

Implementation Guide for Decision Makers – 2D Vaccine Barcode Scanning

Prepared for

Immunization Services Division

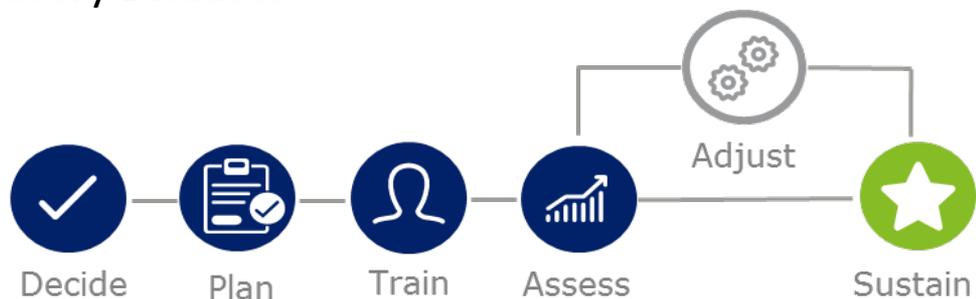
National Center for Immunization and Respiratory Diseases

Centers for Disease Control and Prevention

Prepared by

Deloitte Consulting LLP

May 2018



2D Barcode Scanning: The Issue, Opportunity, and Current Pilot

Issue	Opportunity
<ul style="list-style-type: none"> ▪ >100 million vaccines administered annually in the US ▪ Most vaccines manually typed into electronic medical record (EMR), with documented errors/inefficiencies ▪ Lot number, expiration date, and product ID printed in small font to fit on vaccine vials/syringes ▪ Accuracy of vaccine records critical to patient safety and in the event of vaccine recall or disease pandemic 	<ul style="list-style-type: none"> ▪ 2D barcodes on most vaccine vials/syringes and scanning technology available, but not widely used to record vaccine entries ▪ Even small improvements to vaccine record accuracy or efficiencies can have meaningful impact due to volume and consequences of inaccuracies ▪ Two previous CDC pilots found scanning improved accuracy, time savings, and user satisfaction, though challenges remained, including low scanning rates

Current Pilot and Reporting → Findings Report + Implementation Guide

- CDC partnered with a large health system to pilot 2D barcode scanning implementation across 27 diverse care centers (2015 – 2017); care centers varied by specialty, size, vaccine volume, geographic location
- Data collected through deidentified EMR vaccine records, online survey, observations, and group discussions

Pilot Findings Report *[separate document]*

Detailed findings and methodology from pilot

- Significant improvements to vaccine record quality and efficiency with scanning entry process
- Adherence strategies improved scanning rates
- Staff satisfaction and improved staff safety
- Challenges observed and improvements identified

Implementation Guide *[current document]*

Six-step guide to support health organizations in deciding if vaccine 2D barcode scanning is right for them and aid the implementation decision-making process

Guidance for each step from pilot findings

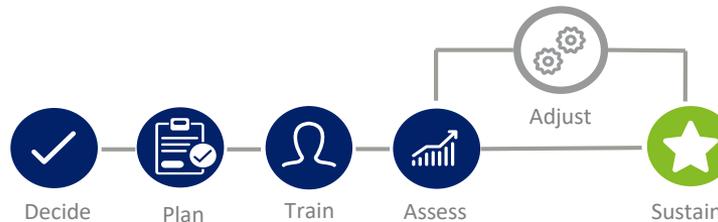


Implementation Guide Outline

1. What is Vaccine 2D Barcode Scanning?

2. Implementation Guide Steps

- **Decide**
- **Plan**
- **Train**
- **Assess**
- **Adjust**
- **Sustain**



3. Learn More About Our Work

What is Vaccine 2D Barcode Scanning?

1. What is Vaccine 2D Barcode Scanning?

2. Implementation Guide Steps

- Decide
- Plan
- Train
- Assess
- Adjust
- Sustain

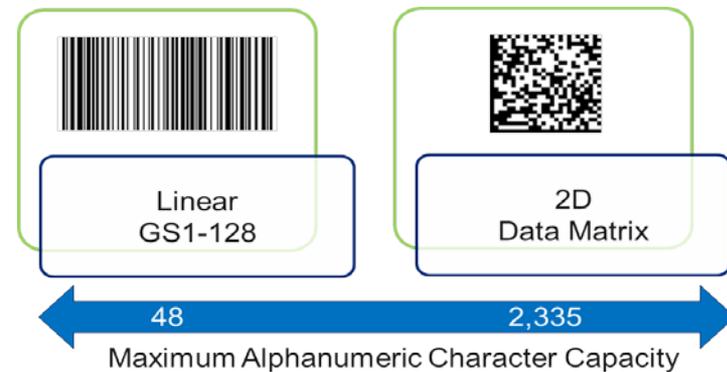
3. Learn More About Our Work

Vaccine 2D Barcode Scanning

What's in a 2D barcode on a vaccine?

Vaccine two-dimensional (2D) barcodes contain more data than traditional, linear barcodes

Vaccine Barcode Contents by Type	
Linear	2D
National Drug Code (NDC)	Global Trade Identification Number (GTIN) <ul style="list-style-type: none">• Includes NDC Lot Number Expiration Date



How does it work?

Vaccinators scan the 2D barcode on a vaccine vial or syringe with a 2D barcode scanner, which then populates data into their electronic medical record (EMR)



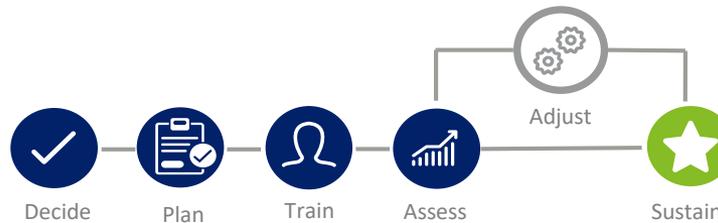
2D barcodes are now on most vaccine vials and syringes, but scanning is still not widely used

Implementation Guide Steps

1. What is Vaccine 2D Barcode Scanning?

2. Implementation Guide Steps

- Decide
- Plan
- Train
- Assess
- Adjust
- Sustain



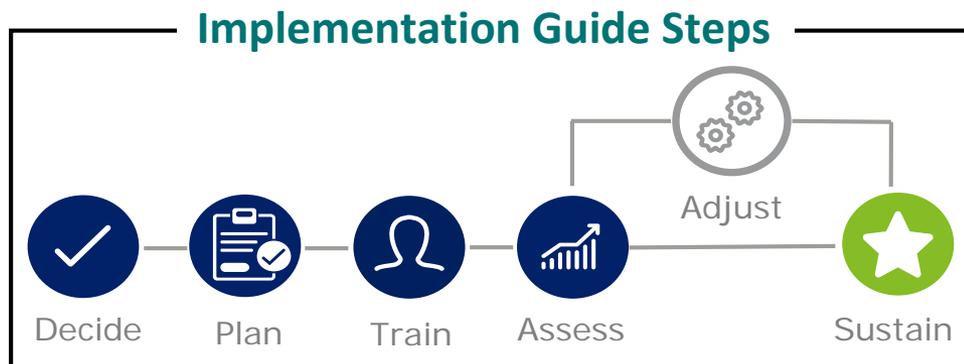
3. Learn More About Our Work

Overview of Implementation Guide Steps

Six steps in the Implementation Guide described in brief below, then detailed content follows

Aim is to support planning and decision-making to implement vaccine 2D barcode scanning

Pilot findings provide foundation for contents within each step ([refer to separate pilot Findings Report for detailed pilot findings and methods](#))



Decide



Decide if adoption of 2D barcode scanning of vaccines is right for your facility or organization, weighing resources needed and potential benefits of scanning

Plan



Plan for scanning implementation, identify how scanning fits into your vaccine administration workflow, and create strategies to maximize scanning use

Train



Train staff on scanning, including development of training materials, practice using scanners, and adjust to the scanning process

Assess



Assess use of scanning, identify challenges being experienced and any sites or practitioners needing additional support to consistently scan vaccines

Adjust



(if needed) Adjust strategies to achieve consistent scanning (e.g., adjustments to workflow, scanner location, or other changes) and address challenges experienced

Sustain



Sustain consistent scanning practices once fully implemented and consider expanded use of scanning

Implementation in Action: Key Lessons Learned

Several key lessons for successful vaccine scanning implementation became evident from pilot data. This guidance can benefit other organizations embarking on this process.

Early Planning and Decisions Made a Big Difference (Take the Time to Get It Right From the Start)

- Sites that found early and lasting success with high and consistent scanning rates typically:
 - Revised their workflow process and protocol from the start
 - Strategically selected scanner location, with input from staff

Patterns of Consistent Scanning and Full Implementation Were Evident Early

- Given the same information, tools, and strategies, sites performed differently, with differences seen early
 - High-volume sites, such as Pediatrics/Shot Clinic, scanned at high rates from the start until pilot end
 - Low-volume sites, including Internal Medicine, struggled the most to scan consistently

Adherence Strategies “Nudged” Participants to Scan More Frequently

- All three groups with a strategy added to promote scanning had the highest scanning rates and the group receiving only the training had the lowest scanning rate
 - Increases to scanning rates aligned with the timing of each strategy implemented
- Scanning rates matter, as benefits of scanning are only realized if the technology is actually used

Adjustments to Resolve Challenges Mid-Course Improved Scanning Use

- Revisiting foundational planning decisions and making revisions improved scanning rates and buy-in
- Ideas for adjustments, even after implementation underway, include:
 - Offering troubleshooting support to work through specific challenges,
 - Providing data on scanning rates to staff and leaders, and
 - Engaging leaders at sites and within organization



Decide





Step 1: Decide Whether or Not to Adopt 2D Barcode Scanning

Assess whether vaccine barcode scanning is right for your organization – are needed elements in place to use scanners? Also, weigh potential benefits and up-front costs to implement scanning.

Icons along the top right will help guide through each step.



Technology & Support Needs

- EMR system that supports 2D barcode scanning for vaccines
- Configuring scanners for EMR and installing scanners



Potential Benefits

- Improved vaccine record accuracy
- Time savings
- Improved staff satisfaction and other benefits



Up Front Costs & Time Needs

- Purchasing scanners/stands
- Training staff/leaders
- Revising vaccine entry and workflow processes
- Configuring/installing scanners



Technology & Support Needs: Foundational Elements for Implementation

In order to appropriately use 2D barcode scanners, the following foundational elements are needed

Electronic Medical Record (EMR) System

- An organization needs to have, or be able to set up, an EMR able to capture data entered at vaccine administration.
 - Some EMRs have 2D barcode scanning functionality built in; updates may be needed for functionality.
 - Ideally, the EMR will be able to capture all data available in the scanned barcode (product ID, lot number, expiration date).

Scanner Configuration and Installation

- Support from an IT resource will enable the configuration, testing, and installation of scanners.
 - Most scanners “out of the box” require some set-up to ensure that scanners function or interface with the specific EMR system correctly. This set-up, which we refer to as configuration, ensures that data encoded in the 2D barcode populates correctly in the EMR. Configuration process may vary by scanner.
- Scanners will need to be plugged into a computer, unless cordless scanners are used.
- An organization should determine the best type of scanner for their needs. [AAP outlines considerations when choosing a scanner.](#)
- Maintenance of scanners and resolution of any scanner/EMR interface challenges should also be considered.

Takeaway

Proper configuration of scanners will ensure data are populating correctly in the EMR when scanned



Potential Benefits with Use of Vaccine 2D Barcode Scanning

Main benefits of vaccine 2D barcode scanning observed during the pilot included:



Improved Vaccine Record Accuracy

- Vaccine lot number, expiration date, and NDC data fields **significantly more accurate when scanned** rather than entered manually (5-9% improvements, depending on data field)
- Improvements varied by specialty and data field



Time Savings

- **Average 21 seconds saved per vaccine scanned** (from timed observations) – a **75% improvement**
- One pilot site **added 12+ vaccine appointments weekly** due to time savings



Staff Satisfaction & Other Benefits

- Participants described various aspects of **satisfaction with scanning**
- Reduced eye strain, reduced hand- and joint-related problems, and disposing of barcoded syringes in room instead of carrying for later entry highlighted as **staff safety benefits**

Learn More

Brief discussion of benefits provided next.
Detailed reporting on each benefit found in the barcoding pilot [Findings Report](#)

