Implementation Guide for Decision Makers

Vaccine 2D Barcode Scanning

Prepared for
Immunization Services Division
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention

Prepared by
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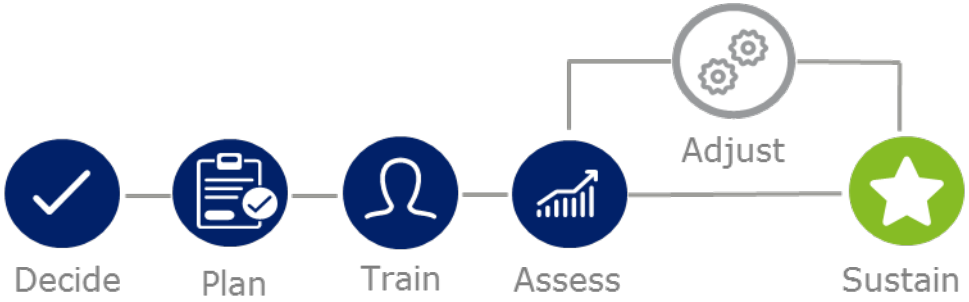


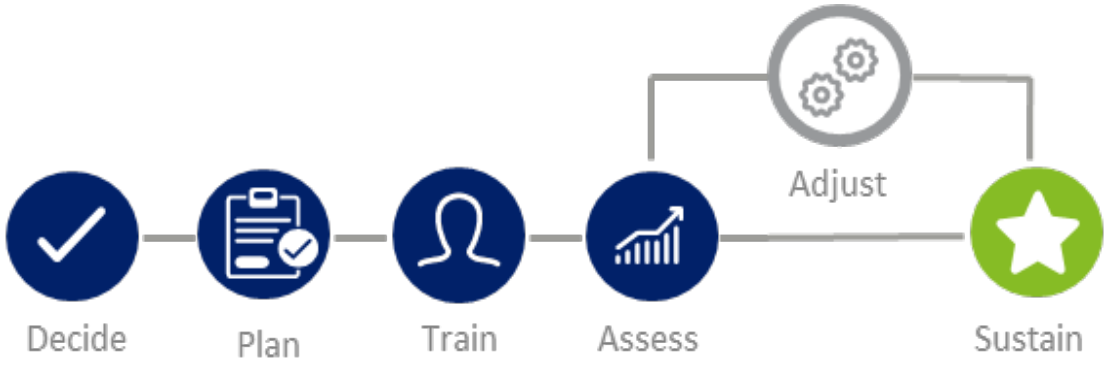
Introduction

The Implementation Guide for Decision Makers is part of the Vaccine 2D Barcode Scanning Implementation Toolkit, which contains resources and tools to support different aspects and phases of vaccine two- dimensional (2D) barcode scanning implementation in ambulatory clinics, pharmacies, health care facilities, and health systems.

This guide is designed to help people in the decision-making role understand the stages of implementation, requirements and components, and potential benefits of vaccine scanning practices for their organization.

Additional resources addressing other aspects of implementation of vaccine scanning practices are available, including: a guide for the project lead, technical implementation guides for vaccine administration and inventory, a workflow determination tool and findings from pilots.

This Guide informs decision makers and their teams on the process and benefits of implementing vaccine 2D barcode scanning practices.



2D Barcode Scanning: The Issue, Opportunity, and Bottom Line

Issue

- >100 million routine vaccines administered annually in the US.
- Most vaccines manually typed into electronic health record (EHR), 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, in the event of vaccine recall, or disease outbreak or pandemic.

Opportunity

- 2D barcodes on most vaccine vials/syringes and scanning technology available, but not widely used to record vaccine entries.
- CDC pilots and case studies found scanning improved accuracy, time savings, and user satisfaction, though challenges remained, including low scanning rates.

