# Use of SMS and Hybrid-SMS Secure Messaging Technology to Administer Patient Reported Outcome Surveys

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## Abstract

In this short paper, the authors aim to demonstrate that conducting Patient Reported Outcome (PRO) surveys via well-designed and thoughtfully planned Short Message Service or Secure Messaging, more commonly referred to as SMS or Text Messaging, results in a higher participation rate, higher completion rate, higher patient satisfaction rate, and significantly lower time involvement by the health providers which ultimately translates to lower costs. The overall objective is to assist healthcare providers in designing robust surveys that result in increased participation and higher completion rates.

## Introduction

SMS is not new technology; It has been around since 1992 [1].  While the initial growth rate was slow, it has now skyrocketed to more than 2 trillion text messages sent each day just in the United States. In times of acute situations, the usage of SMS tends to increase – for example during the COVID-19 pandemic, up to more than 2.2 trillion messages were sent each day[2].

### Why SMS?

The delivery rate of SMS is significantly higher than any other delivery medium at almost 99%. This means that 99% of SMS sent reach their intended audience.

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[1] Technology News, Dec 4, 2017 https://www.vodafone.com/news/technology/25-anniversary-text-message
[2] Taylor, Petroc, Jan 18, 2023 https://www.statista.com/statistics/185879/number-of-text-messages-in-the-united-states-since-2005/

Furthermore, the open rate of SMS is close to 98%, compared to just 20% of emails. Timely response is another huge benefit of SMS. In a typical scenario, 95% of text messages are read and responded to within 3 minutes. Of course, this varies based on industry, audience, and type of SMS[3].

SMS Delivery is defined as a measure of the percentage of outgoing SMS and MMS (Multimedia Messaging Service) which are received at their intended destination, i.e. the end user's mobile device.

While most statistics on SMS are geared towards marketing and customer loyalty, we intend to show that this translates very well to health surveys. For example, in general marketing outreach, the percentage of people who click through on an SMS offer is an astonishing 45%, whereas click-through rates of other mediums such as email languish in the 1-2% range. Another study shows that in a healthcare setting, text message response rates are 60% and 67% better than email response rates and phone call reminder response rates respectively[4].

Our own data and experience indicate that in a healthcare setting where the benefit is to the patient for participating in a survey, the participation rate is over 80%, especially when the provider takes additional steps to improve these numbers. We will discuss some of these in this paper.

SMS and Secure Messaging in a healthcare environment is very appealing to patients of all ages because of the "technology's simplistic elegance and widespread use."[5]

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[3] Romis, Rafael, Mar 25, 2022 https://www.forbes.com/sites/forbesagencycouncil/2022/03/25/4-reasons-why-sms-is-the-future-of-e-commerce/?sh=111d6613528d
[4] Bansod, Aditya, Apr 15, 2020  https://www.healthitoutcomes.com/doc/what-data-tells-us-about-the-state-of-patient-engagement-0001
[5] Eddy, Nathan, Feb 20 2019 "How Patients really want to communicate with doctors" https://www.healthcareitnews.com/news/how-patients-really-want-communicate-doctors

## Opportunities

According to 3rd party research, less than 20% of consumers currently communicate with their healthcare providers via text messaging, but a whopping 98% of them prefer to utilize this channel[6]. According to Beckers Hospital Review, SMS outreach is one of the most successful patient engagement innovations for patients of all ages[7].

This is further backed by an additional global survey by FICO that revealed that 80% of people would actually prefer interacting with healthcare providers using their phones, including appointment reminders, medication reminders, etc.[8]

This tells us that the potential is huge, and if Patient Reported Outcome (PRO) surveys are structured correctly, it could lead to a significant increase in health outcomes, and also result in significantly lower administration costs for the healthcare providers.

Currently, the typical methods of administering PRO are via email, mail, web, or via tablet devices in the providers' office. The participation rates for email and mail are relatively low at 45% and 60% respectively. As technology has allowed providers to use electronic measures, the rates can be as high as 75%[9].