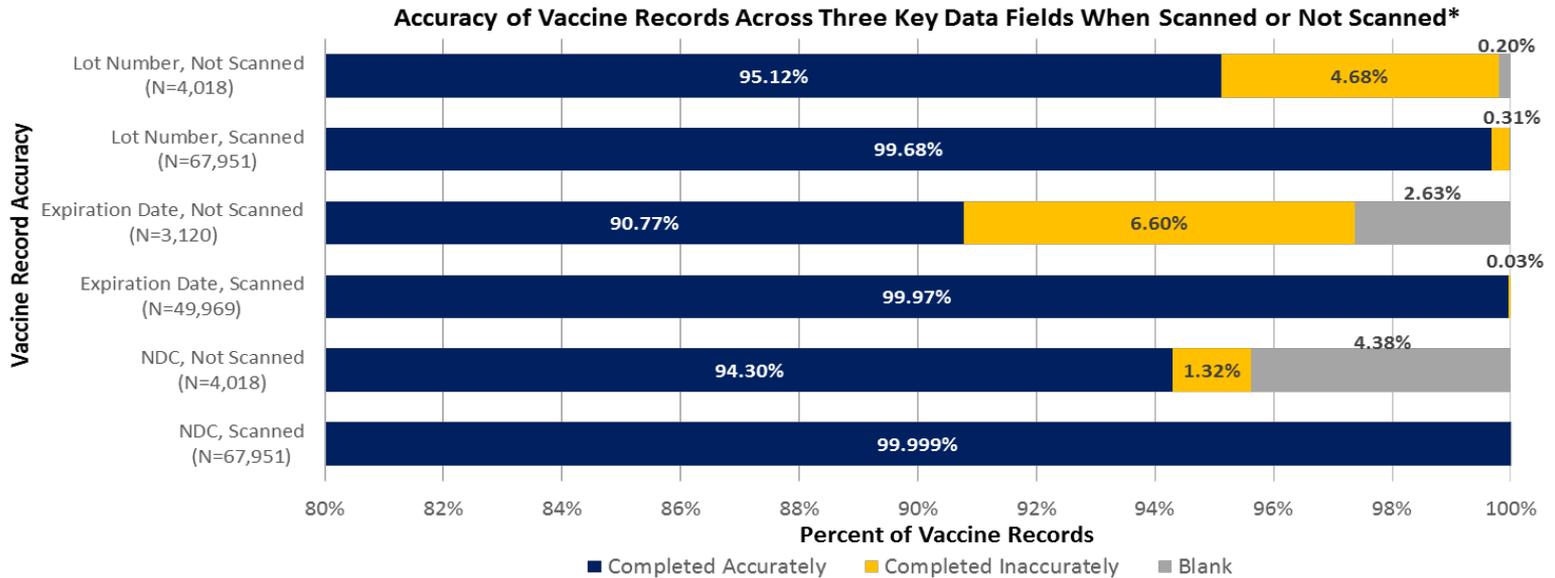


Benefits: Scanning Greatly Improved Accuracy of Data

Vaccine lot number, expiration date, and NDC data fields **significantly more accurate when scanned** rather than entered manually (p<.01)

- Lot number field improved 4.6% (to 99.7%) when scanned
- Expiration date field improved 9.2% (to 99.97%) when scanned
- NDC field improved 5.7% (to 99.99%) when scanned

Accuracy = Complete + Accurate Record (a record must first be complete and data in the field also accurate)



Why Accuracy Matters

Even small improvements to accuracy are meaningful, with over 100 million vaccines likely administered annually in the US**
 – a 1% improvement in data accuracy could impact a million or more vaccine records. Pilot site accuracy improved by 5-9%.

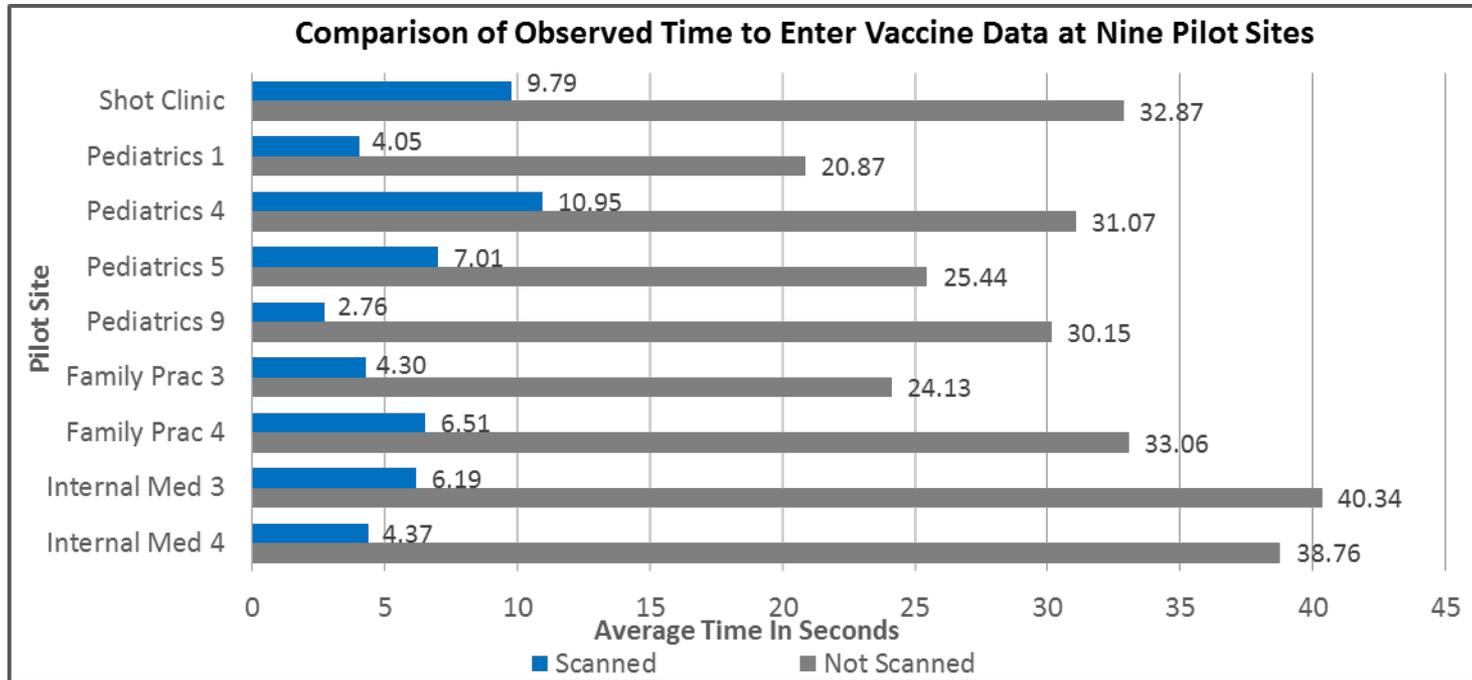
*A data element was considered “complete” if the field was not blank. “Accuracy” was determined by comparison with our reference file. Lot numbers and NDC matching the reference file were deemed “accurate,” whereas records with something in the field, but without a match to the reference file were “inaccurate.” As lot numbers were needed to identify correct expiration dates, records with inaccurate or blank lot numbers were not included in the expiration date analysis. For NDC, matches to either the unit of use or unit of sale were counted as “accurate.”

**Estimated 130+ million vaccines administered to ages <18 years, extrapolated from sample (Rogers et al, 2018: <https://www.ncbi.nlm.nih.gov/pubmed/29249524>); estimated 10 million <1 year of age (VAERS, 2015); over 150 million doses of injectable flu vaccine available for 2017–2018 season (<https://www.cdc.gov/flu/protect/keyfacts.htm>)



Benefits: 75% Time Savings with Scanned Vaccine Entry

Time measurements comparing vaccine entry methods across nine of the pilot sites found an average of **21 seconds saved per vaccine entered when vaccines scanned** (average of 7.04 seconds when scanned and 28.19 seconds when not scanned*) – a **75% improvement**



Potential Time Savings

- While time savings varied by site, the average calculates out to **5.83 hours saved per 1,000 vaccines scanned**.
- These nine sites administered more than 45,000 vaccines during the six-month pilot. If each entry were scanned, **time savings would total 262 hours saved** (for these nine sites), ranging from 3–116 hours for individual sites based on volume scanned.

*Time measurements taken outside actual patient encounters to ensure protocol consistency (using a test EMR portal that functions the same way as the actual EMR); same protocol used and same vaccines recorded across both scanned and not scanned observations; measurements with 13 practitioners across 9 sites



Benefits: Staff Satisfied and Experienced Other Scanning Benefits



Most users reported being satisfied with their experience scanning 2D barcodes, preferred scanning over other entry options, and found it worthwhile to make the change in their process. Other benefits also identified.

94%
Prefer scanning
over other
options

94% (n=152) **agreed/strongly agreed** with the statement, **“Overall, I prefer recording data about vaccines administered to patients using 2D barcode scanning over any approaches our care center has used in the past.”**



These bad boys are
a game-changer



Pilot Participant

76% (n=105) identified **reduced eye strain** as a key benefit of scanning (magnifying glasses were seen during site visits)



76%
Key Benefit:
Reduced eye
strain

64%
Key Benefit:
Disposing of
syringes in
room

64% (n=88) identified **disposing of syringes in room instead of carrying around for later entry** as scanning benefit experienced

“...[Scanning] decreased risk for hand- and joint-related problems related to data entry.”
- Survey Respondent

“It saves time, ensures accurate and consistent data entry, and provides an extra safety step prior to administration.”
- Survey Respondent



Up Front Costs and Time Needs

Initial resources needed for implementation include obtaining equipment and preparing staff and scanners

Purchase Scanners

- Coded scanners cost ~\$150–\$350 each, with cordless options \$500–700 (as of September 2016)
 - AAP [outlines](#) considerations when choosing a scanner
- Number of scanners needed varies based on set-up/placement
- Order stands/wall mounts, if using
- If the number does not match the need, scanners may not be used

Train Staff & Leaders

- Staff need to be trained on using the scanner, and within the EMR
 - Pilot training took less than 30 minutes per session (often in small groups of immunizers and leaders)
 - CDC created [training videos](#) that show how to scan
- Leaders addressing staff questions should have knowledge about scanners

Revise Vaccine Workflow

- Prior to scanner installation, leaders/staff should determine how scanning fits into workflow
 - Some EMRs have safety features (pop-up alerts), which require scanning prior to administration, to get most benefit of function
- Scanner set-up/location linked to workflow process and affects costs (number of scanners, adding/moving computers, as needed)

Configure Scanners

- EMR must enable 2D scanning
- Each scanner needs to be set up to communicate with the EMR (parse/place data in right fields)
- An organization needs to be able to set up/configure scanners purchased specific to their EMR
- The configuration process should be maintained by technical support staff for future use (e.g., if a scanner needs to be reset)

Install Scanners

- After a workstation with a computer and appropriate EMR set-up is identified for installation, a technical or clinical support staff member can plug the scanner into the computer port
- Configured scanner is now ready for scanning unit-of-use barcodes

For successful implementation, an organization needs to engage key players at various points along the way





Plan





Step 2: Plan for Implementation of Vaccine 2D Barcode Scanning

Once determination is made to implement vaccine barcode scanning, planning begins



Set Expectations & Gather Support

- Set expectations for implementation
- Prepare sites for scanning
- Ensure leader engagement/buy-in



Select Scanner Location & Workflow

- Identify best scanner location/set-up
- Revise workflow protocol to include scanning



Identify Ways to Maximize Use

- Understand variability in scanning rates from pilot and how may guide decision-making for others
- Select strategies to encourage consistent scanning



Develop Planning Materials

- Develop implementation plan and timeline
- Determine reach of implementation
- Plan to evaluate and assess scanning implementation

Set Expectations and Gather Support

Prior to the start of scanning, we worked with the pilot organization (Sutter) to identify and communicate expectations with relevant parties. Engagement of both leadership and staff was necessary to promote successful implementation.

Determine Expectations for Scanning Implementation

- Decided how and when scanning would be implemented and expectations for participating sites
- Support made available to sites during implementation

Prepare Sites for Scanning

- Communicated expectations for scanning implementation with staff
- Provided anticipated timeline, preparation tasks, and other initial “asks” of participating sites
- Shared potential benefits and challenges with scanning

Ensure Leader Engagement and Buy-In

- We worked initially with organizational leaders, and through them, with site leads
- Leaders at all levels provided the foundation for accountability and consistency of use
- In the pilot, site leads could make scanning mandatory and ensure formal inclusion in the workflow and verification process

“Our boss should make it mandatory, then it won’t be an issue” - Discussion Participant

Additional Tips for Success Identified During the Pilot

- ❖ Ensure site-lead buy-in, as the leads set expectations with staff and are critical component in the site’s culture
- ❖ Engage leaders and staff in scanner implementation discussions – their expertise is valuable and buy-in critical
- ❖ Make scanning mandatory rather than an optional adjustment to the process

Select Scanner Location

In group discussions, pilot participants described their **decision-making process for scanner location**. Survey data and challenges identified by participants during the pilot provided additional context.

Highlighted next are **four key considerations to identifying the best location for scanners**.

- 1. Determine Most Convenient Location**
- 2. Ensure Location Works For Staff Using the Scanners**
- 3. Location Supports Scanning Prior to Administration of Vaccines**
- 4. Weigh Different Potential Locations**

[Learn More](#)

Further detail on pilot scanner set-ups/locations and related analyses in the pilot [Findings Report](#)

1. Select Scanner Location: Determine Most Convenient Location

When determining the best scanner location(s), think about areas that are conveniently located for staff administering and recording vaccines. Several considerations around convenience are below.

Considerations for Scanner Location

- Locating scanners along the workflow path (e.g., where vaccines pulled from refrigerator, near draw station, or verification locations) identified as way to minimize extra steps and seamlessly blend into the workflow process to become second nature
- Using obvious locations (e.g., in line of sight) noted as helpful when staff are rushed or distracted
- Locating scanners in preferred locations required adjustment to space for some pilot sites (e.g., adding a computer, moving items, or relocating vaccines)
- Including a back-up scanner or scanners in more than one location (helpful when busy or in large space) identified as beneficial by participants
- Scanner stands/wall mounts provide options for where/how scanner sits and provides hands-free/“always on” functionality

“I think it was easy to remember because it is right where we prep the meds. Use the second one out here as a backup, if needed or it’s busy.” - Discussion Participant

“I think that’s the biggest barrier, is just trying to find that workflow where they don’t have to backtrack.”
- Discussion Participant

“We did have to get extra PCs installed, but that was a minimal cost and definitely worth it.”
- Discussion Participant

“What we did was centralize the draw stations. It actually helped tremendously... All vaccines are now stored centrally in one location. And they draw at the same location.” - Discussion Participant

Takeaway

Having scanners in locations where they are **consistently used** is critical

2. Select Scanner Location: Ensure Location Works for Staff

Further, ensure scanner location(s) being considered are agreeable to staff giving and recording vaccines. Lack of agreement with selected scanner location was problematic at some sites in the pilot.