Bottom Line

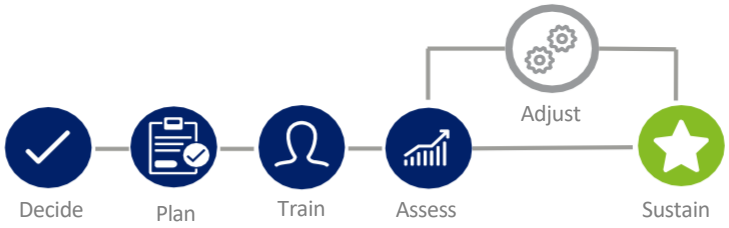
Replacing error-prone manual data entry with automated data entry practices can improve record accuracy while saving time. Providers reported that adoption of scanning practices allowed them to increase the number of vaccines administered per day.

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

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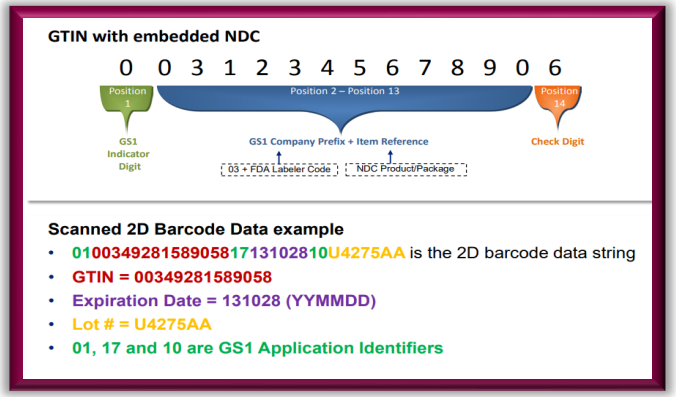
3. Learn More About Our Work

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: up to 2,335 characters instead of 48.

Vaccine Barcode Contents by Type	
Linear	**2D**
National Drug Code (NDC)	Global Trade Identification Number (GTIN) • Includes NDC Lot Number Expiration Date



A vaccine unit-of-use 2D barcode encodes standards-compliant data that can be scanned from any orientation for automated data entry.

2D barcodes are now on most vaccine vials and syringes, and scanning practices are increasingly used by providers like pediatric offices and pharmacies.

Vaccine 2D Barcode Scanning

Why should my organization adopt and use vaccine 2D barcode scanning practices?

Using vaccine 2D barcode scanning has been proven effective at improving data quality and reducing the time required per vaccination administration.

Vaccine 2D barcode scanning improves data quality and completeness, which results in less time spent on corrections/reconciliations.

Reducing the amount of time required to correct data fields or enter in data manually at administration has the potential to save providers money.

Using 2D barcode scanning can save you time with each vaccination, which can increase the number of appointments each location can process.

Implementation Guide Steps

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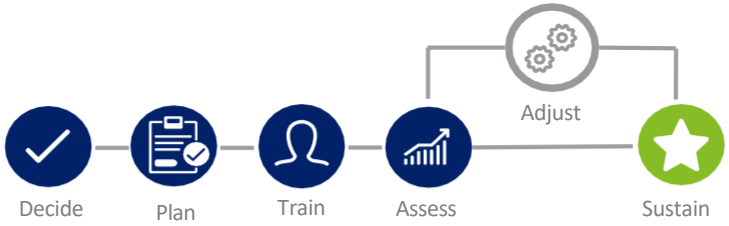


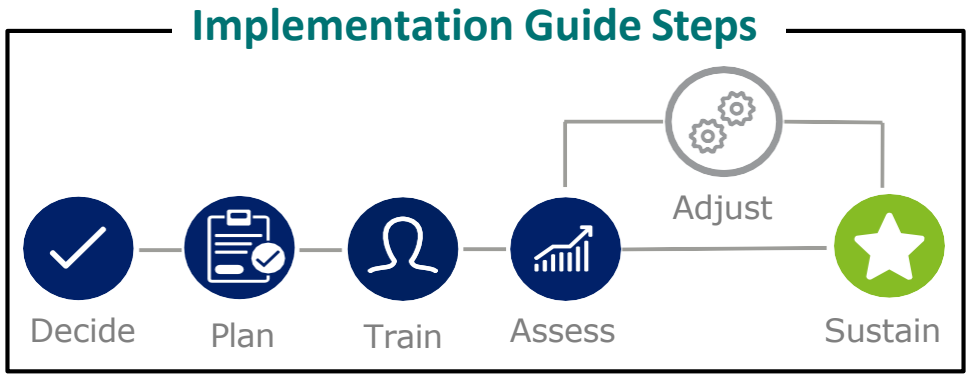
3. Learn More About Our Work

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 and case studies provide foundation for contents within each step. **(Refer to appendix and 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.

