CONSUMER ACCESS TO IMMUNIZATION INFORMATION SYSTEMS: EVALUATION OF A 5-STATE PILOT PROJECT

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ABSTRACT

Shannon Kimberly Stokley: Consumer Access to Immunization Information Systems: Evaluation of a 5-State Pilot Project
(Under the direction of Chrisopher Shea)

Background: Maintaining documentation of a family member's vaccination history is one way to ensure that individuals are accurately informed of their vaccination status. To help increase patients' access to health information in order to enable action, a 5-state pilot project was implemented to allow consumers access to their immunization information stored in their state Immunization Information System (IIS) via a consumer access portal.

Purpose: To evaluate the implementation of the consumer access pilot project and identify the key factors for successful implementation.

Methods: A mixed methods study design, incorporating both quantitative and qualitative methods, was used for this project. The study collected information from the three stakeholders engaged in the implementation of the consumer access portal: the state immunization program (via key informant interviews), the healthcare provider (via key informant interviews and an online survey), and the consumer (via an online survey).

Results: Although stakeholders reported the consumer portal was easy to learn and use, completion of consumer registration was low. Organizational factors contributing to the low uptake was the lack of dedicated staff among the immunization programs to recruit and train providers as well as provide adequate follow-up. Human factors that contributed to low use included many providers forgetting to promote the portal to their patients along with many

consumers forgetting to complete the final steps to activate their account. While the state immunization programs and providers saw the potential for the portal to empower consumers to make decisions about their health, many felt it was too early in the project to see real benefits. However, among consumers who learned that a vaccine was needed, half took action by calling their healthcare provider to learn more or schedule a visit.

Conclusion: A consumer access portal linking consumers to their immunization information stored in their state IIS was moderately successful. As the project continues for another year, adjusting the registration process to allow the consumer to complete all the steps online in one session has the potential to increase the number of users, reduce the burden on the state immunization program and providers and allow for statewide promotion of the portal.

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LIST OF ABBREVIATIONS

CDC	Centers for Disease Control and Prevention
EHR	Electronic Health Records
HIS	Health Information System
HOT-fit	Human-Organization-Technology fit Framework
IIS	Immunization Information System
IT	Information Technology
KII	Key Informant Interview
ONC	Office of the National Coordinator for Health Information Technology
PHR	Personal Health Record
PIN	Personal Identification Number
P-KII	Provider Key Informant Interview
S-KII	State Key Informant Interview

CHAPTER I: INTRODUCTION

Statement of the Issue

During a person's lifetime, he or she is recommended to receive vaccines to protect against 17 diseases.[1,2] The United States immunization schedule is very complex, specifying the recommended ages and intervals at which individuals should receive vaccines. For example, excluding annual influenza vaccines, infants receive up to 25 doses of vaccine by the age of 2 years, adolescents receive up to 6 doses of vaccine between the ages of 11 and 16 years, and adults receive tetanus boosters every 10 years and other vaccines depending on their age and health status.

Remembering which vaccines have been received and which vaccines are needed can be a daunting task for adults, parents and caregivers. When recalling vaccines infants and young children have received, parents have been shown to overestimate the number of doses received for multi-dose vaccines,[3,4] while having better accuracy for vaccines that only require a single dose.[4] When recalling vaccines adolescents have received, parents are more likely to underestimate vaccines received for newly recommended vaccines compared to vaccines that have been recommended for many years.[5] Accuracy of self-report of vaccines received among adults show varying levels of sensitivity and specificity depending on the vaccine.[6,7] In several studies, recall accuracy varied by race/ethnicity, income level, and education level.[3,7,8]

Maintaining documentation of a family member's vaccination history is one way to ensure that individuals are accurately informed of their vaccination status. Although the

Community Guide for Preventive Health Services state there is insufficient evidence to recommend client-held written immunization records as a strategy for increasing vaccination coverage,[9] the reviewers recognized the importance of records to reduce missed vaccination opportunities and prevent over-vaccination. With the use of health information technology increasing, there may be a growing desire for individuals to obtain their information electronically rather than maintain paper-based records. Implementing a program to allow individuals electronic access to their own or their family member's immunization history whenever they need it could be an important step towards positioning individuals to take an active role in ensuring they are completely vaccinated. Before widescale introduction of such a program, it is important to understand the key factors associated with successful implementation so that the stakeholders responsible for implementation and the end user achieve maximum benefits.

Background

Since the early 1990s, state health departments with support from federal, state, and private institutions have been developing and implementing Immunization Information Systems (IIS). IIS are confidential, computerized, population-based systems that collect and consolidate vaccination data from vaccination providers that can be used in designing and sustaining effective immunization strategies.[10] At the point of clinical care, an IIS can provide a comprehensive history of vaccinations and help the healthcare provider determine if additional vaccinations are needed. At the population level, an IIS provides data for assessment of vaccination coverage levels and can help guide public health action to improve vaccination coverage. With the exception of New Hampshire, all states and the District of Columbia have

Immunization Information Systems.[10] The Community Preventive Services Task Force has reported there is strong evidence indicating IIS are effective at increasing vaccination coverage levels.[11] IIS are maintained by the state health department and currently the only people that have access to the information in the IIS are the state health department staff and the health care providers that have been granted access. With few exceptions, consumers do not have the ability to access the IIS to obtain their immunization information.

Recently, there have been several initiatives introduced to improve uptake of health information technology as well as improve access to health information by consumers. The first initiative is Meaningful Use, an incentive program for providers to implement electronic health records (EHR) and use the EHR to achieve specified improvements in care delivery.[12] In order to obtain incentive payments, providers must demonstrate that they are engaging patients and family members in their health care, which includes giving patients paper or electronic access to clinical summaries of their office visits; enabling patients to access an electronic copy of their health information and hospital discharge instructions; using secure e-mail with patients; and providing patients with a way to view, download, and transmit their health information to a third party.[12,13]

The second initiative is a national action plan to support consumer engagement via e-health.[14] The Office of the National Coordinator for Health Information Technology (ONC) has developed the "Three A's" strategy to empower people to improve their health and health care through health information technology.[15] The strategy aims to increase patients': 1) Access to their health information; 2) enable consumers to take Action with that information; and 3) shift

Attitudes so that patients and providers think and act as partners in managing health and health care using health information technology.

To help increase patients' access to health information in order to enable action, ONC, in collaboration with Centers for Disease Control and Prevention (CDC), has obtained the financial resources to implement a pilot project in 5 states (AK, AZ, LA, WA, and WV) to allow consumers access to their immunization information stored in their state IIS via a consumer access portal called MyIR.net™. For each registered user, MyIR queries the state IIS to obtain the user's immunization information. In addition to listing which vaccines have been received, the portal applies a forecasting algorithm based on the recommended immunization schedule and provides a notice if a vaccine is due. Additionally, the portal allows the user to print the official state immunization certificate that may be required, for example, for school or daycare enrollment. The project was initiated in October 2013 and is ongoing. The project is being conducted in four phases: Phase I consisted of selecting the pilot sites and project planning; Phase II consisted of designing the consumer access portal, developing training and marketing materials, and developing the promotional strategy; Phase III is the implementation phase; and, Phase IV is the evaluation of the project.

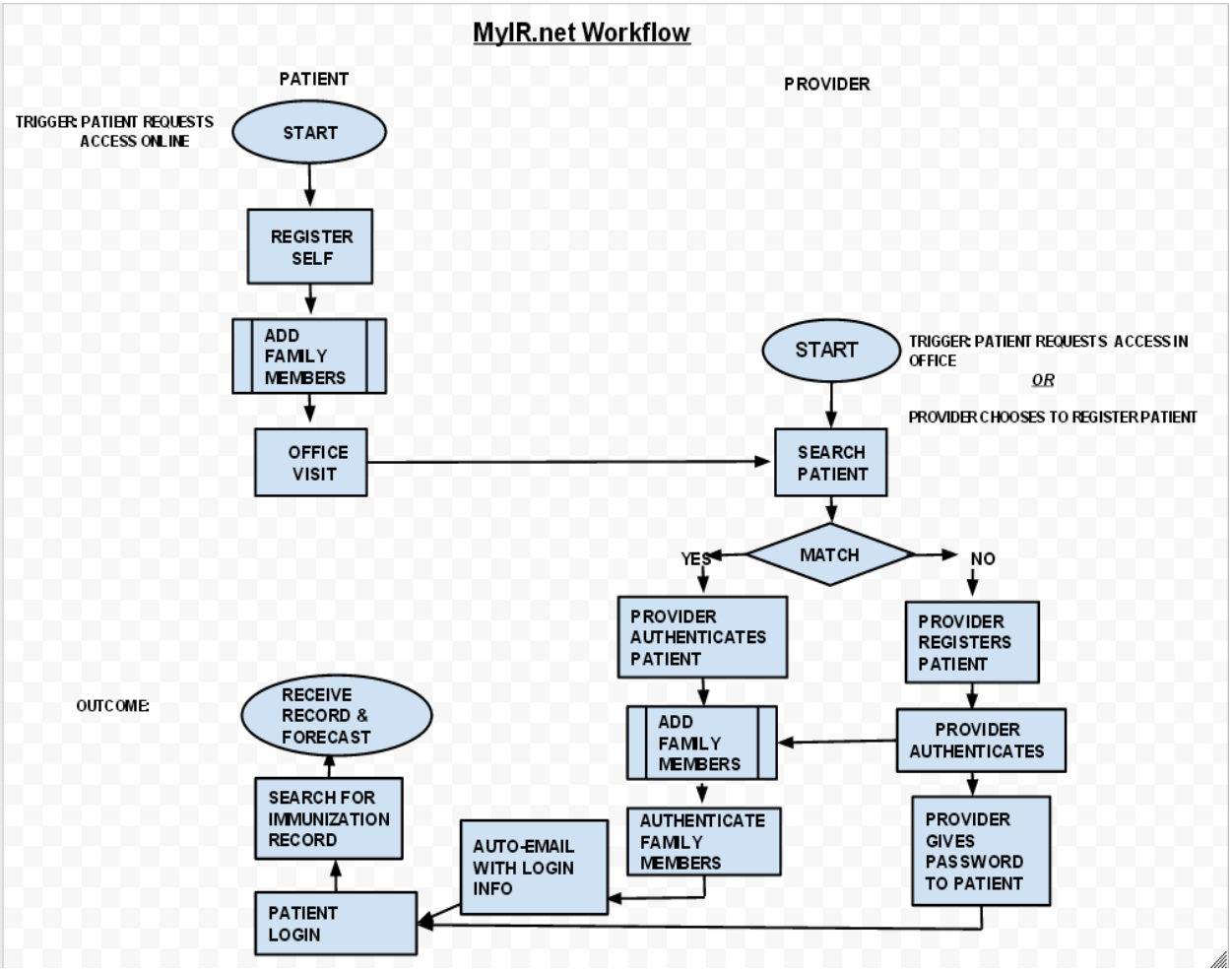
Implementation of MyIR involves recruitment of healthcare providers (specifically, providers who have been granted access to or are currently reporting immunizations to the state IIS) to register consumers. During formative research with consumers, privacy and security of health information was identified as a major concern. In order to prevent consumers from accessing the wrong records (for example, in the case of individuals with similar names), the healthcare provider was determined to be the best person to complete the authentication

of records since they could verify the identity of the consumer and link them to the appropriate records in the IIS. Providers could choose their preferred method for identity proofing of consumers including in-person during a healthcare encounter or through email, phone or fax (e.g., the patient submits a scanned copy of their driver's license). The MyIR portal allows two methods for registering consumers (Figure 1):

1. Provider-initiated Registration: a provider registers a patient (and their family members) for the portal and generates a temporary Personal Identification Number (PIN) during a regular office visit. Additionally, an auto-email with the patient login information is generated and sent to the patient instructing them to complete the registration process. The patient then completes registration by accessing MyIR, entering the PIN to activate their account, and self-selecting a password.
2. Patient-initiated Registration: the patient pre-registers themselves and their dependents through the MyIR website (i.e., enters information for themselves and their family members and self-selects a password). The patient then informs their provider of their registration. Subsequently, the provider conducts identity-proofing (either in-person or using another method of their choosing) and approves and activates the account.

Once registered, individuals can access the information for themselves or their family members at any time.

Figure 1. Registration process for the consumer access portal



Significance of the Issue

A successfully implemented consumer access portal will have many benefits for consumers, the healthcare system, and Public Health. By allowing individuals access to their immunization history information as well as information of their family members, they can learn if vaccines are needed and take the necessary steps to schedule appointments with their doctor to receive the needed vaccines, as well as print state immunization certificates that are required for entry to daycare, school, or summer camp which will save time and money. Benefits to the healthcare system include an increase in patients that are engaged in

monitoring and improving their health and reduced time spent on administrative activities related to completing required state immunization forms. Finally, there could be considerable benefits to Public Health including maintaining high vaccination coverage within the community and improved assistance during times of natural disasters or emergency response. For example, after Hurricane Katrina caused massive destruction, mechanisms were developed to allow health authorities in other states to obtain immunization information from the Louisiana IIS for displaced individuals.[16] If individuals were able to access their immunization information directly, it could ease the demands on perhaps an already overburdened public health system which would be responding to the disaster in other ways.

Successful implementation of the portal depends on the activities of two key stakeholders: state immunization program staff and healthcare providers (including primary care providers, schools, and local health departments). The state immunization program staff are responsible for: 1) recruiting vaccination providers, 2) training providers on how to access the portal and authenticate patients during the registration process, and 3) informing the public about the portal. Participating providers are responsible for 1) promoting the program to their patients, and 2) authenticating the users during the registration process. Inadequate implementation at either the state or provider level could result in poor utilization of the portal by consumers. Therefore, it is important to understand the factors that are associated with successful implementation of this model so that individuals within the catchment area can benefit from the portal.

Purpose and Specific Aims

The purpose of the study is to evaluate the implementation of the consumer access pilot project and identify the key factors for successful implementation. The specific research aims are to:

1. Assess among the state immunization program, a) the level of staffing provided to support implementation, b) perceptions about effective strategies for provider recruitment and training, c) perceptions about effective strategies for marketing the portal to the public, d) overall satisfaction with the portal (including quality of the system, information, and service), and e) perceptions of benefits from using the portal.
2. Assess among providers, a) their overall satisfaction with the training and technical support provided for the portal, b) satisfaction with the performance of the portal (including quality of the system, information, and service), c) the impact of the portal on office work flow, and d) their perception of benefits from using the portal (to the practice and the patient).
3. Assess among consumers, their overall satisfaction with: a) the registration process, b) the usability of the portal, and c) the quality of the information provided by the portal.
4. Use the data collected and analyzed in Aims 1 through 3 to make recommendations for scaling up the project statewide among the 5 pilot sites as well as expanding to other states.

CHAPTER II: REVIEW OF THE LITERATURE

A search of the peer-reviewed literature was conducted to help inform the evaluation of the implementation of the pilot consumer access portal. Because consumer access to an immunization information system has never been performed before, the literature review focused on different aspects related to the pilot concept. The review was conducted to answer the following questions:

1. What is the association between access to an immunization record and receipt of vaccinations?
2. What is the likelihood that individuals would access their immunization information electronically?
3. Is there an association with utilization of the system and increased vaccination?
4. What are the system or organizational level factors associated with implementation of an electronic system allowing individual access to health information?
5. What are the factors associated with health care providers adopting/implementing strategies to improve vaccination coverage?

Hand-held Immunization Records

Prior to the availability of eHealth tools, hand-held written immunization records were (and in some areas may still be) the standard practice for individuals to track the vaccines they or their family member had received. The relationship between hand-held immunization

records and receipt of recommended vaccines may help predict the usefulness of a consumer access portal allowing electronic access to personal immunization information.

A total of 8 studies were identified that evaluated the prevalence of hand-held immunization records and/or the association between a hand-held record and vaccination coverage (Table 1).[17-23] With the exception of one study, the studies were cross-sectional surveys evaluating vaccination coverage among young children. The prevalence of a hand-held immunization record ranged from 33.3% to 81.8% and all studies found a significant association between presence of a hand-held immunization record and higher vaccination coverage (Table 1). The one study that focused on adults was a randomized control trial testing an intervention that included physician prompts and a written health card that documented preventive services.[17] Adult patients receiving the written health card had significant increases in influenza vaccination but no differences were observed for pneumococcal vaccination.

The cross-sectional nature of the studies prevents us from inferring causality between having a hand-held immunization record and receiving a vaccination. It may be that having a hand-held immunization record is a proxy measure for some undefined characteristic that is associated with positive health seeking behaviors. For example, parents that maintain written immunization records for their children place a high value on immunizations and are more engaged with the health system.

The majority of the studies identified were conducted prior to implementation of electronic health records or other eHealth tools; therefore, the studies may not reflect the current prevalence of hand-held immunization records. If the prevalence of hand held records

is decreasing because of the emergence of eHealth tools, it will be critical that individuals can access their records electronically.

Personal Health Records and Immunization

The eHealth tool that best approximates the consumer access portal proposed in this study is a personal health record (PHR). A PHR is an electronic application used by patients to maintain and manage their health information in a private, secure, and confidential environment. They can include information from a variety of sources, including healthcare providers and patients themselves, however they are separate from and do not replace the legal record of any health care provider. Some health systems have created PHRs that are linked to the electronic health record maintained by the healthcare provider.

A search of the published literature identified 8 studies that specifically evaluated intention to or actual access of immunization information from electronic PHRs (Table 2).[24-31] Six studies[24-27,30,31] focused on adults accessing the PHR for their own information and 3 studies[26,28,29] focused on adults accessing the PHR for their child's information. Two studies by Patel et. al. evaluated intention to use a PHR indicating that more than 70% of adults would access a PHR and between 53% and 89% would like the PHR to include their immunization information.[30,31] Four studies reported on actual use of the PHR which ranged from 16.8% to 73%.[26-29] Although none of the studies reported on adult use of the PHR specifically to access their own immunization information, two studies reported that between 51% to 80% of parents viewed their child's immunization information at least once during the study period when accessing the PHR.[28,29] Utilization of the PHR was also found to be significantly associated with higher vaccination coverage among adults[24-27] and children.[26,28,29]

System-level Implementation Barriers

While many studies have evaluated the barriers to utilizing eHealth tools from the consumer perspective, I was only able to identify one study that focused on the perspective of the healthcare system or provider. Ancker and colleagues prospectively followed the development and implementation of new consumer information technologies within three healthcare organizations.[32] Key informant interviews were conducted with members from each organization throughout the development and implementation period. Due to technical barriers and cultural and legal issues surrounding data access, all organizations significantly scaled back their intended consumer technology. Major challenges included: achieving functionality that met the needs of both patients and providers; technical challenges; legal issues related to operationalizing access to data; cultural issues relating to inability to translate information into different languages spoken by patients; and inability to engage vendors for activities unrelated to the meaningful use initiative. The most frequently mentioned facilitators included organizational/managerial strengths and reallocation of resources to conduct development work in-house rather than contracted out.

