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Elizabeth Spaargaren MS, MPH, CPXP
Ann & Robert H. Lurie Children's Hospital of Chicago

Abigail Kozak MBA, CPXP
Ann & Robert H. Lurie Children's Hospital of Chicago

Cara Herbener CPXP
Ann & Robert H. Lurie Children's Hospital of Chicago

Barbara Lawlor Burke MA, CPXP
Ann & Robert H. Lurie Children's Hospital of Chicago

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Cover Page Footnote

A wide range of disciplines were needed to create this positive change in the accuracy of our patient experience surveys. We thank our Advanced Practice Providers for asking thought-provoking questions to begin our search for improvement. We thank our patient families for taking the time to share their experience on our surveys. Finally, we thank our institution for promoting continued improvement and striving towards excellence. This article is associated with the Innovation & Technology 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_InnovTech

Improving the accuracy of Interactive Voice Response (IVR) Technology for pediatric experience scores

Elizabeth Spaargaren MS, MPH, CPXP, *Ann & Robert H. Lurie Children's Hospital of Chicago*,
easpaargaren@gmail.com

Abigail Kozak, MBA, CPXP, *Ann & Robert H. Lurie Children's Hospital of Chicago*, *abymkozak@gmail.com*

Cara Herbener, CPXP, *Ann & Robert H. Lurie Children's Hospital of Chicago*, *cherbener@luriechildrens.org*

Barbara Lawlor Burke, MA, CPXP, *Ann & Robert H. Lurie Children's Hospital of Chicago*, *bburke@luriechildrens.org*

Abstract

The increased use of interactive voice response (IVR) in assessing patient and family experience should be paired with evidence-based practices on how to obtain the most accurate information via this survey mode. We added a brief clarification sentence of the survey scale at the start of the IVR call to improve our experience data both qualitatively and quantitatively. Our setting was an urban pediatric hospital. We gathered lived experiences from our patients, families, and providers to understand and design a change to the IVR survey mode that would reduce survey inaccuracies. Outcome measures were assessed by baseline measurement and post-intervention statistical analysis. Outcome measures were the percent of family comments related to survey errors and the discrepancy in scores for the first question of the survey between the two survey modes, IVR and email. One Plan-Do-Study-Act (PDSA) cycle was used to improve the accuracy of the IVR survey mode. The family survey comments expressing errors made on the first question of the IVR survey were reduced by 92% from a 2.5% (N=3,344 comments) error rate to a 0.2% (N=3,373) error rate. The discrepancy between the first question scores for IVR vs. email reduced by an average of 76.8% change (17.4 vs. 3.8) over a 20-month study period. Our initiative exceeded our goal by statistically significantly reducing the percent of comments expressing errors and the gap in survey mode first question scores.

Keywords

Patient experience, patient family experience, measurement, qualitative data, quantitative data, interactive voice response, IVR, survey mode, phone call, pediatrics, quality improvement

Introduction

Evidence-based improvement in the patient experience relies foremost on the collection of data from the patient experience. Collection of such data has been performed through a variety of methods in the 20th century, but the growth of technology in the past decades has led to an overwhelming amount of data collection via email and telephone.^{1,2} One such example of telephone surveys is, interactive voice response (IVR), which has become a critical component in eliciting patient experience. Patients and families with recent encounters in healthcare settings receive a survey via phone, which they can provide responses and feedback both verbally and numerically. These IVR surveys make use of the wide access to telecommunication devices and allow for direct extrapolation of data into computer-based technologies.³

However, the increased use of IVR phone calls to capture patient and family experience in practice has not seen an equal rise of studies reviewing this relatively new methodology in the patient experience literature. Although

there is some research describing the benefits of IVR as increasing response rate from the millennial population, there is little known for evidence-based practices in maximizing the accuracy of the survey mode.⁴ For instance, one recent behavioral health survey utilizing IVR to collect data points from subjects, found that 58% reported difficulty utilizing the technology.⁵

As this survey mode is still relatively novel in the patient and family experience field, there are still necessary standards for accuracy to be discovered.² IVR surveys can improve the access of patients to healthcare institutions, and importantly IVR has been shown in a few studies to improve overall survey accuracy.^{6,7} Alternatively, in other recent studies on IVR, when compared to more traditional survey collection methods, such as in person surveys or surveys distributed via electronic mail, may be less accurate.⁸ In addition, IVR surveys can be influenced by gender and socioeconomic status.⁵

In our institution, the IVR mode is the most used survey method, yielding 72.6% (N=45,580) of all patient and

family responses in the 2019 Fiscal Year. As patient and family experience data continues to inspire and drive health care quality improvement and research, it is paramount that the experience data collected is accurate.⁹⁻¹² Inaccurate patient and family experience data could lead to ineffective improvement initiatives and a lack of trust in patient-centered efforts.

