

An Alternative to Satisfaction Surveys: Let the Patients Talk

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We propose to replace the standardized 27-item hospital version of the Consumer Assessment of Healthcare Providers and Systems (CAHPS) survey with 1-item questionnaire that asks “What worked well and what needs improvement?” Sentiment analysis can take the responses to this single question and reconstruct a report on frequency of dissatisfied customers and reasons for dissatisfaction similar to reports received from longer surveys. This article shows, by way of an example, how benchmarked and quantitative reports can be generated from patients’ comments. The CAHPS survey asks more leading questions, is less granular in its feedback, has lower response rate, has costly repeated reminders, and may not be as timely as sentiment analysis of a single, open-ended question. This article also shows the implementation of the proposed approach in one critical access hospital and its affiliated clinic and calls for additional research to compare sentiment analysis and CAHPS satisfaction surveys.

The Centers for Medicare & Medicaid (CMS) may require hospitals and clinics to use the Consumer Assessment of Healthcare Providers and Systems (CAHPS) surveys or lose valuable reimbursement.¹ This is being done to meet the Affordable Care Act’s requirement for a standardized, validated, reliable tool for assessing performance of providers, a first step in pay-for-performance schemes.* CAHPS surveys are based on a rigorous, multistep process that included (a) public call for measures, (b) public input, (c) review of the relevant literature, (d) meetings with hospitals, consumers, and survey vendors, (e) large-scale pilot tests including tests of psychometric properties of the instrument, and (f) public reporting of findings in scientific journals.^{2,3} CAHPS surveys represent decades of research on assessment of patient satisfaction with care; as of December 2012, there were 305 articles in PubMed that referenced these surveys. CAHPS instruments are well-established, are reliable, address domains that are distinct, and are in widespread use. Despite these facts, one problem persists. CAHPS surveys are expensive to conduct,

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DOI: 10.1097/QMH.000000000000019

*See Center for Medicare and Medicaid description of Consumer Assessment of Healthcare Providers and Systems. <http://www.cms.gov/Research-Statistics-Data-and-Systems/Research/CAHPS/index.html>.

Key words: *Consumer Assessment of Healthcare Providers and Systems, satisfaction, sentiment analysis, standardization, questionnaire*

especially for small hospitals. Hospitals and clinics have complained about the cost of conducting these surveys, and the CMS has tried to reduce cost by shortening the survey. Originally, the survey was 66 questions long; later, this was reduced to 33 questions and currently to 27 questions.⁴ Of course, the shortest possible survey is 1 question long. In this article, we show how a single-question survey could replace CAHPS surveys.

The Minute survey asks a single question: "What worked well and what needs improvement?" Patients respond in free text. Sentiment analysis is used to classify these comments into complaint or praise.^{5,6} In sentiment analysis, patients' comments are classified on the basis of key word and linguistic and/or semantic analysis of the text.⁷⁻¹¹ Complaints could also be further classified into the categories suggested by CAHPS surveys, for example, communication with nurses, communication with doctors, and physical environment. The number of encounters till next complaint is used for a real-time quantitative measure of satisfaction with care.¹² For example, assume that a patient has made the following comment: "I don't understand why all the rooms in this hospital don't have their own bathroom attached! The paint is chipped and the temperature is uncontrollable in the corner rooms! Having patients sleep in cold is unacceptable." To classify this comment, sentiment analysis examines the frequency of words among a set of known complaints and praises. The words "don't understand why" and "unacceptable" may be used to classify this comment as a complaint if these phrases occur most often within complaints. The phrases in the comment can also be used to further classify the complaint into a particular type. The 5 phrases, (1) "rooms in this hospital," (2) "bathroom," (3) "corner room," (4) "paint is chipped," and (5) "temperature," may be used to indicate that this complaint is about the "physical environment." Each ward or location in the hospital can be benchmarked by using the rate of complaint associated with the location. For example, analysis may show that the hospital is receiving more frequent complaints about the physical environment in ward 3. Improvements can then be planned in this ward.