Adoption of Strategies to Increase Vaccination Coverage

The final focus of the literature review is on the adoption of strategies to increase vaccination coverage. Healthcare providers are a critical component to the registration process of the consumer access portal. Identifying the barriers to adoption of strategies recommended for improving vaccine delivery will inform the evaluation of the implementation of the consumer access portal.

Two strategies for improving appropriate vaccination recommended by the Guide to Community Preventive Services are client reminder and recall interventions and provider reminders.[33,34] Client reminder and recall interventions involve sending notices to patients/parents when a vaccine is due or overdue and have been shown to increase vaccination coverage by 5.1 to 10 percentage points.[33] Provider reminders involve notifying the physician when a patient is due/overdue for a vaccination while the patient is in the office. The notifications can be done manually (i.e., note on the chart) or electronically via a prompt displaying when the physician opens the EHR for the patient.

A systematic review of the barriers to using reminder/recall interventions was performed by Pereira and colleagues.[35] The review identified and summarized 10 articles. The primary barriers identified by the studies include: financial and human resources needed to implement the interventions (including support for programming algorithms to identify patients due/overdue for vaccines); perception of a lack of reliable vaccination data on which to base reminders and recalls; workflow barriers related to computerized clinical alerts and the perception that pop-ups may be disruptive to the patient visit; and varying expectations of the utility of the interventions.

Conclusion

Results from the literature support the concept of a consumer access portal that provides individuals access to their (or their family member's) immunization information. Furthermore, providing electronic access to immunization information may improve vaccination coverage. However, little information is available about the factors associated with successful implementation of an electronic system such as the consumer portal. Because the

implementation of the consumer access portal is dependent on healthcare providers and their staff, and providers have been slow to adopt other strategies to improve vaccination coverage, it will be critical to evaluate their approach to incorporating the portal into their activities and the impact it may have on their work flow. Finally, none of the studies evaluated included a public health agency as a stakeholder. Understanding the organizational capacity, including new resources that will be needed at the State and provider level to support and implement the consumer access portal will be important to develop a plan to successfully expand the project statewide and to other states.

Table 1. Association between hand-held immunization records and vaccination coverage

Author	Study Period	Study Design	Target Population	Prevalence of Hand-held record	Association with Vaccination Coverage
Turner[17]	Sep 1987 – May 1988	RCT; Patients randomized to physician prompt vs physician prompt + written health card	423 adult patients attending resident clinic in Greenville, NC	42%	Patients receiving written card had significant increases in influenza vaccination compared to group only receiving physician prompts (47% vs 29%); no significant differences observed for pneumococcal vaccination (22% vs 24%)
Bolton[18]	1991-1992	Cross-sectional survey	525 children born between Aug 1988 – Mar 1989 living in Baltimore	33.3%	Children with a hand-held vaccination record had higher vaccination coverage for 4:3:1 series at age 24 months compared to children without a record (73.7% vs 40.5%)
Morrow[19]	1993	Cross-sectional household survey	670 children 12-30 months of age residing in Norfolk and Newport News, VA	52%	Lack of having a child's immunization record at home was associated with underimmunization at 12 months (OR=2.4, 95% CI: 2.3-5.0)
Simpson[20]	1994	Cross-sectional household survey	3,813 children 2-24 months of age residing in Texas	72%	Children with an immunization record were more likely to be up-to-date with recommended vaccines than children with no record (67.5% vs 30.4%)
Rosenthal[21]	Jun-Jul 2000	Cross-sectional household survey	165 children 19-35 months of age residing in an inner-city community in Chicago	Not reported	Children with a hand-held immunization card were significantly more likely to have received MMR vaccine (94.1% vs 53.1%; adjusted OR=16.8, 95% CI: 4.2-67.1)
Shaheen[22]	Not reported	Cross-sectional household survey	270 children 24-47 months of age living in and around downtown Los Angeles, CA	81.8%	Presence of an immunization record significantly associated with complete immunization coverage for 4:3:1:3:3 series (OR=2.07, 95% CI: 1.02-4.21)
McEligott[23]	2004-2006	Cross-sectional telephone survey (2004-2006 National Immunization Survey)	National sample of children 19-35 months of age	40.8%	Children with vaccination records were more likely to be up-to-date for the 4:3:1:3:3 vaccination series (83.9% vs 78.6%; adjusted OR=1.62, 95% CI: 1.49-1.77)

RCT=Randomized controlled trial; 4:3:1= receipt of 4 doses of DTaP, 3 doses of polio, and 1 dose of MMR vaccines; 4:3:1:3:3=receipt of 4:3:1 series and 3 doses of Hib vaccine and 3 doses of hepatitis B vaccine.

Table 2. Utilization of personal health records and association with increased vaccination coverage

Author	Study Period	Study Design	Intervention	Target Population	Use of PHR	Association with Vaccination Coverage
Wright[24]	2005-2007	Cluster randomized trial	Online patient portal that allows patients limited access to their EHR; intervention arm received pre-visit eJournal which provided prompts about needed preventive care	11 primary care practices from an integrated academic care network in Boston, MA	100% (by design)	Patients in intervention arm more likely to receive influenza vaccines compared to control arm (22% vs 14%)
Otsuka[25]	2011	RCT	PHR users were randomized to receive an email about herpes zoster vaccine; non-PHR users were randomized to receive a mailed message about herpes zoster vaccine	patients aged 60 years and older without documented herpes zoster vaccination at a General Inernal Medicine clinic in Ohio	100% (by design)	Among PHR users, herpes zoster vaccination rates were higher among intervention than control (13.2%vs 5.0%); among non-PHR users, vaccination was higher among intervention than control (5.2% vs 1.8%)
Nagykaldi[26]	Not reported	Cluster RCT	Wellness Portal website linked to a Preventive Services Reminder System	8 Oklahoma Physicians Resource/Research Network clinicians practices	73%	Among adult participants, portal users had higher pneumococcal vaccination coverage compared to control group (86.3% vs 44.6%); children in the intervention group had higher receipt of recommended vaccines compared to control group (95.5% vs 87.2%)
Krist[27]	Nov 2008 through Aug 2009	RCT	Intervention group invited to register and use Interactive Preventive Health Record (IPHR) linked to the EHR; offered messages on recommended preventive services	8 primary care practices in Northern Virginia	16.8%	No significant differences observed between intervention and control groups for tetanus, influenza, and pneumococcal immunization; within the intervention group, significantly higher tetanus immunization among IPHR users compared to non-users

Tom[28]	2011	Cross-sectional mailed survey	No intervention; survey aimed to better understand how parents use PHRs	600 parents of children with chronic disease ≤5 years old and enrolled in an integrated health care system in Washington	65%	Viewing child's immunizations was reported as most highly used PHR service (80% of users); main reasons for not using PHR include: too busy, forgot login/password, child does not have care needs
Tom[29]	2007-2011	Retrospective study; matched propensity score analysis	no intervention; compared parents who accessed the PHR for their child to parents that did not access the PHR	children enrolled in Kaiser Permanente Hawaii (KPH) and KP Northwest (KPNW) who were ≤31 days old at enrollment and continuously enrolled for 2 years between Jan 2007 and Jul 2011	42% (KPH) 23% (KPNW)	64% of users in KPH and 51% of users in KPNW viewed immunization history of child at least once; KPNW children whose parent used the PHR were more likely to be fully vaccinated by age 2 compared to children whose parents did not use the PHR; no differences in vaccination coverage were seen for KPH
Patel[30]	Feb 2009	Cross-sectional RDD survey	no intervention; assessed consumers potential PHR use	200 adults residing in 8 counties of the greater Buffalo region of NY	70% would use PHR	89% would like their PHR to include immunization records; 2/3 thought the PHR would improve their sense of control over their own health
Patel[31]	Oct-Nov 2008	Cross-sectional in-person survey	no intervention; assessed consumers potential PHR use	Adults entering 3 ambulatory care sites and an emergency department participating in BHIX (Brooklyn HIE program)	78% would use PHR	57% believe that PHR would improve their sense of control over their healthcare; 53% want PHR to include immunization information

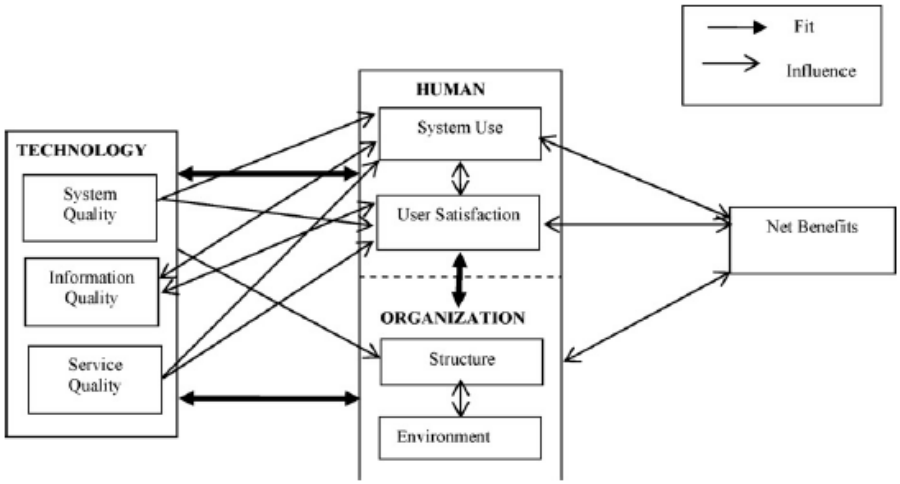
CHAPTER III: RESEARCH DESIGN & METHODOLOGY

Conceptual Framework

While many evaluation studies of Health Information Systems (HIS) focus on technical issues or clinical processes, they do not explain why HIS perform well or poorly within a specific setting. Because the proposed evaluation will not focus on the technical performance of the consumer portal itself but rather how well the consumer portal was implemented at the state and healthcare provider levels, a conceptual framework that incorporates human and organizational concepts in addition to technology concepts was selected.

Development of the evaluation instruments is informed by the HOT-fit Framework (human-organization-technology fit) developed by Yusof et al.[36] The HOT-fit framework (Figure 2) is an extension of the DeLone and McLean framework of Information System Success Model[37,38], which did not incorporate the concept of fit in terms of organizational factors.

Figure 2. Human-Organization-Technology fit (HOT-fit) framework



The HOT-fit framework is comprised of 3 factors (Technology, Human, and Organization) and 8 interrelated dimensions (System Quality, Information Quality, Service Quality, System Use, User Satisfaction, Organizational Structure, Organizational Environment, and Net Benefits). It suggests that the alignment of the different dimensions ultimately leads to a successful Health Information System.

The instruments developed for the proposed evaluation will include questions to address each of the 8 dimensions of the HOT-fit framework. Examples of proposed evaluation measures can be seen in Table 3.

Table 3. Examples of evaluation measures of the proposed HOT-fit framework that will be explored

Factor	Dimension	Evaluation Measures	Stakeholder	Study Aim
Technology	System Quality	Ease of learning the system	S/P	2
		Perceived reliability of the consumer access portal	S/P	2
	Information Quality	Perceived accuracy of the information in the portal	S/P	2
	Service Quality	Perceived ability to provide adequate technical assistance	S	1
		Attitudes towards the technical assistance provided	P	1
Human	System Use	Expectations about use of the portal	S/P/C	2
		Actual use (# registrants)	P/C	2
	User Satisfaction	Overall satisfaction with training and promotional materials	S/P	2
		Overall satisfaction with the consumer access portal	S/P/C	2
		Perceived usefulness of the consumer access portal	S/P	3
Organization	Structure	What was the level of management support for participating in the pilot project	S/P	1
		Was there adequate staffing support	S/P	1
	Environment	Perceived environmental factors that will contribute to implementation success (e.g., small vs large practice; pediatric vs family medicine setting; urban vs suburban vs rural)	S	1
Net Benefits		How did activities relating to support of the consumer access portal impact work volume?	S/P	3
		What is the perception of benefits to the state, providers, and the public after implementation of the pilot project?	S/P	3

S=State immunization program; P=Provider; C=Consumer

Study Overview

A mixed methods study design, incorporating both quantitative and qualitative methods, was used for this project. The study collected information from the three stakeholders engaged in the implementation of the consumer access portal: the consumer, the healthcare provider, and the state immunization program. The data collection method for each component of the study was selected based on the following criteria: the purpose of the data collection, the population to be studied, and the amount of resources available to conduct the data collection. Quantitative surveys were used when the purpose was to obtain general information from a large number of respondents. Qualitative interviews were used when the purpose was to obtain in-depth, detailed descriptions of experiences using the consumer access portal from a small number of respondents.

Study Aim 1: State Immunization Program Evaluation

Key Informant Interviews were conducted with staff from each of the five participating states (S-KII). The purpose of the S-KII was to obtain in-depth information about: a) the level of staffing provided to support implementation, b) strategies deemed effective for provider recruitment and training, c) strategies deemed effective for marketing the portal to the public, d) overall satisfaction with the portal (including quality of the system, information, and service), and e) perceptions of benefits from using the portal.

An introductory email was sent to the point of contact at each state program to explain the purpose of the KII, invite them to participate in the KII, and to request a response with three proposed times that were most convenient to them for participating in the interview.

The recruitment email indicated that we would like the staff members that played major roles with the project implementation to participate in the interview.

A 45 minute semi-structured interview guide was used to conduct the interview (Appendix A). Interviews were conducted via telephone and recorded upon consent. Completed interview recordings were transcribed. Interviews took place between July through August 2015.

Study Aim 2: Provider Evaluation

Data Collection

The provider evaluation consisted of two data collection activities: a survey of all providers actively participating in the pilot project, and key informant interviews with a small sample of providers.

Provider Survey

The provider survey assessed the following dimensions of the HOT-fit framework: a) their overall satisfaction with the training and technical support provided (Service Quality), b) how they operationalized the registration process in their practice (System Use, Structure), and c) their overall satisfaction with the performance of the portal (System Quality, Information Quality, and Service Quality) (Appendix B). The provider survey was administered via the surveygizmo (http://www.surveygizmo.com/), an internet-based survey tool.

For each participating state, a list of all registered users (i.e., the individual had privileges to authenticate and activate consumer accounts), including their email address, affiliated practice or clinic name, and the number of approved consumer accounts for the practice/clinic was obtained. We assumed users affiliated with a practice/clinic that had

approved one or more consumer accounts were “Active” (i.e., actively using MyIR); users affiliated with a practice/clinic that had not approved any consumer accounts were assumed to be “Inactive”. A survey invitation was sent to all registered users regardless of their assumed active status to ensure that all individuals using MyIR had an opportunity to participate.

Data collection for the provider survey occurred from July 27, 2015 through August 31, 2015. Following the methods described for the consumer surveys, an introductory email with the survey link was sent to the registered user. Reminder emails were sent to non-responders every third day (days 4, 7, and 10). Users that did not complete the survey after the 4th and final attempt were assumed to have refused to participate.

Provider Key Informant Interviews

Drawing from the HOT-fit framework, the purpose of the Provider Key Informant Interviews (P-KII) was to obtain in-depth information about: a) their overall satisfaction with the performance of the portal (including quality of the system, information, and service), b) the impact of the portal on office work flow, and c) their perception of benefits from using the portal (to the practice and the patient). A total of 10 interviews were conducted.

Although the qualitative P-KIIs were not expected to be generalizable to all participating practices, every attempt was made to recruit practices from different settings (public vs. private) and with different rates of completed registrations among patients that initiate the registration process (high vs. low). Recruiting practices from different settings was important because the settings have different work flows and patient volumes and different processes may be implemented for registering patients. Additionally, commitment to implementation

may vary by setting since public providers are more aligned with the State Immunization Program and may receive more support.

Recruitment for the P-KII began in July 2015 and interviews were conducted between July-September 2015. To capture the experiences of practices that were actively promoting and using MyIR (rather than practices that may have only tested the system), practices that approved a minimum of 5 consumer accounts were eligible for an interview. An introductory email describing the purpose of the P-KII with an invitation to participate was sent to the primary contact on file for all selected practices. The email also explained that we were interested in talking with the staff member responsible for registering patients in the portal. Based on informal feedback from the State Immunization Programs, participating practices have designated one staff member responsible for the implementation of the portal – this person was considered the primary contact. In most cases, the person is a nurse or office manager. Up to 4 attempts were made to schedule an interview.

A 30-45 minute semi-structured interview guide was used for conducting the interview (Appendix C). Interviews were conducted via telephone and were recorded upon consent. Completed interview recordings were transcribed.

Study Aim 3: Consumer Evaluation

Data Sources

The consumer evaluation consisted of secondary data analysis of two ongoing surveys. Both surveys addressed the dimensions of Information Quality, System Use, and User Satisfaction from the Hot-fit framework. The first survey was administered to individuals who completed all steps of the registration process for the portal and had activated accounts (Fully-

Activated consumers) (Appendix D). The survey included questions about the registration process (including which process was used: self-registration or provider initiated registration) and overall satisfaction with the portal.

The second survey was administered to individuals who started but did not complete all the steps of the registration process (not Fully-Activated consumers) (Appendix E). These individuals have all of their information, including email address, entered into the consumer access portal, but for whatever reason, did not complete the final step to activate their account. This survey included questions about the barriers to completing the registration process. The surveys were launched January 2015 and continued through August 31, 2015. The surveys were conducted by the Centers for Disease Control and Prevention (CDC) in collaboration with ONC and their contractor (Audacious Inquiry). The Human Subjects Coordinator from the National Center for Immunization and Respiratory Diseases, CDC, reviewed the protocol for survey implementation and determined the activity exempt from IRB review.

All surveys were administered via surveygizmo (http://www.surveygizmo.com/), an internet-based survey tool. Because the response rate was expected to be low (~5%), all individuals with complete or incomplete registration were invited to participate. Fully-Activated consumers were invited to complete the survey approximately 2 weeks after registration completion; similarly, not Fully-Activated consumers were invited to complete the survey approximately 2 weeks after registration initiation. Individuals who completed registration more than 2 weeks after starting the process may have been invited to complete both surveys.

Survey procedures included a personalized email inviting the individual to participate in the survey, with a personalized link to the survey. Reminder emails also included a link to the survey and were sent to non-responders every third day up to 3 times (days 4, 7, and 10). If the individual did not complete the survey after the 4th and final attempt, then we assumed the individual refuses to participate.

Data Analysis

Quantitative data analysis was conducted of the consumer and physician surveys using SAS statistical software. Because the surveys were not designed to test specific hypotheses but to provide general information about experiences using the portal, descriptive statistics are presented but no associations were tested.

Qualitative data analysis was conducted with the completed P-KIIs and S-KIIs. Common exploratory techniques were used to discover common themes. An initial codebook based on the HOT-fit framework and stated purpose of the interview was developed. Revisions to the codebook were made through an iterative process with emergent codes. All transcripts were coded using NVivo 10.0. After final coding, summaries of each code were developed and themes identified.

Human Subjects Protection and Confidentiality

This dissertation proposal was reviewed by the University of North Carolina's Institutional Review Board (IRB) and the Human Subjects Coordinator from the National Center for Immunization and Respiratory Diseases, CDC. Because the data collection activities did not constitute research involving human subjects, IRB review was not required.