Decide

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

Assess whether vaccine barcode scanning is right for your organization. E.g., 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

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

Potential Benefits

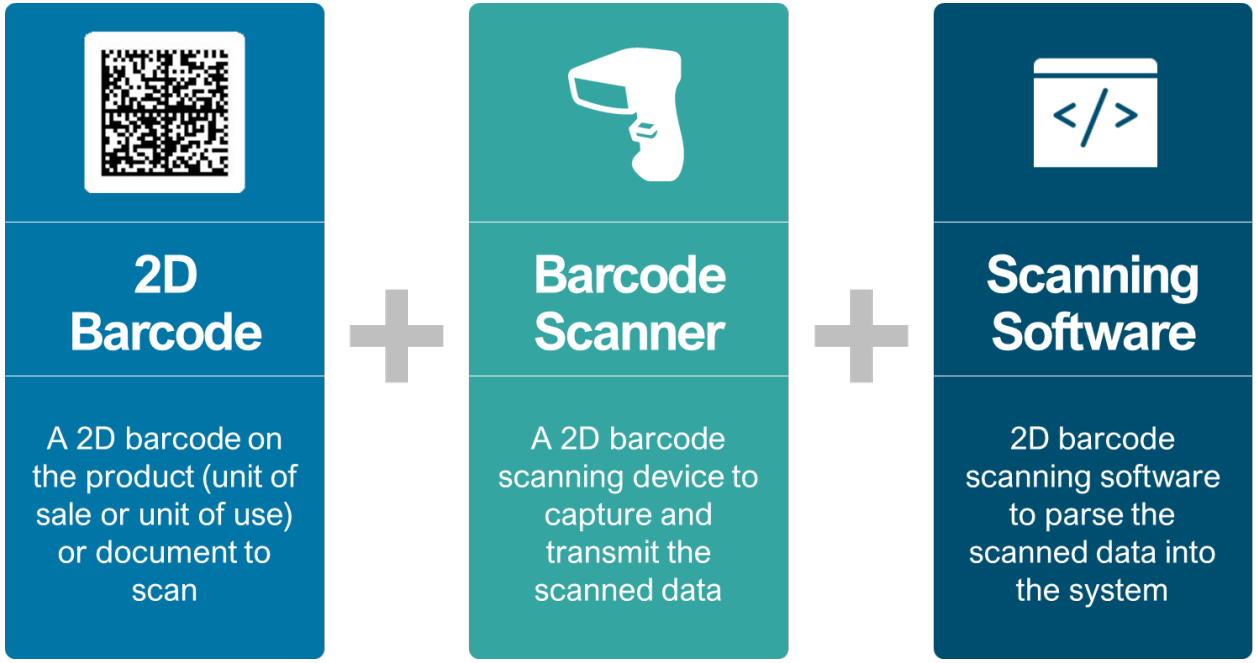
- Improved vaccine record accuracy
- Time savings
- Improved staff satisfaction and other benefits

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:

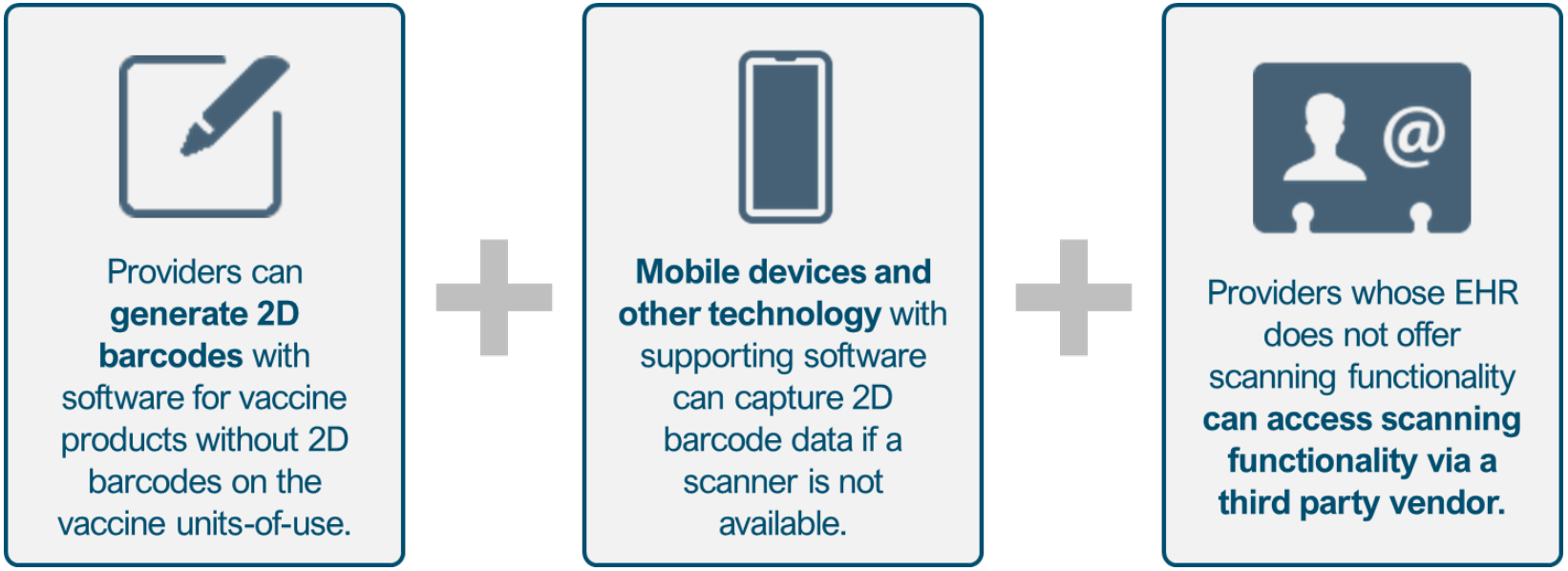


Note: Scanner Configuration and Installation

- 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 EHR system correctly. This set-up, which we refer to as configuration, ensures that data encoded in the 2D barcode populates correctly in the EHR. Configuration process may vary by scanner.
- 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/EHR interface challenges should also be considered.

Technology & Support Needs: Foundational Elements for Implementation

In cases where one or more recommended component options may not be in place, there are alternative component options to facilitate use of 2D barcode scanning practices.



Ideally, providers would implement 2D barcode scanning practices throughout their practice, so that the infrastructure is in place to support routine or emergency use vaccine administration.

Potential Benefits with Use of Vaccine 2D Barcode Scanning

Main benefits of vaccine 2D barcode scanning observed during the pilot and additional case studies included:

Improved Vaccine Record Accuracy

- Vaccine lot number, expiration date, and NDC data fields **significantly more accurate when scanned** rather than entered manually
  - In the pilot, data fields improved by 5-9%, depending on data field.
  - In a case study during COVID-19 mass vaccination clinics, implementing a 2D barcode scanning workaround for emergency use authorization vaccines decreased errors from 11% to 0.03% within one week of implementation.

Potential Benefits with Use of Vaccine 2D Barcode Scanning

Time Savings

- **During the Pilot, providers saved an average of 21 seconds per vaccine scanned** (from timed observations) **– a 75% improvement.**
- One pilot site **added 12+ vaccine appointments weekly** due to time savings.
- In case studies in COVID-19 mass vaccination clinics, time savings from automated data entry practices allowed providers to administer up to 648 **additional vaccines per clinic per day.**
- In one case study, it was reported that **correcting errors** in vaccine records took an average of 15 minutes per record.

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.**

Findings from the Sutter Health Pilot are available here.

Up Front Costs and Time Needs

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

Purchase Scanners

- Corded scanners cost ~$15–$100 each, with cordless options ~$30 to $120 (as of June 2024).
  - 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 EHR
  - 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 EHRs 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).

