sub-domains within 4 topic domains to better understand patient feedback on their hospital experience. We find distinct domains in the textual data that are not completely captured by survey domains. Furthermore, these domains match components of a hierarchical model of health service quality: interpersonal, technical, environmental, and administrative quality. Our findings broaden and deepen understanding of domains on standardized surveys. That is, completely new issues that are not measured in structured surveys are found in patient comments, and even when patient comments can be assigned to specific domains (e.g., nurse communication, discharge, etc.) found in standardized surveys, novel sub-topics provide a more nuanced understanding of patients' hospital experiences. Novel sub-topics found in patient comments include clinicians' diagnostic skill, compassionate care, team coordination, transfer processes, roommates, and others. Health care organizations should utilize state-of-the-art methods to mine insights from patient comments, and ensure they have processes, resources, and capabilities needed to translate insights into action.

Keywords

Patient experience, measurement, HCAHPS, healthcare, compassion, patient narratives

Introduction

An important concern for health care professionals and researchers alike is that standardized patient experience surveys (CAHPS and others) may not fully capture all the domains or topics that are important to patients.^{1,2} As a result, health care professionals may not have a complete picture of what their patients experience. Patient comments and narratives hold the potential to provide significant insights and impact decision-making for both patients and health care clinicians. However, analysis and dissemination of patient comments is inconsistent and may not be representative of common themes and domains.³ The power of systematically understanding and sharing patient comments is undeniable. One health care system has asserted "that incorporating insights [into quality improvement projects] from additional [unstructured] data will help build patient loyalty and provide more useful, seamless, and cost-efficient care."^{4, p. 25}

Some previous studies have shown that patients' comments hold the potential to broaden the domains of patient experience measurement, and thus expand our understanding of what is truly important to patients.² Patient narratives and comments can be so valuable that they have been proposed to replace survey items altogether.⁵ However, there are issues with data sources and methods utilized by previous research. This study is the first to evaluate a large dataset of solicited comments from overnight inpatients collected by a reliable instrument (HCAHPS and vendor survey) by using state-of-the-art analytic methods to obtain insights into topics that are important to patients that broaden and deepen understanding patients' experiences.

While previous research has predominantly utilized unsolicited feedback (e.g., online reviews), our solicited survey data presents some advantages: A known response rate, confirmation that patients were treated by a particular hospital and team of providers, and use of a psychometrically tested instrument that reduces biases.

Many previous studies have utilized data scraped from websites or social media because they are easier to obtain than proprietary data from a health care organization. Data obtained from surveys of known patients avoid some of the issues obtained by scraping comments from websites, including fragmentary content, the representation of less vocal respondents, and reputation manipulation and management.⁶

Studies that have used solicited data sources, including standardized (CAHPS) and vendor surveys, have proven useful in identifying issues that patients believe are important but are not captured in existing survey domains. However, they are predominantly focused on particular clinical settings (e.g., total knee replacement⁷). Additionally, many of the studies we found that use solicited data are from non-U.S. health care markets, limiting their utility in providing organizational and policy-related implications for American health care systems. To address these issues, this study utilizes a large dataset of HCAHPS plus vendor (Press Ganey) surveys, evaluated at the individual patient level, to explore whether there are patient experience topics identified in patients' comments that are not (fully) represented in HCAHPS or vendor survey domains.

The research question being addressed in this study is: Are there aspects of a health care experience that are important to patients but are not being collected in standardized surveys that can be identified by using state-of-the-art analytic techniques to analyze open-ended comments? The rationale for this research is to bring a state-of-the-art natural language processing (NLP) technique to discover latent semantic structures (domains) in a large collection of patient comments to gain a deeper and broader understanding of patients' experiences in the hospital. The decision focus for health care managers is how to (1) provide a more complete (beyond structured survey items) understanding of patient experiences in the hospital, which will (2) help better allocate scarce resources to improve patients' experience (PX), PX metrics, and associated financial implications.

This paper uses recently introduced Top2Vec algorithm, which belongs to the class of methods based on *distributed word representations*.⁸ The structure of patient comments appear to match the domains of an existing empirically-derived hierarchical model of health service quality,⁹ which we use as a foundation to explore results and interpret sub-topics that broaden and deepen appreciation for a hospital stay.