Participants for the provider surveys, P-KII, and S-KII were recruited via electronic letter. In the invitational email, participants were given an overview of the study, the purpose of the data collection, and the length of time expected for their participation. For the provider survey, the act of accessing and submitting the completed survey was taken as consent to participate. For the P-KII and S-KII, verbal informed consent was obtained from each participant. Participants could choose to disengage from the research at any time. Participants did not receive any incentives for their participation.

The identity of the participants has been kept confidential. Surveys of providers did not ask for personal identifiers or the location of the practice setting of the provider. For key informant interviews, participants were assigned a study number. All data and digital recordings were stored on a password-protected network. Destruction of the data collected for this dissertation, including audio recordings, will be conducted in accordance of federal guidelines for the maintenance of federal records.

CHAPTER IV: RESULTS

Overall Metrics for the MyIR Consumer Access Portal

Implementation of MyIR varied by state. As of August 30, 2015, 1,637 healthcare providers had access to MyIR but only 137 (8.4%) approved one or more consumer accounts (Table 4). Louisiana had the most healthcare providers with access to MyIR (n=845) and Alaska the least (n=9).

Table 4. Healthcare provider uptake by state, as of August 30, 2015

	Total # (%)	**Alaska # (%)**	**Arizona # (%)**	**Louisiana # (%)**	**Washington # (%)**	**West Virginia # (%)**
Total number of providers with access to MyIR	1,637	9	662	845	13	108
Provider sites with 0 approved Consumers	1,500 (91.6)	5 (55.6)	645 (97.4)	750 (88.8)	10 (76.9)	88 (81.5)
Provider sites with 1 or more approved consumers	137 (8.4)	4 (44.4)	17 (2.6)	95 (11.2)	3 (23.1)	20 (18.6)

Consumer uptake by state is shown in Table 5. Overall, 6,040 consumers initiated registration through the MyIR portal but only 1,067 (17.7%) completed registration. The majority of consumers initiated registration through the provider-initiated registration workflow (n=4,415). With the exception of West Virginia, the registration completion rate was

higher for the provider-initiated registration workflow compared to the patient-initiated registration workflow.

Table 5. Consumer uptake by state as of August 30, 2015

	Overall	Alaska	Arizona	Louisiana	Washington	West Virginia
Overall						
Total number of consumers initiating registration	6,040	125	606	3,528	132	1,649
Number of Fully-Activated consumers	1,067	32	64	546	27	398
Number of consumers not Fully-Activated	4,973	93	542	2,982	105	1,251
Registration completion rate	17.7%	25.6%	10.6%	15.5%	20.5%	24.1%
Provider-Initiated Registration Workflow						
Total number of consumers initiating registration	4,415	51	243	2,464	121	1,536
Number of Fully-Activated consumers	924	20	51	489	27	337
Number of consumers not Fully-Activated	3,491	31	192	1,975	94	1,199
Registration completion rate	20.9%	39.2%	21.0%	19.8%	22.3%	21.9%
Patient-Initiated Registration Workflow						
Total number of consumers initiating registration	1,625	74	363	1,064	11	113
Number of Fully-Activated consumers	143	12	13	57	0	61
Number of consumers not Fully-Activated	1,482	62	350	1,007	11	52
Registration completion rate	8.8%	16.2%	3.6%	5.4%	0.0%	54.0%

State Immunization Program Key Informant Interview Results

Interviews were conducted with all five participating states. A summary of project implementation by state can be seen in Table 6.

Table 6. MyIR implementation by state immunization programs

	Alaska	Arizona	Louisiana	Washington	West Virginia
Number of staff members	3	2	2 (state level) 9 (field staff)	2	7
Area of implementation	1 City	Statewide	Statewide	Not stated	Regional
Strategy for selecting providers	All providers within catchment area	Tried different provider types but then allowed all providers access via IIS	Started with Champion then moved to Local Health Department field staff responsible for recruiting providers in their jurisdiction	Tried Champion approach, then local health departments but could not generate interest	Nine counties targeting providers that report a high volume of immunizations in a timely manner to state IIS
Strategy for recruiting providers	Site visits	Regional immunization conferences; 'MyIR' button on state IIS	Regional staff discuss with providers during regular communication	Not stated	E-mails and phone calls
Status at end of pilot year	Dropped out of the project due to limited staff	Agreed to continue if consumer registration could be improved	Continuing with project	Continuing with project but all registration conducted through the health department	Continuing with project and piloting tablets in provider practices to assist with registration

<u>Motivation for Implementing MyIR</u>

Overall, the state immunization programs had similar reasons for participating in the pilot project, primarily, empowering consumers with information so they can make decisions about their healthcare and reducing the burden on healthcare providers and the public health department to provide immunization records to their patients.

> …my goal was to enhance consumer's availability to records. By doing that you give them ownership back, or empower them to take control…If they are motivated enough

> to want to have a copy of their record hopefully it would motivate them enough to be up to date.

Two programs also reported that participation could lead to improved data quality in their IIS:

> ...the more folks that were having direct access to their information the more likely they would be to follow up with their provider's office and say I'm missing this immunization, this isn't on my record, those kinds of things, to improve the information that's in the [IIS].

Finally, several programs indicated comfort with participating in the pilot since the vendor that developed MyIR was the same vendor that developed their state IIS.

> I think a big push for us was because it was a product that our vendor had put together. We felt that it would be a pretty seamless something to put in place because the vendor was very familiar with our IIS and that creating that connection wouldn't be an issue.

Organizational Support

All of the state programs relied on existing staff to implement MyIR, though the number of staff working on implementation varied by program ranging from 1 to 11 individuals (Table 6). All of the programs reported their staffing levels were not sufficient for implementation, specifically for recruiting and training healthcare providers, though they varied in estimating the level of dedicated staffing that is needed. All programs felt that dedicated staffing is essential at the beginning of implementation to on-board providers, but once the program is established, fewer staff members would be needed for program maintenance.

Despite the support provided by the funding agencies and their contractors, participation in the pilot program was difficult for all programs, due to three main reasons: the programs underestimated the time and resources needed to implement MyIR; staffing changes made it difficult to support activities related to implementation; and competing demands moved MyIR implementation down on the priority list.

With respect to the time commitment, several programs reported that the recruitment and training of providers took a lot more effort than they had expected. The lack of dedicated staff to the project was problematic, since the existing staff were trying to fit in these activities on top of their already full work load. Additionally, four of the five programs reported there were significant staffing changes to their program, primarily several positions becoming vacant so that the main individual managing the pilot project was having to perform multiple duties within the program.

> …early on, we've made it work but I think we also, like I said, I've been in two different positions since it started and we've had a lot of transfers and [Staff Member] is in a new position and we've had a lot of change just going on in our office in general. So, I think if that hadn't happened, then we probably would've had a little bit more focus on it but in the beginning, like the estimations of time that we had didn't seem, looking back on it, didn't seem really realistic at all.

> I feel like we've always been at a little bit of a disadvantage because we just don't have the staff and the time in this office to put forth as much as we really wanted to.

All the programs mentioned that since MyIR was not a core program requirement (i.e., a required activity for obtaining programmatic funding from CDC), it was moved to the bottom of their priority list.

> We couldn't set aside other programmatic activities. Trying to make core grant requirements is obviously a priority. That was our issue.

> There's no less work to be done and fewer people to do it. It's picking and choosing priorities, and MyIR has really kind of moved us down on the list, if you will.

There were some special situations that were mentioned by two programs that delayed implementation of the pilot project. In one state, their internal IT department (that is responsible for maintenance of the state IIS) did not support participation in the project because they felt that they could build a consumer access portal themselves. But once they

realized they did not have the capacity to create the portal, they “begrudgingly” gave their support.

> I think that that actually really impacted the way that we have been able to approach this project. I think if there had been a resounding excitement for this program within [the state health department] we would've been very different, but I think that at times we really felt like we had to fly under the radar about this and promote it, but not promote it too loudly to draw too much attention, and it's been a challenge.

In another state, there was a lengthy process with their legal department to establish the Memorandum of Understanding to work with the contractors selected by the funding agencies. The primary concern was over information security:

> I think that part of what was really missing was a lot of the security details and I don't know how many other states expect that in a MOU but our state definitely expects to see details about how we're going to ensure that the data is secure as it's moving from one place to the next and we were fortunate in that they were okay with the questions being answered outside of the agreement.

<u>Provider Recruitment Strategies</u>

Programs used varying strategies for rolling out MyIR to the providers in their state (Table 6). For example, due to the geography and healthcare infrastructure of the state, the Alaska program chose to implement MyIR in an isolated community and recruit all providers and schools within that catchment area to make it a community effort. Arizona initially recruited diverse practice types (i.e., a Federally Qualified Health Center, health department clinic, and private provider). However, after the MyIR ‘button’ on their state IIS was accidentally activated for all providers in the state that had access to the IIS, they decided to go statewide and see what type of uptake they would have. Louisiana initially recruited a private provider who was a known immunization champion within the state. After working with the champion, and because of limited resources, they implemented MyIR in the nine regional

health departments and have the regional staff members try and recruit the private providers in their jurisdiction. Washington also tried to approach their known immunization champions but the interest was low. They also tried to approach their local health departments but was also not able to generate interest. Finally, West Virginia took a regional approach, working in nine counties and targeting providers that reported a high volume of immunizations in a timely manner to their state IIS.

During the recruitment process, all of the state programs indicated that providers were very receptive to the idea of MyIR. However, the challenges with maintaining providers in the project were the disruption to the practice workflow, remembering to promote MyIR to patients, and the complicated enrollment process.

> …but the most that we heard from them was the work flow, it was just really difficult to get this in their work flow and to remember to do this.
>
> But the practicality of it, it's involving more time for them. It's a little bit more time but it's still more time. They would like to see the flow to be less obtrusive to their work flow as possible.
>
> I think the issue that we all struggled with was the complicated authentication process for consumers. When you look at traditional clinical providers they have limited appointment times, they have a work clinic flow they're trying to maintain… It was taking them significantly more time that they just didn't have staff again to devote to it.

One program also mentioned the lack of buy-in from the practice administration as being a challenge to recruiting providers:

> We would connect with a nurse or an office manager or one of the school nurses and they were on board with it but they couldn't get their administration to approve it.

Promotion of MyIR to Consumers

Few programs actively promoted MyIR to consumers, rather, they relied on the enrolled providers to do that. While schools were seen as an important stakeholder that could promote MyIR to a large number of consumers, the majority of programs did not approach schools because there were not enough providers in the community utilizing MyIR. They were concerned that after receiving information from the schools, parents would be frustrated because their provider would not be aware of MyIR or have the ability to register them. Similar concerns were also raised about recruiting pharmacists to promote MyIR to their customers. Additionally, the uncertainty surrounding the length of the pilot coupled with limited funds prevented programs from engaging in a large promotional campaign.

> …we didn't have media funds, and we weren't doing a state roll out at the time. We assumed that it initially was going to last a very short period so we didn't ... We were a little unsure how much to advertise. We were hesitant then because of the longevity. We didn't want to put a lot of media information out there and then suddenly have the project end and then try to notify people 'I'm sorry we're no longer' ...

Several materials were developed by the project contractor to promote MyIR, including posters, fact sheets, brochures, and web buttons. All of the programs disseminated the materials to the participating providers and reported they were well received. The only challenge noted with dissemination of the materials was the limited print budget. As a strategy to overcome the limited budget, one state provided all the materials online so participating providers could download and print the items they needed.

All the states placed MyIR information on their website, though there was little activity to direct consumers to the website itself. Finally, none of the programs reported utilizing social

media to promote MyIR, again citing that they were concerned by the limited number of participating providers available to register consumers.

Support from Pilot Funders

All programs felt there was adequate support from the funding agencies (and their contract support). They reported that staff were very responsive and provided helpful resources.

> I will touch on the level of support. It has been unbelievable…I think that it's really helped us because we haven't been able to give as much as I think we would've liked to this project, but because there's been really dedicated people on the other end of this it has absolutely kept it afloat for the state. I think that if we didn't get that kind of support I don't know if we would still be in this project.

The only criticism raised by the programs was about the monthly project calls in which all states participated to provide their status updates and discuss various issues. Although two states found the calls to be helpful – they enjoyed hearing what other states were doing--the other states felt it was not the best use of their time. Problems identified were: low participation among the states, feeling awkward about frequently reporting they had made no progress, and that activities in other states were not relevant to their situation.

> I felt like a lot of the same topics continued to come up. Or, we would review state progress, but really we weren't making any progress. It ended up being empty promises that we continued to repeat. We didn't have the staff. We couldn't follow through. It was not fun to come to the calls and have the same information coming out every time.

> I don't feel like we get a lot of value from the meetings. The things that are happening in the other states really are very different than what's happening in our state and the direction that others are going in isn't really what we're doing. It's another meeting on our calendar. It's another hour that's being taken away from our day...

Perceived Benefits

Many programs felt it was too early to see benefits from implementation of MyIR, though they acknowledged the potential for helping the community and providers.

> I do see the potential benefit as a health unit. I don't really see it right now because it's an effort that is loaded on the front end. But I do see the potential.

Only one program felt the timing was not right for introducing MyIR:

> Immunizations is just one small piece of the health care picture. It was a lot of work for a small return. I think maybe even it was an idea ahead of its time…the whole idea of a consumer portal for things. We're barely getting that at the doctor's office for health records in general, much less our immunization. Having to go to a separate place for something that you don't utilize very often I thought was a lot of work for small return.

Advice for New Programs

The programs offered several pieces of advice for any new program that may be interested in implementing MyIR. All programs mentioned having dedicated staffing for implementation – at least one full-time person devoted to the program. Additionally, some programs recommended understanding the time investment that is needed and having a plan for roll-out. However, programs differed on the best way to roll-out MyIR, one program recommended to start statewide while several recommended to have a staged approach.

State Status

The status for each state at the end of the pilot year is described in Table 6. Because of the lack of staffing to dedicate to the project, Alaska has stopped implementation of the consumer access portal and will not continue for another year. The remaining four states have agreed to continue implementation for another year; however, Arizona agreed to continue only if an alternate registration method can be developed that is not dependent on the healthcare provider. Washington will continue for another year but instead of recruiting healthcare

providers to conduct registration, all registration will be performed by the state health department. They plan to include MyIR information in their routine immunization mailings to approximately 450,000 families in the state. State health department staff have been instructed to register any individual who calls the program to obtain an immunization record for themselves or a family member. Louisiana will continue with the project with no expected changes. Finally, West Virginia will continue with the project with plans to expand to other counties within the state. They also plan to pilot the use of tablets in provider offices to allow patients to initiate the self-registration process while they are waiting to see their doctor so that the practice staff can complete the registration process before the patient completes their visit.

Healthcare Provider Evaluation

Survey Response Rates

A survey invitation was sent to 170 users affiliated with a practice that had enrolled at least 1 consumer as of July 20, 2015 (a total of 83 practices). Overall, 39 (22.9%) clicked on the survey link in the invitation; 34 (87.2%) completed the survey and were included in the analysis. These respondents represented 33 (39.8%) of the active practices. Additionally, a survey invitation was sent to 1,431 users affiliated with a practice that had accessed MyIR but had not yet enrolled a consumer. A total of 157 (11.0%) clicked on the survey link in the invitation. Only 15 (9.6%) reported they were current or former MyIR users and completed the survey and were added to the analytic sample. These respondents represented an additional 13 practices. In summary, the analytic sample included 49 respondents representing 46 participating practices (48% of 96 active practices).

Survey Respondent Characteristics

Characteristics of the respondents by their MyIR status are shown in Table 7. Overall, 72% reported they were currently using MyIR, 18% reported they were no longer using MyIR, and 10% reported they are not currently using MyIR but plan to in the near future. Among the current and former MyIR users, 51.5% had been using MyIR for 12 months or more. The majority of respondents were from a Public Health Department Clinic, provided multiple services, participated in the Vaccines For Children Program, saw an average of 100 or more patients a week, and reported that 50-100% of their patients were publicly insured. Based on MyIR metrics, respondents worked in practices that had approved a median of 2.5 consumer accounts with an interquartile range of 0 – 14 consumers.

Table 7. Provider characteristics of MyIR users by user status[a]

Characteristic	Total # (%)	Current User # (%)	Former User # (%)	Future User[b] # (%)
Overall	49 (100)	35 (71.4)	9 (18.4)	5 (10.2)
State				
Alaska	8 (16.3)	4 (11.4)	4 (44.4)	0 (0)
Arizona	14 (28.6)	9 (25.7)	4 (44.4)	1 (20.0)
Louisiana	20 (40.8)	15 (42.9)	1 (11.1)	4 (80.0)
West Virginia	7 (14.3)	7 (20.0)	0 (0)	0 (0)
Length of time using MyIR				
<6 months	12 (36.4)	10 (34.5)	2 (50.0)	NA
6-11 months	4 (12.1)	4 (13.8)	0 (0)	NA
12 months or more	17 (51.5)	15 (51.7)	2 (50.0)	NA
Practice Facility Type				
Private practice	5 (10.9)	3 (9.1)	2 (25.0)	0 (0)
FQHC	10 (21.7)	9 (27.3)	0 (0)	1 (20.0)
Public Health Department Clinic	26 (56.5)	18 (54.6)	6 (75.0)	2 (40.0)
School Based Health Center	2 (4.4)	1 (3.0)	0 (0)	1 (20.0)
Other	3 (6.5)	2 (6.1)	0 (0)	1 (20.0)
Practice Specialty				
Pediatrics	7 (15.6)	6 (18.2)	0 (0)	1 (20.0)
Family Medicine	10 (22.2)	6 (18.2)	2 (28.6)	2 (40.0)
Multi-Specialty	25 (55.6)	19 (57.6)	4 (57.1)	2 (40.0)
Other	3 (6.7)	2 (6.1)	1 (14.3)	0 (0)
Participate in Vaccines For Children Program	41 (89.1)	28 (84.9)	8 (100)	5 (100)
Avg number of patients seen each week				
<50	8 (21.6)	6 (22.2)	2 (28.6)	0 (0)
50 – 99	7 (18.9)	7 (25.9)	0 (0)	0 (0)
100 or more	22 (59.5)	14 (73.0)	5 (71.4)	3 (100)
Proportion of patients that are privately insured				
<25%	24 (68.6)	16 (59.3)	5 (100)	0 (0)
25-49%	7 (20.0)	7 (25.9)	0 (0)	1 (100)
50-100%	4 (11.4)	4 (14.8)	0 (0)	0 (0)
Proportion of patients that are publicly insured				
<25%	4 (10.8)	3 (11.1)	1 (16.7)	0 (0)
25-49%	11 (29.7)	8 (29.6)	1 (16.7)	2 (50.0)
50-100%	22 (59.5)	16 (59.3)	4 (66.7)	2 (50.0)
Proportion of patients that are uninsured				
<25%	20 (60.6)	15 (60.0)	3 (60.0)	2 (66.7)
25-49%	4 (12.1)	3 (12.0)	1 (20.0)	0 (0)
50-100%	9 (27.3)	7 (28.0)	1 (20.0)	1 (33.3)
Number of consumers "approved" by the practice				
Median	3	3	4	2
Interquartile range	0 - 14	0 - 20	0 - 14	1 - 9

[a]Due to missing responses, numbers may not add up to the total number of respondents; percentages may not add up to 100% due to rounding.