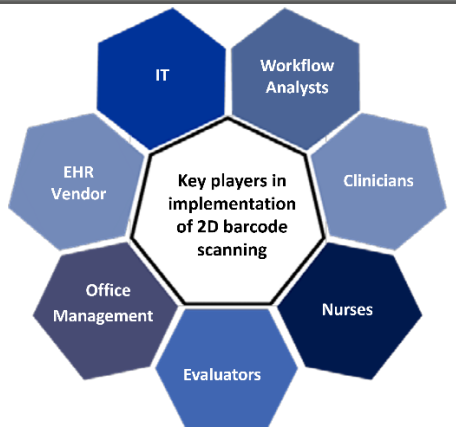
Configure Scanners

- EHR must enable 2D scanning.
- Each scanner needs to be set up to communicate with the EHR (parse/place data in right fields).
- An organization needs to be able to set up/configure scanners purchased specific to their EHR.
- 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 EHR 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



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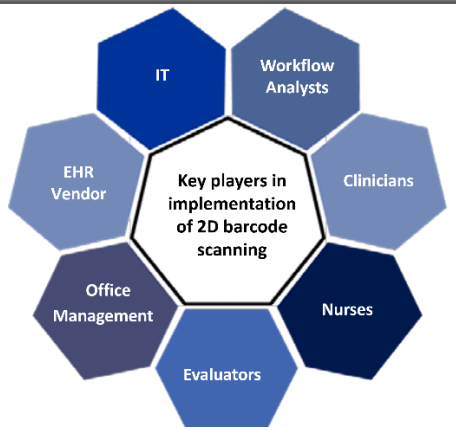


Plan

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 Health) 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*

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.

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

"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 increase 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.

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***, staff are able to dispose of syringes upon administration rather than holding for entry later.
- Some pilot participants described an alternative workflow 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 referenced 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.

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

*Pilot participants used an EHR 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 EHR.

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	• 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”	• May require new computer, if not already there • Back-up scanner suggested, during busy times or if scanner problems
Individual Desks	• Enough computers may already be in place • Familiar location for previous entry/workflow process	• May add steps (worse for some layouts), if not part of vaccine administration path • Requires as many scanners as people

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** – indicate 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.
- **Consider offering scanner stands**, which may make scanning easier on staff.

Identify Ways to Maximize Scanning Use (1 of 2)

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 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.

Identify Ways to Maximize Scanning Use (2 of 2)

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

Strategically Select Sites When Resources are Limited

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

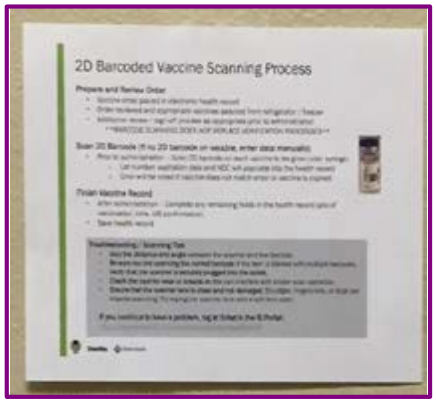
- Selection of higher-volume or specific specialty sites may provide the greatest use and benefit, given higher scanning rates and limited additional support needed by these site types in the pilot.
- Alternately, selection of sites with most room for improvement (e.g., low accuracy) can provide great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

Additional Strategies That May Further Improve Scanning (1 of 2)

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.



"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

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.

Additional Strategies That May Further Improve Scanning (2 of 2)

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

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 alternative workflows.
- 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 Plan and Timeline for Scanning Implementation

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 EHR vaccine records, online survey, on-site observations, and group discussions.
- Indicator of whether scanning took place or not (dependent on EHR) 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.

Learn More Detailed reporting on variability in scanning rates found in the barcoding pilot **Findings Report**

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 (1 of 2)

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 Training and Implementation Support (2 of 2)

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

Plan Set-up and Logistics for Training

- Create a training (or sandbox) environment in your EHR—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 satisfaction, data accuracy 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 EHR and any steps/EHR fields that still need to be completed by staff.
- Troubleshooting tips and tricks.
- Provide opportunities to practice scanner use.
- 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 (1 of 2):

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 EHR.
- Ask for questions—capture all questions to improve subsequent trainings.

Install Scanners

- Scanners already configured and tested for correct use within a given EHR 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.