Patient Reported Outcome Measures (PROM) data is deemed to be very useful in identifying whether an intervention actually helped the patient, yet only around 1% of doctors use PROMs and only about 18% of hospitals were using these surveys (as of 2018). Some hospitals cited a lack of time as the reason for not

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[6] Apr 11, 2022  https://patientengagementhit.com/news/how-text-messaging-meets-expectations-of-healthcare-consumers

[7] Park, Andrea, Jan 16, 2020  https://www.beckershospitalreview.com/digital-health/patients-60-more-likely-to-respond-to-texts-than-emails-report-finds-3-notes.html

[8] Jun 18, 2014  https://www.fico.com/en/newsroom/fico-global-survey-80-smartphone-users-interested-health-care-alerts

[9] Neve, O.M., van Benthem, P.P.G., Stiggelbout, A.M. et al. Response rate of patient reported outcomes: the delivery method matters. BMC Med Res Methodol 21, 220 (2021). https://doi.org/10.1186/s12874-021-01419-2

integrating PROMs into their operations, while others cited a lack of technology as a hindrance to its implementation[10].

## Impact on Survey Completion Rates

Our internal research based on more than 3 million SMS survey questions cover a range of industries including healthcare, transportation, and retail. It indicates that the survey response varies significantly by:

- Number of questions
- Types of questions
- Time of day*
- Type of audience*
- Age of audience*

* HIPAA and privacy rules prohibit us from accessing or sharing this data

Survey response rates vary significantly based on the number of survey questions. For example, our internal data shows that in some cases, the participation rates fall to under 77% if a survey contains 15 or more questions. However, when the patient is notified in advance of the number of questions and anticipated completion time, the rates rise to over 92%. This demonstrates that simply compiling a list of questions and sending them to patients while hoping for high response rates is less than optimal. Each survey type must be designed carefully and expectations set in advance. Patients are shown to be much more receptive when they fully understand what they are getting into.

Here are some statistics based on approximately 216,743 surveys for callers who have opted-in for SMS surveys consisting of approximately 2,925,360 SMS interactions[11]:

[10] Heath, Sara, Nov 2, 2022  https://patientengagementhit.com/news/only-1-of-docs-use-patient-reported-outcomes-measures-proms
[11] IVR Lab, internal anonymized data from 2018-2022

## *Impact of Number of Survey Questions*

Generally speaking, as the number of questions increase, the participation rates decrease.

*Table 1 – Number of Questions*

| Num of Surveys | Survey Questions | % of people that completed all questions |
|---|---|---|
| 14,743 | 6 or less question | 91% |
| 10,360 | 7-12 questions | 77% |
| 6,774 | 13-20 questions | 63% |
| 5,180 | 21-30 questions | 54% |
| 2,789 | 30 + questions | 47% |

*Chart 1 – Number of Questions*
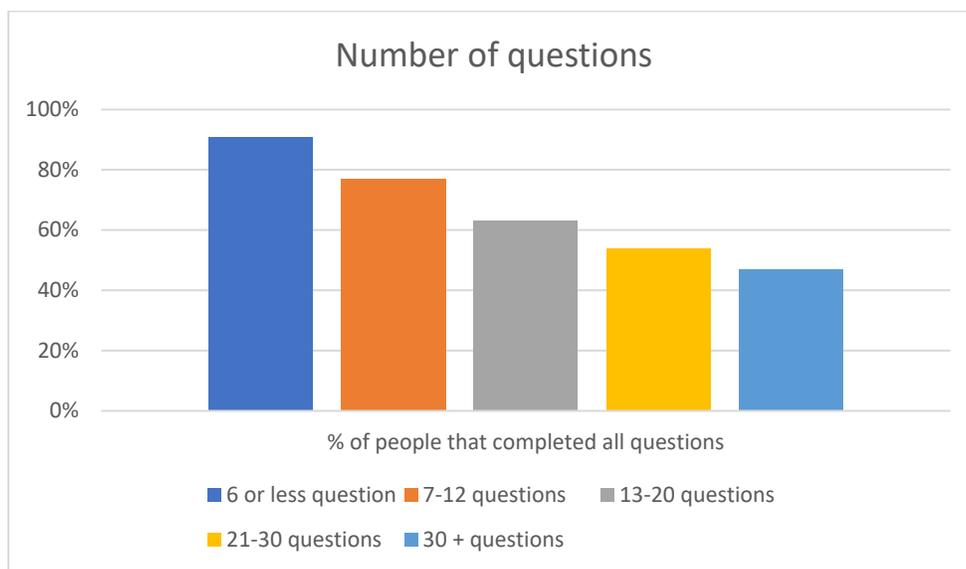
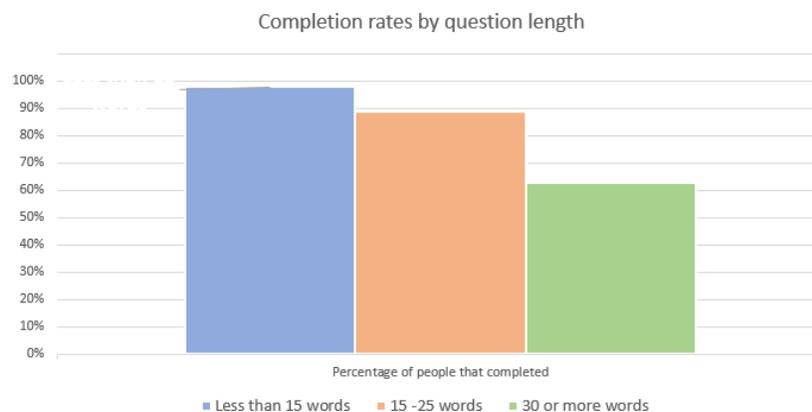## Impact of Survey Completion Rate Based on Length of Questions:

Some of our data also indicates that participation rates decrease as the length or complexity of the questions increase[12]. The following table shows the participation rates based on the word length of questions with other relevant variables being consistent such as the number of questions. Answer response choices are not counted in the question length.

*Table 2 – Question Length in Words – (after setting expectations – see section on setting expectations)*

| Num of Surveys | Question Word Length | Percentage of people that completed |
|---|---|---|
| 2,683 | Less than 15 (avg: 13) | 98% |
| 2,030 | 15 -25 words (avg: 23) | 89% |
| 653 | 30 or more words (avg: 39) | 63% |

\* Average word count across the entire survey, all questions

*Chart 2 – Question Length*



Completion rates by question length

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[12] IVR Lab, internal anonymized data from 2018-2022 – All survey types

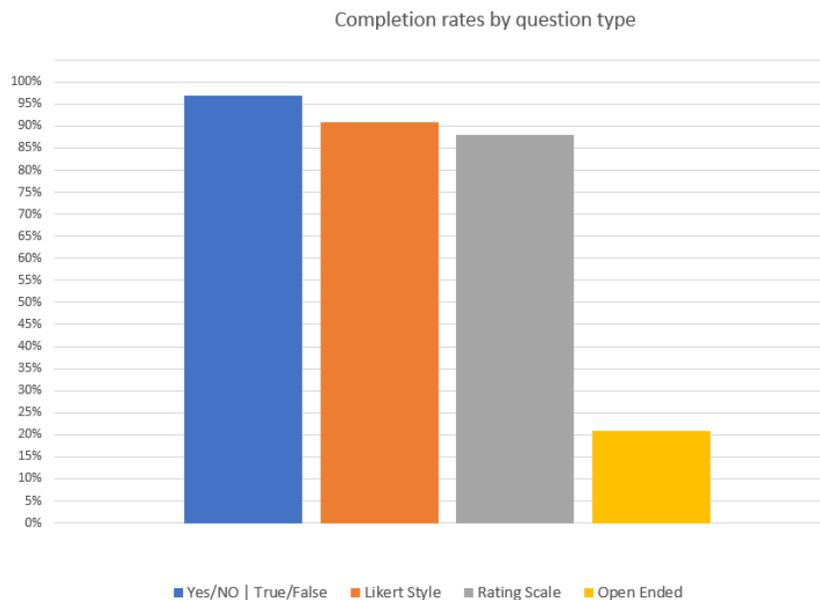## Impact of Survey Completion Rate Based on Type of Questions:

It was also noted that the survey completion rates were affected by the type of question.

*Table 3– Survey Completion based on Question Type*

| Num of Surveys | Question Type | % of people that completed all questions* |
|---|---|---|
| 94,686 | Yes/NO \| True/False | 97% |
| 41,090 | Likert Style | 91% |
| 25,011 | Rating Scale | 88% |
| 16,079 | Open Ended | 21% |

* Surveys in this sample consisted of similar question types and participants were informed of the number of questions and expected completion time in advance. Completion rates would likely vary when questions are presented in mixed format.

*Chart 3 – Question type*



Completion rates by question type

Completion rate varies depending on the type of participant. For a participant in a marketing survey, completion rate often depends on the incentive being offered. In a company/customer relationship, bias often plays a role. Clients who have something to complain about are more likely to complete a survey than clients who are generally satisfied. Similarly in a healthcare environment, the severeness of the patient's medical condition may incentivize them to participate more fully in a PRO survey. As an example, a survey regarding a routine medical checkup is likely to elicit less enthusiastic response than a survey following up after a surgery.