[b]Future User: respondent indicated they are not yet using MyIR but plan to in the near future.

Key Informant Interview Participants

A total of 10 interviews were conducted with participating providers from 4 states. Because Washington had difficulty with sustained provider involvement, and we had previously spoken with the one provider who had utilized MyIR (and that provider had stopped participating), there were no providers from Washington included in this analysis. Characteristics of the key informant interview (KII) participants can be seen in Table 8.

Table 8. Characteristics of key informant interview participants (N=10)

Characteristic	**Number**
State	
Alaska	1
Arizona	2
Louisiana	3
West Virginia	4
Practice Type	
Public	6
Private	4
Time using MyIR	
<1 year	4
1-2 years	6
Average number of patients per week	
≤200	5
>200	5
Type of services provided	
Immunization only clinic	3
Pediatric	3
Multiple services	4
Number of approved consumers*	
Median	29
Range	5 - 1094

*As of July 25, 2015

Training and use of Marketing Materials

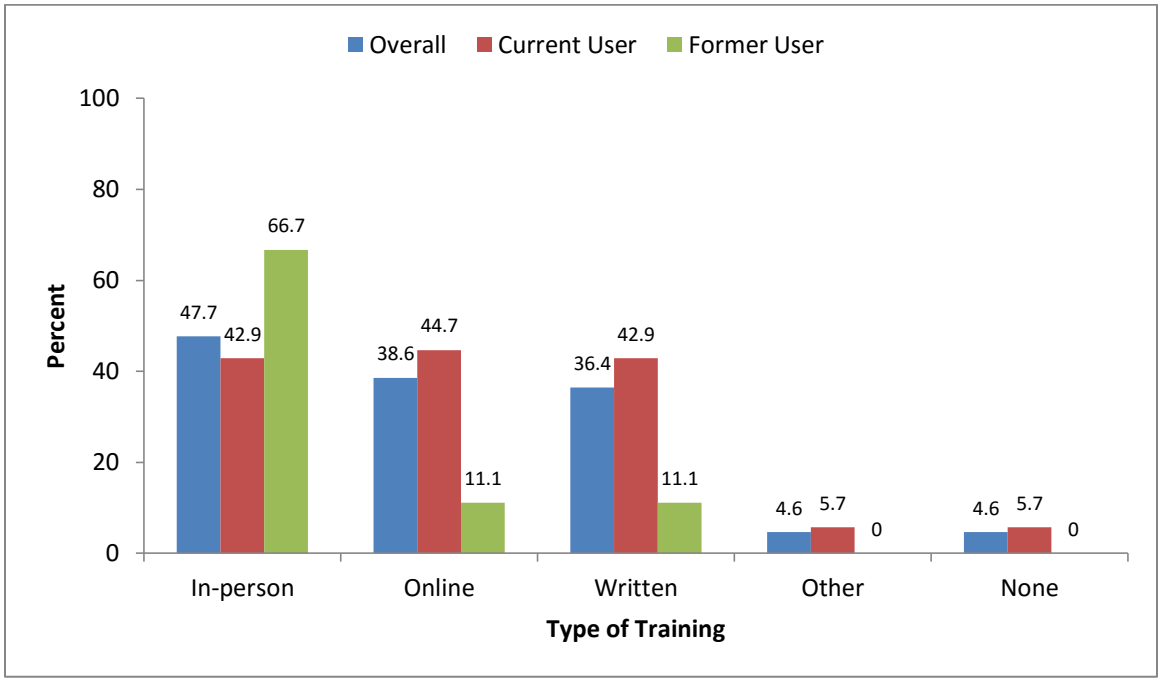
Among survey respondents, the type of training received by MyIR user status is shown in Figure 3. Overall, 47.7% received in-person training, 38.6% received training online via webinar or videos, 36.4% reviewed written materials, and 4.6% received training through another mechanism. Only 4.6% indicated they did not receive any training. Among those who received some type of training, 29.3% received training through more than one mode. The majority of respondents (85.7%) reported they were satisfied or very satisfied with the training they received.

Among the KII participants, the majority received training online via webinar or videos, only two received in-person training. In general, the majority reported the training was sufficient, but three providers felt the training was not sufficient, citing it didn't cover all the steps of registration or the product itself wasn't ready for implementation.

> The training material I received didn't go through the whole step... I didn't feel like it gave enough information on the instructions for the parent.

> I feel like the immunization program with the state was learning the program at the same time as us. The whole system was still in the finishing stages of design at the time they were training us. We didn't feel like they rolled out a fully finished project.

Figure 3. Type of training received by MyIR user status, provider survey[a]

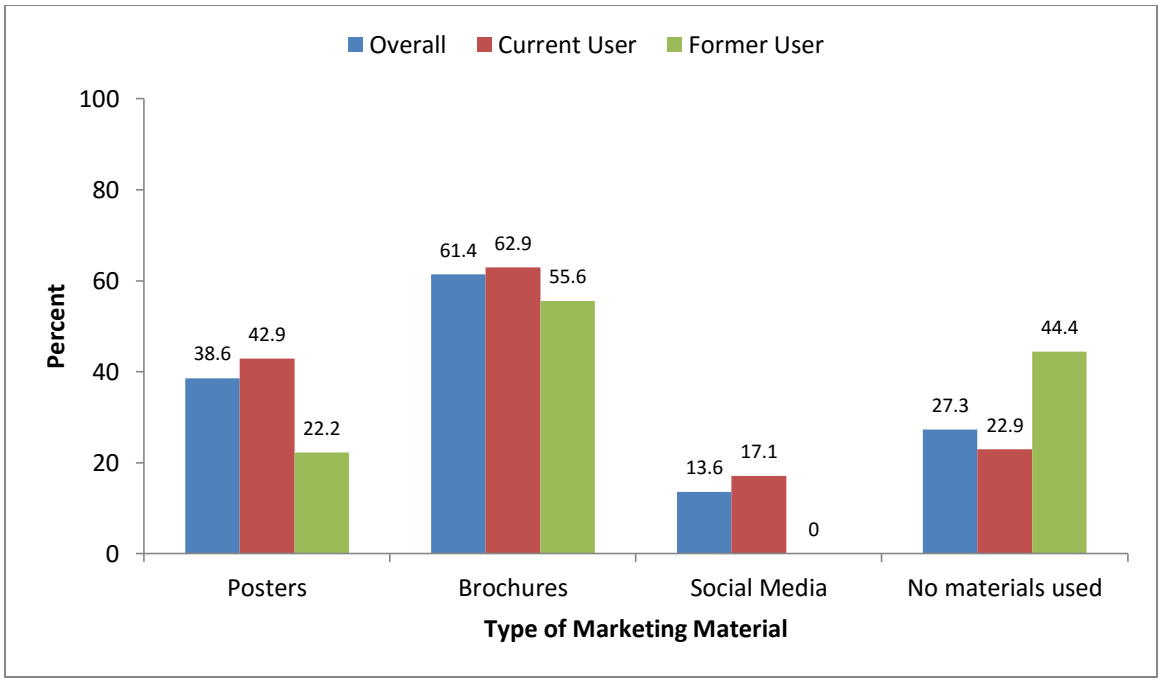


[a]Respondents could select more than one option

The type of marketing materials used to promote MyIR to their patients varied across respondents (Figure 4). However, Former MyIR Users reported a higher frequency of not using any marketing materials. Among respondents that reported using marketing materials, 46.9% reported using more than 1 material. Respondents who reported using more than one marketing material had a higher median number of approved consumers (median=7, IQR: 1-38) compared to respondents who reported using only one marketing material (median=1, IQR: 0-14).

KII participants also reported using brochures, but several reported developing their own materials because they did not receive any. None of the providers reported posting information on their website or through the practice's social marketing accounts.

Figure 4. Type of marketing materials used to promote MyIR to patients by MyIR user status[a]



[a]Respondents could select more than one option

Process for Registering Consumers

The process that survey respondents use for registering consumers is shown in Table 9. Because the reported process was similar for Current and Former MyIR users, only the overall results are presented. The majority of respondents (68.4%) reported using only the Provider-Initiated registration work-flow to register patients, with a minority using only the Patient-Initiated work-flow (13.2%) or a combination of Provider- and Patient-Initiated work-flows (18.4%). A minority of respondents (22.0%) reported that only one person in the practice was responsible for informing and registering patients. Front office staff and nurses were the most frequently reported staff members responsible for informing and registering patients.

Similarly, among KII participants, all but one provider was using the provider-initiated registration process. While one provider utilized the patient-initiated registration process, the majority were not aware that the option was available. Among one provider that was aware of

the patient-initiated process but was not using it, the reason for not using it is they could not determine which patients in the queue to be approved were their patients.

A majority of survey respondents (61.9%) reported that the process of informing patients about MyIR and registering patients occurred at the same point of the visit (at check-in: 23.8%; during the encounter 33.3%; at check-out: 4.8%). The median number of approved consumer accounts varied by the process used for informing and registering patients. Respondents reporting they conduct the entire process during check-in were affiliated with practices with the largest median of approved consumers (median=22.5, IQR: 5-38), followed by those that conduct the process at different times (median=1.5, IQR: 0-6.5), or conduct the process during the encounter when the patient is in the exam room (median=1, IQR: 0-7).

Among the KII participants, the majority reported that the registration process was conducted by the front office staff – only three providers reported the nurse was responsible for registration. Additionally, only four providers targeted all patients, the majority targeted only a subset of patients, those that were specifically asking for copies of their immunization record or those who were there for well-child or immunization only visits.

Overall, survey respondents reported positive attitudes towards the registration process, with the majority agreeing or strongly agreeing that the process was easy (68%), fast (60%), and they were satisfied with the process (60%) (Figure 5). However, a third agreed that the process was disruptive and 37% agreed or strongly agreed that they were unable to discuss MyIR with patients because of lack of time.

Among KII participants, while most patients were receptive to registering for MyIR, several challenges to patient registration were noted, including staff forgetting to promote

MyIR, lack of time to complete all the steps for registration, it was disruptive to the clinic work flow, and patient's lack of internet access at home.

> There's a few steps to it because you have to get the registration information. There's a couple back and forths that have to happen with PIN numbers and what not. It was a bit disruptive to client appointment.
>
> Then there's a little bit of a challenge for the girls at the front desk to remember to give these out and to incorporate one more form into the visit at the check-in process.
>
> Honestly, time ... when this all came about time was a factor because of things that were going on here. We're really small. There's only a few of us here, so we just ... to try to find the time to do this, we were always interrupted.

There was some concern that patients would be less likely to register for MyIR if their practice also provided a patient portal that allowed them access to medical information in the EHR. Only 17 survey respondents (38.6%) reported their practice offers a patient portal. Among these respondents, only 5 (31.3%) reported that patients were less likely to register for MyIR because they could access information through the patient portal. Only a few participants in the KII reported having a patient portal – none of the providers reported that the portal was a barrier to registering patients for MyIR. Many commented that their patient portal was not well used and had similar challenges to registration that MyIR did (specifically patient lack of internet access). One practice reported that MyIR registration was easier than their patient portal and that the staff preferred to promote MyIR over the patient portal.

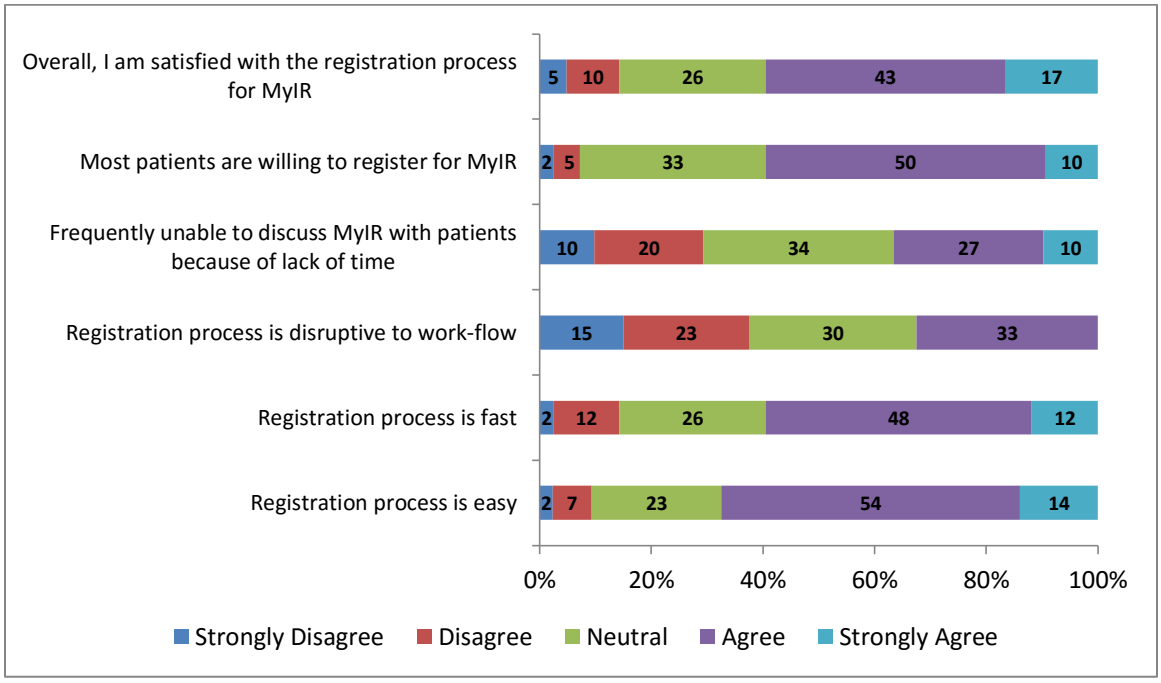
Table 9. MyIR consumer registration process among current and former MyIR users (n=44)[a]

Question	# (%)
Process used for registering patients	
Provider-initiated only	26 (68.4)
Patient-initiated only	5 (13.2)
Both provider- and patient-initiated	7 (18.4)
Number of staff that inform and register patients	
1 person	9 (22.0)
2-3 people	13 (31.7)
4-5 people	10 (24.4)
6 or more people	9 (22.0)
Staff responsible for INFORMING patients about MyIR[b]	
Front office staff	26 (57.8)
Nurse	25 (55.6)
Medical Assistant	13 (28.9)
Other	4 (8.9)
Staff responsible for REGISTERING patients	
Front office staff	21 (48.8)
Nurse	15 (34.9)
Medical Assistant	2 (4.7)
Other	5 (11.6)
What is the registration process?	
Inform and register patients at check-in	10 (23.8)
Inform and register patients during the encounter	14 (33.3)
Inform and register patients at check-out	2 (4.8)
Inform and register at different times of the visit	16 (38.1)
Materials given to patients to help them remember to complete registration	
Reminder cards	7 (17.5)
Print out that includes PIN	19 (47.5)
Other	5 (12.5)
Do not use any materials	9 (22.5)

[a]Due to missing responses, numbers may not add up to the total number of respondents; percents may not add up to 100% due to rounding.

[b]Respondents could select more than one option.

Figure 5. Provider attitudes toward the MyIR registration process



Perceived Benefits of MyIR

While 63% of survey respondents agreed or strongly agreed that they were satisfied with MyIR, few respondents reported observing benefits to their practice or patients (Figure 6). Although 22% disagreed or strongly disagreed and 39% were neutral with the statement that MyIR has had a positive impact on their practice, these respondents had a larger median number of approved consumer accounts (median=3, IQR: 1-14) compared to those that agreed or strongly agreed with the statement (median=0, IQR: 0-25). However, the median number of approved consumer accounts was similar for those that disagreed/strongly disagreed or were neutral (median=3, IQR: 1-10) and those that agree/strongly agreed (median=3, IQR: 0-22.5) with the statement that MyIR had a positive impact on their patients.

Among KII participants, several reported that MyIR was beneficial to their patients, specifically patients that are transient or have received care from multiple providers.

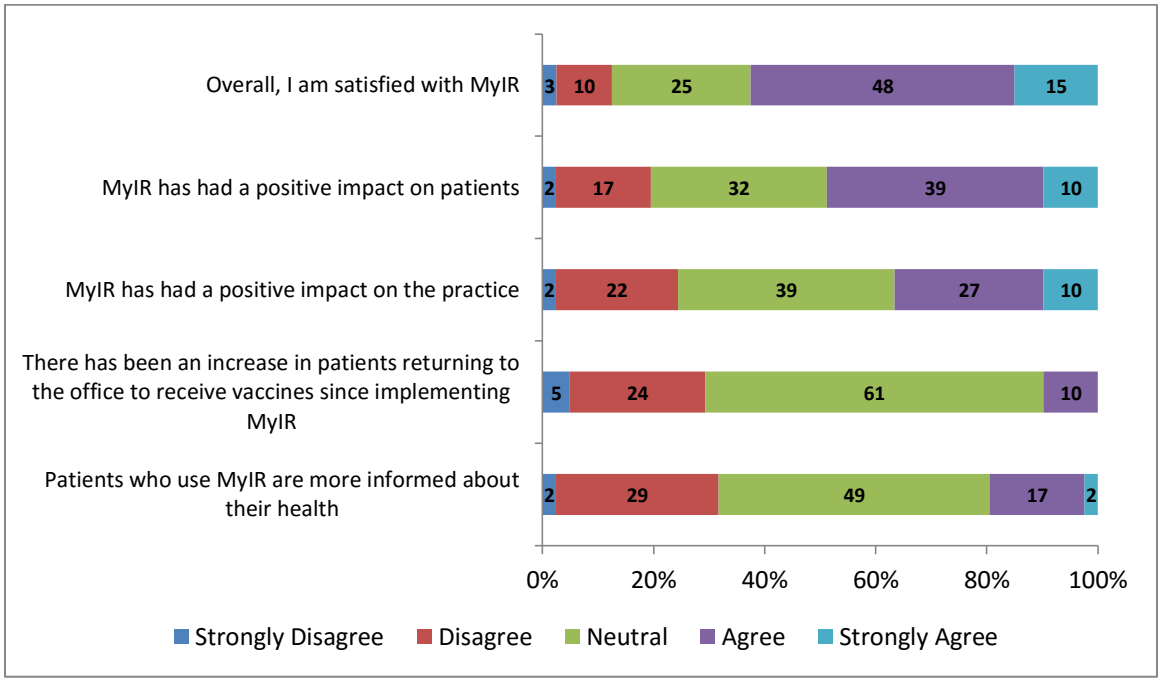
> For certain clients it was the perfect thing especially in this area. We have people that receive services at a variety of different clinics, based on what their health insurance may or may not be at a certain point. We also have a lot of people that are moving in and out of [the area]. For folks that were transient, MyIR was perfect because it gave them access to an up to date medically verified immunization record from their house…They were very appreciative of it.
>
> I had one lady where I had to register all four kids, and she called me back saying, 'Thank you. Thank you so much for taking the time to do this.'