Empirical Research on Patient Comments

To grasp the contributions of previous research and to identify gaps in mining unstructured patient comments, the authors searched for relevant articles. Our search was extensive, but this was not a systematic review,^{e.g.,}¹⁰ as it

was not one of the objectives of the research. However, articles were identified through extensive literature searches on Google Scholar utilizing the following search terms: "Patient comments," "patient narratives," "cahps patient comments," and other related terms. We also employed a snowball technique that explored the references of relevant articles to discover additional pertinent publications, including the recent systematic review by Khanbhai et al.,¹¹ which had identified nineteen (19) articles that used NLP to evaluate unstructured patient text comments. This process resulted in a total of thirty-eight (38) peer-reviewed studies that have analyzed unstructured patient survey data to learn more about health care experiences ([see Table SM1 in supplementary material linked here.](#)) Articles are categorized by type of data (unsolicited/solicited) and then sorted by date of publication. Overall, Table SM1 shows that, while many previous studies have evaluated patients' comments to obtain a better view of their experiences, only one has utilized solicited data acquired by a validated instrument and method to explore patient perspectives of hospitalization.¹² While that study utilizes solicited data and acceptable techniques, its main limitation was that it did not uncover novel topics that expand knowledge of patient experiences in the hospital. It also appears that the data were from an outpatient setting; our study is of patients who have experienced hospitalization.

Methods

We analyzed a large dataset of in-patient survey responses collected by the largest patient experience survey vendor in the U.S. health care industry (Press Ganey) for an eleven-hospital health care system in a large Midwestern US city. IRB approval was obtained from the health care organization and the lead author's institution. Respondents were not identified in the dataset provided by the host institution, ensuring the anonymity and confidentiality of the data. Respondents include patients treated for a variety of conditions with no exclusions, who all spent at least one night in the hospital as an inpatient. The survey instrument includes Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) domains and items followed by vendor-specific items grouped by domain. Only the vendor-specific domains are followed by comment boxes that allow respondents to write free-form text responses following the survey items. See Table 1 for specific items by domain included in the vendor survey. Vendor items follow the HCAHPS survey which is mandated to be presented first. Click here to see the entire HCAHPS survey: <https://www.hcahpsonline.org/en/survey-instruments/>

Unstructured data analysis has been used to determine topical and sentiment information that outperforms coarse quantitative customer ratings.¹³ Textual data scraped from

Table 1. Vendor Survey Domains and Items

Domain	Survey Item	Scale
ADMISSION	Speed of admission process	Five Point Scale: Very Poor, Poor, Fair, Good, Very Good
	Courtesy of the person who admitted you	
ROOM	Pleasantness of room décor	
	Room cleanliness	
	Courtesy of the person who cleaned your room	
MEALS	Room temperature	
	Noise level in and around room	
	Temperature of the food (cold foods cold, hot foods hot)	
	Quality of the food	
NURSES	Courtesy of the person who served your food	
	Friendliness/courtesy of the nurses	
	Promptness in responding to the call button	
	Nurses' attitude toward your requests	
	Amount of attention paid to your special or personal needs	
TESTS AND TREATMENTS	How well the nurses kept you informed	
	Skill of the nurses	
	Waiting time for tests and treatments	
	Explanations about what would happen during tests or treatments	
VISITORS AND FAMILY	Courtesy of the person who took your blood	
	Courtesy of the person who started the IV	
PHYSICIAN	Accommodations and comfort for visitors	
	Staff attitude toward your visitors	
DISCHARGE	Time physician spent with you	
	Physicians' concern for your questions and worries	
	How well physician kept you informed	
	Friendliness/courtesy of physician	
PERSONAL ISSUES	Skill of physician	
	Extent to which you felt ready to be discharged	
	Speed of discharge process after you were told you could go home	
	Instructions given about how to care for yourself at home	
	Help arranging home care services (if needed)	
	Staff concern for your privacy	
	How well your pain was controlled	
OVERALL ASSESSMENT	Degree to which hospital staff addressed your emotional needs	
	Response to concern/complaints made during your stay	
	Staff effort to include you in decisions about your treatment	
QUALITY OF SERVICE	How well staff worked together to care for you	
	Likelihood of your recommending hospital to others	
	Overall rating of care given at hospital	
QUALITY OF SERVICE	How well did we meet your expectations for treating you with dignity and respect?	Three Options: Did Not Meet Expectations, Met Expectations, Exceeded Expectations
	How well did we meet your expectations for delivering service with a caring attitude?	
	How well did we meet your expectations for listening to your concerns and responding appropriately?	
QUALITY OF SERVICE	Did a nurse leader from your patient care unit visit you at bedside?	Yes or No
	Did you receive a follow-up phone call from a hospital representative after your visit?	

