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Survey Response Rates to a Self-Initiated Longitudinal Survey Accessed by a Quick Response Code in Six Different Regions of the United States

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Abstract

Background

A quick response (QR) code allows rapid access to an online survey via a smartphone and may improve response rates for web-based surveys. We report the response rates for a QR code-based, self-initiated, longitudinal survey of opioid use and pain scores following hospital discharge in pediatric surgical patients.

Methodology

All parents of pediatric patients who underwent surgery at one of six pediatric medical facilities were asked to participate in the study from October 5, 2020, until July 15, 2021. Those who chose to participate accessed the initial enrollment survey using a QR code on a handout provided. The next day they received an emailed link to a daily survey until their child was not requiring opioids and had pain scores of less than 4 for the previous 48 hours.

Results

A total of 1,759 families were asked to participate in the study. The parents of 44 patients completed the initial enrollment survey by accessing the QR code (response rate of 2.5%). Of those who completed the initial survey, 67% were lost to follow-up during the survey series.

Conclusions

We found an extremely low response rate for a self-initiated survey accessed by QR code. Additionally, we found a drop in the response rate with each successive daily email-based survey. At the end of the survey series, the majority of the initial participants had dropped out. We recommend using alternative modalities (informed consent, telephone call, weekly surveys) for initiating and delivering surveys to improve response rates for similarly designed studies.

Categories: Anesthesiology, Pediatrics, Orthopedics
Keywords: orthopedics, pediatrics, response rates, survey response, qr code

Introduction

Survey response rates have declined dramatically in the past three decades. The response rate dropped from 67% in 1995 to 29% in 2018 in a British postal survey of new mothers who delivered in hospitals [1]. Surveyors continue to evaluate new survey modalities that may improve response rates. Web-based surveys can reduce the costs and time required of survey personnel. However, the majority of survey studies have reported reduced response rates for web-based surveys compared to surveys distributed by mail or telephone [2,3]. A quick response (QR) code allows rapid access to a web-based survey with a smartphone and may improve response rates for web-based surveys [4]. There is little information on the effect of alternative survey modalities on survey response rates. We are not aware of any reports of survey response rates associated with QR code access to a self-initiated, self-administered longitudinal survey. The primary aim of this study is to report the response rates of parents of recently discharged post-surgical pediatric patients to a self-initiated survey accessed by QR code in six cities in the United States. This article was previously posted as a preprint on the Research Square server.

Materials And Methods

All methods were performed in accordance with the relevant guidelines and regulations, as approved by the Washington Institutional Review Board (IRB) on 12/07/2020 (IRB tracking number 20201412). Following IRB approval, parents of pediatric surgical patients were asked to participate in the study from October 05, 2020,

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until July 15, 2021. All children under 18 years of age having surgery at six pediatric medical facilities were eligible to participate in the study (Lexington, Kentucky; Honolulu, Hawaii; Shreveport, Louisiana; St. Louis, Missouri; Pasadena, California; and Spokane, Washington). The number of eligible participants during this time period was released by each site without further disclosure of any Protected Health Information.

Due to limited research-trained staff, written consent was deferred at the time of the study introduction. Rather, the nurse or anesthesiologist caring for the patient provided parents with a brief verbal introduction to the study and an explanation of how to use QR codes. Parents were then given a handout containing a QR code, a Uniform Resource Locator (URL) link, and a detailed explanation of the study (Appendix 1). Those who chose to participate accessed the initial Enrollment Survey using the QR code. This survey presented information about the study and asked parents to provide an attestation that they had read and agreed to participate in the study. Parents who did not understand English or Spanish or did not have internet access were excluded from the study. All surveys were designed on the survey platform Qualtrics (Seattle, WA). All study materials, including the surveys, were available in Spanish and English.