Additionally, providers reported MyIR has benefitted their practice, primarily by reducing the number of requests for immunization records from their patients as well as improving the flow of their visits. "It's reduced the number of records requests we get and it's very helpful to parents."

KII respondents also gave advice for practices that were considering implementing MyIR: have dedicated staff, incorporate materials into the patient registration packet, understand the time commitment and potential impact on practice work flow (especially for large volume practices), and "just do it". Finally, it was recommended that the state health department follow-up with practices to ensure implementation was going well.

> After that initial training which was helpful, there really was no follow up training. The person with the immunization program transitioned to another position. From then on we really felt on our own for figuring things out.
>
> I think it takes someone to be checking in with a practice on a regular basis to say what's going well, how many people are signing up. Just that kind of accountability throughout the year to give accountability and also offer support if there are technical difficulties or road blocks happening. I think that would really help it be effective.

Figure 6. Provider attitudes towards benefits of MyIR



Consumer Survey Results

An invitation to participate in the Fully Activated Consumer survey was sent to 2,184 individuals. A total of 1,207 were determined to be ineligible for the survey because they had not fully activated their MyIR account (n=1,122; this was due to an incorrect algorithm which was not identified until late July, 2015) or email invitation could not be delivered (n=85). Among the 977 individuals with a fully activated MyIR account, 94 (9.6%) clicked on the survey link provided in the invitation. Of the 94 that clicked on the survey link, 86 (91.5%) completed the Fully Activated survey and were included in the analysis.

An invitation to participate in the Incompletely Activated Consumer survey was sent to 4,190 individuals. A total of 376 were determined to be ineligible for the survey because the email invitation could not be delivered. Among the 3,814 eligible individuals, 119 (3.1%) clicked on the survey link provided in the invitation. Of the 119 that clicked on the survey link, 94

(79%) completed the Incompletely Activated Consumer survey and were included in the analysis.

Consumers from all five states were represented in the consumer survey analysis. In both the Fully Activated Consumer and the Incompletely Activated Consumer surveys, the majority of respondents came from Louisiana and West Virginia. Because of the small sample sizes for some of the states, only aggregate results will be presented for the survey questions.

Both the fully activated and incompletely activated consumer surveys assessed how consumers learned about MyIR and their primary motivation for registering. Fully activated and incompletely activated consumers were most likely to learn about MyIR through their healthcare provider (60.5% and 47.9%, respectively) and were most interested in using MyIR to view and print immunization records for their children (Table 10).

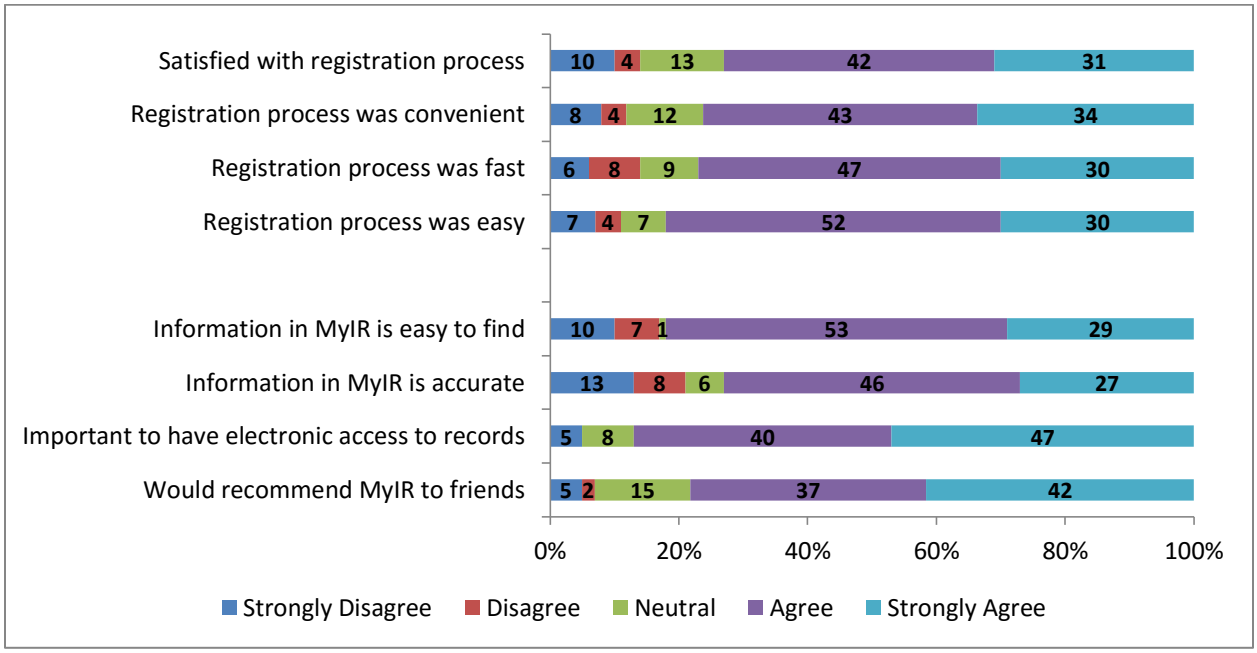
Table 10. Consumer survey results – how consumers learned about MyIR and their motivations for registering

Survey Question	Fully Activated Consumers # (%)	Incompletely Activated Consumers # (%)
How did you find out about MyIR?		
Healthcare provider	52 (60.5)	45 (47.9)
Print materials	2 (2.3)	6 (6.4)
Friend	2 (2.3)	8 (8.5)
Other	30 (34.9)	34 (36.2)
Main reason for registering		
Healthcare provider recommended it	11 (12.9)	21 (24.7)
To view immunization information	45 (52.9)	24 (28.2)
To print immunization records for daycare/school/camp/work	24 (28.2)	35 (41.2)
Other	5 (5.9)	5 (5.9)
Whose records were you using MyIR for?[a]		
Child	74 (86.1)	68 (72.3)
Self	47 (54.7)	30 (31.9)
Spouse	22 (25.6)	8 (8.5)
Parent	9 (0)	2 (2.1)
Other	1 (1.2)	5 (5.3)

[a]Respondent could select more than one option.

The Fully Activated Consumer survey further assessed a consumer's overall satisfaction with the registration process and the performance of the portal. Overall, 73.1% agreed or strongly agreed that they were satisfied with the registration process with the majority agreeing or strongly agreeing that the registration process was easy, fast, and convenient (Figure 7). Additionally, consumers agreed or strongly agreed that information in MyIR was easy to find and accurate and 79% agreed or strongly agreed that they would recommend MyIR to their friends.

Figure 7. Fully activated consumers' satisfaction with using MyIR*



*Percentages may not add to 100 due to rounding.

Use of MyIR among Fully Activated Consumers is shown in Table 11. Overall, 83.7% of consumers have accessed MyIR, with the majority (69.8%) using it to view immunization records. Among the 30% that reported printing immunization records, the majority (73.1%) did so for school or daycare. Among the 16% that have not yet accessed MyIR, the main reasons were due to not needing to view their information (57.1%) or because they forgot their login information (7.1%). Among the 40% of users who reported MyIR indicated a vaccine was needed for themselves or a family member, 53.5% reported taking some action including: calling their doctor to see if the vaccine was needed (14.3%), had been received (3.6%), or to schedule a visit (35.7%).

Table 11. Use of MyIR by fully activated consumers (n=86)

Question	Number	Percent
Which functions have you used?[a]		
Viewed immunization records	60	69.8
Printed immunization records	26	30.2
Other	8	9.3
Have not yet used MyIR	14	16.3
Reason for printing immunization record?[a,b]		
For school or daycare	19	73.1
For employer	1	3.9
Other	7	26.9
Did MyIR indicate a vaccine was needed?		
Yes	28	40.0
What action was taken after learning a vaccine was needed?[c]		
Called Doctor to see if vaccine was needed	4	14.3
Called Doctor to report vaccine had been received	1	3.6
Scheduled a visit with Doctor	10	35.7
Waiting to discuss with Doctor at next visit	5	17.9
Have not taken any action yet	8	28.6
Why haven't accessed MyIR yet?[d]		
Forgot login information	1	7.1
Did not need to view immunization record	8	57.1
Other	5	35.7

[a] Respondent could select more than one option.
[b] Question asked only for those that reported they had used MyIR to print immunization records.
[c] Question asked only for those that reported MyIR indicated a vaccine was needed.
[d] Question asked only for those that reported they have not yet accessed MyIR.

Reasons for not completing the registration process among not Fully Activated Consumers can be seen in Table 12. Among individuals who initiated registration through the provider-initiated workflow (45.2%), the top three reasons for not completing include: they forgot to go online to complete (26.8%), they forgot or lost their PIN information (22.0%), or they did not have time to complete (17.1%). Among individuals who initiated registration through the patient-initiated workflow (54.8%), the top three reasons for not completing registration include: they did not know they had to go to the provider office to finish the

registration process (37.2%), they planned to complete registration during their next visit with their provider (23.3%), or they were not willing to schedule a visit with their provider just to complete the registration process (18.6%).

Table 12. Reasons for not completing the registration process among not fully activated consumers (n=94)

Question	Number	Percent
Method of registration		
Provider-initiated	42	45.2
Self-initiated	51	54.8
Reason for not completing registration: Provider-initiated group		
Forgot to go online and complete	11	26.8
Forgot/lost PIN information	9	22.0
Did not have time to complete	7	17.1
Not informed to go online to complete	3	7.3
No longer interested	1	2.4
Other	10	24.4
Reason for not completing registration: Self-initiated group		
Did not know had to go to the provider office	16	37.2
Plan to complete registration during next visit with provider	10	23.3
Not willing to schedule a visit with the provider	8	18.6
Forgot to schedule a visit with the provider	4	9.3
Provider was unable to approve registration	5	11.6

CHAPTER V: IMPLEMENTATION PLAN

Table 13 shows the key findings of the evaluation organized by the HOT-fit framework, identifying the successes of the pilot project as well as challenges that need to be addressed if the project is to continue and expand. Although the technology of the consumer portal was easy to learn and use, few consumers (18%) completed all the steps of the registration process. The main organizational factor that contributed to the low uptake was the lack of dedicated staff among the immunization programs to recruit and train providers as well as provide adequate follow-up. Human factors that contributed to low use included many providers forgetting to promote the portal to their patients along with many consumers either forgetting to complete the final steps to activate their account (27% of those registering through the provider-initiated workflow) or not knowing they had to visit their healthcare provider to complete registration (37% of those registering through the patient-initiated workflow). While the state immunization programs and providers saw the potential for the portal to empower consumers to make decisions about their health, many felt it was too early in the project to see real benefits. However, results from the evaluation suggest that accessing the consumer access portal lead to positive health behaviors; among consumers who learned that a vaccine was needed, half took action by calling their healthcare provider to learn more or schedule a visit.

Although providers reported that the registration process was easy and fast, 33% reported it was disruptive to their workflow and 37% reported they frequently did not have sufficient time to discuss the portal with their patients. In order to reduce the burden on the

state immunization programs and providers and increase consumer registration, the registration process must be improved. The authentication process, which required approval by a healthcare provider, was developed because of concerns raised by consumers and providers over security of personal information. However, requiring provider involvement is limiting the reach of the portal. Recruiting, training, and providing adequate follow-up is a significant amount of work which the state programs do not have the capacity to support. Since a small number of providers are registering patients (only 8% of those with access to MyIR), the state programs are not able to promote the program broadly throughout the state.

The following sections outline a plan for strengthening the implementation of the consumer access portal, as well as expand its reach to consumers as the pilot project enters its third year. The plan includes development of a technology solution that will streamline consumer registration, thereby reducing the burden on immunization programs and providers. Furthermore, expansion of the promotion activities to consumers is proposed to reach a greater audience, and improved monitoring and feedback of the project will ensure implementation is on track and can be adjusted if needed. Finally, recommendations are made for expanding implementation to additional states.

Table 13. Key findings organized by HOT-fit framework

Factor	Dimension	Successes	Challenges
Technology	System Quality	• Providers reported system was easy to learn how to use • Consumers reported information was easy to find	• None identified
	Information Quality	• Consumers reported information was accurate	• None identified
	Service Quality	• None identified	• Providers reported lack of follow-up from state program
Human	System Use	• Providers that incorporated registration into visit check-in had higher number of approved consumers • Majority of consumers reported using the portal to view or print immunization records	• Few providers registering consumers • Low registration completion rate among consumers • Providers forget to promote consumer access portal • Consumers forget to complete final registration steps
	User Satisfaction	• In general, providers were satisfied with training • Many providers reported they were satisfied with the system • Consumers were satisfied with the system and would recommend to their friends	• None identified
Organization	Structure	• None identified	• State programs did not have sufficient staff to recruit and train providers • Some providers were not supportive once they learned the level of work involved
	Environment	• Public providers easier to onboard than private providers	• None identified
Net Benefits		• Among consumers learning they needed a vaccine, half took action • Some providers reported the portal had a positive impact on their practice	• Some providers reported registration process was disruptive to their work flow • State programs reported it was too early to see benefits but there was a lot of potential to help consumers

Alternative Registration Process

Eliminating the provider from the registration process has the potential to simplify the registration process for the consumer by allowing the consumer to complete registration in one on-line session rather than make a visit to their healthcare provider's office. Additionally, a new registration process will allow the state immunization program to promote the consumer access portal through multiple channels and across the entire state since they will no longer be limited to promoting to consumers served by participating providers. The disadvantage of removing the provider from the registration process is the ability to confirm the identity of the consumer in-person and link the consumer to the correct records in the state IIS.

Identity proofing, or the process by which an organization collects and verifies information about a person for the purpose of account opening or issuing credentials, has become a concern for companies and government organizations. Organizations want to make sure they can correctly identify the right individual for the right purpose and minimize the risks related to misidentification, impersonation or theft. The National Institute of Standards and Technology (NIST) developed technical guidelines for implementing electronic authentication consistent with the four levels of assurance (LOA) defined by the Office of Management and Budget.[39] For each LOA, the NIST guidance describes a coordinated set of identity-proofing and authentication methods that, when used together, can provide specific levels of confidence that the entities involved in electronic transactions are who they claim to be. Each LOA describes the degree of certainty that the user has presented a valid identifier that refers to his or her identity.

A Level 3 LOA technology solution is proposed for streamlining registration for MyIR. The solution requires two authentication factors: verification of identifying information along with proof of possession of a token. The process also includes alternate processes in the event that identifying information cannot be verified.

The proposed process (Figures 8-12) expands the current consumer-initiated registration process but removes the requirement to visit the healthcare provider to activate the account for most individuals. After selecting "Self-Registration" from the MyIR webpage, the consumer will see screens (customized by state) that provide information about the workflow and available options (Figure 8). Next, the consumer will enter their email address, create a password, and enter identifying information (i.e., name, phone numbers, gender, DOB, address). A Matching Algorithm is then used to match the entered identifying information to information that is in the state IIS. Depending on the outcome of the Matching Algorithm, the consumer will be directed to one of three options (Figure 9). If there is an exact match (Figure 10), a Short Message Service (SMS) text with an access code is sent to the consumer if the consumer provided an SMS enabled phone number; once the consumer enters the access code in MyIR, their account is activated. If the consumer does not have an SMS enabled phone, then the access code would be transmitted via autodial to the phone number provided. If a phone number is not available, then the access code will be sent to the consumer by mail. If the Matching Algorithm is unable to match the consumer to a record in the IIS (Figures 11-12), then the consumer will be informed they can activate their account by visiting their healthcare provider or, if the state chooses to implement, contact the state immunization program to complete the state-assisted registration process. The state-assisted registration process will be

determined by the state according to their requirements and may include the consumer sending (via mail, fax, or email) a copy of their driver's license or other acceptable proof of identification.

Although the proposed alternative registration method does not completely eliminate the need for assistance from healthcare providers or the state program altogether, since they will need to assist consumers who are unable to match to a record in the IIS, their involvement is expected to be significantly reduced. Evaluation of the participating state IIS, which has been conducted by the MyIR vendor, indicate that the registration information provided by the consumer would result in a match 85% of the time; therefore, it is estimated that approximately 15% of consumers would need to contact their healthcare provider or the state immunization program to complete their registration. Therefore, implementation of the alternate registration work-flow has the potential to increase the registration completion rate from 18% to over 80%.