Once improvements have been put in place, the rate of complaints can be examined again to see whether the change has led to real and statistically significant improvements.

Note that in the classification of comments, words have multiple meanings. In the comment provided earlier, temperature is referring to a characteristic of a physical building. In other contexts, temperature may refer to fever. Accurate sentiment analysis requires an understanding of the context in which words or phrases have been used. There are numerous patents on how to conduct sentiment analysis. This article does not focus on the artificial intelligence procedures used in sentiment analysis. Instead, we show what can be learned through these methods and how these methods produce output that is similar to reports from CAHPS surveys.

We begin with an example of the application of sentiment analysis. We report on the implementation of this procedure within one small rural clinic and critical access hospital. This implementation included the hospital emergency department, the radiology department, the laboratory department, and the clinic. The article ends with a contrast between CAHPS and Minute surveys.

METHODS

Sources of comments

There are 2 types of patient comments: solicited and unsolicited. Solicited comments rely on a survey of patients and asking questions such as "What worked well and what needs improvement?" Others have asked, "What frustrated or disappointed you about your care or experience?" These single-question items solicit patient comments. Unsolicited comments do not involve surveys. Patients, who care enough about an issue, can send their comments to hospital registries or government agencies or post their comments on the Web. The unsolicited comments tend to attract individuals with strong feelings, as they have to go beyond their usual procedures to register their comment. In our implementation, we relied on solicited comments.

Several methods were used to solicit the comments. At the 4 locations, receptionists provided patients with comment cards. Patients could complete the card and drop it in a suggestion box or mail the card as a postcard. These comments were then transcribed into the computer. In addition, 3 kiosks were organized and put in strategic positions within the organization so that patients could directly enter their comments into the computer.

Classification of comments

Comments were classified into complaint or praise. The classification was done by first parsing comments into sentences and sentences into a set of words (a generic term that we use here to refer to English words, misspelled words, or abbreviated words). All propositions and some common short words were dropped from analysis. Let the phrase $W_1 \dots W_m$ show m words within comment A . The likelihood ratio associated with each phrase was calculated from the training data set, which at the time of this report contained 9760 known complaints or praises. We calculated the posterior odds (PO) of a comment being classified as a complaint using the following formula:

$$PO = \frac{p(W_1|C)}{p(W_1|N)} \frac{p(W_2|C, W_1)}{p(W_2|N, W_1)} \dots \frac{p(W_m|C, W_1, W_2, \dots, W_{m-1})}{p(W_m|N, W_1, W_2, \dots, W_{m-1})} \frac{p(C)}{p(N)} \quad i \in A$$

where W_i is the i^{th} word used in classification of the phrase in comment A . In this formula, C and N indicate complaints and praises in the training data set. The likelihood ratio associated with the first phrase was calculated as the prevalence of the word among complaints divided by the prevalence of the same word among praises. A word with a likelihood ratio more than 1 increased the odds of classifying the comment into a complaint. The likelihood ratio of the next word was calculated in the same fashion, but now complaints and praises were restricted to comments that contain all words that have been used in the prediction task so far. In this fashion, the im-

pact of each phrase on the predictions was based on prior words examined. Since the order of examining various words mattered, the key in having accurate predictions was judicious use of the next word to include in the analysis. One approach for selecting an appropriate order for processing the words is to first use words associated with largest likelihood ratio.¹³ Another approach, one used here, is to first use phrases of longest length that repeat at least k times and have a statistically significant likelihood ratio.*

Despite best efforts, computer may err in classifying some comments. In these occasions, the manager reviewing the comments can ask for a reclassification. If a reclassification is requested, as well as for a random set of comments, a human reviewer examines the comments and corrects the errors in computer classification of the comment.