Considerations for Scanner Location

- Some pilot participants noted they did not scan because the scanner location selected did not work for them. Reasons provided included:
 - Scanners located off workflow path
 - Computer log-in delays or issues with computers where scanners are set up
 - Lack of interest in participating
 - Not being included in the decision-making process for scanner location

“It worked for [name] in the lab, worked for [name] at their desk, worked for me only in my room. If you’re going to just put in the lab, everybody isn’t going to use it. If only at desk, not all going to use it.”
- Discussion Participant

“There’s no way we can expect someone to log off the computer, so someone else can log on, scan their vaccine, then log back off. It just wasn’t going to work.” - Discussion Participant

“...decision made by someone else. There was no consulting on where they ended up.” - Discussion Participant

“I would use it if in an individual patient room, because that’s where I’m inputting all information... and don’t have to log in twice. It’s an extra step, I’m not going to do that.” - Discussion Participant

Takeaway

Engaging staff in decision-making process may **promote buy-in** and increased scanner use

3. Select Scanner Location: Supports Scanning Before Administration

Also ensure scanner location(s) being considered support scanning vaccines prior to administration to maximize benefits of scanning achieved.*

Considerations for Scanner Location

The layout at some sites can add extra steps or impede scanning of vaccines prior to administration, depending on scanner location

- Scanning before administration in the pilot provided benefits of:
 - **Pop-up alerts**, which identified if a vaccine was incorrect or expired, with benefits to both patients and staff*
 - **Staff safety benefits**, where staff are able to dispose of syringes upon administration rather than holding for entry later
- Some pilot participants described a workaround put in place to utilize scanning only after administration to improve speed of entry (time savings with scanning and using only one entry step) and accuracy of data (since scanned at some point), but missed out on other critical safety benefits (including those highlighted above)
- Other pilot participants stated that their scanner location impeded their ability to scan prior to administering vaccines. Reasons included not being near scanners until after vaccines administered or not having enough time to get to the scanner location prior to administration

“We had an immunization error, Hep B given instead of Hep A. That was caught by the scanner "vaccine not ordered" when documenting after administration.”
– *Survey Respondent*

“I used to work in different offices. For us, the fridge room is pretty central. For other offices, the fridge is located way across from their desk. If they had to go back to their desk, I feel like [scanning] wouldn’t happen before.”
- *Discussion Participant*

Takeaway

Scanning prior to administration can **maximize benefits** to patients and staff

*Pilot participants used an EMR that had pop-up notices such as when a vaccine was expired or did not match the doctor’s order. Scanning prior to administration may offer perceived safety benefits when using such an EMR.

4. Select Scanner Location: Weigh Different Potential Locations

Finally, weigh the various scanner location(s) being considered. Pilot feedback and scanning rates for various scanner locations are provided to share pilot learnings as others consider their best location.

Considerations for Scanner Location

- No single location was preferred by all pilot participants or all participating sites
- Two scanner locations elicited the most positive feedback from pilot participants: the **refrigerator/draw room** and **individual desks**
- Pilot participants described the importance of having a **back-up scanner** or alternate location available
- Location selection links to the number of scanners needed (and if stands/wall mounts preferred)
- Primary benefits and challenges identified by pilot participants for refrigerator/draw and individual desks *below*
- Scanning rates across various scanner locations/set-ups within pilot follow

Location	Benefits Identified	Challenges Identified
Refrigerator/ Draw Area	<ul style="list-style-type: none"> • Already in these areas to pull or prep vaccines • Single or fewer computers/scanners needed, even for larger staff and vaccine volume • Great enthusiasm for this scanner location from staff and leaders; “it just makes sense” 	<ul style="list-style-type: none"> • May require new computer, if not already there • Back-up scanner suggested, during busy times or if scanner problems
Individual Desks	<ul style="list-style-type: none"> • Enough computers may already be in place • Familiar location for previous entry/workflow process 	<ul style="list-style-type: none"> • May add steps (worse for some layouts), if not part of vaccine administration path • Requires as many scanners as people

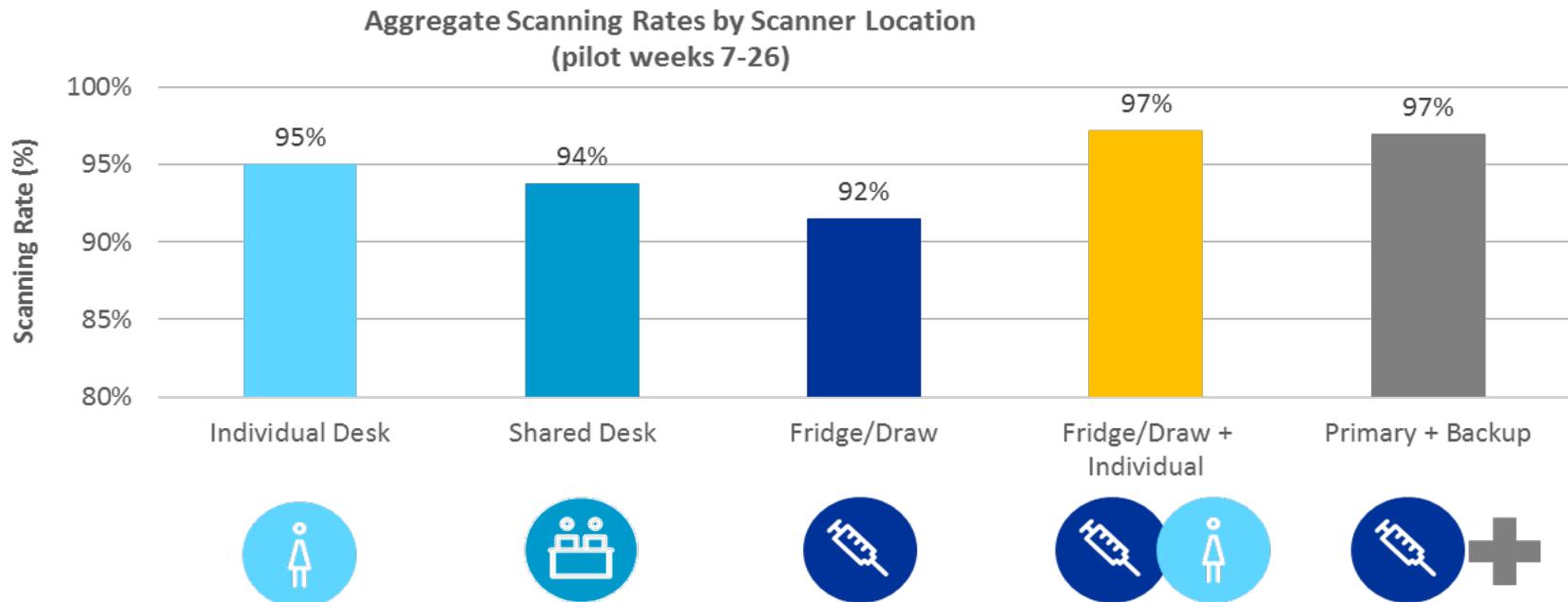
“I think that’s a key thing, that the med location and scanner need to be together. I think that’s a huge barrier. And having it be a step after they pull the medication out is key. So there isn’t time to add in other steps along the way.” - Discussion Participant

“I liked it at my desk better.”
- Discussion Participant

Scanners in More than One Location Had Highest Pilot Scanning Rates

Aggregate scanning rates for various scanner locations in pilot ranged from **92% – 97%***

- **Scanners at more than one location** (used equally often or a primary + backup option) **had higher scanning rates than single location set-ups**
 - **Refrigerator/draw/prep area paired** with another location (used equally or as primary, with backup also) had **highest scanning rates** (both 97%)
 - **Refrigerator/draw/prep area as only** scanner location had **lowest scanning rate** (92%)



*Scanner location and scanning rates starting in pilot week 7 (when observed and location had stabilized); in order to report by scanner location and not scanning rates for individual sites, two scanner locations removed from comparison (only one site had each of two specific scanner location configurations)

Revise Workflow Protocol to Include Scanning

Once determination is made of the best location for scanners, formal revision of the workflow process to include scanning can further support scanning. Pilot participant feedback provided guidance below.

1. Develop a revised workflow & identify exact workflow step where scanning takes place

- For sites with multiple scanning locations/multiple workflows, determine the steps and ordering for each
- Pilot staff described difficulty remembering to scan initially because it was not integrated into their usual workflow process and was not mandatory
- Without a revised workflow in place specific to scanning, staff described doing things differently and being unclear on expectations

2. Include staff administering vaccines in workflow revision discussions

- Staff can voice their preferences, include their day-to-day expertise into the plan, and identify any concerns from the start
- Satisfaction with the final product and buy-in were noted as increased (during pilot) with this inclusion

“Before we all had our own way of how, where, when we documented, and this streamlined it for us, so we are all doing the same way now.”

- Discussion Participant

“I think it’s important for staff to have a clear understanding of what the expectation is and that we have a standard process. Standard work is extremely important, especially if it is something that you will be holding people accountable to.”

- Discussion Participant

Success Strategies for Selection of Scanner Location & Revised Workflow

Pilot participants described reasons for their success and identified ways others could select scanner location and revise workflow processes with greatest success.

- **Determine location of scanner and how scanning fits into workflow early** (prior to installation and start of scanning, if possible); **adjust location and workflow process as needed**, rather than struggling with a set-up or process that is not working or not being used
- **Ensure staff are clear on expectations** – whether scanning is mandatory and when in the vaccine administration process scanning is to take place
- **Engage both leaders and staff in scanner location and workflow change discussions**
- **Make scanning second nature**, so that it integrates into process effortlessly
- **Scanners in the med room/refrigerator/draw areas identified as best location for many** because they **already go there to pull or draw vaccines**; this location **did not work for all** pilot staff or sites
- **Backup scanners** provide another option for scanning during busy times, when there are problems with primary scanner, or for sites with an expansive layout
- **Don't roll out new workflow and entry process during busy time**, such as flu season; it's hard to adjust to a new process and work through challenges when too busy



Identify Ways to Maximize Scanning Use

Participating pilot sites scanned at fairly high rates, on average, though variation found. Knowledge of these variations, which may carry over to other organizations:

Identify Sites or Practitioners Likely to Need Additional Support

Specific site and practitioner characteristics were linked to scanning rates in pilot. Scanning rate data provided information on challenges being experienced and identified where additional support was needed.

- Sites with a lower volume of vaccines given (e.g., Internal Medicine) had lower scanning rates and required more support to fully implement scanning, compared with sites with higher-volumes
- Sites or practitioners without consistent scanning habits also needed additional support to increase scanning

Identify Strategies (“Nudges”) to Maximize Scanning

Inclusion of various strategies improved scanning rates in the pilot, beyond providing only training to participants. Benefits of scanning are only realized if scanning is actually used; therefore, identification and inclusion of such strategies to maximize scanning is important.

- Signing commitment cards, providing scanning rates to practitioners, and leader visits greatly improved rates
- Strategies added from the start and at mid-pilot effectively improved scanning in the pilot

Strategically Select Sites When Resources Limited

An organization might not have resources to implement scanning across all of their sites initially.