Efforts to improve the validity of survey scales have taught us to pretest and review the results of surveys to ensure accuracy.^{13,14} However, this preliminary review and analysis struggles to provide discrete steps to improve IVR accuracy. Corporate survey vendors often provide a guide when implementing a new survey mode, but ongoing review and analysis for troubleshooting and improvement are often necessary as surveys are distributed to a real-life population.

If families are confused by the IVR survey scale leading them to press the wrong number for the first response and if the IVR first survey question score is significantly different from email, then implementation of a clear scale clarification sentence before the first survey question on the IVR survey mode will improve the accuracy of the IVR patient and family experience data. Our intervention was to create a one sentence description of the survey scale that would be inserted right before the questions started on the IVR survey mode. We hypothesized we could study this intervention and see if it was associated with fewer error-related family comments and smaller discrepancies in scores related to IVR vs. email.

Methods

This work was reviewed and determined to be a quality improvement project, exempt from oversight of human subjects search by the Institutional Review Board (IRB) (IRB # 2021-4380).

Context

Our institution is an urban, free-standing 364-bed pediatric academic tertiary-care center that receives around 45,000 patient and family experience survey responses annually. We employ two diverse modes to collect these responses: email and IVR phone calls. We use the mixed-mode approach to maximize our response rate.^{15,16} Both survey modes are weighted equally when analyzing patient and family experience data, so the discrepancy between the two survey mode results are expected to be minimal.

The surveys are sent for visits from four main areas of the hospital: Inpatient, Emergency Department, Ambulatory and Outpatient Procedural Services. Surveys are first sent via email to the family in the evening after their visit or discharge from the hospital. If the family does not have an email on file or if the family has not filled out the emailed survey within forty-eight hours, the family will receive a

phone call that allows them to complete the survey through IVR.

Interactive voice response (IVR) is defined by IBM as “an automated telephone system that combines pre-recorded messages or text-to-speech technology with a dual-tone multi-frequency (DTMF) interface to engage callers, allowing them to provide and access information without a live agent.”¹⁷ IVR technology reached its peak in the early 1980’s and is most recognizable in the automation of call centers today.¹⁸ IVR technology is used in industries such as customer service, education, finance, and healthcare.¹⁷ In healthcare, IVR technology is applied widely for clinical and non-clinical purposes. Examples of this include medication compliance, chronic disease management, substance abuse treatment, research, scheduling operations and patient experience.^{2, 18-21} The IVR patient experience survey mode is an automated system that prompts the user to answer from the prerecorded questions and responses by using the phone keypad throughout the call.²² There is a 60-second introduction when filling out the survey via IVR that explains the goals of the survey.

The most frequent scale used in the survey is a four-point Likert scale with responses of “No” – “Yes, somewhat” – “Yes, mostly” – and “Yes, definitely” with the IVR keypad responses of 1, 2, 3, and 4 respectively. The first survey questions are always on this four-point scale and ask, “Did nurses treat your child with courtesy and respect?” for the Inpatient, Emergency Department and Outpatient Procedural Services areas and “Did this provider treat your child with courtesy and respect?” for the Ambulatory survey areas. Two questions on the survey ask the “Overall Rate” and if the family “Would Recommend” the hospital. These two survey questions have an 11-point scale ranging from 0 being the worst score and 10 being the best score. The different survey scales are described after each question with the numbers that correspond to each response. The final question of every survey is the open-ended question of “What else would you like to say about your experience?” This last question allows the families to share a comment about any topic.