The procedures used for classification of comments into complaints were repeated to further classify complaints into 8 broad categories: (1) getting in to be seen, (2) wait time, (3) physician related, (4) nursing related, (5) staff related, (6) cost-of-care issues, (7) facility issues, and (8) privacy-related complaints. These categories were obtained from the organization of CAHPS surveys.

Describing change over time

To describe rate of satisfaction, encounters over time were combined together and a rate of satisfaction was calculated using the following formula:

$$\% \text{ Complaints}_j = \frac{\text{Number of complaints in time period } j}{\text{Number of comments in time period } j}$$

It is logical that the rate of positive comments should be related to the rate of satisfaction. For example, Santuzzi and colleagues¹⁴ found that

*For additional details, see provisional application no. 61/58255, filed January 3, 2012. Alemi F. Sentiment analysis through context dependent probability models, 2013.

patients with positive comments had higher satisfaction scores than patients with negative comments. Others have also found a similar relationship between the rate of positive comments and satisfaction with service.^{15,16}

Testing of significant improvement

We used time-between control charts to assess the time-between dissatisfied clients.¹⁷ The frequency of satisfaction was examined in the last n comments. If complaints were common, then the test statistic was calculated as the number of consecutive satisfied patients. Otherwise, it was calculated as the number of consecutive dissatisfied patients.

Real-time reports

Calculations of rates of complaints require organizations to wait till a fixed number of encounters have occurred. Center for Medicare and Medicaid requires survey of a large set of patients before the rate is judged to be accurate. In contrast, we reevaluated the rate of satisfaction after each comment. An alert was sent in real time to the clinic and hospital managers if the number of consecutive complaints for last comment exceeded historical patterns. A computer analyzed the data and automatically wrote the text in the report and displayed the appropriate charts and figures. As a consequence of these changes in data collection and reporting, the managers could understand satisfaction within their unit in real time.

RESULTS

To give the reader a sense of the granularity of feedback received from comments, we list 5 recent comments for each location and how the sentiment analysis classified each comment:

Radiology

1. *Praise:* Always pleasant.
2. *Praise:* Registration within 15 minutes. Was seen within 10 to 20 minutes. Professional,

courteous informative. Laboratory technician X was super prompt and polite.

3. *Praise:* Everything seems to me to go smoother.
4. *Praise:* Everything is fine.
5. *Praise:* Easy to access services once I called the general phone number instead of radiology. Quick and professional and as always courteous.

Laboratory

1. *Complaint:* Registration worked well because X was friendly and knew what she was doing. Despite that, the registration desk/reception desk is a source of frustration for both patient and hospital employee in that the responsibility for answering incoming phone calls and transferring them to the appropriate department or person interferes with the registration process. X was interrupted by incoming calls at least 10 times while she was registering me for my weekly standing order laboratory draw. Some of these calls, by their nature, were more complicated than just answering and transferring calls. This conflict between patients sitting in front of you at your desk and patients calling in is unfair to all. The telephone reception duties should be handled by back office personnel—those without face-to-face patient contact. X was unable to concentrate undivided attention to me and was also unable to concentrate her undivided attention to callers. This is a setup for inefficiency and dissatisfaction. Besides all of this, she has an incredible paperwork load.
2. *Praise:* X was efficient and very professional. No need for improvement.
3. *Complaint:* Needed annual physical. Dr X was great. X in taking blood, fun blood test, did a great job. I see that this clinic had a very high turnover. All employees look like who is going to be let go next. When you get a blood test, three 8 × 11 forms are sent to the laboratory. One of these forms contains all the personal information on yourself, wife, person to contact, etc. I am wondering whether I shouldn't see my

attorney about my privacy being all over the clinic last time myself and my wife got a blood test?

4. *Praise:* Fast, efficient. Highly competent, friendly. A great experience.
5. *Praise:* Staff is friendly and knowledgeable. A good experience overall. Laboratory was very gentle with blood draw, much better than the hospital up north.