Figure 8. Alternate registration work-flow: initiation and matching algorithm

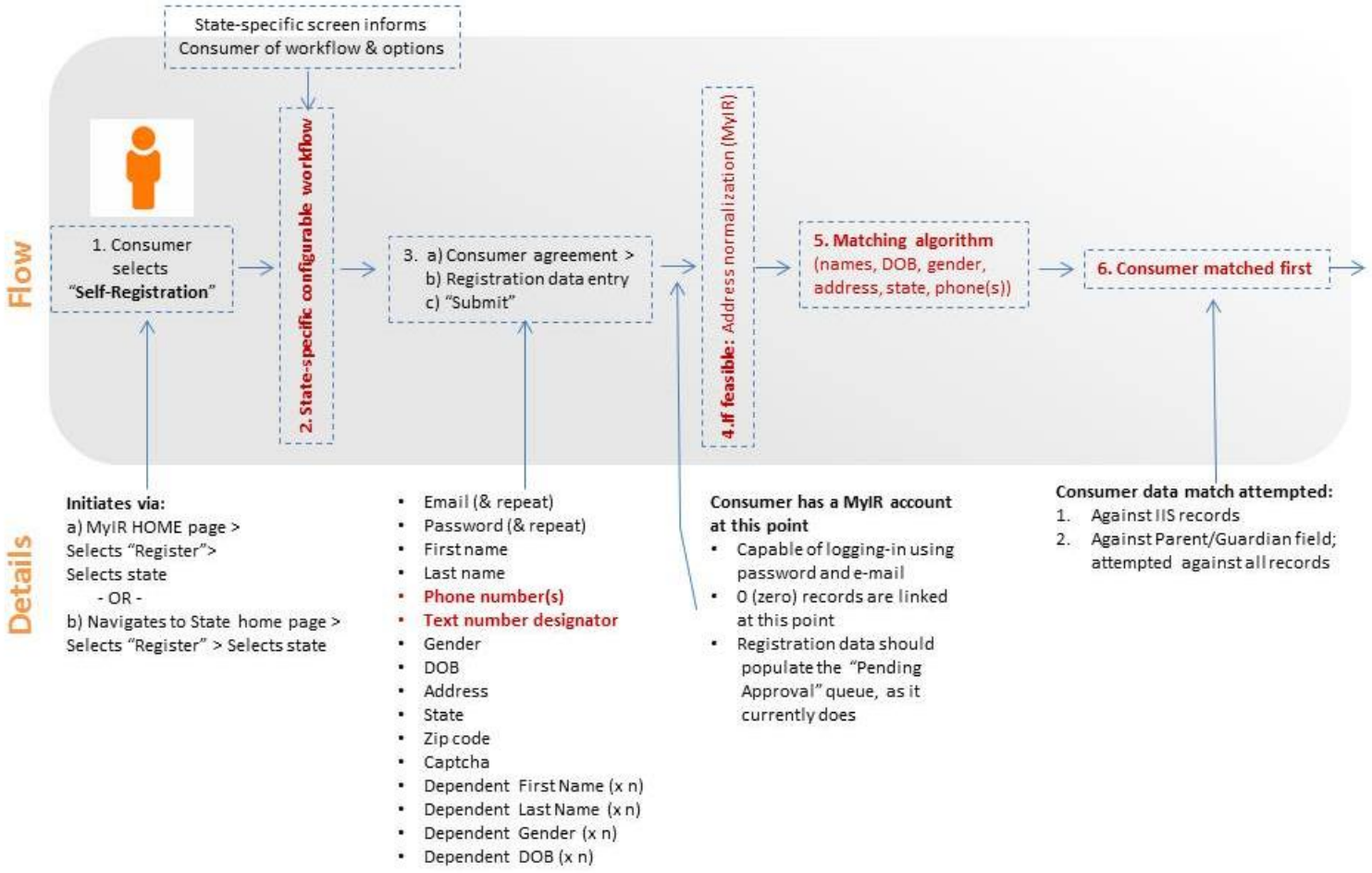


Figure 9. Alternate registration work-flow: matching algorithm outcomes

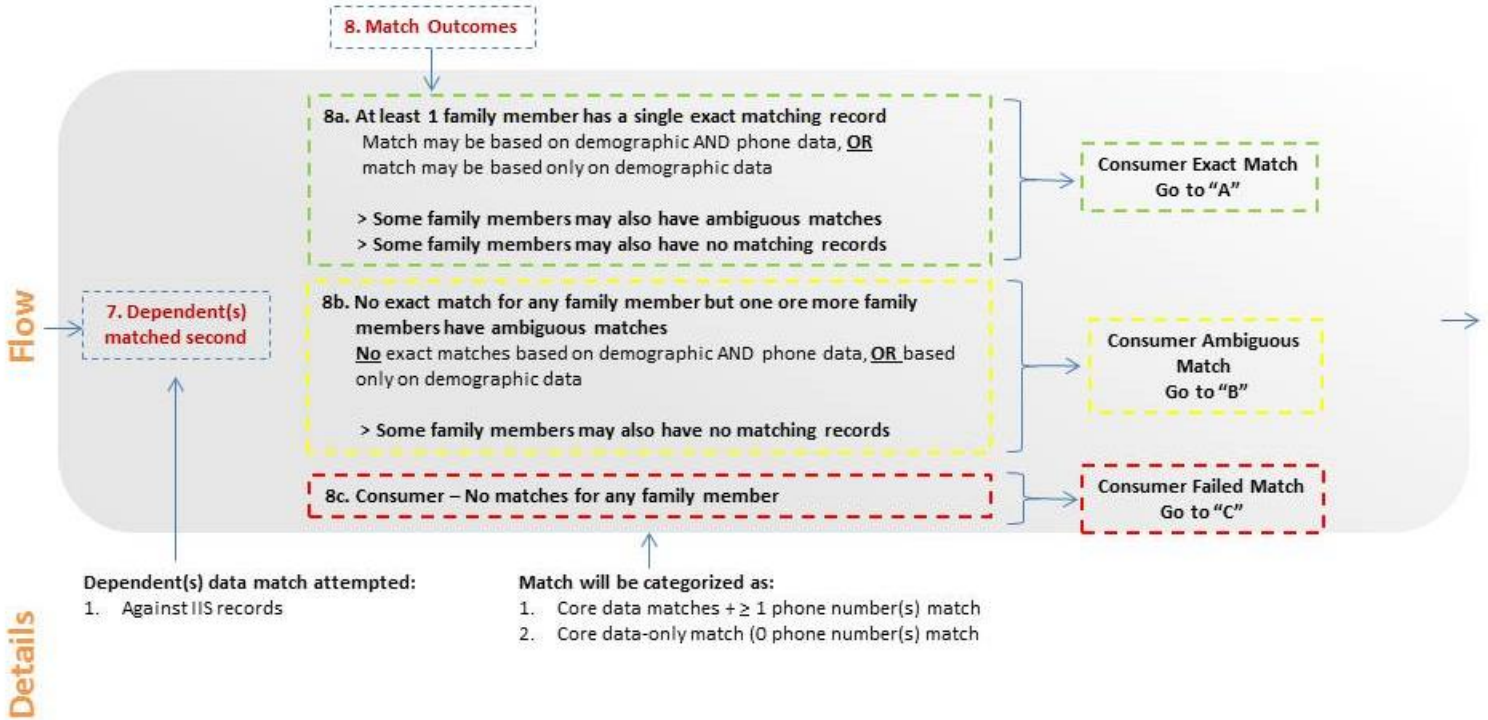


Figure 10. Alternate registration work-flow: consumer exact match

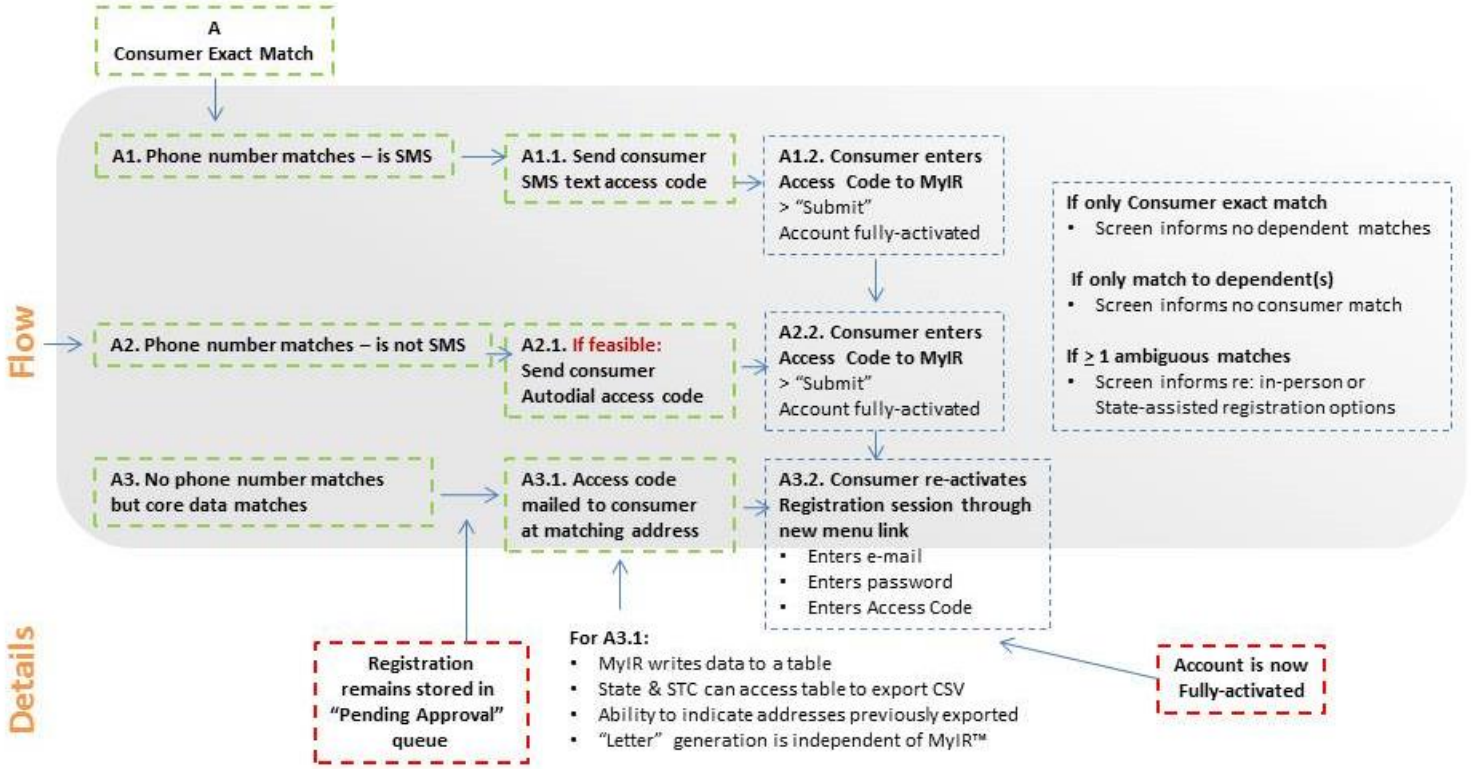


Figure 11. Alternate registration work-flow: ambiguous match

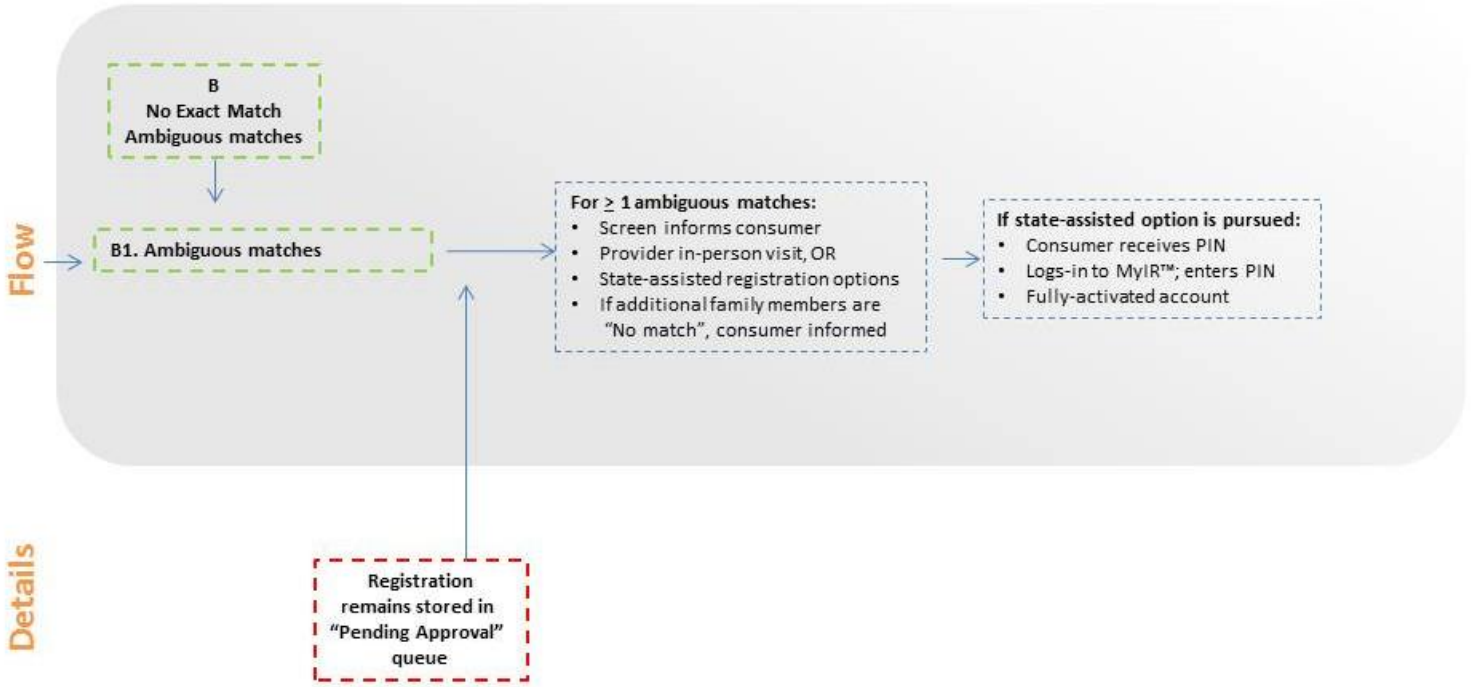
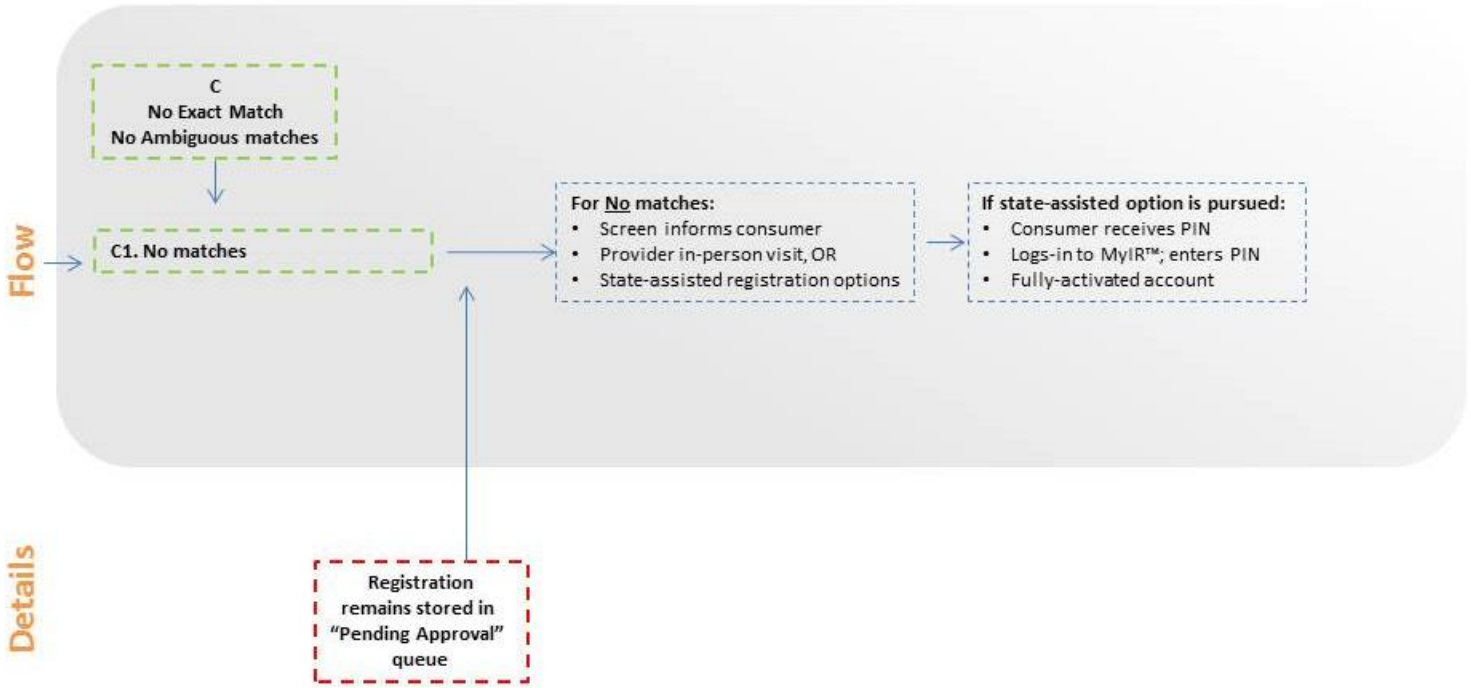


Figure 12. Alternate registration work-flow: no match



Promotion Strategy

Implementation of the alternate registration work-flow will enable the state program to pursue a marketing strategy to increase consumer demand. Up until this point, the programs reported they were unable to market directly to consumers since there were a limited number of healthcare providers conducting registration for MyIR. Since the alternate registration work-flow is not solely dependent on healthcare providers, the state programs can utilize several platforms to reach consumers across the entire state, including: state health department materials and website; vaccination provider offices and pharmacies; schools; and social media. A summary of the marketing strategy can be seen in Table 14. Prior to implementation, existing materials will need to be revised to reflect the alternate registration work-flow. Materials should continue to highlight the convenience and security of the consumer access portal but now promote the registration website.

The updated marketing plan for state programs will incorporate MyIR messaging into all immunization materials that are developed for the community. For example any materials developed to promote vaccination should contain a message/weblink for accessing MyIR to obtain their immunization records, including vaccination reminders sent to parents whose child is due for a vaccine. Additionally, MyIR should be prominently featured on the main immunization webpage with links to direct consumers to the registration page. Finally, during major immunization observances such as National Infant Immunization Week (April), Immunization Awareness Month (August), and National Influenza Immunization Week (December), the program should incorporate messages about MyIR in any materials developed

for the media. Information should also be provided to members of the state immunization coalition so that they can disseminate through their networks.

Table 14. MyIR marketing strategy by key stakeholder

Stakeholder	Strategy
State Immunization Program	• Incorporate MyIR messaging into existing materials disseminated to the public • Feature MyIR prominently on website • Disseminate MyIR messaging through social media accounts • Incorporate MyIR messaging into items developed for times of Immunization Observances (e.g., Infant Immunization Week) • Disseminate MyIR information to VFC-enrolled providers • Incorporate discussion of MyIR during routinely scheduled site visits with VFC-enrolled providers • Share materials with Immunization Coalition members for distribution through their networks

Healthcare Providers and Pharmacists	• Disseminate marketing tool-kit to providers
	  • Posters and brochures for display in the office
	  • Information sheet to be disseminated at check-out (or with prescription orders)
	  • Web buttons to be placed on their websites
	  • Scripted messages that can be disseminated through their social media accounts

Schools	• Disseminate marketing tool-kit to schools
	  • Informational letter that can be disseminated by the school to parents during the school year
	  • Incorporate MyIR informational materials into school registration packets
	  • Web buttons to be placed on their websites
	  • Scripted messages that can be disseminated through their social media accounts

Although healthcare providers have less of an active role in consumer registration with the proposed alternate registration work-flow, they remain an important advocate for promoting MyIR. Since the providers would not be required to incorporate registration into their routine activities they may be more willing to advertise and promote MyIR, and possibly

register the few patients that are unable to match to a record in the IIS. To educate providers, state programs should incorporate information about MyIR (including registration information) into their regular communications with providers, including newsletters. State immunization program staff responsible for conducting routine site visits to Vaccine For Children enrolled providers should also incorporate educational messages about MyIR into their discussions with the providers as well as information about patient registration (including links to instructional videos). Posters and brochures should be provided to providers so they can advertise MyIR in their practices. Additionally, web banners and web buttons should be made available to providers to place on their practice website to direct patients to the MyIR website to register their account.

Pharmacists are also important partners within the community and can be approached to help promote MyIR to their customers. Since the pharmacist does not have an active role with the alternate registration process, the concerns states raised about reaching out to pharmacists should be alleviated. Similar to the promotion strategy with healthcare providers, posters, brochures, and web tools can be made available to pharmacists to help advertise MyIR at their check-in and check-out counters. Additionally, an information sheet can be developed to be included with prescription orders.

Finally, schools will be a critical partner in promoting MyIR. All of the participating state programs mentioned the need to work with schools to promote MyIR to their students. A school letter should be developed to be included in school registration packets as well as any communication materials that are disseminated to parents. Additionally, web tools can also be

made available to be posted on their websites to assist parents with obtaining the required immunization certificates for school registration.