- Selection of higher-volume or specific specialty sites may provide the greatest use and benefit, given higher scanning rates and limited additional support needed by these site types in the pilot
- Alternately, selection of sites with most room for improvement (e.g., low accuracy) can provide great benefit

Variability Found in Pilot Scanning Rates

Analyses of pilot scanning rates found variability by site, specialty, vaccine volume, and strategy groups

Site



39% – 99%

• Though the **overall scanning rate was 94%** (n=67,951) across all sites during the pilot, **individual sites varied** from 39% to 99% of vaccines scanned

Specialty



71% – 98%

• **Pediatric sites (97%)** and a **Shot Clinic (99%)** had **highest scanning rates**; Internal Medicine sites had lowest scanning rates (71%), with Family Medicine sites in the middle (87%)

Volume



74% – 97%

• Average **scanning rates varied by weekly vaccine volume**, from 74% for low-volume sites (<25 vaccines weekly), to 90% for medium-volume sites, to 97% for high-volume sites (>100 vaccines weekly)

Adherence Strategy Group



92% – 96%

• Four groups compared; **all groups with a strategy beyond training had the highest scanning rates**, compared with the Training-only group, on average and at the end of the pilot

[Learn More](#)

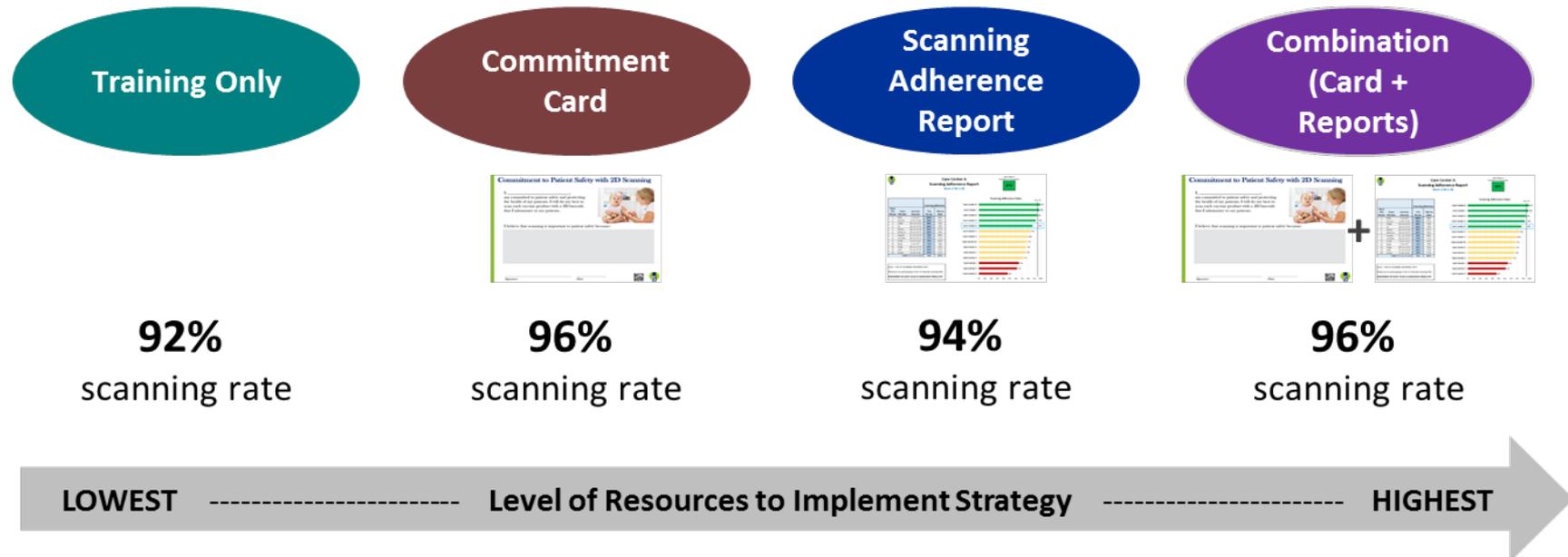
Detailed reporting on variability in scanning rates found in the barcoding pilot [Findings Report](#)

Adherence Strategies Significantly Improved Scanning Rates

Adherence strategy groups aimed to maximize scanning use, with groups differing by levels of resources to implement and timing during the pilot.

Significant differences found in average scanning rates across these groups,* with:

- **Training-only group** having the **lowest average scanning rate** and
- **All other groups (with some additional strategy implemented)** having **significantly higher average scanning rates**

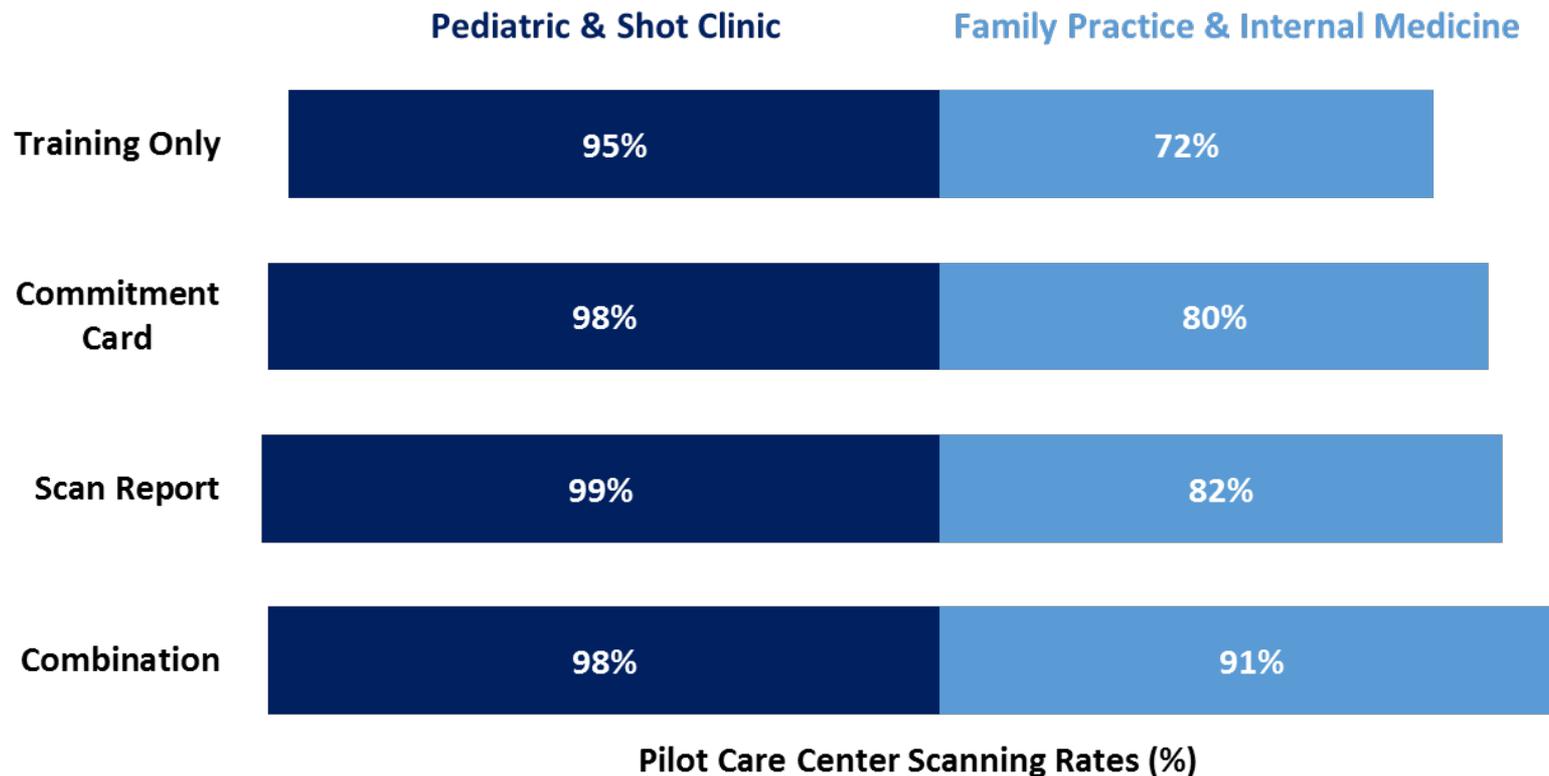


*Statistically significant at the p<.0001 level

Adherence Strategies Most Effective at Family & Internal Medicine Sites

Adherence strategies performed similarly for **Pediatric and Shot Clinic** sites, with significant variation seen for **Family Practice and Internal Medicine** sites.*

Training-only groups had the lowest scanning rates across all specialties in pilot.

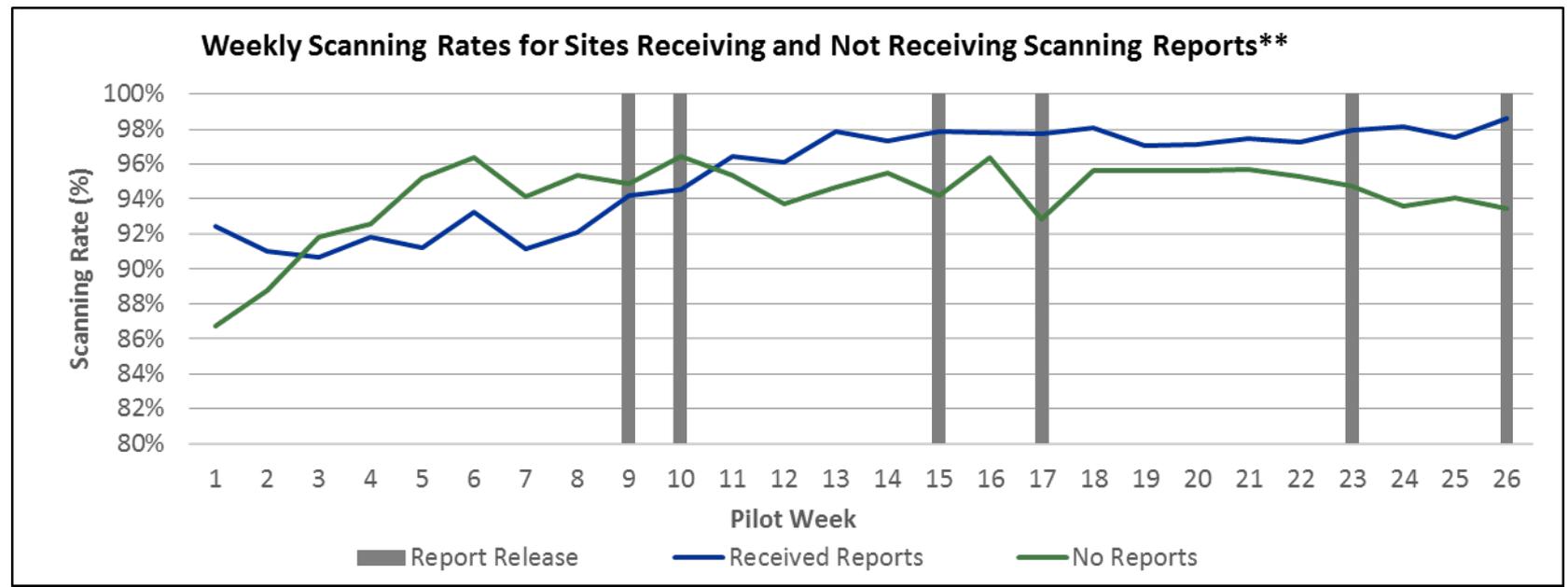


*Differences statistically significant at the p<.001 level

Scanning Rates and Feedback Highlight Success of Scanning Reports

Significant increase in scanning rates observed after release of initial scanning adherence reports (for sites receiving reports, **blue line**).* Increases continued as additional reports released through end of pilot. **Minimal changes in scanning rates for sites not receiving reports (green line).** Grey bars show report releases.

Staff reaction to reports described **increased vigilance, improved awareness, and competition among colleagues.**



“It [the reports] definitely made me more vigilant.”
- Discussion Participant

“I need to step up my game.”
- Discussion Participant

“Humans are competitive. In this kind of thing it’s like, [name], you didn’t scan? You knocked down our score 6% because you missed one.”
- Discussion Participant

*Statistically significant increase in scanning rates after reports released for sites receiving reports compared with those not receiving reports; significant at the p<.001 level

**For sites receiving scanning reports, weekly vaccine volume varied from 838 to 1,615. For sites not receiving scanning reports, volume varied from 1,239 to 2,190.

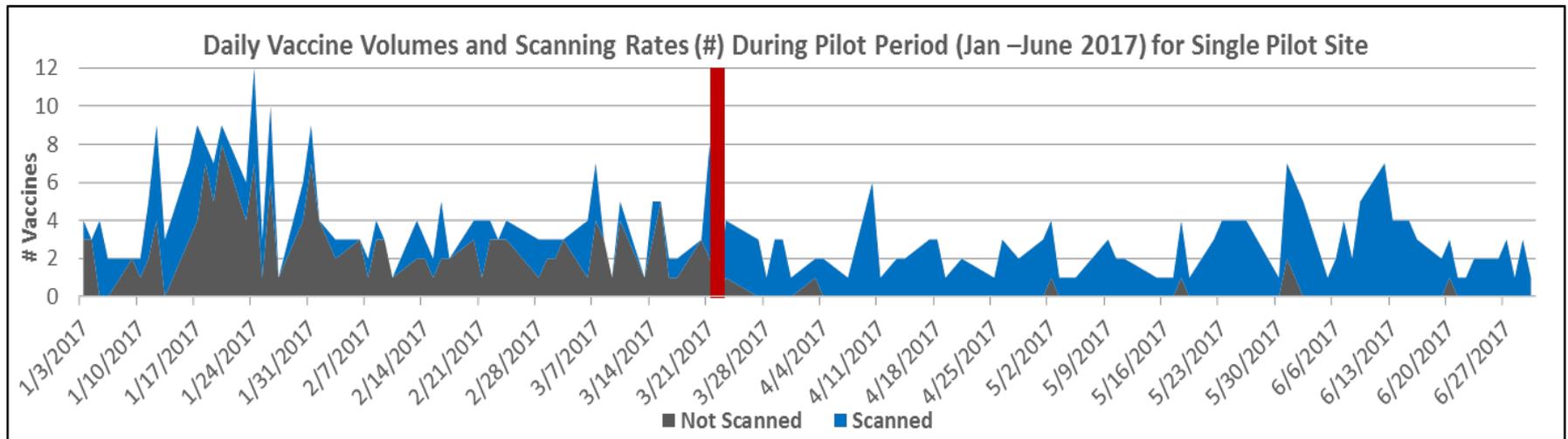
Leadership Involvement Mid-Pilot Improved Scanning Rates

An **unplanned (but effective) strategy** involved a visit by health system leadership to a site with low scanning rates mid-pilot.

Comparison below of scanned (**blue**) and not scanned (**grey**) vaccines across the pilot (for this site) show a changed pattern after leader visit (on March 22nd, shown with **red bar**).

Significant increase in scanning rate found after leader visit to this site ($p < .0001$).