Emergency department

1. *Praise:* Everyone was very kind in my painful time of need.
2. *Complaint:* I came in with my husband and the nurse was rude and short. I felt like I was treated like a second-class citizen.
3. *Complaint:* Too slow. Should have a backup. People get pissed off.
4. *Complaint:* X had a negative attitude and was not professional.
5. *Praise:* Good response from emergency department.

Clinic

1. *Praise:* Everything and everyone worked efficiently. Thank you.
2. *Praise:* Always pleasant.
3. *Complaint:* This doctor insulted me and didn't chart or care about my case. Called me an addict and liar, even though I don't often come in.
4. *Complaint:* Needed annual physical. Dr X was great. X in taking blood, fun blood test, did a great job. I see that this clinic had a very high turnover. All employees look like who is going to be let go next. When you get a blood test, three 8×11 forms are sent to the laboratory. One of these forms contains all the personal information on yourself, wife, person to contact, etc. I am wondering whether I shouldn't see my attorney about my privacy being all over the clinic last time myself and my wife got a blood test?
5. *Praise:* X gave me a thorough annual examination. All went well.

As these comments show, there are considerable variations among what patients are concerned about. Each comment is informative in its own right. Managers should read them as they become available. Over time, however, it is difficult to understand patterns among comments. The following quantitative analysis was used to guide managers to better understand patterns across comments.

Figure 1 displays the change in rate of positive comments at 4 locations within the organization. The rate of positive comments was the highest in radiology (100%) and lowest in the emergency department (74%). The laboratory and the clinic had a rate of 83% positive comments. Figure 1 also shows changes in the rate of positive comments over time. Note that all locations improved their rate (radiology was at 100% and stayed there). In the laboratory, this improvement was achieved through more comments and higher percentage of the comments being positive. In the emergency department and in the clinic, this was achieved through lowering the number of complaints. The rate of positive comments across these locations can be compared with each other despite the fact that patients at some locations had more comments submitted than other locations.

The statistical significance of findings can be assessed by constructing time between charts. Figure 2 shows the number of consecutive complaints in all 4 locations. The control limit for each location is shown by the straight line. This limit is derived from the historical rate of complaints. When the number of consecutive complaints exceeds the control limit, then managers are alerted by an e-mail. This provides a real-time notification of changes in satisfaction levels. For example, there were 3 consecutive complaints in the emergency department in visits 19, 20, and 21. At visit 21, the number of consecutive complaints exceeded the historical control limit. At this point, managers of the emergency department received an automated alert. Note that there were 5 occasions in which the clinic managers and 1 occasion in which the laboratory managers received an alert.

The analysis also provides a comparison of types of complaints received. Figure 3, for example, compares the rate of complaints within each category