Our study schema is presented in Figure *1*. During the study, parents received four types of surveys. The Enrollment Survey collected demographic data: the child's birthdate, the surgery date, and an email address to receive links to subsequent Health Insurance Portability and Accountability Act (HIPAA)-compliant surveys. The Introduction Survey was sent on the day of hospital discharge determining any pain medications prescribed, including opioids and non-opioids. Next came the Follow-up Survey which asked for the highest pain score (0-10) and the number of opioids taken in the previous 24 hours. Parents received this until the child had not required opioids and reported a pain score of less than 4 for the previous 48 hours. Lastly, the Final Survey was sent asking how opioids were stored, the number of remaining opioids, if unused opioids were disposed of, if any non-opioid pain medications were used, side effects experienced from the pain medications, and parent's satisfaction with their child's pain control. The Final Survey also asked a series of questions regarding the child's previous history with opioids, diagnoses of anxiety or depression, and the parent's opinion of their child's pain tolerance. The total number of surveys a parent received varied as surveys were designed to continue until no opioids were required and the pain was well controlled. The minimum time to complete the study was four days after surgery.

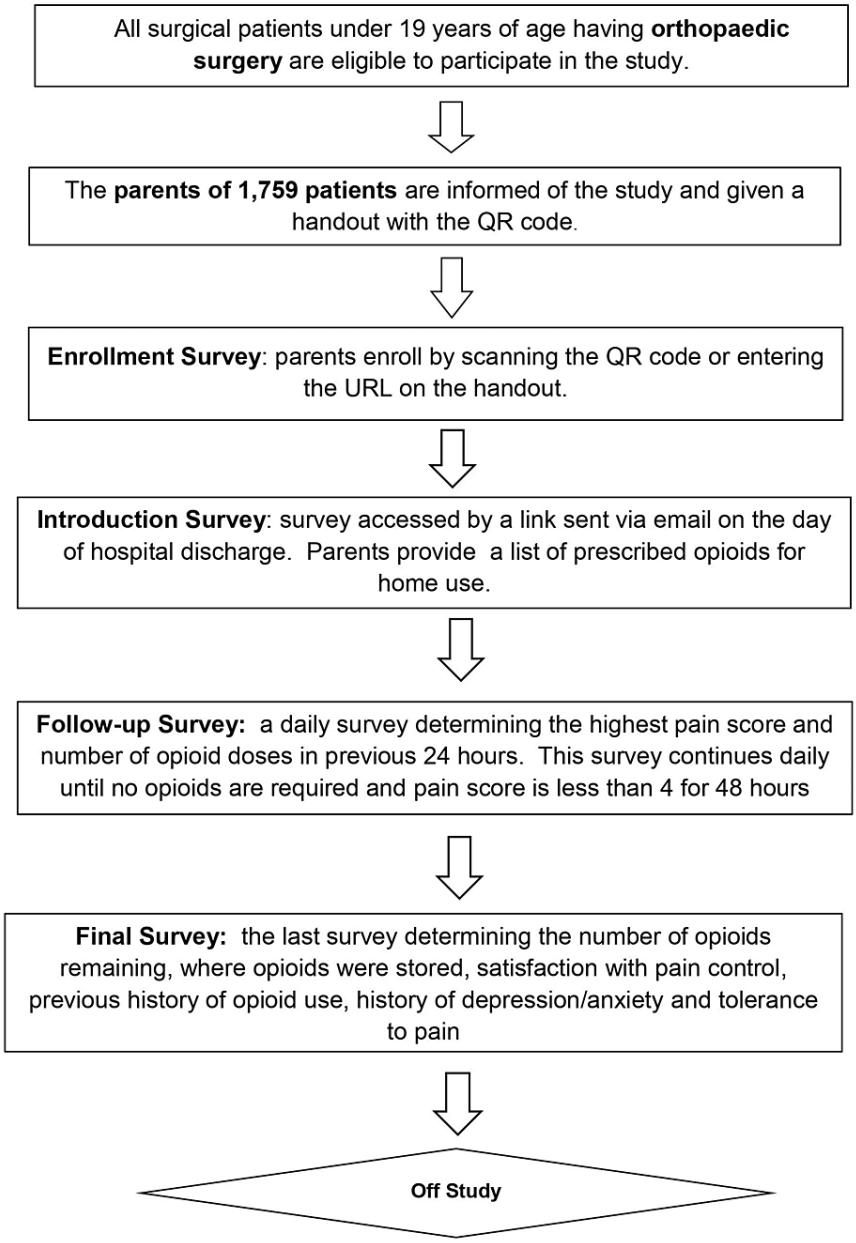

FIGURE 1: Study schema.