Introduce Scanning (2 of 2):

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.

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 which are finding early implementation success.

Gather Information

Carry out previously developed evaluation plans, 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 alternatives 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: Alternative Workflows 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 shortcuts or alternative workflows are not taking place.

Entry of Vaccine Data in One Step

- Two versions of this alternative 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 EHR 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.

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.

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.

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.).

Organizations which consistently scan with few challenges may be ready to sustain practices: **can go to *sustain* phase next**.

Organizations with inconsistent scanning and/or challenges may need adjustments: **move to *adjust* phase next.**

Potential Assessment Criteria for Inclusion

- Scanning rates/patterns
- Challenges being experienced
- Confirmation that revised workflow protocol in use or revised/alternative workflows 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.

Nudging Strategies Increase Adherence to Scanning Practices

Benefits of barcode scanning are only realized when technology is consistently used.

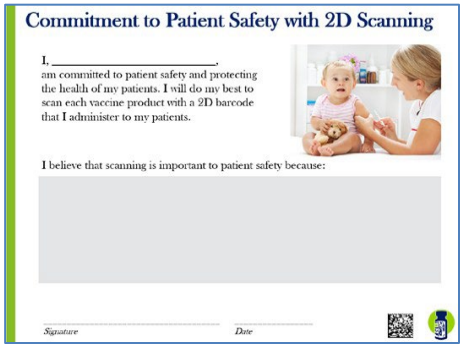
Adherence strategy groups were assembled during the pilot to assess whether changes to implementation could improve scanning rates.

Training Only	Commitment Card	Scanning Adherence Report	Combination
Training on use of 2D scanners and protocol for scanning	Written personal rationale for scanning/signed commitment to scanning	Posted report – compares individuals at center and center to other centers	Combination of all previous strategies
Training *+ No other steps*	***Training*** *+* ***Commitment Card***	***Training*** *+* ***Scanning Adherence Report***	***Training*** *+* ***Commitment Card*** *+* ***Scanning Adherence Report***

Nudging Strategies Increase Adherence to Scanning Practices

Training, commitment cards, scanning adherence reports, and combinations thereof can increase scanning practices.

Sample Commitment Card



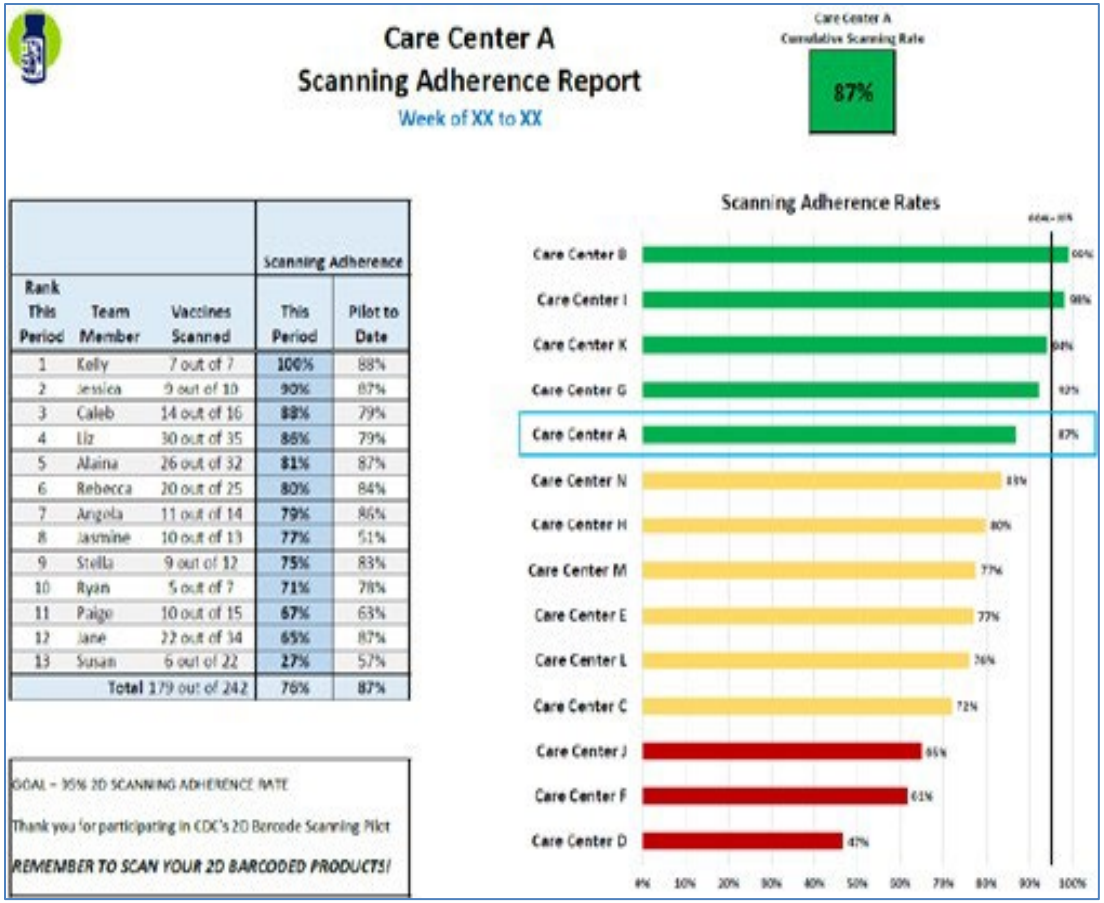
Commitment to Patient Safety with 2D Scanning