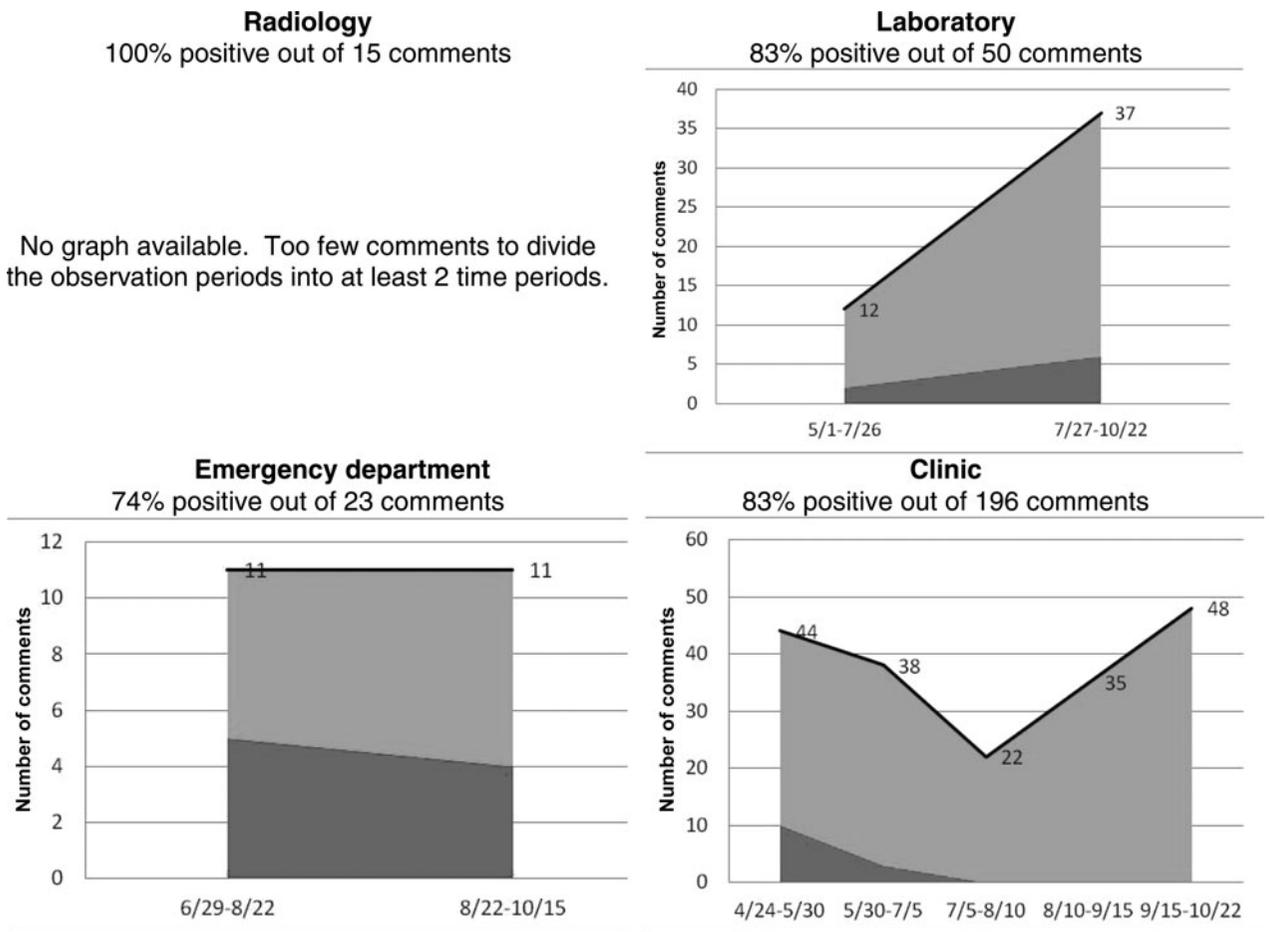


Figure 1. Rate of positive comments at 4 locations. Dark shaded area shows complaints, grey area shows praises.

with the unit with a closest overall score. The Y axis shows the daily rate of complaints. The X axis shows various types of complaints. Note that comparison of the clinic and the laboratory reveals that the laboratory is more likely to receive nursing-related and wait time complaints; the clinic is more likely to receive staff-related, getting to be seen, cost, facility, and physician-related complaints. Comparison of clinic and emergency department reveals that the emergency department is more likely to receive complaints about getting to be seen, nursing-related, staff-related, cost, and facility issues; the clinic is more likely to receive wait time complaints. Neither one differs much in privacy-related complaints. The classification of complaints attracts managers' atten-

tion to the need for improvement in specific areas. Like longer CAHPS surveys, the responses to our single-question survey were analyzed to attribute complaints to specific categories.