Average Scanning Rates
Pre-visit: 34%
Post-visit: 97%

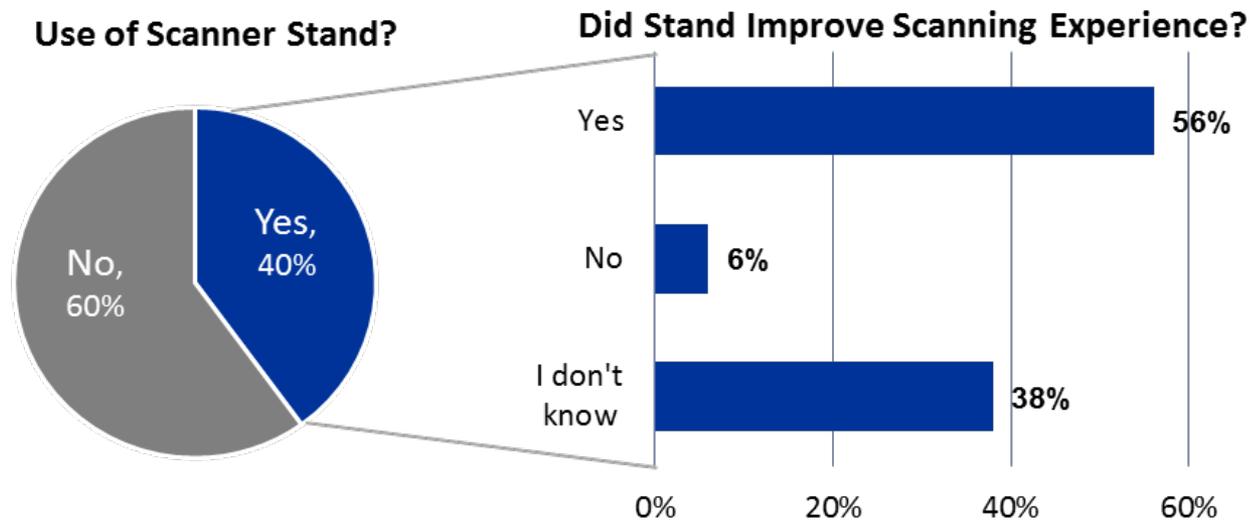


Use of Scanner Stands Beneficial to Many Pilot Participants

Pilot participants had the option to use a scanner stand, which holds the scanner in place and eliminates the need to hold the button down, allowing users to waive the vaccine under a continuous beam and scan with one hand.

Survey participants provided feedback on the use of stands during the pilot.

Pilot Scanner Stand



Respondents noted that stands made scanning **“faster”** and **“easier”**

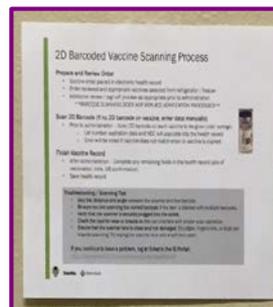
55 of 138 survey respondents (40%) used a stand during the pilot. The 55 respondents having used a stand were then asked if use of the stand improved their scanning experience.

Additional Strategies That May Further Improve Scanning

Pilot staff/leaders identified their own strategies and suggestions to help others scan more consistently.

Post Reminders to Scan/Protocol to Follow

- A few sites developed signs to remind them to scan
- One site posted training one-pager to wall near fridge



Resolve Challenges Being Experienced

- Develop a cheat sheet that includes:
 - How to hold the scanner/vial
 - Tips to get tricky labels to scan
 - Whom to call if there are problems
- Develop a protocol for physicians on how they could aid efficiency
 - For example, ordering vaccines while still in the patient room enables vaccines to be in the system, scanned, and verified promptly

“One of the biggest frustrations for supervisors is looking at adherence to standards, workflows, and policies, a lot of it is based on observation... When you give an employee a review that they are not pleased with, it would be extremely beneficial to have data to support that.”

- Discussion Participant

Formalize Protocol of Scanning within Workflow

- Make scanning mandatory and communicate this from the start
- Add a “verbal check” into the verification process (asking if vaccine already scanned) to ensure scanning prior to vaccine administration
- Have specific people (one or two) do all tray verifications to add consistency and accountability

Ensure Scanning Takes Place and as Intended

- Observe staff to ensure workflow is implemented as intended and not using a workaround
- Identify other sources of data available to assess scanning

“You can’t train someone to a standard process and then not audit them and not follow up to make sure. Just because someone has been trained doesn’t mean that it’s not still going to fall to the wayside.”

- Discussion Participant

Develop Scanning Implementation Plan and Timeline

Once determination is made to adopt 2D barcode scanning for vaccines, development of an implementation plan provides a solid foundation for implementation.

Determine Sites for Scanning

- Determine the reach of scanning implementation to include all sites or a select number of sites
- Organizations with limited resources may strategically select a limited number of sites for implementation

Determine Number of Scanners/Stands Needed

- Identification of scanner set-up locations for all sites informs the number of scanners needed
- Ensure site leaders/staff are engaged in this discussion to improve scanner number estimate
- Determine if scanner stands/wall mounts needed, for which sites, and how many needed

Determine Project Materials Needed

- Materials for development include those to train staff on scanner use and protocol
- Additional materials may be developed to support consistent use (*detailed in Step 3 “Train”*)

Timeline for Implementation

- Develop an estimated timeline for completion of tasks and launch of scanning
- An organization may time implementation to ensure that higher-volume times of year are included (such as flu season and back-to-school) or may want to implement during a slower time to allow staff to learn and adjust away from busier schedules

Develop Plan to Evaluate and Assess 2D Barcode Scanning Efforts

After key scanning implementation decisions made, develop plans for both a **broader evaluation** of the full implementation effort and an **early pulse-check assessment**. Data collected early enables course correction, while data collected throughout provides a more complete picture.

What

- Identify key metrics and questions to answer with evaluation activities, who will collect these data, how and when data will be collected, how data will be analyzed, and how findings will be used
- Consider:
 - What information is most important to leadership and other stakeholders?
 - What information needs to be monitored to ensure scanning is working correctly?
 - How do you identify any on-the-ground challenges with using 2D barcode scanning?

How

- Our pilot data included collection and analysis of de-identified EMR vaccine records, online survey, on-site observations, and group discussions
- Indicator of whether scanning took place or not (dependent on EMR) was critical to our evaluation
 - Scanning rates used to identify sites and individuals struggling to scan and needing additional support, as well as those scanning consistently from early in the pilot
 - Scanning rates identified variability in scanning implementation and adherence strategy success
 - Scanning rates provided to some staff and sites in reports to maximize their use of scanning



Train





Step 3: Train and Introduce 2D Barcode Scanning

Prepare to train participants, install scanners, and for the early stage of initial scanner use



Training Preparations

- Plan training and implementation support
- Develop training materials



Introduce Scanning

- Conduct training
- Install scanners
- Allow adjustment period



Plan Training and Implementation Support

Prepare for upcoming trainings and scanner implementation by gathering the right people and setting up training environment

Identify Scanning Champion and Implementation Support Team

- Identify a scanning champion (site leader or person dedicated to scanning implementation across sites)
- Identify person(s) to support implementation process, from testing the scanners, working with staff to determine the best workflow, planning logistics, and setting up trainings

Identify Trainers and Staff to Train

- Identify trainers—this may be a champion at each site or a resource dedicated to all trainings
- Confirm which staff to train at each site

Plan Set-up and Logistics for Training

- Create a training (or sandbox) environment in your EMR—preload dummy data for use during training
- Collect assorted vials/syringes and bring scanners to provide hands-on scanning practice during training
- Configure scanners (as described in Decide Phase)
- Identify space for training—depending on site and staff size, this may be a desktop at a station, a breakroom with a computer, or a dedicated training room
- Set training schedule—depending on site size and patient schedule, training may take place one on one in intervals throughout the day or in a large group session at a predefined time (lunch, before/after patients)
- Have a mechanism to track who has received training (e.g., sign-in sheet)
- Have a plan to train anyone not available during trainings (such as through a train-the-trainer process)



Develop Training Materials

Training that Includes:

- Benefits of scanning and rationale for implementation of scanning--examples as identified in the pilot are patient safety, staff safety, and time savings
- Recommended scanner location and workflow (if any)
- Changes from current workflow (if any)
- Screenshots of fields that will be populated with scan
- Demonstration of scanning integration with the EMR and any steps/EMR fields that still need to be completed by staff
- Troubleshooting tips and tricks
- Provide opportunity to use scanners
- Describe any additional strategies that will be rolled out to maximize scanning and use (e.g., commitment cards/scanning rate reports)

Handout that Includes:

- Identified site workflow(s) (if any)
- Tips and tricks
- Contact information for help and questions

Optional Materials:

Some pilot participants created their own materials to promote scanning or identified other materials that would have been helpful, such as:

- Develop tips and tricks for scanning—this could be posted by scanners (e.g., how to hold the scanner, move vial to aid scanner)
- Reminder to scan sign posted near vaccines/prep area or scanners



Introduce Scanning

Train participants, install scanners, then allow them to get familiar with scanning and their new workflow in actual practice. In the pilot, training and scanner installation occurred together.

Conduct Training

- Log in to training (or sandbox) environment prior to training start
- Introduce trainer/champion and training purpose
- Log names of all participants (e.g., in sign-in sheet)
- Walk through training materials
- Allow all staff hands-on experience to try out scanners using the training (or sandbox) environment in EMR
- Ask for questions—capture all questions to improve subsequent trainings

Install Scanners

- Scanners already configured and tested for correct use within a given EMR can be installed at locations selected for scanning use
- Each scanner is plugged into the computer port, then is ready for scanning unit-of-use barcodes

Allow Adjustment Period

- Communicate the time frame for grace period in which staff can continue to use traditional approach for data capture or scanning as they get used to scanning
- Communicate point at which staff should commence scanning all 2D barcoded vaccines and set leadership expectations about frequency of scanning
- Follow up to request feedback on experience with scanners, adjustments made (location/workflow), and ensure sites have fully implemented scanning
- Follow up to review workflow and scanner usage
- Be prepared to offer suggestions to support use of scanning



Assess





Step 4: Assess Implementation of Scanning

After an initial period of using scanners (a few days/weeks), monitoring the implementation process, including rates of scanning, can provide guidance on how scanning implementation is going, where additional support and adjustment are needed, and where successes are being found.



Gather Information

Assess Early Status

- Collect data for early assessment of scanning
- Gather feedback from staff/leaders to aid understanding

Evaluate Across Implementation

- Continue data collection to evaluate implementation broadly and identify any changes taking place



Analyze Data

- Analyze data at regular intervals, including within the first few weeks
- Use scanning indicator (if available) to monitor scanning rates
- Identify types and extent of challenges faced
- Assess whether protocol is being followed



Implementation Status

- Use collected data to determine how implementation is going for sites and staff
- Determine which sites or staff need additional support/adjustment and those finding early implementation success



Gather Information

Carry out evaluation plans (previously developed), including both an early pulse-check and broader understanding of implementation overall.

Gather data identified, which can be used early (in first few weeks) and on a regular basis to understand scanning implementation, successes, and help identify challenges needing resolution.

Early Status Check (First Few Weeks)

- Collect data that will inform an assessment of scanning implementation; consider including data on extent scanning is used
- Gather feedback from staff and leaders at sites to help understand:
 - Any initial barriers to full implementation
 - Challenges faced in early stages of implementation
 - Strategies for early success
- Assessment early in the scanning process can identify sites or staff needing course correction and provide them support quickly

Evaluate Broader Implementation

- Continue data collection throughout implementation efforts to understand fuller picture of implementation, challenges, and successes
- Findings from the broader implementation can provide lessons learned to other sites within the organization waiting to implement scanning or perhaps to the field more broadly to guide future efforts by others



Analyze Data to Understand Support Needs and Early Successes

Use of collected data to assess scanning implementation **identifies sites and staff doing well, those struggling, and any in between.**

Such identification enables targeted support for sites in need, better understanding of challenges being experienced, and lessons to be learned from sites easily integrating scanning.

Identify Sites or Practitioners Likely to Need Additional Support

- Sites or practitioners without consistent scanning habits can be readily identified and offered support
- Contextual information beyond just scanning rate can identify breakdowns in scanner use and support needs

Identify Challenges Being Experienced

- Types and extent of challenges being experienced by sites and practitioners

Identify Alterations to Intended Use

- Adjustments or workarounds to scanning guidance in place can limit benefits experienced

Identify Early Successes

- Assess any clear patterns of successful implementation
- Strategies by sites or practitioners aiding their use of scanners or ease of implementation
- Success strategies can be utilized to help struggling sites or practitioners *adjust*



Beware:

Workarounds Can Limit Scanning Benefits

Pilot participants described deviations from the trained scanning protocol that could limit safety benefits of scanning. Two examples highlighted below.

Assess during early implementation to ensure such workarounds are not taking place.

Entry of Vaccine Data in One Step

- Two versions of this workaround identified – both create vaccine entry shortcuts
- Both versions described by multiple pilot participants, across several pilot sites, from the pilot start and through the end

1. After Administration

Waiting until after vaccine administration to scan, when all data are now available for entry (such as site of injection). If EMR functionality has pop-up alert checks (such as expired vaccine or match to doctor's order), these benefits are not realized

2. Prior to Administration

Entering data not yet confirmed (such as site of injection, time given) prior to vaccine administration

Survey Confirmation

17% of 138 survey respondents indicated scanning vaccines after administration (survey at end of the pilot period)



Scanning Patterns Can Identify When Consistency is Found (or Not)

Figures below show **four scanning patterns by pilot sites**, which differ by how they started, variability in scanning rates, and when consistency was seen (from start, midway, never).