Evaluation and Feedback

Interviews with the healthcare providers highlighted the lack of feedback provided regarding the implementation of the consumer access portal. As the project enters its third year, monitoring implementation and sharing selected outcomes with key stakeholders will be critical to sustaining interest and support for the project. Proposed below is a plan for developing a dashboard for summarizing project metrics; a plan for evaluating the implementation of the alternate consumer registration work-flow; and a plan for providing feedback to the state immunization programs.

Monthly Dashboard

While metrics of selected outcomes have been provided throughout the project, they were difficult to interpret and were reviewed inconsistently by project management staff. A monthly dashboard is proposed to allow project staff to monitor progress with the consumer registration, determine how many consumers are unable to match to a record in the IIS, as well as quickly identify areas of concern that need to be addressed. Appendix F is a draft dashboard displaying key indicators for each registration process. A dashboard will be created for each participating state as well as for the project overall. The expectation is that the dashboard will be reviewed by project management staff each month. Additionally, each state will receive their dashboard and they can choose to share the information with their partners as appropriate.

Evaluation of Alternate Registration

The proposed evaluation of the alternate registration will involve several components including: monitoring the number of new accounts in the monthly dashboard mentioned above; conducting a consumer survey to evaluate the registration experience and identify any challenges with use of the portal; and an evaluation of the marketing activities.

Similar to what was conducted in year 3, two consumer surveys are proposed: one of consumers with activated accounts, and one of consumers who initiated but did not complete the registration process. Consumers will be invited to complete an online survey approximately 2 weeks after they completed their registration (Activated Consumers) or initiated their registration (Incomplete Registrants). The survey instruments from Appendices D and E will be modified to incorporate response options appropriate for the alternate registration process but will continue to monitor similar constructs related to satisfaction with the registration process and satisfaction with the portal itself. Survey results will be summarized each month and shared with project management staff for discussion and determination if changes to the registration work-flow are needed. Because the response rate for the Incomplete Registrant survey was so low (~3%), it is proposed that the survey for this group only be conducted for a limited period (i.e., 90 days) to conserve resources. Additionally, it is expected that any problems that may exist with the alternate registration would be identified during the first few months of implementation and very little new information would be gained by continuing the survey. However, if changes are made to the registration work-flow, the project management team could continue the survey for a longer period.

Feedback to State Immunization Programs

As mentioned above, the monthly dashboard will be provided to each state for review along with results from the consumer surveys. The metrics can be discussed during the monthly project calls. The states had mixed feelings about the monthly calls with some finding it helpful and others not comfortable with the format. To help make these calls more meaningful and effective, it is proposed that instead of focusing on state updates, the call focus on a specific topic each month, for example, receiving input on the alternate registration work-flow, review of the marketing strategy, and impact of the new registration process on their program.

Sustainability Plan and Expansion to Other States

While funding for a third year of the project has been secured, a plan for sustained funding and support for the current participating states is needed as well as a strategy for supporting expansion to additional states. To date, the pilot project has been supported by an Interagency Agreement between CDC and ONC, with ONC managing the contracts with the marketing and IT vendor as well as providing overall project management. While this model has been successful with developing the portal and marketing materials and guiding the states with implementation, the model does not provide the states with the financial resources to hire staff. Below is a proposed model for sustainability that continues the relationship between CDC and ONC but also allows for direct support to the state programs. The model includes providing financial assistance to the state programs to support staffing and marketing activities and development of a service contract with IT vendors to support maintenance of the portal.

State (and select city) Immunization Programs receive their core funding through a 5-year Cooperative Agreement from CDC as well as funding for special projects through supplemental Cooperative Agreements. The core award outlines the required activities that the program must complete but allows the program flexibility with how they will implement their program as well as the ability to implement other non-required activities the program feels are important. The current core award ends in 2017 and discussions are underway regarding the funding requirements for the 2018-2022 award cycle. Thus, this is the perfect opportunity to incorporate activities related to the consumer access portal into the next funding cycle so that programs wishing to implement a consumer access portal receive the necessary resources. Although funding the consumer access project through a supplemental award is an option, it is less desirable since the project period is time limited and programs may be hesitant to apply for funds since there may be perceived uncertainty of long-term support and commitment from CDC. Additionally, CDC does not have the staffing capacity to take on management of multiple supplemental awards, whereas incorporating the consumer access activity into the core award could be managed by the existing Project Officer assigned to the state. Therefore, incorporating this activity into the core award is preferred as it will demonstrate CDC's support of consumer access to immunization information, will signal to the programs that this is an area worth pursuing, and will not over-burden CDC's staffing capacity. Additionally, having this activity in the core award will establish accountability among the programs since they would be expected to report on progress in their annual report and continuation funding applications. This is critical as all of the pilot state programs reported that because implementation of MyIR was not a requirement, it fell very low on their priority list.

It is not expected, nor desired that every state begin implementation of a consumer access portal in 2018. Results from the current evaluation found that high organizational support, adequate staffing levels, and a high quality IIS are important factors for successful implementation of a consumer access portal. Therefore, to increase the likelihood of successful implementation, a phased approach over the 5-year funding cycle is proposed where core award funding is made available once states demonstrate that they meet the organizational and technological criteria listed in Table 15.

Table 15. Criteria for funding state programs to implement a consumer access portal

Domain	Criteria
Organization	• Have documented support for implementation of a consumer access portal from the organization, including senior leadership, IT, and legal • Have the ability to hire staff (permanent or contractor); if not hiring staff, then have staff identified • Willing to work with CDC-selected IT vendor(s)
Technology	• The IIS can receive submissions in accordance with interoperability standards endorsed by CDC for message content/format and transport • When the IIS receives queries from other health information systems, it can generate an automatic response in accordance with interoperability standards endorsed by CDC for message content/format and transport • At least 85% of childhood vaccination providers report vaccinations to the IIS • At least 85% of children <18 years in the geographic area are included in the IIS

While the 2018-2022 Cooperative Agreement can provide financial support directly to the state immunization programs, a separate mechanism is proposed for supporting the IT vendor(s) that develop and maintain the consumer access portal technology. CDC has developed a simplified acquisition mechanism for IIS IT solutions. This mechanism ensures that quality standards are met, drives competition and innovation, and capitalizes on economies of

scale. Additionally, the mechanism reduces the burden on the state immunization program to negotiate and manage a contract for IT services.

The pilot project utilized one vendor for developing the technology for the consumer access portal; this vendor also develops and supports several state IIS. While the vendor developed an IIS-agnostic product (i.e., the portal is compatible with any IIS, regardless of IIS product), it is possible that states will be hesitant to utilize a product created by an IIS vendor that is not their own. Product vendor may be an important factor for participation since several of the pilot states mentioned that a reason they were willing to participate in the pilot was that the portal was created by their IIS vendor. Furthermore, while the pilot project vendor has successfully developed the technology for a consumer access portal, other vendors may have innovative ideas for a consumer access portal, especially with respect to consumer registration.

Since the 5-year Immunization Awardee Cooperative Agreement and IT vendor contract will not begin until 2018, continued support for currently participating states should be provided through the existing Interagency Agreement (IAA) with ONC. During the next two years, the IAA should support the current project activities as well as development of a Consumer Access Toolkit for state immunization programs. The Toolkit should provide an overview of the staffing resources needed for implementation, a marketing plan including existing materials that can be customized for the state, and a proposed implementation schedule. The Toolkit should be made available during 2017 to assist state immunization programs with preparing their funding application for the 2018-2022 Cooperative Agreement.

CHAPTER VI: DISCUSSION

Since the publication of the national plan to support consumer engagement via e-health in 2013,[14] there has been significant growth in providing consumers access to their medical information as well as tools to help manage their health. In 2014, 83% of qualifying physicians had adopted an EHR in their practice, with 47% giving patients access to view, download, or transmit their electronic health information.[40,41] Additionally, the availability of health and wellness apps through the Apple iOS platform more than doubled between 2013 and 2015, with over 90,000 health and wellness apps available.[42] The MyIR consumer access portal is one more tool consumers can use to be better informed and empowered to make decisions about their health.

Evaluation of the MyIR consumer access portal identified challenges to implementation but also demonstrated success in influencing positive health seeking behaviors. As of August 30, 2015, over 1000 consumers across 5 states have registered and activated their account with MyIR and use of the MyIR portal is higher than what has been observed for other e-health systems. Among registered consumers, 84% accessed their MyIR account at least once whereas in 2014, only 55% of patients who were offered online access to their medical record accessed their information at least once.[43] The large proportion of consumers accessing their account suggests the portal is offering information of value to the consumer, however, once the consumer views or prints their immunization information it is not clear how frequently they will continue to access their account. Even if consumers only access their account occasionally, the

evaluation results suggest that the portal positively influences health behavior: among consumers that learned they or a family member needed a vaccination, over half took action and contacted their healthcare provider.

The main barrier to broader implementation of the MyIR portal is the reliance on healthcare providers to register consumers. Because state immunization programs were unable to prioritize activities related to implementation due to insufficient staff, only a small number of healthcare providers were recruited to promote the portal to consumers. Participating healthcare providers reported positive attitudes towards the portal; however, office staff frequently forgot to promote the portal to their patients and some reported the registration activities were disruptive to their practice. The negative impact on clinic work flow is a common barrier cited for physician promotion of PHRs to patients.[44]

To address the challenges identified for the state immunization programs and healthcare providers, a technology solution to streamline and improve the registration process has been proposed. This solution has the potential to increase the consumer registration completion rate while reducing the burden on healthcare providers and state immunization programs. Furthermore, the alternative registration process will allow the state programs to market the consumer access portal to their entire state rather than to areas served by participating providers. However, maintaining awareness of and support for the MyIR portal among healthcare providers will be important as patients are more likely to utilize e-health tools that are recommended by their physician.[42,44]

As more physicians offer PHRs to their patients, there is a risk for portal fatigue which could reduce consumer interest in the MyIR portal. In an ideal world, patients should be able to

access all their health information from one account. However, limited interoperability between systems remains challenging and it will likely be many years before a fully integrated PHR can be achieved. Until such a time occurs, improving the registration process, implementing a robust promotion strategy, and offering features such as vaccination reminders and the ability to print an official immunization record will help ensure the MyIR portal remains an attractive tool for consumers to monitor their family's immunization records.

Limitations

This study has several limitations that must be acknowledged. For the state key information interviews, there is potential for social desirability bias in the responses since participants were aware of my affiliation with CDC, one of the funding organizations for the pilot project. However, I believe this bias to be minimal since the participants frequently provide feedback to CDC about immunization program activities and were very candid with their responses and discussion of project challenge since several of them had discussed their challenges/concerns previously during their monthly project management calls.

The provider key informant interviews are also subject to social desirability bias. Additionally, the eligibility criteria for selection, i.e., approving at least 5 consumer accounts, may have biased the sample to providers who may be more likely to overcome challenges to incorporating MyIR into their practice or have greater organizational support for MyIR than providers that have approved fewer consumers. However, the criteria ensured that participants were consistent users of MyIR and would have a better understanding of how it has impacted their practice and their patients. Furthermore, the quantitative online survey, which was disseminated to all participating providers, provided the ability to confirm

experiences and attitudes across the spectrum of providers with different levels of participation. Because findings were consistent between the two data collection activities, it is believed any potential bias from the key informant interviews is limited. Although the response rate was low for the provider online survey, it was consistent with the literature[45] and a response was received from a staff member from almost half of the participating practices. Though the limited sample size prevented me from conducting analysis by provider characteristics.

The consumer surveys also suffer from low response rates although the response rate was higher among consumers with a fully activated account (~10%) compared to consumers who initiated but never completed registration (~3%). These response rates are lower than what has been observed in other published studies.[46] Factors that may have contributed to the low response rate include an unattractive subject line, unfamiliarity with MyIR, lack of an incentive, and email fatigue. Because demographic information was not available, I am unable to determine if respondents differed from non-respondents. Although only approximately 3% of the incompletely activated consumers responded, their reported reasons for not completing the registration process was consistent with the challenges reported by the state immunization programs and healthcare providers; it's not clear that new or different information would have been observed if the response rate had been higher.

Conclusion

A consumer access portal linking consumers to their immunization information stored in their state IIS has been moderately successful. As the project continues for another year, adjusting the registration process to allow the consumer to complete all the steps online in one

session has the potential to increase the number of users, reduce the burden on the state immunization program and allow for statewide promotion of the portal. Evaluation of the alternate registration workflow will be important to determine its ability to accurately link consumers to their records. While this method should help improve the reach of the portal, monitoring changes in identity proofing methodology is needed to ensure the portal is taking advantage of the latest technology and following the current standards. Incorporating support for a consumer access portal into the CDC core Cooperative Agreement for state immunization programs will help provide the financial support for states interested in implementing a portal. As more consumers have access to their immunization information, it will be important to evaluate the impact on receipt of recommended vaccinations.

APPENDIX A: STATE KEY INFORMANT INTERVIEW

Introduction

Thank you for agreeing to speak with us today. Before we begin, we would first like to introduce ourselves. I'm Jennifer Hui from Audacious Inquiry, and I'm Shannon Stokley from the Centers for Disease Control and Prevention, and we will be conducting the interview. Just to remind you, the purpose of this interview is to learn more about how [PROGRAM NAME] has been implemented in your state. The interview should take about 30-45 minutes and all of your answers will be kept confidential. Any information that you provide will be reported only as summary information. Your name or the name of your state program will not be connected to your answers in any way. With your permission, I would like to record our interview.

- Are there any questions that you have about the interview?
- Do you agree to participate in the interview?
- May I record the interview?

Intro question

1. What was the motivation for your state to implement [PROGRAM NAME]?
   Probe if needed:
   - Anticipated benefits to providers/community?

Organizational support

The next set of questions focus on your organization.

2. How many staff members supported the implementation of [PROGRAM NAME] and what roles did they play?

3. Did you hire new staff or use existing staff members?

4. Do you feel this level of staffing was sufficient to support the implementation?
   If not, how many additional staff members are needed and what would they do?

5. What additional resources would you need to expand implementation of [PROGRAM NAME] statewide?

Provider recruitment

Now we would like to move on to the topic of provider recruitment.

6. What was your strategy for selecting providers for [PROGRAM NAME]?
   Probe if needed:
   - Did you focus on a particular location of the state?
   - Did you select providers based on particular characteristics? (large vs small practice, pediatrician vs family physician, urban vs rural)
   - Existing relationship?

7. What was your approach for recruiting providers?
   Probe if needed:
   - How did you inform providers about [PROGRAM NAME]?
   - Who did you speak with at the practice to obtain buy-in/commitment?

8. How receptive were providers to implementing [PROGRAM NAME]?
   Probe if needed:
   - If not receptive, what were the main concerns or reasons for not wanting to participate?
   - If receptive, why do you think so?

9. Based on your experiences so far, what approach would you use to expand [PROGRAM NAME]?
   Probe if needed:
   - Are there different types of providers you would approach?
   - How would you prioritize provider recruitment?
   - Would you make changes to how you recruit providers?

Marketing plan/materials

Now we would like to ask you about the marketing plan and marketing materials.

10. How did your program advertise [PROGRAM NAME] to consumers?
    Probe if needed:
    - Magazine ads, billboards, web sites, etc.
    - Rely on the provider to inform patients?

11. Of the marketing materials that were developed, which materials did you use?
    List the different materials if needed

12. Are there other materials that you think would be helpful?
    Probe if needed:
    - Materials for providers
    - Materials for consumers

Overall satisfaction

Finally, we want to ask about your overall experience with [PROGRAM NAME].

13. How satisfied are you with the implementation of [PROGRAM NAME]?
    Probe if needed:
    - If unsatisfied, what would you do differently to improve implementation?
    - If satisfied, what are the key factors that made implementation successful?

14. How do you think [PROGRAM NAME] benefitted providers?
15. How do you think [PROGRAM NAME] benefitted consumers?

16. How do you think [PROGRAM NAME] benefitted your program?

17. Lastly, what advice would you give to another state that is considering implementing [PROGRAM NAME]?

Those are all the questions we have for you today. Thank you again for your time and participation.

APPENDIX B: PROVIDER SURVEY

Thank you for agreeing to participate in this survey. The purpose of this survey is to help us evaluate and improve [PROGRAM NAME]. Your participation is voluntary. Your identity will not be linked to your survey responses and your responses will be kept confidential. You may skip any question that you do not want to answer.

1. Is your practice currently implementing [PROGRAM NAME]?
    a. Yes [GO TO QUESTION 2]
    b. Have not done so but plan to in the coming month(s) [GO TO QUESTION 4]
    c. No [GO TO QUESTION 2]

2. When did you start implementing [PROGRAM NAME] in your practice?
    Month_____(drop down option with months of the year listed)
    Year_____(drop down options: 2013, 2014, 2015)

[NOTE: Those that answered 'Yes' to Q1 will go to Q5; those that answered 'No' to Q1 will go to Q3]

3. When did your practice stop implementing [PROGRAM NAME]?
    Month_____(drop down option with months of the year listed)
    Year_____(drop down options: 2013, 2014, 2015)
    [GO TO QUESTION 5]

4. When do you plan to start implementing [PROGRAM NAME] in your practice?
    Month_____(drop down option with months of the year listed)
    Year_____(drop down options: 2015, 2016)

[Text below would only appear for respondents that answered 'No' to question 1]
Even though your practice is no longer using [PROGRAM NAME], we are still interested in learning about your experiences with [PROGRAM NAME]. Please continue with the survey and answer the questions based on the time period when your practice was implementing [PROGRAM NAME].