DISCUSSION

By way of an example, we have shown that it is possible to solicit comments from patients and to analyze these comments to determine needed improvements. The data presented show that in 3 locations, the rate of complaints declined after the use of sentiment analysis. Data also showed that the text of comments could easily be turned into quantitative

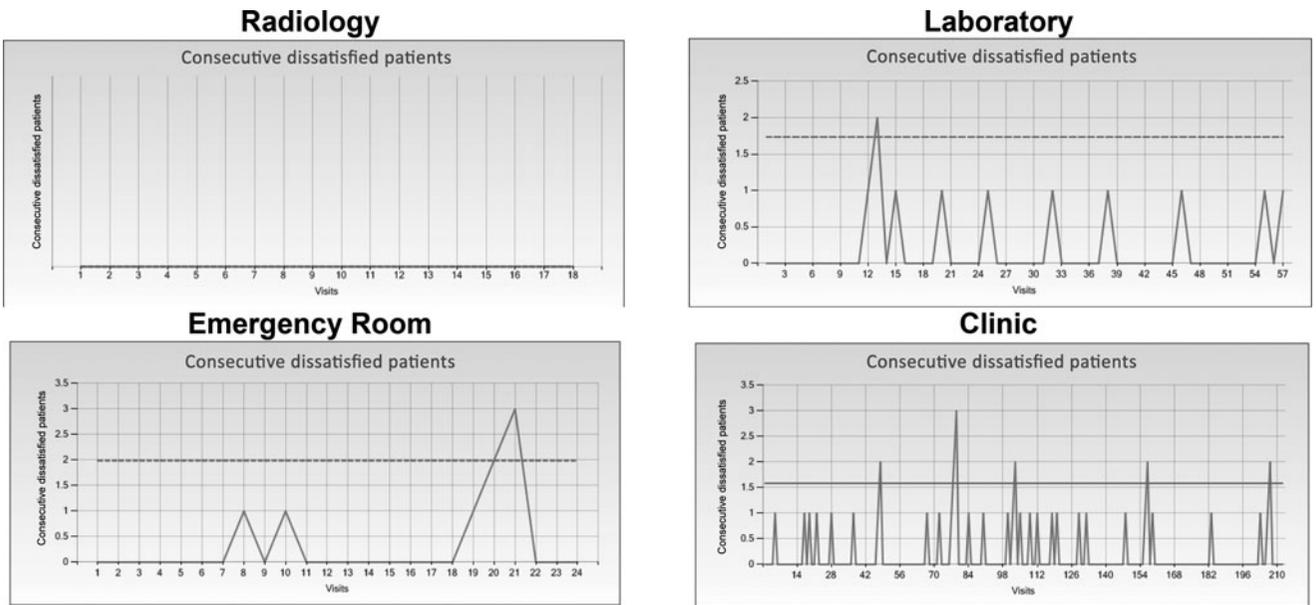


Figure 2. Time between control charts.

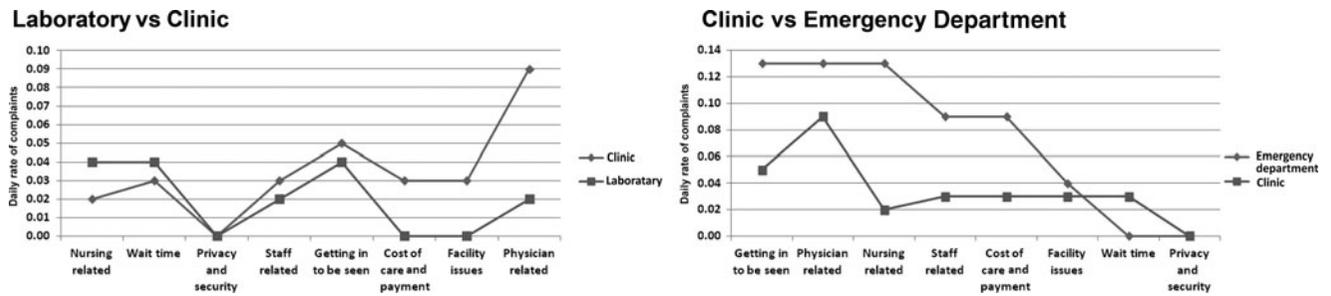


Figure 3. Comparative benchmarks.

reports that attribute complaints to specific professions or operations. A manager using sentiment analysis could have benchmarked reports similar to what is typically provided after longer CAHPS surveys. In addition, this manager would have a far more detailed and granular report listing the specific comments in the voice and words of the customer.