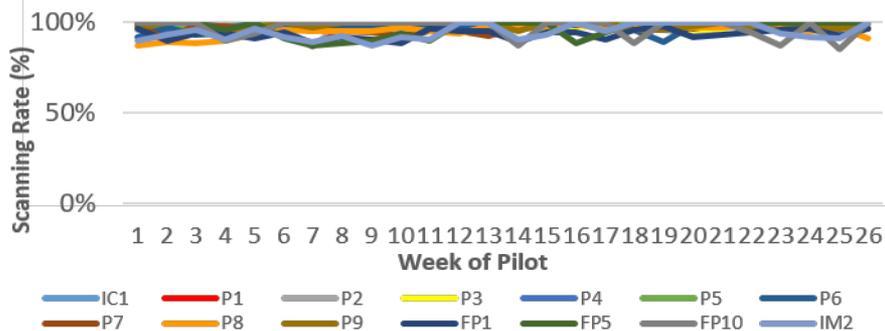
Consistency = habit formation

Even within the first few weeks, patterns of consistency were seen (or not).

This **enables targeted support for sites in need and lessons to be learned from sites easily integrating scanning.**

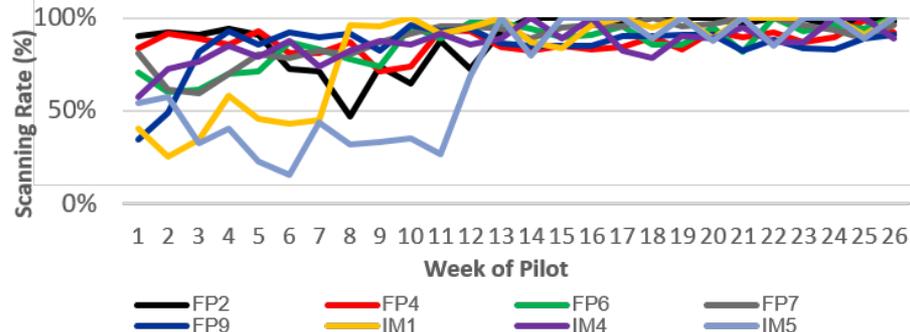
Start Strong, Stay Strong (14 sites)

14 sites consistently scanned early and maintained throughout the pilot; these sites needed little support after initial planning efforts



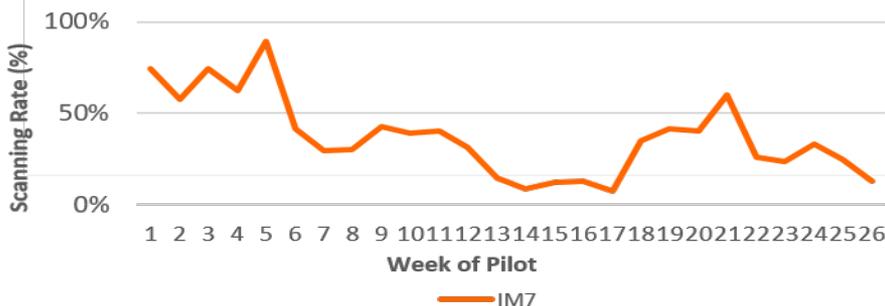
Start Slow, Get Strong (8 sites)

8 sites started slow, but found more consistency partway through the pilot; Critical events, revisited planning and receiving scanning reports noted



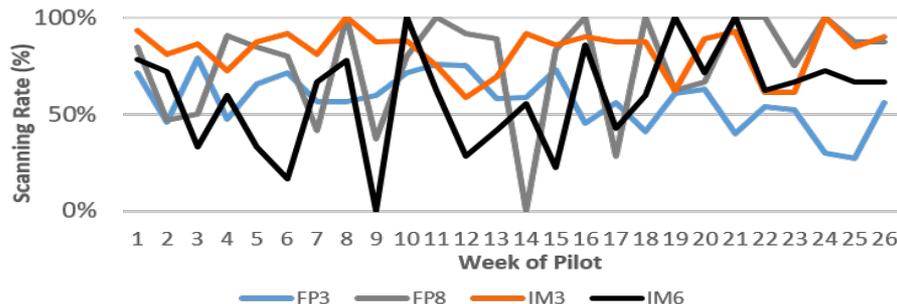
Solid Start, Lose Ground (1 site)

1 site within this pattern; started fairly strong, then changed scanner location and lost momentum; such sites can benefit from additional support to address challenges and reengage participants



Lows and Highs (4 sites)

4 sites varied greatly in scanning rates throughout the pilot and did not find consistency in scanning rates by pilot end; such sites can benefit from additional support to address challenges and reengage participants

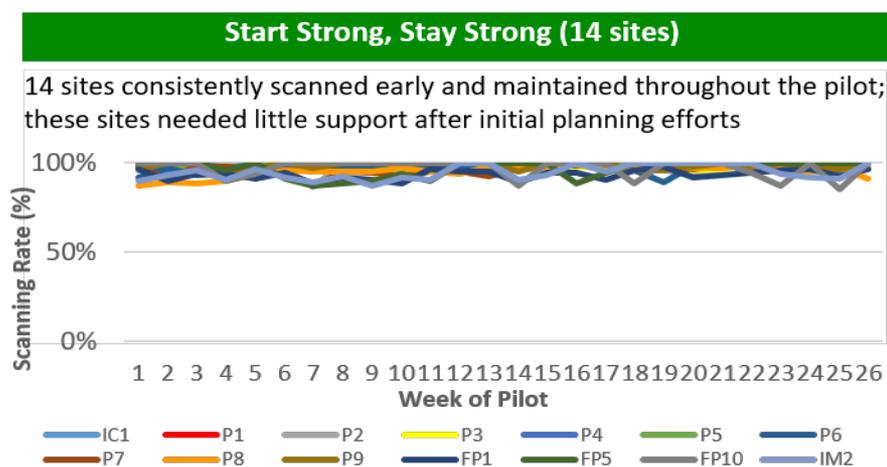




Pilot Scanning Patterns Identified Early Success Sites

One pattern, the **“Start Strong, Stay Strong”** group, found early and lasting scanning success.

Their consistently high scanning rates indicate **habit formation** was developed and maintained (further supported by additional data gathered at these sites).

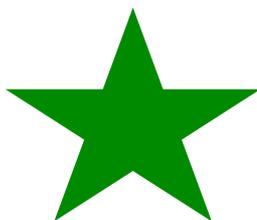


Goal is this pattern

Which Sites Fit This Pattern?

- ❖ **All Pediatric/Injection (Shot) Clinic and high-volume sites in pilot fit this pattern** (across all adherence strategy groups)
- ❖ 3 Family Practice and 1 Internal Medicine site (each signed commitment cards, received scan reports, or shared a leader with Pediatric sites)

Learn from Successes of These Sites



- ❖ Early and thoughtful planning decisions identified scanner location/protocol that worked for them and adjustments made as needed to ensure use
- ❖ Solutions found versus challenges allowing scanning to stop

Dig Deeper

Case example of several sites within the **“Start Strong, Stay Strong”** group presented next

Start Strong, Stay Strong Case Example: Successful Implementation Across Multiple Sites



Case Example: Start Strong, Stay Strong

Specialty	Vaccine Volume	Scanner Location(s)	Intervention Groups	Pilot Scan Rate (avg)
Peds (3 sites) FP (1 site)	894-2,659 total (Peds) 234 total (FP)	Primary refrigerator area + back-up elsewhere (all sites)	Report + Card (Peds 2); Scanning Report (Peds 6); Training-only (Peds 9 + FP 10)	97% - 99% (Peds) 96% (FP)

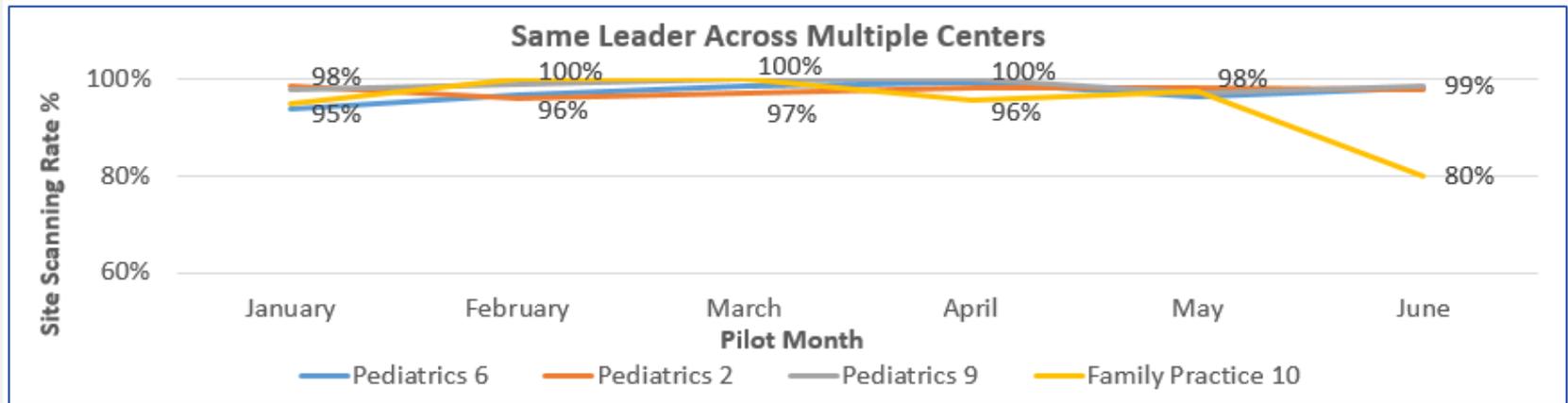
Context: Same leader implemented barcode scanning across four sites (3 Peds and 1 FP); two received scanning rate reports and two were training-only sites

Outcome: High engagement from start to end of pilot across all four sites; staff found implementation easy, even a few reluctant to try a new process

Keys to Success: Determined workflow prior to scanner installation, leader oversaw implementation and checks to ensure compliance (set protocol and expectations, follow-through); scanner location (in med room) critical for this site

“As an LVN that doesn’t need to have someone double check, it gives me a safety check.”

“I don’t want to go to a site that doesn’t have it because I don’t want to have to type it.”



Note: The drop for FP 10 in June was due to 4 vaccines not scanned in the time period and being a low-volume site



Pilot Scanning Patterns Identified Sites Needing Support

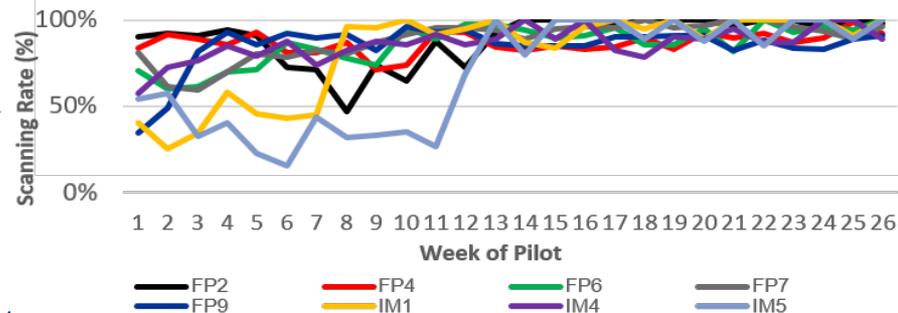
The other three pilot scanning patterns started with **extensive variability**, indicating an **inconsistency in scanning habits** and **ongoing challenges** experienced.

Of these, the “**Start Slow, Get Strong**” group found better consistency partway through pilot. The other two groups (in blues) struggled to find consistency, even by pilot’s end.

- ❖ All of these sites need additional support
- ❖ Ways pilot sites improved scanning described in upcoming “*Adjust*” step
- ❖ Hope is to find consistency at some point, even if not at start (similar to grey group) and not duplicate patterns of blue groups

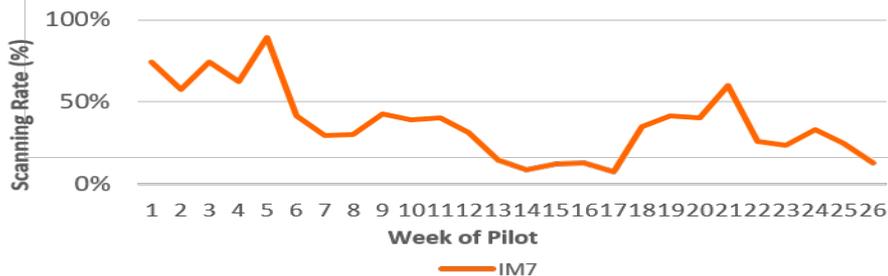
Start Slow, Get Strong (8 sites)

8 sites started slow, but found more consistency partway through the pilot; Critical events, revisited planning and receiving scanning reports noted



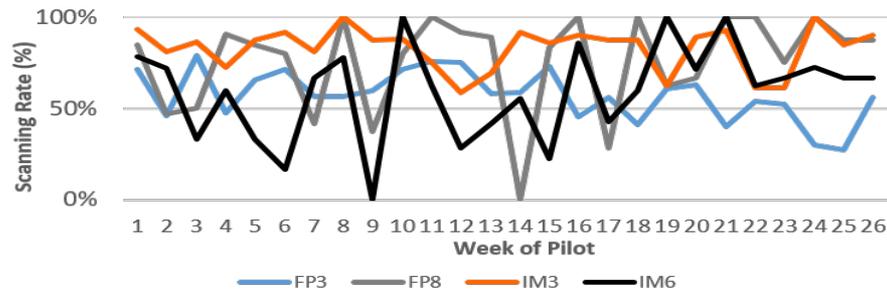
Solid Start, Lose Ground (1 site)

1 site within this pattern; started fairly strong, then changed scanner location and lost momentum; such sites can benefit from additional support to address challenges and reengage participants



Lows and Highs (4 sites)

4 sites varied greatly in scanning rates throughout the pilot and did not find consistency in scanning rates by pilot end; such sites can benefit from additional support to address challenges and reengage participants



Dig Deeper

Further details on these patterns, including case examples, in the ***Adjust*** section



Determine Implementation Status

An organization should determine the best data they have available for assessment, timing of assessment, and their own cut-offs for categories (e.g., high/low rates, threshold for consistency, etc.).