Table 2. Incidence of Patient Comments, Number of Words by Domain, and Descriptive Statistics

	Number of Patients	% of Total	Mean # of Words/Comment	S.D.
No comment	26,248	54.0%	N/A	N/A
One comment	7,497	15.4%	13.70	11.94
Two comments	5,025	10.3%	13.19	11.22
Three comments	3,232	6.7%	14.09	11.89
Four comments	2,141	4.4%	14.29	11.78
Five or more comments	4,449	9.2%	13.22	12.01
Total	48,592	100.0%		

a website and analyzed using Latent Dirichlet Allocation (LDA) produced results similar to quantitative ratings.¹⁴ Despite the popularity of LDA methods, from a class of models called probabilistic generative models, their weaknesses are well known and include requiring the number of topics to be known, custom stop-word lists and need for stemming and lemmatization.¹⁵ Further, these methods often utilize bag-of-words representation of documents and ignore the ordering and semantics of words. *Distributed representations* of documents and words can capture semantics of words and documents and are based on all words included in the documents in context, without needing stop-words, stemming or lemmatization. The Top2Vec method conceptualizes topics as vectors jointly embedded with document vectors and word vectors in the semantic space. Such methods have been found to be significantly more informative and representative than previous models.⁸

We analyzed data in a sequential manner. Transcribed comments were first analyzed by Top2Vec algorithm in Python. Six hundred and fifty-two (652) groupings of comments were initially identified. The Top2Vec algorithm does not require any substantial cleaning of the comments as it takes the entire document as words in context without requiring removal of stop-words or by transforming the words by applying lemmatization and stemming. Therefore, the need for initial processing was minimal. For all groupings, a group number, the closest words, and associated comment numbers were identified as the output of the Top2Vec processing. The research team then manually examined the closest words and original comments classified in those groupings into four topic domains and approximately twenty sub-domains to identify recurring, reinforcing, and novel sub-topics. Thus, we followed a combination of machine learning methods and manual processing. This process relies on the strength of both machine learning (ability to handle large number of documents) and human researchers (ability to understand semantic nuances) to get to the task at hand.

Results

The data included all returned surveys from patients discharged from eleven hospitals within a single health care system between January 2015 and December 2016, representing two years of data collection. The survey allowed for patients' item responses and comments on their experience with the hospital and treatment they received. The survey was sent to the entire population of patients who were discharged from this health care system during this timeframe. A total of 48,592 surveys were returned, for a response rate of 28%, in line with overall CAHPS response rates.¹⁶ The dataset includes 65,998 distinct comments describing experiences on ten different domains of hospital care, including admission, meals, test/treatment, hospital room, nurses, physicians, visitor/family, personal issues, discharge, and overall hospital experience. For incidence of patient comments, number of words by domain, and descriptive statistics on patients' comments, see Table 2.

We find that textual data exhibited a multifaceted structure, consistent with previous work with patient comments. The issues raised by these comments can be conveniently summarized in four distinct domains, or topic areas consistent with an empirically-established hierarchical model of service quality domains in health care.⁹ Furthermore, these issues are not completely captured by standardized survey domains. We did not find evidence of other domains or aspects of service quality in our data, suggesting that the model utilized to make sense of our findings is valid and largely complete. Analysis of data reveal a more fine-tuned understanding of these categories, as even when domains that are quantitatively assessed in HCAHPS and vendor surveys were identified in our dataset, the novel sub-domains we identify provide a more nuanced understanding of patients' experiences in the hospital. As a result, our findings broaden and deepen the domains currently measured on standardized surveys. See columns 5 and 6 of Table 3 for a representation of findings and patient quotes that exemplify the novel sub-topics identified in our analysis.

The four dimensions included in this sophisticated, empirically-tested model of service quality in health care are listed and defined below:

1. “Technical quality reflects the expertise, professionalism, and competency of a service provider in delivering a service.”⁹, p. 126
2. “Interpersonal quality reflects the relationship developed and the dyadic interplay that occurs between a service provider and a user.”⁹, p. 126
3. “Administrative service elements facilitate the production of the core service while adding value to a customer’s use of a service.”⁹, p. 126
4. Environmental quality “comprises a complex mix of environmental features.”⁹, p. 126 The physical environment creates a tangible context in which service interactions take place.

This framework captures some elements found in many other conceptualizations of service quality: Quality of technical aspects of care, compassion of staff, scheduling, and facilities,¹⁷ technical competence, interpersonal manner, and system issues,¹⁸ and interpersonal style, clinical expertise, and issues with the system.¹⁹ Thus, this model of service quality represents the dimensions of other models while expanding domains of service quality in health care. As a result, this service quality framework⁹ offers a very comprehensive view of service quality which allows for broadened and deeper insights into patient perspectives of their health care experiences. Additionally, this model of service quality provides managers with specific areas on which to focus their quality improvement efforts.