## Increasing Participation and Completion Rates by Setting Expectations

All other factors consistent, the completion rates were approximately 34.5% higher (weighted average) when the user was provided with clear expectations ahead of time about the following[13]:

- How and when to expect the survey, including frequency of survey
- Time commitment for survey
- Benefit to end-user, example: better health care management

Expectations can be set as simply as stating at the beginning of the survey:

- "This survey is expected to take less than 3.5 minutes to complete and will assist your healthcare provider in evaluating your health in a more effective manner."
  OR

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[13] IVR Lab, internal voice & SMS survey statistics, all Industries 2016-2022

- "This survey consists of 22 short questions and is expected to take less than 4 minutes to complete and will assist your healthcare provider in evaluating your health in a more effective manner."

It was established that participation rates increase significantly when the patient is informed in advance of the number of questions and approximate time for completion.

The following data shows participation rates for the same number of questions, but this time the end-users were clearly informed at the very beginning of the survey about the estimated number of questions and the anticipated completion time.

*Table 4 – Number of Questions – pre-informed*

| Num of Surveys | Survey Questions | % of people that completed all questions | Approx Improvement |
|---|---|---|---|
| 36,716 | 6 or less question | 99% | 8.79% |
| 35,047 | 7-12 questions | 95% | 23.38% |
| 53,405 | 13-20 questions | 89% | 41.27% |
| 18,358 | 21-30 questions | 83% | 53.70% |
| 23,365 | 30 + questions | 78% | 61.70% |

Note: In pre-informed surveys, participants are informed about the number of questions expected in the survey AND estimated time it would take to complete before the start of the survey. Additionally, each question in the survey had a counter (example: 2/23).