5. What type of training did you receive for [PROGRAM NAME]? (check all that apply)
    a. In-person training
    b. Webinar or online video
    c. Reviewed written training materials
    d. Other (specify)

6. How satisfied are you with the training that you received?
    a. Very satisfied [*GO TO QUESTION 8]*
    b. Satisfied *[GO TO QUESTION 8]*
    c. Not satisfied *[GO TO QUESTION 7]*

7. How do you think the training could have been improved?
   [free text field]

[NOTE: For those who answered 'B' to question 1, Go To Question 21]

8. Do you use any of the materials listed below to inform patients about [PROGRAM NAME]? (check all that apply)
   a. Posters (displayed in the office)
   b. Patient brochure
   c. Social Media
   d. Other (specify)

9. What kind of registration process does your practice follow? (check all that apply)
   a. **Provider-initiated registration** – practice staff members complete the registration and authentication of the account during an office visit
   b. **Patient-initiated registration** – patient initiates the registration process online; account authentication and activation is completed during an office visit

10. How many staff members in the practice have the responsibility for informing and registering patients?
    _____ [drop down box with numbers 1-10]

11. Who in the office is responsible for informing patients about [PROGRAM NAME]? (check all that apply)
    a. Front office staff member
    b. Nurse
    c. Medical Assistant
    d. Other (Please enter an 'other' value for this selection)

12. When during the office visit is the patient informed about [PROGRAM NAME]?
    a. At check in
    b. During the patient encounter (for example, when interacting with the patient/family in the exam room)
    c. At check out
    d. Other (Please enter an 'other' value for this selection)

13. Who in the office is responsible for registering patients?
    a. Front office staff member
    b. Nurse
    c. Medical Assistant
    d. Other (Please enter an 'other' value for this selection)

14. When during the office visit is the patient registered for [PROGRAM NAME]?
    a. At check in
    b. During the patient encounter (for example, when interacting with the patient/family in the exam room)
    c. At check out
    d. Other (Please enter an 'other' value for this selection)

15. Do you provide any materials to the patient to help them remember their account information?
    a. Reminder cards where the patient can write down their pin number
    b. Printout with pin number
    c. Other (Please enter an 'other' value for this selection)

16. For each statement listed below, please indicate how strongly you agree with the statement.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The process for registering patients is easy to complete					
The process for registering patients is fast to complete					
The process for registering patients is disruptive to the office visit					
We frequently are unable to discuss [PROGRAM NAME] with patients because of lack of time					
Most patients are willing to register for [PROGRAM NAME] once they learn about the program					
Overall, I am satisfied with the process for registering patients					

17. Does your practice use an Electronic Health Record (EHR)?
    a. Yes
    b. No *[GO TO QUESTION 19]*

18. Does your practice offer a patient portal to access their health record?
    a. Yes
    b. No [*GO TO QUESTION 19*]

19. Based on your experience, do you think your patients are less likely to register for [MY PROGRAM] because they can access their immunization information through the patient portal?
    a. Yes
    b. No

20. We are interested in your perceptions about the overall benefits of [PROGRAM NAME]. For each statement listed below, please indicate how strongly you agree with the statement.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Patients who use [PROGRAM NAME] are more informed about their health					
The number of requests we receive for immunization records has decreased since implementing [PROGRAM NAME]					
There has been an increase in patients returning to the office to receive vaccines since implementing [PROGRAM NAME]					
[PROGRAM NAME] has had a positive impact on our practice					
[PROGRAM NAME] has had a positive impact on our patients					
Overall, I am satisfied with [PROGRAM NAME]					

Finally, we would like to learn a little more about your practice.

21. Please select the response that best describes your facility.
    a. Private practice
    b. Federally Qualified Health Center or Rural Health Clinic
    c. Public health department clinic
    d. School based health center
    e. School
    f. Other (specify)

22. Please select the response that best describes your practice specialty.
    a. Pediatrics
    b. Family medicine
    c. General internist
    d. Multi-specialty
    e. Other (specify)

23. Does your practice participate in the Vaccines For Children (VFC) program?
    a. Yes
    b. No
    c. I don't know

24. On average, how many patients does your practice see each week?

    _____

25. In your practice, roughly what percentages of your patients are in the following groups? (Please approximate; groups may not sum up to 100%)

	0%	**1-9%**	**10-24%**	**25-49%**	**50-74%**	**100%**
Private insurance	☐	☐	☐	☐	☐	☐
Insured by Medicaid or your state's Children's Health Insurance Program (CHIP)	☐	☐	☐	☐	☐	☐
Uninsured	☐	☐	☐	☐	☐	☐

26. We are very interested in learning about your experience using [PROGRAM NAME]. Would you be willing to complete a brief survey approximately 1-2 months after you have implemented [PROGRAM NAME]?
    a. Yes
    b. No

[If answer yes above, include text below…]
Thank you for agreeing to participate in the future survey about [PROGRAM NAME]. Please enter your name and email address below. We will send an invitation via email approximately 1-2 months after your planned implementation date (which you provided at the beginning of this survey).

Name _____
Email _____

Thank you for your time completing this survey!

APPENDIX C: PROVIDER KEY INFORMANT INTERVIEW

Introduction (2 minutes, Σ=2 min)
Thank your for agreeing to speak with us today. Before we begin, we would first like to introduce ourselves. I'm Jennifer Hui from Audacious Inquiry, and I'm Shannon Stokley from the Centers for Disease Control and Prevention, and we will be conducting the interview. Just to remind you, the purpose of this interview is to learn more about how [PROGRAM NAME] has been implemented in your practice. The interview should take about 30 minutes and all of your answers will be kept confidential. Any information that you provide will be reported only as summary information. Your name or the name of your practice will not be connected to your answers in any way. With your permission, I would like to record our interview.

- Are there any questions that you have about the interview?
- Do you agree to participate in the interview?
- May I record the interview?

Intro question (3 minutes, Σ=5 min)
1. What was the motivation for your practice to implement [PROGRAM NAME]?
   Probe if needed:
   - Anticipated benefits to practice/patients?

Training (5 minutes, Σ=10 min)
We would like your feedback on the training you received for [PROGRAM NAME].

2. How was the training delivered?

3. Did the training adequately prepare you for using [PROGRAM NAME]?

4. Are there any areas that should have been included or emphasized more during the training?

Implementation (15 minutes, Σ=25 min)
The following questions are about how [PROGRAM NAME] has been implemented in your practice.

5. Please describe for us the process for registering patients in [PROGRAM NAME].
   Probe if needed:
   - Who in the office is responsible for informing and registering patients?
   - When during the office visit is the patient informed about [PROGRAM NAME]?
   - When during the office visit is the patient registered for [PROGRAM NAME]?
   - How do you inform the patient that after the visit they need to log in to complete the registration process?
6. Has this always been the process since you started the pilot or did you make changes after you gained some experience registering patients?

- If changes were made, probe to find out what changed and why.

7. How has the implementation of [PROGRAM NAME] impacted office work flow?
   Probe if needed:
   - Does it fit seamlessly into the visit or does it take time away from the visit?

8. When offered to register for [PROGRAM NAME], do patients agree to register?
   Probe if needed:
   - If no, what is the main concern/hesitation that patients have?

Marketing Materials (4 minutes, Σ=29 min)
We'd now like to ask for your feedback on the marketing materials used to promote [PROGRAM NAME].

9. Are you using any materials to promote [PROGRAM NAME]?
   If needed, list possible materials: posters, fact sheets, etc.
   - Probe for both provider and patient focused materials.

10. Where are the materials displayed or how are they used?

11. Are there other materials that you think would be helpful for promoting [PROGRAM NAME] to patients?

Overall Experience (3 minutes, Σ=32 min)
Finally, we want to ask about your overall experience with [PROGRAM NAME].

12. How do you think implementation of [PROGRAM NAME] has benefited your patients and practice?
    Probe if needed:
    - Reduction in requests for immunization information from patients?
    - Increase in patients scheduling visits to obtain due/overdue vaccines?

13. Lastly, what advice would you give to a practice that was thinking about implementing [PROGRAM NAME]?

Those are all the questions we have for you today. Thank you again for your time and participation.

APPENDIX D: CONSUMER SURVEY (REGISTRANTS)

Thank you for agreeing to participate in this survey. The purpose of this survey is to help us evaluate and improve [PROGRAM NAME]. Your participation is voluntary. Your identity will not be linked to your survey responses and your responses will be kept confidential. You may skip any question that you do not want to answer.

1. How did you find out about [PROGRAM NAME]? (check all that apply)
    a. Healthcare provider told me about it
    b. Print material (e.g., posters, newspaper)
    c. Social Media (e.g., Facebook, Twitter)
    d. Friend
    e. Other (please specify)

2. How did you register for [PROGRAM NAME]?
    a. I filled out a paper form and my healthcare provider used it to register me
    b. I registered myself online

3. The following questions are about your experience registering for [PROGRAM NAME]. Please answer each question based on how strongly you agree with the statement.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
3a. The registration process was easy to complete					
3b. The registration process was fast to complete					
3c. The registration process was convenient					
3d. Overall, I am satisfied with the registration process					

4. What is the <u>main</u> reason why you registered for [PROGRAM NAME]?
    a. My healthcare provider recommended that I register
    b. I want to view immunization information for me and my family
    c. I want to print immunization records required by daycare, school or camp
    d. I want to print immunization records required by an employer
    e. Other (please specify)

5. Please complete the following statement: I have used (or plan to use) [PROGRAM NAME] to access immunization records for: (check all that apply)
    a. My child(ren)
    b. Myself
    c. My spouse
    d. My parent(s)
    e. Other (please specify)

6. Which functions of [PROGRAM NAME] have you used? (check all that apply)
    a. Viewed online immunization records
    b. Printed an official immunization certificate
    c. Other (please specify)
    d. Have not yet viewed or printed immunization records since completing the registration process

[**If select "b", go to question 7, if select "a" or "c" but NOT "b", go to question 8; if select "d" then go to question 11**]

7. What was the reason for printing the official immunization certificate? (check all that apply)
    a. My child's school or day-care required the form
    b. My child's camp required the form
    c. My employer required the form
    d. I was required to submit the form to obtain a travel visa
    e. I used the form to verify dependents for WIC services
    f. Other (please specify)

8. When viewing the immunization record(s) for yourself or your family member(s), did [PROGRAM NAME] indicate that you or your family member needed a vaccine?
    a. Yes **[go to question 9]**
    b. No **[go to question 10]**

9. What action did you take after you learned that a vaccine was needed?
    a. Called my healthcare provider to make sure the vaccine was really needed
    b. Called my healthcare provider to report that the vaccine had already been received and that my record contained an error
    c. Scheduled a visit with my doctor to receive the vaccine
    d. Waiting to discuss it with my healthcare provider
    e. Have not taken any action yet

10. The following questions are about your experience with using [PROGRAM NAME]. Please answer each question based on how strongly you agree with the statement.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
10a. When I access [PROGRAM NAME] it is easy to find the information I need					
10b. The information included in my (or my family's) immunization records [PROGRAM NAME] is accurate					
10c. It is important to me to have electronic access to my and my family's immunization records					
10d. I would recommend [PROGRAM NAME] to my friends and relatives					

[GO TO QUESTION 12]

11. Why have you not accessed [PROGRAM NAME] since completing the registration process? (check all that apply)
    a. I forgot that I had registered for [PROGRAM NAME]
    b. I forgot my login information
    c. I did not need to view immunization records for me or my family
    d. Other (please specify)

Now we would like your opinion on our advertising materials. For the following questions you will be shown a set of images of materials that have been developed to promote [PROGRAM NAME].

12. Shown here are images of our print materials. Please click on each piece of material that you remember seeing. If you have not seen any of the materials before, please click on the option 'I haven't seen any of the materials before'.
    a. Display images of the print materials
    b. I haven't seen any of the materials before

13. Shown here are images of our online materials. Please click on each piece of material that you remember seeing. If you have not seen any of the images before, please click on the option 'I haven't seen any of the materials before'.
    a. Images of the online materials
    b. I haven't seen any of the materials before

[NOTE: if answer 'b' to both Q12 and Q13, go to Q15]

14. Of the materials that you reported seeing before, please click on the item you like best. If you do not like any of the images displayed, click on the option 'I do not like any of the images'.
    a. Images would be displayed based on answers to numbers 2 and 3
    b. I do not like any of the images

15. Of the materials shown here, please click on the item that would be most effective in encouraging you to register for [Program Name]. If you do not like any of the materials displayed, click on the option 'I do not like any of the materials'.
    a. Display images
    b. I do not like any of the materials

Thank you for answering all our questions! Click on the 'submit' button to exit the survey.

APPENDIX E: CONSUMER SURVEY (INCOMPLETE REGISTRANTS)

Thank you for agreeing to participate in this survey. The purpose of this survey is to help us evaluate and improve [PROGRAM NAME]. Your participation is voluntary. Your identity will not be linked to your survey responses and your responses will be kept confidential. You may skip any question that you do not want to answer.

1. How did you find out about [PROGRAM NAME]? (check all that apply)
    a. Healthcare provider told me about it
    b. Print material (e.g., posters, newspaper)
    c. Social Media (e.g., Facebook, Twitter)
    d. Friend
    e. Other (please specify)

2. How did you start the registration process for [PROGRAM NAME]?
    a. I filled out a paper form and my healthcare provider used it to register me [**GO TO QUESTION 3**]
    b. I pre-registered myself online [**GO TO QUESTION 5**]

3. To complete the registration process, you need to log in to [PROGRAM NAME] and enter your personal identification number (PIN). Why were you unable to complete the registration process for [PROGRAM NAME]?
    a. I forgot I had to go online to finish the registration process
    b. I was not informed that I had to go online to complete the registration process
    c. I have not had time to finish the registration process
    d. I forgot or lost my login/PIN information, so I could not complete the process
    e. I am no longer interested in accessing immunization information for me and my family
    f. Other (specify)

4. If you are still interested in activating your account, please type the email address you gave to your provider and we will send you an email with directions for completing the registration process.
    a. Type email address: _____
    b. I am not interested in activating my account.

    [GO TO QUESTION 6]

5. To complete the registration process, you need to visit your healthcare provider to verify your information. Why were you unable as yet to complete the registration process for [PROGRAM NAME]?
    a. I didn't know I need to visit my healthcare provider to finish the registration process
    b. I forgot to schedule a visit with my healthcare provider to finish the process
    c. I have been unable to schedule a visit with my healthcare provider
    d. I am not willing to schedule a visit with my healthcare provider to complete the registration process
    e. I plan to complete the registration process the next time I visit my healthcare provider
    f. My healthcare provider was unable to approve my registration

6. What is the main reason you started to register for [PROGRAM NAME]?
    a. My healthcare provider recommended that I register
    b. I wanted to view immunization records for me and/or my family
    c. I wanted to print immunization records required by daycare, school, camp, or my employer
    d. Other (please specify)

7. Please complete the following statement: I was planning to use [PROGRAM NAME] to access immunization information for: (check all that apply)
    a. My child(ren)
    b. Myself
    c. My spouse
    d. My parent(s)
    e. Other (please specify)

Now we would like your opinion on our advertising materials. For the following questions you will be shown a set of images of materials that have been developed to promote [PROGRAM NAME].

8. Shown here are images of our print materials. Please click on each piece of material that you remember seeing. If you have not seen any of the materials before, please click on the option 'I haven't seen any of the materials before'.
    a. Images of the print materials
    b. I haven't seen any of the materials before

9. Shown here are images of our online materials. Please click on each piece of material that you remember seeing. If you have not seen any of the images before, please click on the option 'I haven't seen any of the materials before'.
    a. Images of the online materials
    b. I haven't seen any of the materials before

    [NOTE: if answer 'b' to both Q8 and Q9, go to Q11]

10. Of the materials that you reported seeing before, please click on the item you like best. If you do not like any of the images displayed, click on the option 'I do not like any of the images'.
    a. Images would be displayed based on answers to numbers 2 and 3
    b. I do not like any of the images

11. Of the materials shown here, please click on the item that would be most effective in encouraging you to register for [Program Name]. If you do not like any of the materials displayed, click on the option 'I do not like any of the materials'.
    a. Display images
    b. I do not like any of the materials

Thank you for answering all our questions! Click on the 'submit' button to exit the survey.

APPENDIX F: MYIR DASHBOARD – [MONTH]

Table 1. Registration outcomes by registration method

Indicator	Registration Method			
	Overall	Provider-Initiated	Self-Initiated	Alternate Work-Flow
Total number of consumers initiating registration				
Number of Fully-Activated consumers				
Number of consumers not Fully-Activated				
Registration completion rate				

Table 2. Alternate registration method key indicators

Indicator	Outcome # (%)
STEPS 1-3: Initiation	
Number of consumers initiating registration	
STEPS 4-8: Matching	
Number of consumers with an EXACT match	
Number of consumers with an AMBIGUOUS match	
Number of consumers with NO match	
Consumer EXACT Match	
Number of consumers receiving access code via SMS	
Number of consumers entering access code into MyIR	
Number of consumers receiving access code via autodial	
Number of consumers entering access code into MyIR	
Number of consumers receiving access code via mail	
Number of consumers entering access code into MyIR	
Total number of consumers with a fully activated account	
Consumer AMBIGUOUS Match	
Total number of consumers with a fully activated account	
Consumer NO Match	
Total number of consumers with a fully activated account	
Registration Completion	
Total number of consumers with a fully activated account	

Figure 1. Select indicators from Fully Activated Consumer Survey (N=)

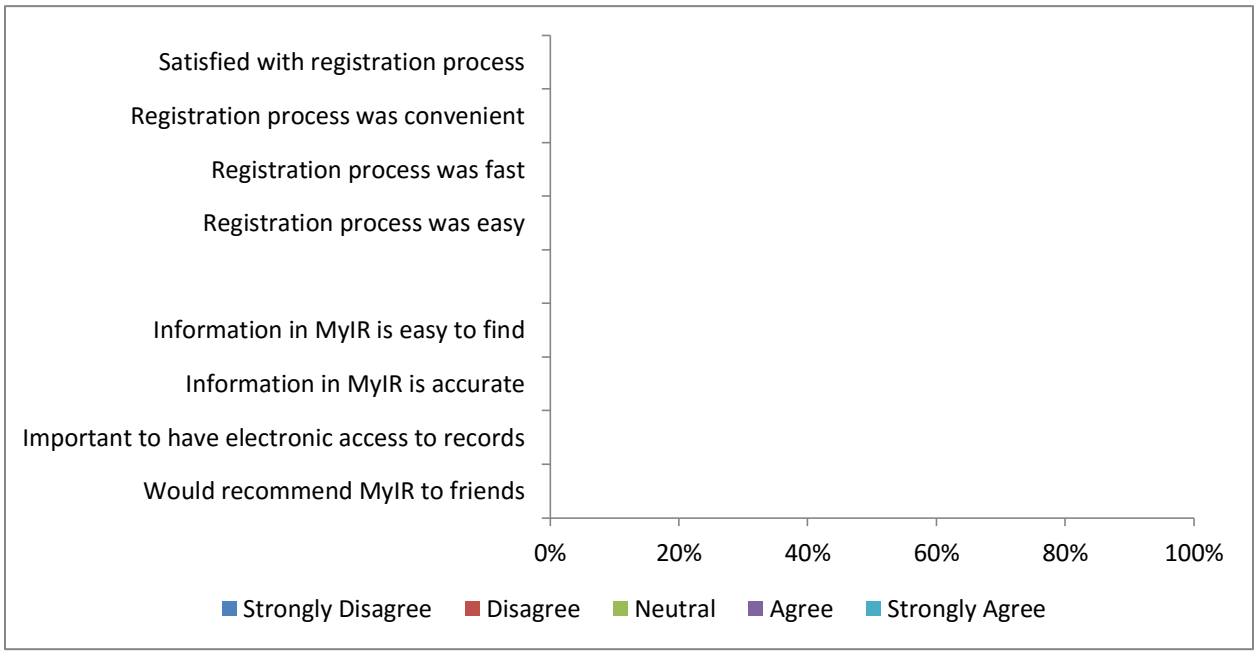


Table 3. Select indicators from Fully Activated Consumer Survey

Question	Number	Percent
Which MyIR functions have you used?		
Viewed immunization records		
Printed immunization records		
Other		
Have not yet used MyIR		
Did MyIR indicate a vaccine was needed?		
Yes		
What action was taken after learning a vaccine was needed?		
Called Doctor to see if vaccine was needed		
Called Doctor to report vaccine had been received		
Scheduled a visit with Doctor		
Waiting to discuss with Doctor at next visit		
Have not taken any action yet		

Figure 2. Reasons for not completing registration, Incomplete Registrant Survey (N=)

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