Technical Quality. The structured survey items do not attempt to collect much information regarding patient perceptions of health care providers’ technical quality. Only skill of the nurses and physicians are asked in the HCAHPS survey as single items (see Table 1). This is an important shortcoming of existing CAHPS and vendor surveys, as patients provide ample comments on their perceptions of clinicians’ skill levels. In our data, patients’ comments were found to be structured into the following sub-topics: diagnostic skill, perceptions of procedures, how quickly care was performed, and team coordination. These findings provide evidence that patients are observant of clinical aspects of hospital services. The topic of technical quality is not well represented in the structured HCAHPS survey. As a result, our findings deepen and broaden understanding of patient perceptions of technical (clinical) quality.

Interpersonal Quality. As hospitalization exposes a patient to various people serving in many different roles (physicians, nurses, allied staff, non-clinical staff, etc.), it is a service experience that has a high degree of interpersonal interactions. As a result, interpersonal quality is a significant driver of patient perceptions and overall ratings. However, existing structured survey items do not attempt to assess patients’ perceptions of compassionate care or honesty (see Table 1). In our data, the sub-topic that

dominated interpersonal manner was the patient perception of compassionate care. A second sub-topic that emerged was honesty. Thus, these sub-topics deepen our understanding of interpersonal service quality. They also represent issues that are able to be managed by hospital staff and that are important to patients.

Administrative Quality. Administrative service elements are required to fully provide a service and comprise elements that are familiar to patients. In standardized surveys, administrative quality is represented by the domains of admission, discharge, and some of the items in other sections (e.g., experience in the hospital, personal issues). In our data, in addition to these sub-topics related to admission and discharge processes, novel sub-topics of administrative quality also emerged viz. wait time, paperwork, visitor policies, payment processes, and transfer (from one facility to another) processes, which provided additional depth to understand patient perceptions of admission and discharge. These sub-topics are not measured by standardized survey items.

Environmental Quality. Standardized surveys assess several dimensions of environmental quality: cleanliness, noise, and food. Patient comments in our dataset provided both positive and negative feedback on these three topics, but also demonstrated additional sub-topics of room temperature, bed comfort and visitor comfort, facility and room design and condition, and issues with roommates. Thus, our findings broaden and deepen understanding of environmental quality by exposing issues that are not captured on standardized surveys.

Discussion

We conducted a systematic analysis of free text patient comments to address an important gap in extant literature. Utilizing solicited data from a valid source and using state-of-the-art text analytic techniques, we obtain a deeper and broadened view of patients’ experiences in the hospital as compared to those captured in current standard survey domains. Results were found to fall into four categories, which are represented by the four domains of a hierarchical model of service quality in health care.⁹ Thus, the contributions that this study makes are to deepen understanding of measured patient experience domains and identify novel domains of hospital inpatient experiences.

In some ways, the results presented here are consistent with previous studies, strengthening an argument for generalizability. However, most importantly, the results presented here broaden and deepen a view of the patient’s

Table 3. Domains Identified from Unstructured Patient Data Compared with Structured Survey Domains and Items

Service Quality Domains Emerging from Unstructured Data	Existing HCAHPS Domain	Existing Vendor Survey Domains & Items*	Topics Identified that Reinforce Domain Components	Topics Identified that Represent Novel Domain Components	Representative Patient Quotes
Technical Quality	No Domain; Pain Items	“Skill of the Nurses” and “Skill of Physician” Items; One Pain Item; Tests and Treatments; One item on teamwork	Skill; Tests, Treatments, Labs; Pain Relief	Quickness, Procedures, Team Coordination, Diagnostic Skill	“You have one nurse who is an expert on giving IVs.” “Dr. X is an excellent doctor - I trust his judgment and expertise completely.” “I delivered shortly after arriving at the hospital, and I was amazed how quickly [my nurse] set everything up and cared for me.” “Very poor coordination of information by Drs - my wife & I were told very little about tests, nothing about results & conflicting information.”
Interpersonal Quality	Nurses and Doctors	Nurses, Physician, Personal Issues, and Quality of Service Domains	Communication	Compassionate Care, Honesty	“The professional standards [the nursing staff] displayed as well as their compassionate care was exemplary.” “[The nursing staff] laughed and cried with me, giving me emotional support.” “The first doctor gave family false hope. Doctors need to be honest, and not provide false hope.”
Administrative Quality	Admission & Discharge	Admission & Discharge Domains	Admission; Discharge	Wait Time, Paperwork, Visitor Policy, Transfer Process, Payment Process	“Check out procedure coordination. Too much attention to corporate policy and not enough to patient wishes.” “The wait time for my [procedure] was way too long.” “[My nurse] made sure all paperwork was completed ahead of time so it was quick & easy once I got the all-clear from the doctors.” “I needed to be transferred to [Hospital B] for heart surgery - Thank goodness, I was transferred because [Hospital A] couldn't care for me.”
Environmental Quality	Hospital Environment Domain (Cleanliness and Quiet only)	Room & Meals Domains	Cleanliness; Noise (Alarms, Conversations); Meals	Room Temperature, Bed & Visitor Comfort, Facility and Room Design and Condition, Roommate	“West facing room. The temperature varied. Had to get several blankets. Remove or use, as room temp varied.” “Very nice couch for visitors. Rooms are beautiful and function well.” “Bathroom door was broken, would not close, window blinds broken, would not open or close, both things had to be repaired.” “My roommate had many visitors very often and were loud. Difficult to sleep. They were there often late at night.”