*Chart 4 – Number of questions – pre-informed*

**Number of Questions – pre-informed**
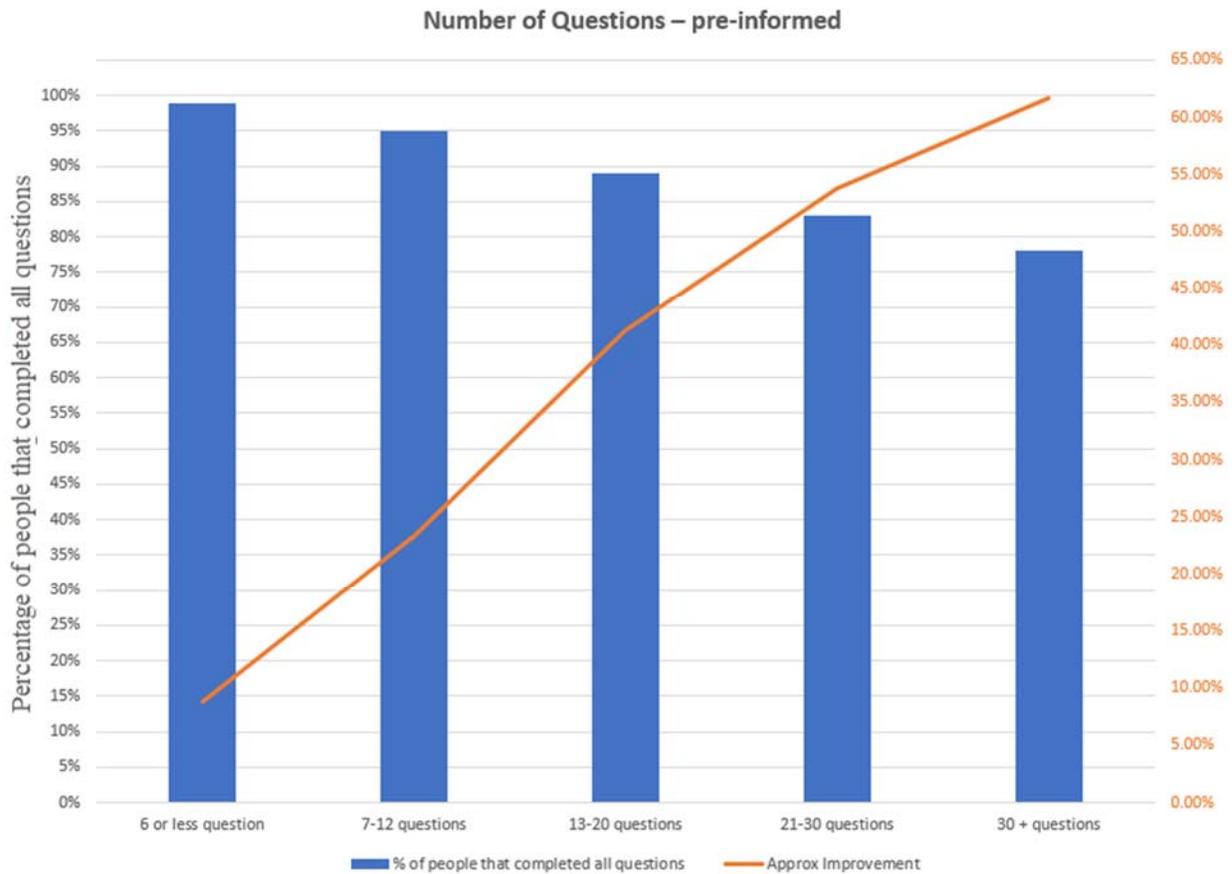


## Impact on Completion Rates based on Patient Reported Outcome Survey Methods

Assessing Patient Reported Outcomes such as pain, fatigue, physical functioning, emotional distress, and social role participation is crucial in evaluating the overall well-being of individuals suffering from various chronic diseases. These PROs can provide valuable insight into the quality of life of patients and inform the development of effective treatment plans. There are a variety of methods for conducting PRO surveys, including paper-based, computer-based, and phone and SMS-based surveys. While there is limited data available for evaluating phone and

SMS administered PRO surveys, we can use extrapolation to make reasonable assumptions.

For crafting effective SMS-based PRO surveys, we had two types of sources to work with:

- Paper-Based (such as those made available by Healthmeasures, FACIT measures, or custom measures provided by the clinical researcher)
- Digital (such as the Computer Adaptive Testing (CAT) system)

As shown in Table 1, the number of questions has a significant impact on survey completion rates. Paper-based surveys typically contain 30+ questions, however, there are numerous short-forms available from Healthmeasures that contain fewer than ten questions[14]. Regardless of the medium, more questions equal more effort required by the patient (as perceived by the patient). Some of this burden can be neutralized by setting clear expectations ahead of time as discussed in an earlier section.

Due to their very nature, the Computer Adaptive Testing (CAT) system has an inherent advantage because of the generally fewer number of questions required to measure outcomes.

Any of these sources can be used to design an effective SMS based PRO survey system.


## Benefits to the Health Care provider: Quicker Results and Lower Costs

SMS-based PRO surveys result in quicker responses, faster tabulation at a lower cost in terms of money and manpower when you factor in numerous follow up attempts, and creation of apps as well as keeping them updated.

More specifically, due to their very nature, paper-based PRO surveys take a long time to tabulate and require significant intervention by the healthcare provider to

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[14] https://www.healthmeasures.net/search-view-measures

address issues like missing information or legibility. By the time the results have been tabulated and understood, several days could have easily passed. This is a less than ideal situation for patients.

For existing digital administration, including CAT surveys, the tabulation is instantaneous and less follow up is required, but there is often a large cost to maintain computer systems and apps for various types of mobile operating systems. As a result, things can get outdated very quickly. Further, from an end-user point, they either have to physically go someplace for an in-office survey or have to remember multiple logins and download apps.

For a SMS-based system, a common mobile phone is more than sufficient. For the health care provider, there is no hardware or software to buy or maintain. 100% of the administration is done in a secure HIPAA compliant cloud-based system. Because standard SMS (including hybrid-SMS secure messaging), is largely system agnostic, the end user, i.e. the patient, does not need to have any special device other than a regular mobile phone, nor is there any need to download any special apps.

According to a 2005 report by the Centers for Medicare & Medicaid Services, typical costs per completed survey via various mediums were as follows[15]:

- Mail Survey: $15
- Manual Phone Survey: $20
- Automated IVR Survey (voice): $10

Considering that the national healthcare costs have more than doubled since 2005[16], we can safely assume that the cost to administer PROs have also increased in the past 18 years. Compare to these, the average cost of a SMS-based survey can be less than $5 per survey. This makes it affordable for even the smallest provider and allows for a much broader penetration rate.