I, _____,
am committed to patient safety and protecting the health of my patients. I will do my best to scan each vaccine product with a 2D barcode that I administer to my patients.

I believe that scanning is important to patient safety because:

_____ _____
Signature Date

Sample Scanning Adherence Report



Care Center A
Scanning Adherence Report
Week of XX to XX

Care Center A
Cumulative Scanning Rate
87%

Rank This Period	Team Member	Vaccines Scanned	Scanning Adherence This Period	Scanning Adherence Pilot to Date
1	Kelly	7 out of 7	100%	88%
2	Jessica	9 out of 10	90%	87%
3	Caleb	14 out of 16	88%	79%
4	Liz	30 out of 35	86%	79%
5	Alaina	26 out of 32	81%	87%
6	Rebecca	20 out of 25	80%	84%
7	Angela	11 out of 14	79%	86%
8	Jasmine	10 out of 13	77%	51%
9	Stella	9 out of 12	75%	83%
10	Ryan	5 out of 7	71%	78%
11	Paige	10 out of 15	67%	63%
12	Jane	22 out of 34	65%	87%
13	Susan	6 out of 22	27%	57%
	Total	179 out of 242	76%	87%

GOAL = 95% 2D SCANNING ADHERENCE RATE

Thank you for participating in CDC's 2D Barcode Scanning Pilot

REMEMBER TO SCAN YOUR 2D BARCODED PRODUCTS!

Scanning Adherence Rates

Care Center B
Care Center I
Care Center K
Care Center G
Care Center A
Care Center N
Care Center H
Care Center M
Care Center E
Care Center L
Care Center C
Care Center J
Care Center F
Care Center D

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

Sustain

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

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)

Adjust

Further Adjustments Needed: Stay in *Adjust* Phase.

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.

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/iis/2d-barcodes/index.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
- Vaccine 2D Barcode Scanning Functionality Testing Resource
- 2D Barcode Scanning Functional Requirements
- AAP Guidance
- GS1 Guidance
- Training videos