QR: quick response

On April 12, 2021, an error occurred in the survey platform resulting in participants receiving no subsequent surveys after completing the Enrollment Survey. The study was terminated on July 15, 2021, because of an inadequate survey response rate.

The primary outcome of this report is the response rate to the initial Enrollment Survey by QR code. Secondary outcomes include the number of participants who were lost at each successive survey, mean time to complete each survey, survey completion rate, and the item response rate for completed surveys.

Results

A total of 1,759 families were asked to participate in the study. Only 44 parents accessed the Enrollment Survey using the QR code (response rate of 2.5%). The response rate of individual cities is shown in Table *1*. The range of response rates was 0.7% in Pasadena to 3.2% in Spokane, with all sites other than Spokane being under 2%. Overall, 40% (21/52) of the respondents were from the Spokane site.

City	Number of patients	Number of respondents	Response rate (%)
Honolulu, Hawaii	183	2	1.1
Lexington, Kentucky	180	2	1.1
Pasadena, California	136	1	0.7
Shreveport, Louisiana	360	4	1.1
Spokane, Washington	660	29	4.4
St. Louis, Missouri	240	4	1.7
Total	1,759	52	2.96

TABLE 1: Response rate by site for initial survey accessed by QR code.

QR: quick response

The percentage of participants who were lost at each successive survey is displayed in Table *2*. This analysis only includes patients who responded prior to the platform error. Here, 1,379 families were asked to participate and 33 enrolled. There was a loss of participants with each successive survey. Of those 33 enrolled, 19 (67%) failed to complete the longitudinal study leaving an overall study completion rate of 1% (14/1,379).

Survey name	Enrollment survey	First sent survey	Follow-up survey	Opioid repeat survey	Final survey
Responses	33	25	20	15	14
Number lost	8	5	5	5	1
% lost	24	20	25	33	6

TABLE 2: Loss of participants with each successive survey.

The number of questions for each survey, the mean time for survey completion, survey completion rate, and the item response rate are listed in Table *3*. Of the 52 parents who used a QR code to access the Enrollment Survey, only 44 (85%) completed the survey. All parents who accessed subsequent surveys completed that survey. There were no skipped questions in any of the surveys. All surveys were brief, with the longest having 16 questions (Final Survey), and the longest mean time for completion of any survey was five minutes and five seconds (Enrollment Survey, including attestation). There were no skipped questions in any of the surveys.

Survey name	Enrollment	First sent	Follow-up	Opioid repeat	Final
Number of questions	10	7	3	2	16
Mean time (minutes:seconds)	5:05	1:32	0:14	0:25	2:49
Completion rate (%)	85	100	100	100	100
Item response rate (%)	100	100	100	100	100

TABLE 3: The number of questions, mean duration for survey completion, survey completion rate, and the item response rate for each survey.

Discussion

The important findings of this study are an extremely low response rate (2.5%) for a self-initiated

longitudinal survey accessed by QR code in six cities in the United States. We found a drop in the response rate with each successive email-based survey and the loss of the majority (67%) of the initial participants by the end of the survey series. These results were comparable in each participating region of the country.

The use of the QR code to access a survey by smartphone was first described in 2016 and offers promise as a new survey modality [5]. Eighty-five percent of American adults own a smartphone [6]. The use of the QR code reduces many of the problems associated with web-based surveys by immediately directing the person to the correct survey via the smartphone camera. However, there are limited reports of the use of the QR code to self-initiate a survey, with all involving small, targeted populations such as a class of medical students or patients in an urgent care waiting room [7,8]. This is the first report we are aware of evaluating the use of a QR code for self-initiated survey distribution in a large study population. In addition, we are unaware of a report demonstrating the response rate decline in a daily, longitudinal survey of any modality.