*Please see Table 1 for exact item wording and placement on the survey.

hospital experience. First, our results partially match an analysis of Yelp narratives which found support for quality of technical aspects of care, compassion of staff, scheduling, and facilities.¹⁷ These domains closely relate to our four quality dimensions, providing additional support for the accuracy and generalizability of our results. The results presented here are also consistent with three broad

topics that have been identified previously, namely technical competence, interpersonal manner, and system issues.¹⁸ Beyond these, our research produced nuanced understanding of the domains identified in previous research (see Table 3 for specific sub-topics). Importantly, our study confirmed and expanded the three domains

labelled in these studies yet detected an additional domain – environmental quality.

Findings related to each of the four domains pose interesting realizations and implications. For instance, it has been argued that technical quality can be difficult for patients to assess,²⁰ but analysis of our data shows that patients frequently comment on physician and nurse clinical skills. The sub-topics of technical quality that were discussed by patients included diagnostic skill, perceptions of procedures, how quickly care was performed, and team coordination. First, increasingly patients are being recognized as micro-experts in their condition, allowing them to gain better insights into clinical skill and quality.²¹ This may allow them to assess diagnostic skill. Conversely, patient narratives may conflict with clinicians' perspectives on diagnostic accuracy – either way, it is imperative for health care professionals to recognize that patients are commenting on this aspect of their experience. Second, team or care coordination is quite important to patients and health care providers alike, as it has been shown to reduce health care costs²² and improve patient experience.²³ Patient voices clearly are communicating that they observe and remember when care appears to be coordinated and when it does not.

Regarding interpersonal quality, two sub-topics emerged: compassionate care and honesty. Compassionate care in the delivery of health care has been an important area of academic inquiry as well as a significant area of interest for clinicians. As patient perceptions of compassionate care can be measured using established methods e.g.,²⁴ it is a topic that can be added to existing surveys without inventing new scales. Compassionate care is a skill that can be taught and advanced. There are many reputable and established programs designed to teach compassionate care, including Schwartz Center Rounds²⁵ and Press Ganey's Compassionate Connected Care.²⁶

Administrative quality is assessed by evaluating non-clinical activities. In our data, the topics that matched established survey domains were admission and discharge. Novel sub-topics of administrative quality that emerged are wait time, paperwork, visitor policies, payment processes, and transfer processes. There was some interaction among these topics, as wait time related to admission, discharge, as well as other service processes. While wait time has been shown to be an important issue in outpatient settings, little attention has been paid to patients' perceptions of waiting time while in the hospital. However, our research shows that patients are expressing levels of (dis)satisfaction with inpatient waiting time as well. Paperwork and processes (visitor, payment, and transfer) are aspects of a patient's experience that are necessary but can be managed. Each of these sub-topics are within the control of health care organizations and may

represent low-hanging fruit for improvement in patient experiences.

Elements of environmental quality that patients commented on that overlap with survey domains were cleanliness, noise, and food quality. Novel sub-topics include room temperature, bed and visitor comfort, facility and room design and condition, and issues with roommates. A systematic review of health services literature has shown that there is a positive association between the built environment and patient perceptions, satisfaction, and emotions.²⁷ Again, there are existing methods to measure users' perceptions of environmental quality in hospitals,²⁸ which can be included in patient experience surveys. Roommates in the hospital can have a profound effect on patient perceptions of their experience²⁹ and even their recovery.³⁰ This should encourage hospitals to assign roommates carefully, and to develop methods to best pair patients in a room together.