Appendix

- Grand Forks, North Dakota Public Health Case Study

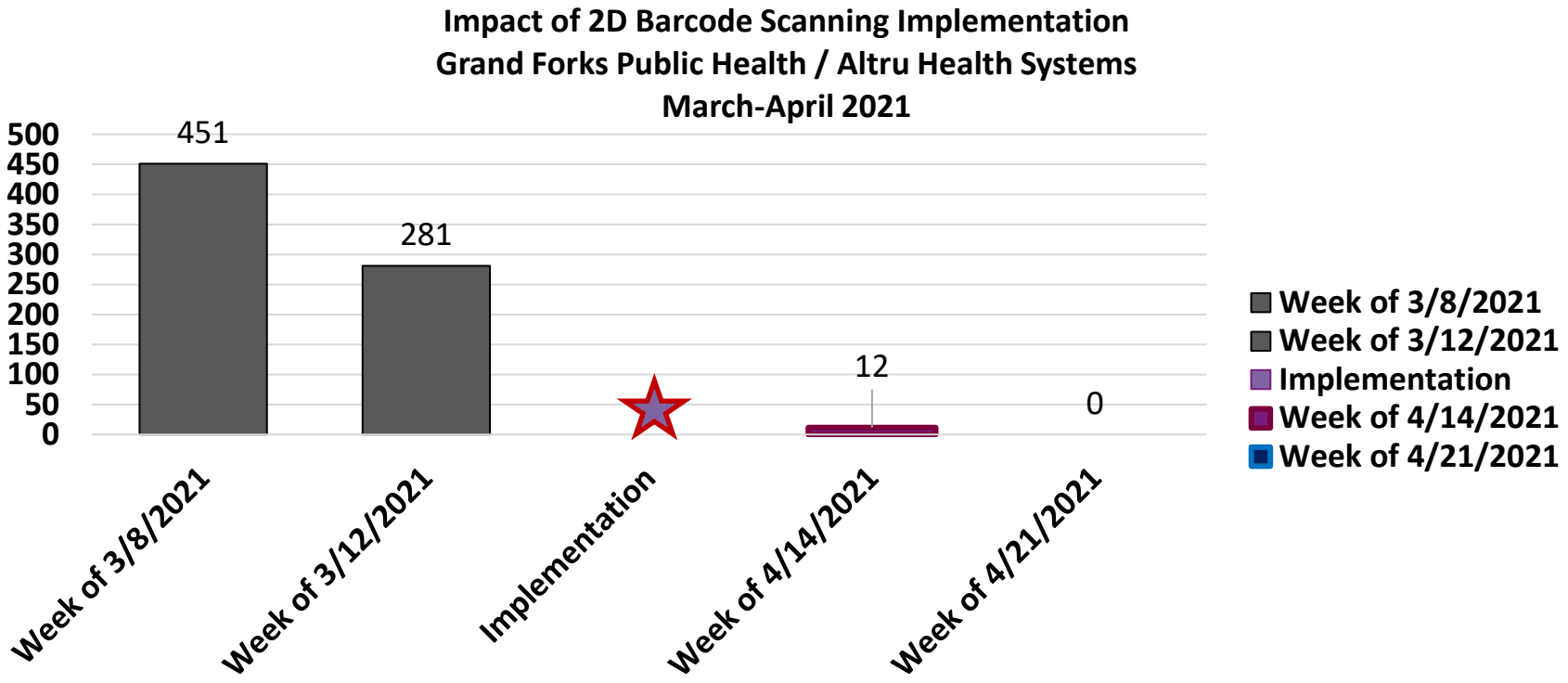
Grand Forks, North Dakota Public Health Case Study Summary

In a North Dakota case study, the Grand Forks Public Health Department partnered with a local health system, Altru Health, to use software to generate 2D barcodes when the EUA COVID-19 vaccines did not offer 2D barcodes on the units-of-use. The 2D barcode generating software encoded the same data which would have been found on vaccine units-of-use, resolving the 2D barcoding gap in EUA COVID-19 vaccines.

The generate-print-post workaround allowed 2D barcode scanning at administration, **added vaccination appointments** per clinic per day, and **resolved the health department's data quality issues**. Prior to implementation of the 2D barcode scanning workaround, the Grand Forks Public Health Department clinics were experiencing large numbers of data errors. One week had 451 erroneous data out of approximately 4,000 records.

The **cost** to correct erroneous records for a one-week period was estimated at $2,480. To manually correct each erroneous record averaged **15 minutes** of staff time.

Grand Forks, North Dakota Public Health Case Study Summary



Post-implementation, the error rate dramatically **reduced to 12 erroneous records by the first week** and **zero erroneous records by the second week**, with corresponding reductions in staff time and cost for the local health department.

Additionally, the EUA COVID-19 vaccination clinics were able to **add up to 648 vaccination appointments per clinic per day due to this 2D barcode workaround** for automated and interoperable data entry.