There are conflicting views on what is an adequate survey response rate. Federal public policy research surveys require an 80% response rate for funding. Editors of journals in the social and health sciences defined the lowest acceptable survey response rate as 60% [9]. Pew polling agencies conduct public opinion polls with accurate results with response rates in the single digits [10]. The concern about surveys with low response rates is that they may produce non-response bias, so that the results may not represent the intended population. More recent evidence suggests that, above a low threshold response rate, there is a weak relationship between the response rate and the non-response bias [11]. Although the absolute value of this low threshold is not defined, the 3% response rate we found likely falls below that threshold.

The reasons for the decline in survey response rates observed in the past two decades are many and likely influenced our response rate. One reason is increasing survey fatigue. In addition to our study, all our participants were also given a tablet to complete a survey while waiting for their first clinic appointment after surgery and many were approached to participate in a genomics study at their first clinic visit prior to surgery that includes a long survey of over 100 questions. Other reasons for declining survey response rates include concerns about the dissemination of personal information. This may have been an issue in our patient population as parents may have been hesitant to divulge their child's opioid use for fear of identifying their child as having a persistent opioid use problem. We tried to account for this by making the survey anonymous. Our parents may have also been overwhelmed with caring for their child after surgery and having their other children at home during the coronavirus disease 2019 pandemic lockdown period and required remote learning. The use of a web-based survey accessible by a smartphone has been shown to produce lower response rates in patients over 75 years of age [12]. Our participants were all parents of children under 19 with the majority being in their third and fourth decades of life.

We found a loss of participants with each successive survey. Longitudinal studies conducted over many years report a decrease in participation rates with each follow-up survey because of a loss of interest in the survey subject [13]. This may have been a factor in our study as some participants remained in the survey for up to three weeks. Long and complicated surveys may produce a low survey completion rate and a high dropout rate with successive surveys. However, the brief survey duration and excellent survey and item completion rates in all four surveys make it unlikely that the surveys were the cause of the low response rates and high dropout rate.

We included data on participants after the error with survey distribution to illustrate the issues that web-based surveys present. Considerable time must be dedicated to designing these web-based surveys (six months) and continued vigilance is required to ensure proper function. Proper selection of a survey vendor is also key. Our study platform was designed for business applications so we were limited in our functionality when adapting it for a healthcare longitudinal study. We recommend thorough and thoughtful planning of the survey process, then ensuring the chosen vendor is able to execute this process.

Short message service (SMS) text messaging has shown improved response rates compared to email messaging. The combination of email and SMS messaging has produced the best results [14]. This study was intended to use SMS text messaging but, because of technical issues with Qualtrics, we were forced to use email. Although this may have improved our results, it is unlikely to have reached an acceptable response rate.

Other survey modalities have been associated with improved response rates. In a similar study that surveyed adult opioid use postoperatively after hospital discharge, patients were required to give informed, written consent prior to hospital discharge and were reached by phone calls on a weekly basis for four weeks [12]. A comparison in response rates reveals dramatically improved results. They had a similarly sized patient population of 1,880 patients who were approached to be in the study and 705 provided written, informed consent (38% response rate vs. 2.5%). Of these, 134 were lost to follow-up at the first phone call (20% vs. 24%). They lost 10 additional patients over the next month (1.4% vs. 40%). They reported that 561 patients completed the study (29.8% vs. 1.0%). These response rates are far greater than what we observed and suggest that informed, written consent and phone call follow-up at weekly intervals produce far superior results.

This study has limitations in both survey design and data collection. In regards to survey design, we were unable to verbally consent families leading to a lost opportunity for a person-to-person introduction to the study. Additionally, our survey platform lacked the ability to use SMS communication or send reminder emails. Finally, we were unable to offer families any incentives to participate in the study. In regards to data collected for the families that did participate, we had little demographic data to compare those who enrolled versus our surgical population. We did not collect family input on survey implementation. Finally, there is a possibility more families were unable to enroll due to survey platform malfunction.