Like any research, ours has limitations. One such issue is that data were collected from one health care system. However, eleven hospitals with varying characteristics (rural/suburban/urban, number of beds, leadership styles) were represented alleviating this limitation to some extent. Future studies that obtain data from differing facilities and compare patients' comments according to hospital characteristics would be interesting. Second, our study did not account for changes over time – our data were aggregated and analyzed in a cross-sectional method. Future studies may assess the impact of a quality improvement effort over time, taking a longitudinal approach.

Practical Implications

As a result of our research, health care managers who face a decision point of how to allocate scarce resources to improve care design and delivery have significantly more and different information on which to base their decisions. The results strongly support two important implications for health care management to improve service quality. First, improving patient experience survey instruments and data collection is a nascent topic that is worth considering: "It is time for a comprehensive effort to modernize and democratize all surveys and related data used to assess patient experiences with care."³¹ This research provides empirical support for the recommendation that HCAHPS surveys should be re-evaluated, expanded, or re-designed to capture more fully what is important to patients when in the hospital. Evaluations of other standardized surveys (CG-CAHPS, Hospice and Home Health CAHPS, etc.) should be performed to explore whether the results found here apply across various health care contexts. This research provides support for the recommendation that HCAHPS surveys should be re-evaluated, expanded, or re-designed to capture more fully what is important to

patients when in the hospital. Consideration should be given to expand the domains of standardized surveys to include all topics that are important to patients.

Efforts should also be made to employ methods to increase the percent of patients who include comments on their surveys and the length and depth of their comments (telephone, IVR, email; survey wording and cover letter). Eliciting customer narratives and comments will be imperative in order to generate sufficient unstructured data to properly model customer perceptions and preferences. A current U.S. government-funded initiative is designed to include open-ended items on patient surveys.³¹ This effort was based on rigorous academic research that developed a valid instrument for eliciting patient narratives. An additional source of unstructured data are complaints and compliments.³² In health care, organizations must comply with regulations on how complaints are processed and addressed. These data may reveal important considerations for safety and care and quick analysis will make it easier for health care organizations to understand and prioritize patient comments and to monitor patient feedback on a continuous basis.³³

Second, patient narratives and comments can inform service providers how they might improve the design and delivery of services. “In a health policy environment that incentivizes attention to patient experience, rigorously elicited narratives hold substantial promise for improving quality in general.”³⁴, p. 177 Moreover, gauging performance by looking at quantitative ratings alone can create a myopic view of service quality issues.³⁵ Focusing on negative comments may provide more variance in understanding issues than positive comments.³³ Simply collecting unstructured data and making sense of it is necessary but insufficient to drive change. A good place to start is to develop or hire state-of-the-art methods that mine important insights from patient comments. This research provides a template for analyzing unstructured data in an efficient manner to generate managerially-relevant insights.

A health care organization must have processes, resources, and capabilities in place to translate insights into action. Issues that organizations face in properly utilizing unstructured data include data integrity, integrating such data into predictive models, and generating meaningful business intelligence.⁴ “Patient feedback is likely to be more influential if it is specific, collected through credible methods and contains narrative information.”³⁶, p. 173 Once insights have been mined from patient comments, strategies and tactics must be designed to facilitate improvements in service quality. We argue that the insights gained from our study can facilitate the creation of new metrics of PX that can be tracked over time. Improving these metrics should help improve overall PX scores since they are derived from patient comments and thus represent aspects of hospital experience that matter to

them. “Small measurable improvements in patient experience may be achieved over short projects. Sustaining more substantial change is likely to require organizational strategies, engaged leadership, cultural change, regular measurement and performance feedback and experience of interpreting and using survey data.”³⁷ Rapid feedback adoption can be achieved by utilizing an Engage, Support, and Promote (ESP) model, which identifies barriers to implementing improvement initiatives, engages individuals in better understanding patients’ experiences, and provides an opportunity to rapidly change processes and policies.³⁸

Conclusion

This research is the first to analyze a large dataset of solicited patient comments in a comprehensive and scientifically sound manner, with insights structured according to an empirically-derived model of service quality. As a result of the findings generated here, health care managers can better understand the breadth and depth of patient experiences in the hospital. The topics identified in this research are specific, actionable, and meaningful to improving care delivery, patient experience metrics, and associated financial implications (including Value Based Purchasing).³⁹ Implications of this research also include a call to re-evaluate the structure, content, and data collection methods of patient surveys to more fully represent the domains of importance to patients. Finally, health care organizations should consider systematically analyzing various sources of patient comments, from complaints, survey comments, letters, and other sources, to hear from as many patients as possible. In this way, health care organizations will be better able to recognize and address issues in care delivery.