As an example, using the combination of scanning rates and challenges identified can provide context into a site's full implementation of scanning. An organization might use this data to categorize sites as outlined below.

Consistent Scanning and Few Challenges

- High and consistent scanning patterns observed and few to no ongoing challenges may mean that sites won't require adjustments
 - Monitoring should continue to ensure they don't experience a new challenge or lose ground

Similar to early weeks of pilot pattern:

Start Strong, Stay Strong (14 sites)

Inconsistent Scanning and/or Challenges

- Low, medium, or inconsistent early scanning rates
- Any level of scanning rate, even high, if there are several remaining challenges or a potential major disruption is imminent

Similar to early weeks of pilot patterns:

Start Slow, Get Strong (8 sites)

Solid Start, Lose Ground (1 site)

Lows and Highs (4 sites)

Sustain

**May Be Ready to Sustain Practices:
Can Go to *Sustain* Phase Next**

Adjust

**Adjustments Needed:
Move to *Adjust* Phase Next**

Potential Assessment Criteria for Inclusion

- Scanning rates/patterns (*used in example above*)
- Challenges being experienced (*used in example above*)
- Confirmation that revised workflow protocol in use or revised/workarounds developed
- Assess staff satisfaction with scanner location
- Other data to determine whether there is full implementation or need for adjustments



Adjust





Step 5: Overview: Adjust *(if needed)*

An initial assessment of implementation may have found that some sites or staff still struggle with consistent scanner use. Troubleshooting challenges and making adjustments may improve workflow integration and increase scanner use. *Those with high and consistent scanner use can skip this step.*



Identify Challenges

- Use data collected in “Assess” phase to understand types and extent of challenges
- Gather more detailed information from specific sites/staff needing support
- Determine if a few specific solutions can address most challenges or need multiple solutions



Develop Solutions and Adjust

- Develop solutions specific to challenges faced by sites or staff
- Revisit previous steps/suggestions from the “Plan” phase for potential resolutions to challenges
- Implement solutions to address challenges
- Allow integration period for changes
- Assess whether changes have improved scanning use



Sites Addressing Challenges and Making Adjustments Found Eventual Success

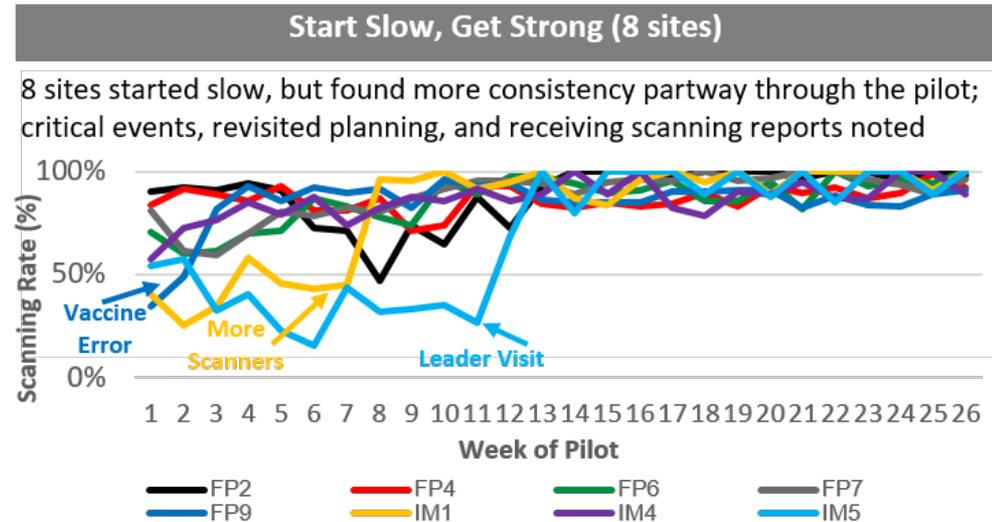


With adjustment, even low scanning sites can improve and find consistency.

The “Start Slow, Get Strong” group found better consistency mid-pilot by adjusting their practices.

Which Sites Fit This Pattern?

- ❖ 5 Family Practice and 3 Internal Medicine sites
- ❖ All except one site received strategies to maximize scanning
 - 6/8 sites received scanning reports, 1 signed commitment cards (FP4)
 - 1 site received training-only (FP9)



How These Sites Moved from Variability to Consistency

- ❖ Six sites received scanning reports (alone or with commitment card), with increases after report releases
- ❖ The single training-only site in this group found consistency after experiencing a vaccine error and revising their process (*see next case for details*)
- ❖ Another site received an unexpected leader visit, then made multiple adjustments (*upcoming case*)
- ❖ One site realized they did not have enough scanners and requested more (in week 7)

Dig Deeper

Two case examples from the “Start Slow, Get Strong” group presented next

Start Slow, Get Strong Case Example 1: Revise Everything After “Aha” Moment



Case Example: Start Slow, Get Strong

Specialty	Vaccine Volume	Scanner Location(s)	Intervention Group	Pilot Scan Rate (avg)
Family Practice (FP9)	Medium (1,508 for pilot)	Patient rooms, changed to single shared in refrigerator area	Training-only	83%

Challenge: Limited engagement by staff and leadership; difficulty remembering to scan; low scanning rate initially

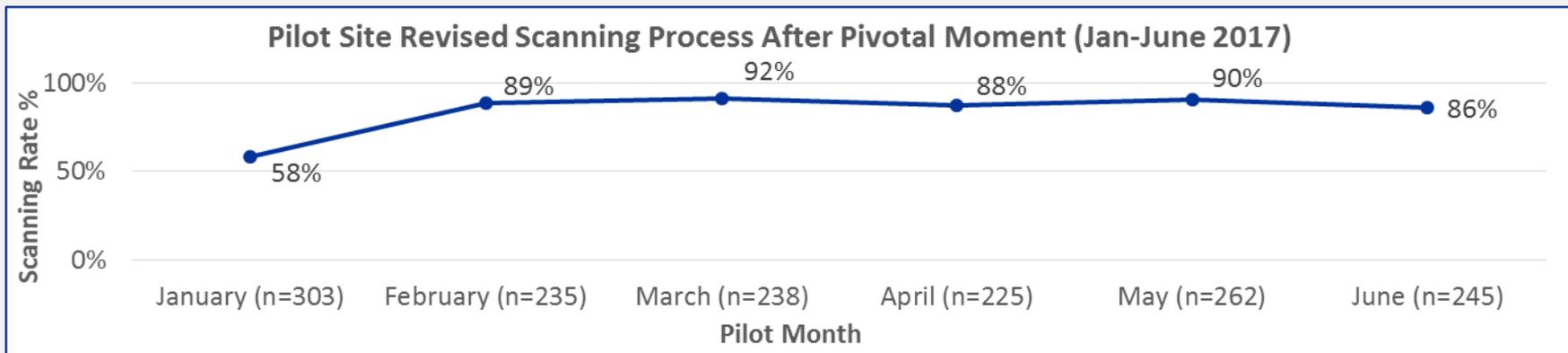
What Changed? Administering an expired vaccine (early in pilot) was “aha” moment; site leaders looked at process and revised workflow to ensure scanning took place prior to administration; reorganized vaccine storage and scanner locations, obtained new computer for refrigerator room, defined a standard process and retrained staff, added verbal check into verification process (“has this been scanned?”), added audit

Outcome: Increased scanning rates; streamlined vaccine location (time savings seen); staff clear on protocol/expectations and leaders audit for compliance; leader wants better way to track scanning (such as scanning reports) to keep staff accountable

“Once we figured out the workflow that worked well. Initially it was difficult.”

“I think that’s a key thing, that the med location and scanner need to be together. I think that’s a huge barrier.”

“We’re human and we’re not perfect. But that’s what makes this so amazing. It does help add that extra layer of security for the patient and protection for the employee as well.”



Start Slow, Get Strong Case Example 2: Scanning Process Overhaul After Leader Visit



Case Example: Start Slow, Get Strong

Specialty	Vaccine Volume	Scanner Location(s)	Intervention Group	Pilot Scan Rate (avg)
Internal Medicine (IM5)	Low (386 total for pilot)	Shared in refrigerator room	Scanning Report	60%

Challenge: Low engagement from start; saw low scanning rates in early reports, but did not know how to address issues, did not prioritize full participation or understand all benefits

What Changed? Visit by leadership to pilot site (March 22, *green arrow in Figure below*) encouraged full participation and shared tips and tricks to improve use; site lead developed detailed scanning protocol, required staff scan vaccines before administration, added scanning into verification, and created reminder sign to aid compliance; engaged staff in process and encouraged identification and resolution of issues as they arose

Outcome: Scanning rates increased quickly and remained high; Staff described enthusiasm for scanning, time savings, and safety benefits; leader/staff like report accountability

“Once we started using it, we started loving it.”

“Once we developed the new workflow it really improved.”

“...potential for cost savings because we can scan and then get rid of vial in pharmaceutical waste in room...”





Key Challenges Found in the Pilot Across Multiple Data Sources

Pilot participants identified challenges experienced through various data collected across the pilot. **Several themes appeared across multiple data sources.**

Awareness of these challenges may aid identification and resolution by others implementing scanning.

Challenge		Data Source(s) in which Challenge Was Identified		
Challenge Type	Challenge	User Survey	Group Discussions	Ongoing Observations/ Challenge Log
Scanning Difficulties	Scanner sometimes not scanning	●	●	●
	Some vaccines harder to scan	●		●
	Receiving error messages that NDC not in system/barcode not recognized		●	●
Scanner Location/ Issues	Location of scanner/set-up did not work	●	●	●
	Needing additional scanners	●		●
Low Engagement	Limited buy-in and understanding of scanning importance	●	●	●
Unclear on Scanning Protocol	Workarounds developed that do not align to scanning protocol (e.g., entering data in one step before or after administering vaccine)		●	●
	Unsure if staff is scanning	●	●	●

Learn More

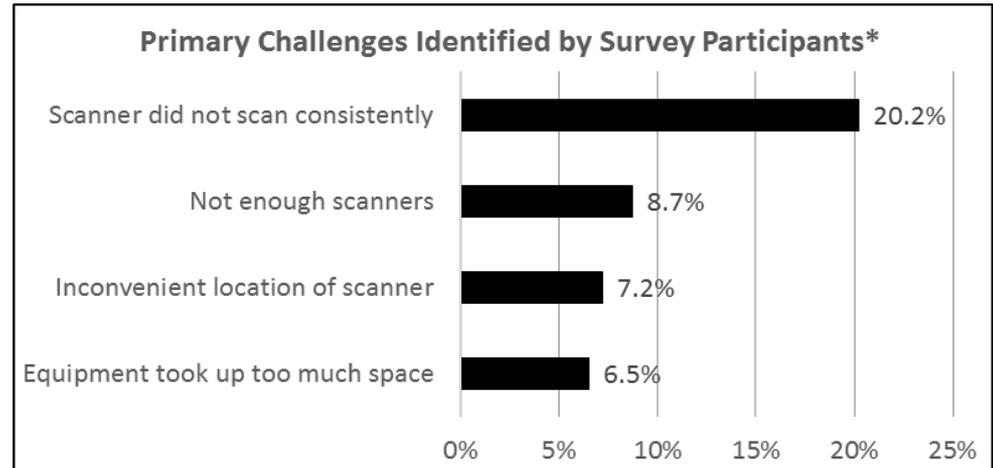
Further details on participant challenges found in the barcoding pilot [Findings Report](#)



Select Challenges and Solutions Identified by Survey Participants

Survey respondents (n=138) agreed/strongly agreed they **experienced specific challenges** (figure right) with scanning.

Inconsistency of scanners (e.g., needing to scan more than once) **most frequently identified** as a challenge (n=28).



Survey respondents experiencing inconsistent scanning challenges (n=28) then asked to **describe any patterns noticed and solutions to resolve these issues**. Examples of categories and responses below.

Specific Vaccines/Vaccine Labels

- Specific vaccines identified as particularly problematic (DTaP, hepatitis)
- Barcodes on certain vaccines partially cut off at the edge of the label
- Differences seen when labels are light or dark

No Pattern Identified

Several indicated “No patterns” or “None”

“It isn't always the same vaccine. Not sure what the issue is.”
– Survey Respondent

Strategies Used to Resolve

- Holding vial specific way
- Holding for extended period
- Restarting EMR, closing chart

“How the vial is held under the scanner makes a difference if it is picked up by the scanning process.”
– Survey Respondent

*Survey question: Please indicate the extent to which you agree or disagree with the following statements regarding potential challenges you may have experienced when using 2D barcode scanning to record data about vaccines administered to patients. Agree/Strongly Agree responses considered as challenge.