Patient and family experience data is analyzed and used for transparency, recognition, and the generation of ideas for improvement. The hospital’s Patient-Family Experience Team is responsible for facilitating these efforts and consists of one lead parent coordinator, two internal consultants, one director and one senior director. The Patient-Family Experience Team distributes monthly data reports throughout the hospital, coordinates patient- and family-centered improvement initiatives, and organizes data needed for hospital compliance (i.e., The Joint Commission, CMS Grievances) and various designations (i.e. Magnet, US News & World Report). The team originally used post-discharge mailed surveys with more than 80 questions to collect patient and family experience

but chose to modernize their process to emailed and IVR surveys with about 15 questions in 2018 to increase survey return.^{9,16} Today, the team employs many strategies for engaging and hearing the voices of our patients and families. Examples outside of the post-discharge surveys include virtual and in-person rounding, phone call interviews, family advisory committees, focus groups and having patients and families join improvement work groups and committees at the hospital.

Intervention

In May 2019, the Patient-Family Experience Team met with the hospital's Advanced Practice Providers (APPs), a group of providers who historically outperformed experience benchmarks, to review recent patient and family experience data. The APP group raised concern for their decline in scores for the "provider courtesy and respect" question with sustained statistically significantly above benchmark scores for "overall rate of provider" question. Since the "provider courtesy and respect" question was the first one on the surveys and IVR was recently implemented that fiscal year, the group APPs and patient and family experience professionals postulated that there was confusion regarding the appropriate means of responding to the first question of the IVR survey prompt.

After this initial discussion, our team used the Institute for Health Care Improvement Model for Improvement methodology to ask appropriate questions to get to the root cause of the issue and brainstorm changes to our survey that would result in an effective impact.^{23,24} This Model for Improvement framework is widely used at our hospital and guides the user through three key questions while conducting quality improvement initiatives: 1. What are we trying to accomplish? 2. How will we know that a change is an improvement? and 3. What change can we make that will result in an improvement?²⁴ This framework encouraged our team to create small tests of change using their Plan-Do-Study-Act (PDSA) cycle of improvement. We went back to the data and analyzed both the quantitative survey results from families and their qualitative comments left at the end of the surveys for further insight.²⁵ Quantitative and qualitative data analysis revealed opportunities to improve the IVR accuracy for the first question on the survey. At this point in our journey, we answered the first two questions in the Model for Improvement framework: our goal was to have the most accurate data from the IVR survey mode, and our qualitative and quantitative patient and family experience data would inform us if a change made was an improvement.

Our team worked with the survey vendor to make changes by adding a one-sentence scale description to the IVR surveys. Our team ensured that 1) a short script describing the scale would be inserted in the IVR phone call right before the first question was asked and 2) the script went

from negative to positive to mirror how the scale is presented in the survey. The exact scale clarification script is as follows: "*The following questions will use a four-point scale where 1 is No, 2 is Yes, Somewhat, 3 is Yes, Mostly and 4 is Yes, definitely.*" The location of where the communication would be inserted in the IVR introduction was especially important. After reading the qualitative family comments and understanding their lived experiences of confusion with the first question, and in partnership with our health care providers, we exercised experience-based design to add the scale clarification right before the first question was asked.^{10,12} Having the communication explanation right before the first question was important to ensure the family understood how to answer for the scale they were about to use. Our team hypothesized that if the family missed the first 60 seconds of the introduction, hopefully the sentence before the first question would give them an opportunity to understand how to respond. We implemented the clarification of the four-point Likert scale into the IVR scripts on June 25, 2019.

Study Period

The study period for analyzing the qualitative data was from February 2019 until December 2019. The pre-intervention period began February 26, 2019 and served as the historical control until June 24, 2019. June 25, 2019 to December 8, 2019 served as the follow up post-intervention period. Although the study periods vary before and after implementation, the number of comments received is similar (pre: 3,344, post: 3,373) and our team concluded the total number of comments received was more important than specific dates when comparing this type of qualitative data.

The study period for analyzing the quantitative data was for twenty months starting at the beginning of our fiscal year in September 2018 until April 2020, with the pre-intervention period being the first 10 months ending on the date of intervention, June 25, 2019 and the post-intervention 10-month period beginning on the date of intervention until the end of April 2020. Here, the both the timeframe and the number of survey returns was important in comparing the effect of the intervention.