References

1. Evans R, Berman S, Burlingame E, Fishkin S. It’s Time To Take Patient Experience Measurement And Reporting To A New Level: Next Steps For Modernizing And Democratizing National Patient Surveys. *Health Affairs Blog*. 2020; <https://www.healthaffairs.org/doi/10.1377/hblog20200309.359946/full/> (March 16, 2020)
2. Huppertz JW, Smith R. The Value of Patients’ Handwritten Comments on HCAHPS Surveys. *Journal of Healthcare Management*. 2014;59(1):31-47.
3. Agency for Healthcare Research and Quality. The Influence and Use of Individual Patient Comments. Accessed July 31, 2021, <https://www.ahrq.gov/talkingquality/measures/understand/patient-comments.html>
4. Kambies T, Mittal N, Roma P, Sharma KK. Dark Analytics: Illuminating Opportunities Hidden within Unstructured Data. In: Briggs B, ed. *Tech Trends 2017: The Kinetic Enterprise*. Deloitte University Press; 2017:21-33.

5. Alemi F, Jasper H. An Alternative to Satisfaction Surveys: Let the Patients Talk. *Quality Management in Healthcare*. 2014;23(1):10-19.
6. Schlesinger M, Grob R, Shaller D, et al. A Rigorous Approach to Large-Scale Elicitation and Analysis of Patient Narratives. *Medical Care Research and Review*. 2018;https://doi.org/10.1177/1077558718803859:1-20.
7. Bovonratwet P, Shen TS, Islam W, Ast MP, Haas SB, Su EP. Natural Language Processing of Patient-Experience Comments after Primary Total Knee Arthroplasty. *The Journal of Arthroplasty*. 2021;36(3):927-934.
8. Angelov D. Top2Vec: Distributed Representations of Topics. *eprint arXiv:200809470*. 2020;https://arxiv.org/pdf/2008.09470.pdf(August 2020):1-25.
9. Dagger TS, Sweeney JC, Johnson LW. A Hierarchical Model of Health Service Quality: Scale Development and Investigation of an Integrated Model. *Journal of Service Research*. 2007;10(2):123-142. doi:10.1177/1094670507309594
10. Doyle C, Lennox L, Bell D. A Systematic Review of Evidence on the Links between Patient Experience and Clinical Safety and Effectiveness. *BMJ Open*. 2013;3(1):e001570.
11. Khanbhai M, Anyadi P, Symons J, Flott K, Darzi A, Mayer E. Applying Natural Language Processing and Machine Learning Techniques to Patient Experience Feedback: A Systematic Review. *BMJ Health & Care Informatics*. Mar 2021;28(1)doi:10.1136/bmjhci-2020-100262
12. Doing-Harris K, Mowery DL, Daniels C, Chapman WW, Conway M. Understanding Patient Satisfaction with Received Healthcare Services: A Natural Language Processing Approach. *AMLA Annual Symposium Proceedings*. 2016;2016:524-533.
13. Ganu G, Kakodkar Y, Marian A. Improving the Quality of Predictions using Textual Information in Online User Reviews. *Information Systems*. 2013;38(1):1-15.
14. James TL, Villacis Calderon ED, Cook DF. Exploring Patient Perceptions of Healthcare Service Quality through Analysis of Unstructured Feedback. *Expert Systems with Applications*. 2017/04/01/ 2017;71:479-492. doi:https://doi.org/10.1016/j.eswa.2016.11.004
15. Yang K, Cai Y, Chen Z, Leung H-f, Lau R. Exploring Topic Discriminating Power of Words in Latent Dirichlet Allocation. *Proceedings of COLING 2016, the 26th International Conference on Computational Linguistics: Technical Papers*. 2016:2238-2247.
16. Heath S. HCAHPS Survey Non-Response Bias Impacts Scores, Practice Improvement. *Patient Engagement HIT*. 2019;https://patientengagementhit.com/news/hcahps-survey-non-response-bias-impacts-scores-practice-improvement(May 1, 2019)
17. Ranard BL, Werner RM, Antanavicius T, et al. Yelp Reviews of Hospital Care can Supplement and Inform Traditional Surveys of the Patient Experience of Care. *Health Affairs*. 2016;35(4):697-705.
18. López A, Detz A, Ratanawongsa N, Sarkar U. What Patients Say About Their Doctors Online: A Qualitative Content Analysis. *Journal of General Internal Medicine*. 2012/06/01 2012;27(6):685-692. doi:10.1007/s11606-011-1958-4
19. Espinel AG, Shah RK, Beach MC, Boss EF. What Parents Say about Their Child's Surgeon: Parent-Reported Experiences with Pediatric Surgical Physicians. *JAMA Otolaryngology-Head & Neck Surgery*. 2014;140(5):397-402.
20. Shaywitz D. Are Patients The Best Judge Of Physician Quality? *Fortune*. 2014;September 13, 2014(https://www.forbes.com/sites/davidshaywitz/2014/09/13/are-patients-the-best-judge-of-physician-quality/?sh=486ded1f6561)
21. Cordier J-F. The Expert Patient: Towards a Novel Definition. *European Respiratory Journal*. 2014;44(4):853-857.
22. Khullar D, Chokshi DA. Can Better Care Coordination Lower Health Care Costs? *JAMA Network Open*. 2018;1(7):e184295-e184295.
23. Mohr DC, Benzer JK, Vimalananda VG, et al. Organizational Coordination and Patient Experiences of Specialty Care Integration. *Journal of General Internal Medicine*. 2019;34(1):30-36.
24. Lown BA, Muncer SJ, Chadwick R. Can Compassionate Healthcare be Measured? The Schwartz Center Compassionate Care Scale™. *Patient Education and Counseling*. 2015;98(8):1005-1010.
25. Goodrich J. Supporting Hospital Staff to Provide Compassionate Care: Do Schwartz Center Rounds Work in English Hospitals? *Journal of the Royal Society of Medicine*. 2012;105(3):117-122.
26. Press Ganey. Compassionate Connected Care: A Care Model to Reduce Patient Suffering. *Press Ganey Performance Insights*. 2014;https://www.pressganey.com/docs/default-source/default-document-library/compassionate_connected_care.pdf:1-7.
27. Sag I, Zengul FD, Landry AY. Patient Perceptions of Servicescape in Healthcare: A Systematic Review of the Literature. *Journal of Healthcare Management*. 2018;63(2):94-104.
28. Andrade C, Lima ML, Fornara F, Bonaiuto M. Users' Views of Hospital Environmental Quality: Validation of the Perceived Hospital Environment Quality Indicators (PHEQIs). *Journal of Environmental Psychology*. 2012;32(2):97-111.
29. Yakusheva O. Health Spillovers among Hospital Patients: Evidence from Roommate Assignments. *American Journal of Health Economics*. 2017;3(1):76-107.
30. Lijia T, Rui-Xi Z, Long G, et al. Relationship between Patients in Hospital Affects Recovery from Total