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[15] Jordan, Harmon; White, Alan; Joseph, Catherine; Carr, Darcy "Costs and Benefits of HCAHPS" https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/downloads/hcahpscostsbenefits200512.pdf

[16] Telesford, Imani; Rakshit, SAhameek et al "How has US spending on healthcare changed over time?" https://www.healthsystemtracker.org/chart-collection/u-s-spending-healthcare-changed-time/

## Convenience

Above all, compared to other mediums including paper, phone-based, CAT system via a computer, a tablet, or via an app, SMS-based surveys allow the patient to participate in the survey at their convenience and without having to remember multiple usernames and passwords or downloading apps. A thoughtfully structured SMS-based survey would first ask if the patient is ready to participate, and if they are not, has the ability to automatically follow up. Patients that are mobility impaired do not have to leave their homes or even their chairs so long as they have their phone handy. Language is also not an issue; Surveys can be administered in the preferred language of the patient.

## Security and Compliance

With an SMS-based PROM system, ID verification is generally performed in the same manner as it is done in a medical clinic or hospital – through information already known to the patient like date of birth, last name, zip code etc.

Some healthcare providers express concern regarding communication with patients via SMS due to HIPAA laws. However, under HIPAA regulations, healthcare organizations can communicate with their patients directly by text, but they must text with care and follow specific guidelines.

Alternatively, they can remain in compliance provided they inform the patients of potential risks associated with using SMS.

However, with the type of system we have envisioned and have developed, this becomes irrelevant because while our system utilizes regular SMS to initiate a PRO survey, the actual survey Q/A is done via a secure messaging system accessible from any mobile device without having to download anything. All in all, it is extremely seamless to the patient.

Industry Standard SSL (Secure Sockets Layer) and Transport Layer Security (TLS) should be used to secure all survey traffic. Database fields containing sensitive Protected Health Information (PHI) or Personal Identifiable Information (PII) should be encrypted using AES-256. Disk volumes should also be encrypted using the industry standard AES-256 algorithm; this ensures that all data at-rest is encrypted including databases.

In recent years, the FCC (Federal Communication Commission) has also taken significant steps to reduce spam with SMS by requiring providers to pre-register intent and expected content. This alone significantly increases the delivery rate and ensures that patients will receive the SMS survey messages[17].

## Summary and Conclusion

In this paper, we explored the benefits of using Short Message Service (SMS) to administer Patient Reported Outcome (PRO) surveys. The use of SMS for health surveys has several advantages, including a high delivery rate of 99%, high open rate of nearly 98%, and quick response time (95% of messages are read within 3 minutes). Our own research indicates that the participation rate for SMS-based health surveys is over 85%.

We also discussed the impact of various factors on survey completion rates, including the number, length, and the type of questions. Our data shows that participation rates are higher when patients are informed in advance of the number of questions and estimated completion time. Additionally, participation rates are higher when the user understands the benefit of completing surveys.

Finally, we discussed the advantage of SMS-based PRO surveys for healthcare providers, including quicker results, lower costs, and convenience for patients. SMS-based PRO surveys allow patients to participate in the survey at their convenience and without having to remember multiple usernames and

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[17] Dortch, Marlene H. Nov 21, 2018  "Wireless Messaging Service Declaratory Ruling" https://docs.fcc.gov/public/attachments/DOC-355214A1.pdf

passwords. Our system is secure and HIPAA compliant, using industry standard encryption algorithms to protect sensitive information.

In conclusion, it is our determination that improved health outcomes, lower costs for healthcare providers, and higher patient satisfaction can be achieved with effective use of communication technology in conjunction with well-designed and executed PRO surveys.

## About the Authors

Rayomond Chinoy (Ray) is the founder and CEO of IVR Lab. He founded IVR Lab in 2013 focusing on creating highly customized telephony integration solutions. One main unique aspect of the company is that it rarely offers pre-packaged solutions. As a boutique technology company, it has the capability and flexibility to offer customers exactly what they want. He designed the very Interactive Voice Response Systems to track hundreds of thousands of money orders issued by various retail clients across the country, including companies like Circle K, Stripes, Flash Foods and Mapco. In the years following, various other industries were added to the roster, including transportation, insurance, and healthcare.

Ray has a BA in International Business Management from Eckerd College (High Honors), and an MBA in Health Care Management from St. Leo University. He is also a holder of several patents in technology.

Ray lives in the beautiful and sunny Tampa Bay area with his wife, three children, and a very cute mini Aussiedoodle puppy.


Anushka Chinoy studies Computer Science at the University of South Florida. She expects to graduate in December 2023 with a BS in Computer Science. She is also a part time intern at IVR Lab. Her interests are photography, art and music.