Study of the Intervention

To determine if our intervention had an impact on the accuracy of families responding via IVR, the primary outcomes were the percent of comments describing survey errors made on the first survey question and the discrepancy in scores between the IVR and email mode for the first survey response. A balancing measure of IVR phone call drop off rates was also assessed to determine if there was a negative impact of adding the scale clarification to the IVR survey.

Measures

We summarized data using proportions for binary variables (survey error comments, IVR drop off rate). We summarized the quantitative data using percent change for the outcome measure of discrepancy in scores between IVR and email mode.

Analysis

A z-score test was used to assess statistical difference in the two proportional measures (survey error comments and IVR drop rate). A one-tailed t-test was used to assess statistical difference in the discrepancy in scores between IVR and email mode. These statistical analyses revealed the impact of improvement efforts for both outcome measures.

Results

Outcome Measure 1: Qualitative Analysis

During the pre-intervention study period, 82 families expressed selecting the wrong answer for the first question of the survey using the IVR mode. This amounted to 2.5% (N=3,344 comments) of our families misinterpreting the first question’s scale and answering inaccurately. Below is one verbatim comment example revealing this misinterpretation:

“My initial response, the first question I hit two, I intended to hit four so just so you’re aware I don’t want to skew the results that should have been a four not a two thank you.”

During the post-intervention study period, 8 families expressed selecting the wrong answer for the first question of the survey using the IVR mode. This is 0.2% (N=3,373) of the total comments received during this time, which is a 92.0% decrease in comments received related to accidental

responses on the first question of the survey. Performing a one-tailed z-test where alpha is .05 on the proportion of comments describing errors made revealed the percentage of comments after intervention being statistically significantly smaller (z=7.9, p<.00001, alpha=.05).

Outcome Measure 2: Quantitative Analysis

During the first 10 months of FY19, the 4 unique survey areas had an average of 17.4 percentage point difference on the first survey question where the IVR score was significantly lower than the email score. This discrepancy ranged from 12.3 to 23.1 percentage points. The scores for the survey questions can be anywhere between 0% to 100%, so a discrepancy of 17.4 percentage points, is an extremely high and significant difference in score. We did not see this gap for the remaining survey questions. During the 10 months after the intervention, the 4 unique survey areas had an average of 3.8 percentage point difference on the first survey question where IVR was only slightly lower than the email score. The new discrepancy ranged from 2.8 to 4.7 percentage points. We saw similar slight discrepancies in the remaining survey questions. Detailed results are shown in Table 1. This table shows the gap in scores for the two different modes of surveying (IVR vs. email) across our four main surveying areas before and after the implementation of the scale description in the IVR method. All pre-implementation responses were collected from 9/1/2018-6/24/2019. The post-implementation responses for all areas were collected from 6/25/2019-4/30/2020.

Performing a one-tailed t-test where alpha is .05 on the gaps discrepancies of scores revealed the two samples as statistically different, with the gap between IVR vs. email scores being statistically significantly smaller after the intervention (t=5.7, p=.0006, alpha=.05).

Table 1. Gap in Scores between IVR and Email Modes of Surveying

Unique Survey Area	Pre-Implementation Email Score minus IVR Score (percentage points) <i>N_{IVR}, N_{Email}</i>	Post-Implementation Email Score minus IVR Score (percentage points) <i>N_{IVR}, N_{Email}</i>	Difference in Pre- vs. Post-implementation Gaps in Scores	% Decrease in Gap
Emergency Department	23.1 4270, 832	2.8 4226, 1132	20.3	87.9%
Inpatient	15.2 1804, 613	4.0 1951, 765	11.2	73.7%
Ambulatory	19.2 17050, 6587	4.7 17096, 8409	14.5	75.5%
Outpatient Procedural Services	12.3 1696, 788	3.7 1844, 1025	8.6	69.9%

Balancing Measures

Although adding a clarifying sentence to the IVR prompt seems obvious in the improvement in our experience data, our team was very concerned that it would lead to increased drop-offs. Knowing longer surveys lead to a higher risk that users will terminate the call before completion, our team was concerned that the one additional clarifying sentence regarding the scale may increase our IVR drop rates.^{22,25} Pre-implementation, the IVR drop rate for 8 weeks (4/29/2019-6/24/2019) was 29.4% with 4,905 number of total IVR responses. After adding the brief scale clarification sentence, the IVR drop rate for 8 weeks (6/25/2019-8/20/2019) was 21.3% with 4,531 number of total IVR responses. A z-test revealed the IVR drop rate after the implementation of this clarification sentence was statistically significantly lower than before the implementation (z-value=9.019, p-value <0.00001, alpha=0.05).