A Focus on the Lowest-Performing Staff Members Can Pinpoint Struggles

Low scanning rates at the worst-performing centers were frequently driven by just one or two people. **Use of scanning rate data can identify sites and practitioners with low scanning rates.**

Identification of individuals struggling to scan consistently and resolution of challenges being experienced can greatly improve scanning participation and benefits.

13 Sites (of 27 in pilot) had <90% Scanning Rate

- Staff members with the most unscanned vaccine administrations at these sites usually had **very low (<50%) personal scanning rates.**
- Unscanned vaccinations in this group often **concentrated in one or two staff members.**

CASE EXAMPLE (from a site with 59% scanning rate):

One staff member had a 40% personal scanning rate, with missed scans for this staff member accounting for 53% of the site's missed scans.

Two staff members at this site accounted for >80% of the site's total missed scans.

Takeaway

The difference between high- and low-scanning centers is often just a few struggling staff members



Develop Solutions and Make Necessary Adjustments

Develop Solutions

- Develop solutions specific to challenges faced by sites or staff members
- Revisit steps and suggestions from “Plan” phase for resolutions to challenges experienced

Solutions to Challenges May Include

- Changing scanner location
- Revising workflow to (better) incorporate scanning
- Engaging staff and leaders further
- Reminding participants why scanning is important and benefits of scanning
- Sharing strategies to scan more easily
- Adding adherence strategies, even mid-course (providing scanning rates, (re)signing commitment card)

Make Adjustments

- Implement solutions to address challenges
- Allow period to integrate into practice
- Assess whether changes improved scanning

Pilot Adjustments Made to Improve Scanning

- Use of scanner stands
- Leadership visit to troubleshoot challenges and reenergize staff
- Revising entire process of scanner location, workflow process, and staff engagement, to increase scanner use
- Development of reminder signs posted by refrigerator or other commonly seen location
- Adding verbal check into verification process (asking if vaccine already scanned) to ensure scanning prior to administration

Learn More

Further details on solutions developed and adjustments made in the barcoding pilot [Findings Report](#)



Redetermine Implementation Status – Consistency Now Found?

After making adjustments to address identified challenges, and giving staff time to adapt to any changes, sites' implementation status should be reassessed to determine next steps.

Successful Adjustments

Consistent Scanning and Few Challenges

- For example, if scanning rates:
 1. Increase to the predetermined threshold and
 2. Appear consistent/stable, and
- Identified challenges appear resolved or minimal

Similar to late pilot scanning patterns of:

Start Strong, Stay Strong (14 sites)

Start Slow, Get Strong (8 sites)

Adjustments Not Made/Not Successful

Inconsistent Scanning and/or Challenges

- For example, if scanning rates:
 1. Have not increased to point of predetermined threshold, or
 2. Are not consistent/stable, or
- Multiple remaining challenges, regardless of scanning rate, or
- Remaining significant challenge(s) identified (e.g., potential major disruption)

Similar to late pilot scanning patterns of:

Solid Start, Lose Ground (1 site)

Lows and Highs (4 sites)



**May Be Ready to Sustain Practices:
Can Go to *Sustain* Phase Next**



**Further Adjustments Needed:
Stay in Adjust Phase**

**Dig
Deeper**

**“Start Solid, Lose Ground” case next
shows struggling site/no adjustment**

Solid Start, Lose Ground Case Example: Strong Start, then Disruption and Decline



Case Example: Solid Start, Lose Ground

Specialty	Vaccine Volume	Scanner Location(s)	Intervention Group	Pilot Scan Rate
Internal Medicine (IM7)	Low (553 total for pilot)	Individual room/desk moved to single shared scanner near refrigerator room	Training-only	39%

Challenges: Engagement at the start did not maintain; strong staff personalities and limited leadership engagement; dissatisfaction with scanner location

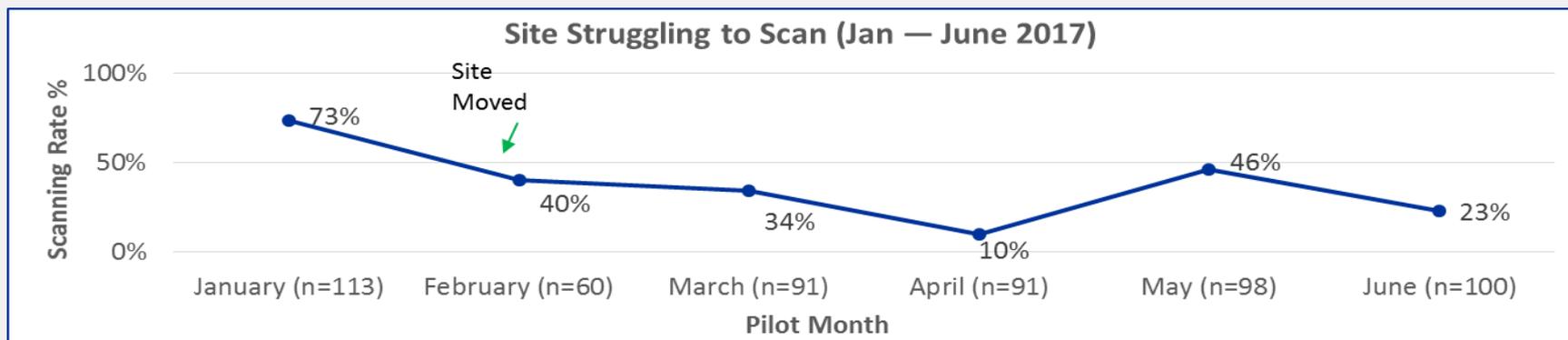
What Changed? Office moved in early February, and staff separated into two suites; staff in one suite dissatisfied with new scanner set-up/location, which changed from patient rooms/individual desks to shared area near refrigerator

Outcome: Staff in one suite stopped scanning altogether as leadership had not resolved tension between staff on scanner location; other suite described satisfaction with location and scan benefits; scanning rate very low by pilot end

“Our boss should just make it mandatory...”

 (scanner location) “decision made by someone else...”

 “I would use it if...don’t have to log in twice. It’s an extra step, not going to do that.”



What Now?

Sites struggling after an extended period need an overhaul – revisit the “Plan” and “Adjust” steps and think critically about challenges being experienced and creative solutions to solve



Sustain





Step 6: Sustain and Expand Use of Barcode Scanning

Once scanning is fully and consistently incorporated into the vaccine data entry process, sustain this practice. Strategies to further improve and expand barcode scanning also explored.



Sustain Use of Scanning

- Establish threshold for regular or consistent scanning to move into sustain phase
- Continue to monitor scanning
- Ensure ongoing use and buy-in of staff and leaders



Expand Use of Scanning

- Expand scanning to other sites within the health system (if appropriate)
- Engage immunization community to support scanning efforts



Sustain Use of Scanning

Once staff are scanning regularly, additional monitoring may be needed to ensure sites do not lose ground and any new issues are addressed.

Pilot sites overwhelmingly wanted to continue scanning after the pilot ended and suggested expanding scanning efforts within their organization.

Sustaining Scanning: Recommendations From Pilot Experience Supporting Implementations

- An organization should define its own threshold for regular or consistent scanning, at which a site stays in the “sustain” phase
 - Ensure only 2D barcoded vaccines (those able to be scanned) are included in scan rate estimates
- Continue to monitor scanning and address challenges within pilot sites to improve scanning further
- Ensure best location for scanners, right number of scanners, and effective workflow protocols in place at all sites using scanners

97% of survey respondents reported “Yes!” or “Leaning toward yes” when asked if they **would like their site to continue scanning** after the pilot ends (n=159 of 164)

“Please don’t take our scanners away!”
– *Workflow discussion participant who knew pilot was ending*

Consider expanding scanning to any sites not previously included within the organization, using lessons learned, once at least some original sites have reached the sustain phase

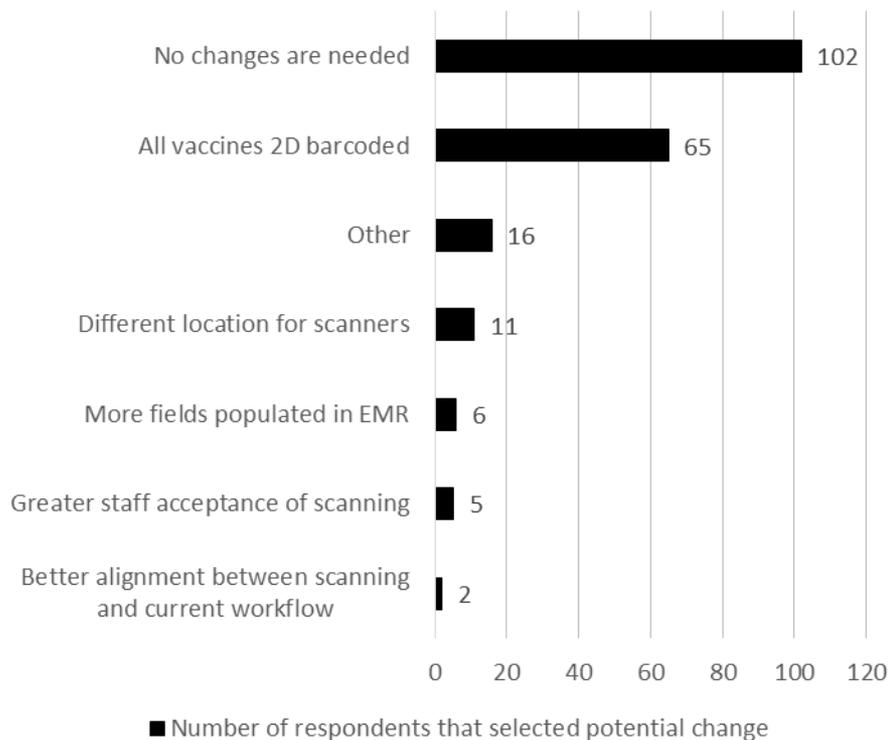


Improve Scanning and Implementation Further – Pilot and Beyond

Survey respondents (n=164) identified **necessary changes for 2D barcode scanning to be used more regularly** at their site. Multiple options could be selected. **Most frequently “no changes” selected** (n=102), perhaps suggesting that high buy-in was achieved or the implementation was appropriate.

Beyond the pilot, such feedback provides guidance on ways to further improve 2D barcode scanning. Parties best able to address identified changes are identified.

Number of respondents that selected a potential change needed to increase use of scanning



Role for Immunization Community

Various immunization community members are best positioned to address changes identified by pilot participants to increase use of scanning

- **Vaccine Manufacturers:** The most selected actual change needed was having **2D barcodes on all vaccines** (n=65)
- **EMR Vendors:** Expanded EMR functionality (n=6) that would enable **more information to be populated in the EMR** with a scan would require engagement of EMR vendors
- **Health Care System:** Changes to **scanner locations** (n=11), increasing **staff buy-in** (n=5), and **better alignment with the workflow** (n=2) could be addressed by organizations implementing scanning



Engage Immunization Community to Support Scanning Efforts

Various ways the immunization community can support improvement and expansion of scanning efforts

Vaccine Manufacturers/Pharmaceutical

- Include 2D barcodes on all vaccines
- Ensure print quality/contrast of labels to be easily picked up by scanners
- Ensure 2D barcodes on labels print correctly (do not get cut off)
- Consider adding 2D barcodes to other medications

EMR Vendors

- Ensure/increase functionality of EMR to support scanning
- Ensure indicator (scan flag) available for health care system to track whether scanning took place or not
- Streamline scanner configuration to work easily with EMR (currently coordination of EMR/scanner/health system)
- Add pop-up alerts if vaccine scanned does not match order or is expired (or others identified by users)

Scanner Vendors

- Ensure scanner functionality with barcodes and EMR
- Streamline scanner configuration to work easily with EMR (currently coordination of EMR/scanner/health system)
- Ensure scanner has right sensitivity/ability to support scanning barcodes on curved vials and prefilled syringes or labels with limited contrast

Health Systems/Practitioners

- Communicate with vendors any needs identified by health system/practitioners to support scanning and maximize benefits (such as expanded EMR functionality, barcodes on additional products, improvements to labels, etc.)
- Expansion of scanning through adoption by new health systems and scaling for those scanning on limited basis
- Ensure right scanner locations, workflow process, and staff buy-in to support successful implementation

Learn More About Our Work

1. What is Vaccine 2D Barcode Scanning?

2. Implementation Guide Steps

- Decide
- Plan
- Train
- Assess
- Adjust
- Sustain

3. Learn More About Our Work

Find Additional Information About Our Work



Where can I find additional information?

- Visit the **CDC 2D barcode site** for 2D vaccine resources :
<https://www.cdc.gov/vaccines/programs/iis/2d-vaccine-barcodes/about.html>
- Search key words: “CDC 2D Barcode”

What’s on the CDC 2D barcode site?

- 2D barcoding pilot reports and other pilot materials
 - Pilot **Findings Report**
 - **Implementation Guide** for decision-making (*this document*)
 - Summary reports from previous pilots
- Current list of 2D barcoded vaccines
- 2D Scanning Functional Requirements
- AAP Guidance
- GS1 Guidance
- Training videos