It is important to compare our approach with CAHPS surveys, which like sentiment analysis attempt to measure and improve satisfaction but use entirely different procedures. In CAHPS surveys, the patient is asked to respond to the question “Using any number from 0 to 10, where 0 is the worst hos-

pital possible and 10 is the best hospital possible, what number would you use to rate this hospital?” Patients are also asked 26 other questions so that specific causes of dissatisfaction can be identified. In contrast, in Minute survey and associated sentiment analysis, one asks one question from the patient: “What worked well and what needs improvement?” Sentiment analysis classifies the responses to correspond to same categories of drivers of dissatisfaction as those listed in CAHPS surveys. Time to complaint and the rate of complaints can be used to calculate various benchmarks. Despite the fact that one relies on the text and the other on rating, both

CAHPS surveys and sentiment analysis provide similar reports. Both approaches calculate the rate of satisfaction: CAHPS surveys count the percentage of responses that are negative, so does sentiment analysis.

CAHPS surveys require hospital to solicit response from 300 patients for most categories of patients (100 for smaller critical access hospitals). Patients are sampled over the course of a year, and reports are available at end of the year. Nonrespondents are required to receive 4 reminders, typically by additional mailing and phone calls. In contrast, Minute survey is short enough that it is possible to solicit responses from all patients—if that is desired. No reminders are sent to nonresponders. A recent pilot study showed that the response rate to Minute survey at exit was 75%, which is higher than the response rate to CAHPS surveys, even when patients are given reminder to respond.¹⁸ By keeping the number of questions asked to the lowest possible and by soliciting the feedback quickly after the visit, Minute survey increases the response rate, reduces the need for reminders, and lowers cost of the survey.

The resampling and recontacting of patients not only cost money but also delay the response. CAHPS surveys are conducted several weeks after the initial visit and are not specific to any visit. Patients are asked to think back and speak to their general experiences. Minute survey can be conducted after each visit. No sampling is needed and therefore the survey could occur immediately when the patient has most vivid memories of their experiences. The longer one waits for assessing patient satisfaction, the less satisfied the patient.¹⁹ The need to recontact nonresponders may improve response to CAHPS surveys, but the associated delay introduces new bias.

CAHPS surveys were designed to enable comparison across provider units. Therefore, the question for each domain, the procedure for data collection, and the possible answers are all standardized. In contrast, Minute survey asks the same question for all domains and allows any response, but it classifies the responses to the same categories as CAHPS surveys. Sentiment analysis classifies the comments into similar categories as CAHPS surveys. In essence, it allows the comparisons without standardization of answers.

Psychometric properties of this classification procedure is not known and is one area where additional research is needed.

The type of information and the granularity of information provided by sentiment analysis may be superior to the structured data collected through CAHPS surveys. Questions in the CAHPS surveys are leading questions and may bias the response. Surveys that ask about specific areas of performance may change what respondents attribute their dissatisfaction to. For example, asking a question about nursing may bias patients to attribute their frustration during the visit to the nurse, although they were uncomfortable because of the temperature in the room. In contrast, sentiment analysis does not ask a leading question. Patients can talk about anything they wish. The fact that the patients select to talk about one or another aspect is what makes the survey informative. If patients talk about parking, a question not asked in CAHPS surveys, then this is what is important; this is what is frustrating the patients. Sentiment analysis provides more flexibility and fewer leading questions than CAHPS surveys.