Discussion

Our team identified IVR survey accuracy on the first question of the patient and family experience surveys as an area for improvement. Over the course of our implementation of one clarifying sentence of the survey scale to the IVR introduction, the percent of families leaving comments about IVR survey errors reduced by 92.0% and the discrepancy in scores between the email and IVR survey mode saw a percent reduction by an average of 76.8%. When reviewing our balancing measure, IVR drop rate, we found that adding one sentence to a 60-second-long introduction does not increase IVR drop rate and reduced our drop rate statistically significantly from a rate of 29.4% to 21.3%. One PDSA cycle was conducted that resulted in immediate, statistically significant improvements for both outcome measures.¹² Significant improvement was ultimately achieved and sustained with the intervention of adding one sentence to clarify the scale at the start of the IVR surveys.

Recent studies have explored the strengths and limitations of using IVR especially in the COVID-19 era.²⁶ IVR yields higher response rates and some evidence suggests that it is more inclusive for those with lower health care literacy.²⁶⁻²⁸ The benefits of IVR and the fact that it accounts for 72.6% of all our patient and family experience results makes the accuracy of the data even more important to our hospital.

One limitation of IVR that Hensen et al. described was the inability of individuals to clarify questions.²⁶ This is a similar limitation that we found with our study. If a family did not clarify a mistake was made on the first question of the IVR survey, there would be no way for our team to find it and remove it from the data. To control for this limitation, our team reviews individual results monthly to ensure consistent and valid responses.

Throughout this quality improvement project, our team was reinforced with the invaluable lesson of partnering with patients, families, and providers in every part of the process.^{9,10,29,30} We witnessed how actively engaging with and listening to the group of APP's leads not only to improvement in the data accuracy, but a deeper partnership and trust with all hospital providers. Although personally reviewing 800 comments per month is a large time commitment of our Patient-Family Experience Team, without the voice of our families explaining their accidental responses, we would not know the root cause of our APP's concerns of the data. Listening to our provider partners and acknowledging their concerns fostered greater trust in the data and encouraged more collaboration in the future. One hospital leader provided the below feedback for our team:

"Thank you for all the time and effort in bearing all of our feedback and working with our vendor to make the necessary changes. I appreciate the PFE Team's efforts."

There is wide application for this quality improvement initiative due to the increased use of IVR over the past few years to collect patient experience data.² The way hospitals used to collect patient experience data is rapidly changing from manually mailed surveys to the future of IVR, email, text and QR codes.^{1,2} New literature encourages the modernization of patient experience surveys with changing to IVR being one of the recommendations.² Although these new modes allow for real-time data that can be translated quickly to real-time action, their novelty can sometimes lead to limited quality assurance.^{4,17} There is a current opportunity to study and share survey validity improvement as there are minimal resources to hospitals, and survey vendors are learning with us as simultaneously.

After our team's success with this IVR intervention, our team has spread this information internally and externally to our survey vendor and partnering pediatric hospitals. We encourage other hospitals collecting experience results through IVR and other modes to stratify their results by survey mode and to review verbatim comments. Discrepancies in the scores between survey modes and comments regarding errors on the IVR survey are indicators that adding a scale description before the first question on the IVR survey could lead to statistically significant positive changes to the accuracy and validity of the data. To accomplish this change successfully, hospitals will need data analysts to stratify the data, supportive leadership, and a strong partnership with an attentive and capable survey vendor to trial the changes. Our team also found the Model for Improvement framework helpful and easy to use for this type of improvement.¹² With more hospitals adopting IVR as a survey mode for collecting experience, this one small implementation leads to maximizing the accuracy of the data from patients and families.

Our team continues to look for ways to improve the accuracy of our surveys and the response rates that we receive. Looking at the data objectively, partnering with our patient families, providers and survey vendor, and consistent quality assurance checks have allowed our team and hospital to trust the experience data. This trust in turn empowers our internal partners to create positive change and experience improvement every day.

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