- Knee Arthroplasty (TKA)—A Prospective Study. *Journal of Orthopaedic Science*. 2017;22(5):880-885.
31. Agency for Healthcare Research and Quality. *The CAHPS Patient Narrative Elicitation Protocol: A Scientific Approach to Collecting Comments on Experiences of Care*. 2017;5. <https://www.ahrq.gov/cahps/index.html>
 32. Yildiz Erduran G, Lorcü F. The Examination of Complaints About the Health Sector by Text Mining Analysis. *Proceedings of the International Symposium for Production Research 2018*. 2018:612-621.
 33. Guney S, Childers Z, Lee TH. Understanding Unhappy Patients Makes Hospitals Better for Everyone. *Harvard Business Review*. 2021;<https://hbr.org/2021/04/understanding-unhappy-patients-makes-hospitals-better-for-everyone>(April 2, 2021)
 34. Grob R, Schlesinger M, Barre LR, et al. What Words Convey: The Potential for Patient Narratives to Inform Quality Improvement. *The Milbank Quarterly*. 2019;97(1):176-227.
 35. Gallan AS, Girju M, Girju R. Perfect Ratings with Negative Comments: Learning from Contradictory Patient Survey Responses. *Patient Experience Journal*. 2017;4(3):15-28.
 36. Baines R, de Bere SR, Stevens S, et al. The Impact of Patient Feedback on the Medical Performance of Qualified Doctors: A Systematic Review. *BMC Medical Education*. 2018;18(1):173-185.
 37. Davies E, Shaller D, Edgman-Levitan S, et al. Evaluating the Use of a Modified CAHPS® Survey to Support Improvements in Patient-Centred Care: Lessons from a Quality Improvement Collaborative. *Health Expectations*. 2008;11(2):160-176.
 38. Baines R, Underwood F, O’Keeffe K, Saunders J, Jones RB. Implementing Online Patient Feedback in a ‘Special Measures’ Acute Hospital: A Case Study using Normalisation Process Theory. *Digital Health*. 2021;7:20552076211005962.
 39. Center for Medicare & Medicaid Services. The Hospital Value-Based Purchasing (VBP) Program. Accessed July 30, 2021, <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/HVBP/Hospital-Value-Based-Purchasing>