Conclusions

We found an unacceptably low response rate for a self-initiated, longitudinal survey accessed by QR code in a large study population. We found a loss of participants with successive daily surveys and the loss of the majority of the participants by the end of the survey series. While we believe QR codes remain a viable option for web-based survey distribution, the failure of this survey study provides lessons for future researchers. Survey design considerations should include maximizing participant recruitment, an end-user-friendly interface, limited survey questions and survey frequency, adequate reminder and follow-up, and, most importantly, a capable survey platform.

Appendices

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Dec 07, 2020

Shriners Hospitals for Children™

ALL SURGICAL PATIENTS

Opportunity to participate in a clinical research study

ANONYMOUS PAIN MANAGEMENT SURVEY

Establishing Prescribing Guidelines for the Opioid Epidemic:

A Prospective Evaluation of Opioid Requirements Following Orthopaedic Surgery in Pediatric Patients at the Shriners Hospitals for Children.

Introduction

Researchers at the Spokane Shriners Hospitals for Children® have developed a research project to study pain management after surgery. The project is designed to determine the level of pain and optimal pain medications (oxycodone, Tylenol, etc.) that are needed after orthopaedic surgery in children and adolescents. This study will be an anonymous survey of the number of pain medications required each day after hospital discharge. After reading the information on this sheet, if you want to take part in the study and have a smart phone please scan the QR code below and tap the banner on your screen to enroll. If you don't have a smart phone but have internet access you can enroll in the study by entering the tinyurl below.

Insert QR Code here

Scan this QR code on your smart phone camera and tap the banner to enroll! *(make sure "battery saver" is disabled)*
or visit: insert tiny URL

We hope this information can help children like yours by reducing the number of opioids available for misuse and help curb the opioid epidemic by providing data on opioid requirements after specific surgeries. This research study is completely voluntary. If you choose not to have your child participate, it will not in any way affect the care your child receives at Shriners Hospitals for Children now or in the future.

Who can participate?

This study is open to all children and adolescents under 19 years old who are undergoing orthopaedic surgery at any Shriners Hospitals for Children location. You will need a smart phone or internet access in order to complete the survey. The surveys are available in English or Spanish only.

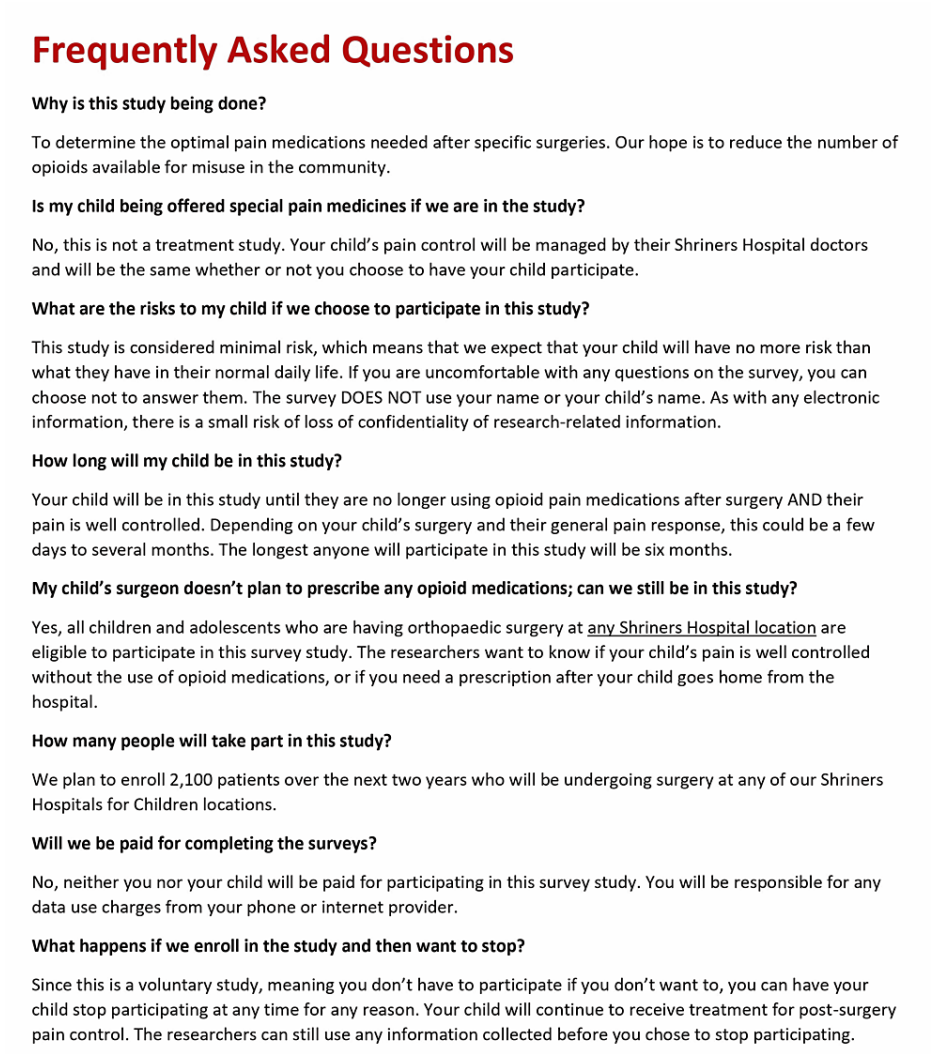
What to expect:

Scan the QR code on this flyer, or if you do not have a smart phone use the website address: **insert tiny URL.** Either of these will take you to a secure on-line survey platform that will provide detailed information about the study, the frequency of the surveys and how to enroll your child in the study. The survey DOES NOT ask for your name or your child's name. After you enroll your child, you will be prompted to complete the surveys at regular intervals by email. The surveys ask questions about your child's pain level and the number of pain medications taken that day, which should take less than 3 minutes. The surveys will continue until your child is no longer taking opioids and their pain is well controlled. The first and last survey may take longer to complete.

For more information

If you want more information, or are interested in having your child participate in this study, please contact Charlotte Preuschoff, Clinical Research Coordinator, at 509-623-0427. She can answer preliminary questions you may have.

FIGURE 2: Survey handout with the quick response code.



Frequently Asked Questions

Why is this study being done?

To determine the optimal pain medications needed after specific surgeries. Our hope is to reduce the number of opioids available for misuse in the community.

Is my child being offered special pain medicines if we are in the study?

No, this is not a treatment study. Your child's pain control will be managed by their Shriners Hospital doctors and will be the same whether or not you choose to have your child participate.

What are the risks to my child if we choose to participate in this study?

This study is considered minimal risk, which means that we expect that your child will have no more risk than what they have in their normal daily life. If you are uncomfortable with any questions on the survey, you can choose not to answer them. The survey DOES NOT use your name or your child's name. As with any electronic information, there is a small risk of loss of confidentiality of research-related information.

How long will my child be in this study?

Your child will be in this study until they are no longer using opioid pain medications after surgery AND their pain is well controlled. Depending on your child's surgery and their general pain response, this could be a few days to several months. The longest anyone will participate in this study will be six months.

My child's surgeon doesn't plan to prescribe any opioid medications; can we still be in this study?

Yes, all children and adolescents who are having orthopaedic surgery at any Shriners Hospital location are eligible to participate in this survey study. The researchers want to know if your child's pain is well controlled without the use of opioid medications, or if you need a prescription after your child goes home from the hospital.

How many people will take part in this study?

We plan to enroll 2,100 patients over the next two years who will be undergoing surgery at any of our Shriners Hospitals for Children locations.

Will we be paid for completing the surveys?

No, neither you nor your child will be paid for participating in this survey study. You will be responsible for any data use charges from your phone or internet provider.

What happens if we enroll in the study and then want to stop?

Since this is a voluntary study, meaning you don't have to participate if you don't want to, you can have your child stop participating at any time for any reason. Your child will continue to receive treatment for post-surgery pain control. The researchers can still use any information collected before you chose to stop participating.

FIGURE 3: Page two of the survey handout with the quick response code.

Additional Information

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. Washington Institutional Review Board issued approval 20201412. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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