Need for standardization

The CMS regulations require CAHPS surveys. The claim is sometimes made that government agencies and the public need standard data collection to compare performance of providers. The argument is that if everyone did his or her own survey, then no one would have comparable data. This desire to standardize the process has led the CMS to exclude the use of any other data collection method such as sentiment analysis. The CMS has also excluded the use of e-mails on grounds that not everyone has access to e-mail and responses may be biased. All of these policies have been made in the name of standardization. But the claim is fundamentally flawed standardization does not require that we all use the same survey or the same method of data collection. It only requires that scores from one survey or one method of data collection should be translatable to scores from another survey using a different method. This is likely to be the case.

Preliminary data show that sentiment analysis and hospital CAHPS surveys are highly correlated.¹⁴ A recent report showed that 10 hospitals' overall CAHPS scores had a correlation of 0.74, with the average sentiment analysis scores for the same hospitals during the same time period (correlation calculated from a graph provided in Siegrist and Madden²⁰). A sample of 10 hospitals is not a conclusive sample. Nevertheless, these pilot data suggest that sentiment analysis and CAHPS surveys may be interchangeable scores. Additional research is needed to explore the overlap of these methods. The CMS and other organizations that need standardized scores may be able to take both types of data.

One argument for standardization is that providers should not be able to manipulate the reported satisfaction levels. CAHPS surveys prevent manipulation by stipulating how the survey should be conducted (who does what, when, and where). In this article, we have provided an entirely different method of conducting satisfaction surveys that does not follow the procedures for CAHPS surveys. Nevertheless, our approach also provides a way of reducing provider manipulation of findings. There are many ways to reduce provider manipulation.

This article has relied on solicited comments, but complaints are also available through hospital registries, government agencies (eg, Department of Health and Human Services), various media, and through the Web.²¹⁻²⁵ If we rely on unsolicited comments, then there is no data collection cost. Providers are less able to manipulate unsolicited data (eg, complaints to government agencies). In contrast, providers may be able to reduce complaints to hospital registries by making it difficult to submit such complaints. It might be necessary for the CMS to stipulate the operation of hospital registries. The point is that both Minute and CAHPS surveys can be organized in ways that reduce provider manipulation of the results.

Research direction

This article argues that the CMS should explore sentiment analysis as an alternative to CAHPS sur-

veys. We hypothesize that CAHPS surveys ask more leading questions, are less granular in their feedback, may have lower response rate, may cost more because of repeated reminders, may delay patient responses, and may produce the same or lower level of insights as Minute survey. Pilot data support our hypothesis. The idea that data from Minute survey could replace or augment CAHPS surveys requires a great deal of examination and study, including:

- Clear data collection procedures are needed for Minute survey. Standardized methods are needed to specify who collects data from whom and when. These procedures should reduce data collection costs and burden.
- A comparison of results, maybe comparing CAHPS composite measure results with the results from Minute survey, is needed. We have hypothesized that Minute survey could perform better than CAHPS surveys. Data are needed to test this hypothesis.
- It could be informative to see whether issues that are flagged in CAHPS surveys also show up in Minute survey, plus are there issues CAHPS surveys never report that show up in Minute survey.
- It is important to estimate whether and by how many weeks would Minute survey results be available sooner. The effect of the delay in data on patients' satisfaction and on managers' use of the data needs to be documented.

In the end, we need to know whether Minute survey is more likely to lead to improvements than current CAHPS surveys. If data on comparisons of these 2 methods were available, it would allay concern about inflexible regulations preventing innovations in assessing patient experiences.

CONCLUSIONS

CAHPS surveys require patients to fit their responses into preset questions. Minute survey asks patients to talk freely, in any way they wish. These are 2 different approaches to the same results. Different means to the same end. They should be compared. It is important to understand the relative

advantages of each approach. One thing is for sure, comments are expressed in the consumer's true voice whereas structured CAHPS surveys fit these views into preset expectations. If the consumer voice needs to be heard, then the best way forward is to let the patient talk.

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