



TECHNICAL IMPLEMENTATION GUIDE: VACCINE INVENTORY

Vaccine 2D Barcode Scanning Implementation Toolkit

National Center for Immunization and Respiratory Diseases (NCIRD)
Centers for Disease Control and Prevention (CDC)

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Introduction

The Technical Implementation Guide: Vaccine Inventory is intended for information technology (IT), electronic medical record (EMR), and/or inventory management personnel who are assisting with the implementation of vaccine two-dimensional (2D) barcode scanning for vaccine inventory in ambulatory clinics, health care facilities, and health systems. The Guide provides recommendations on technology and training needs drawn from pilots performed by CDC from 2011 to 2017 and additional information from the field.

Now that all vaccine secondary packaging, or units of sale (UoS), have a 2D barcode affixed, inventory information may be imported into an inventory management system with a 2D barcode scanner. Two possibilities of managing inventory with 2D barcodes are listed below. Click on the letters to navigate to two sample process flows in the appendix.

- A** Documentation of new inventory upon receipt of shipment.
- B** Active management of inventory through decrementation at the lot level upon vaccine administration by crosswalking UoS and unit of use (UoU) data.

Using This Guide

This Guide is divided into the following chronological phases. The first two and the last two phases have been paired in this document because the tasks in the pairings are closely related.



Plan & Prepare



Go-Live & Maintain



For more information on...

Implementing vaccine 2D barcode scanning for administration, refer to [Technical Implementation Guide: Vaccine Administration](#).

Implementing vaccine 2D barcode scanning for data entry to or inventory management in the [Immunization Information System \(IIS\)](#), jump to [page 18](#).

Plan and Prepare

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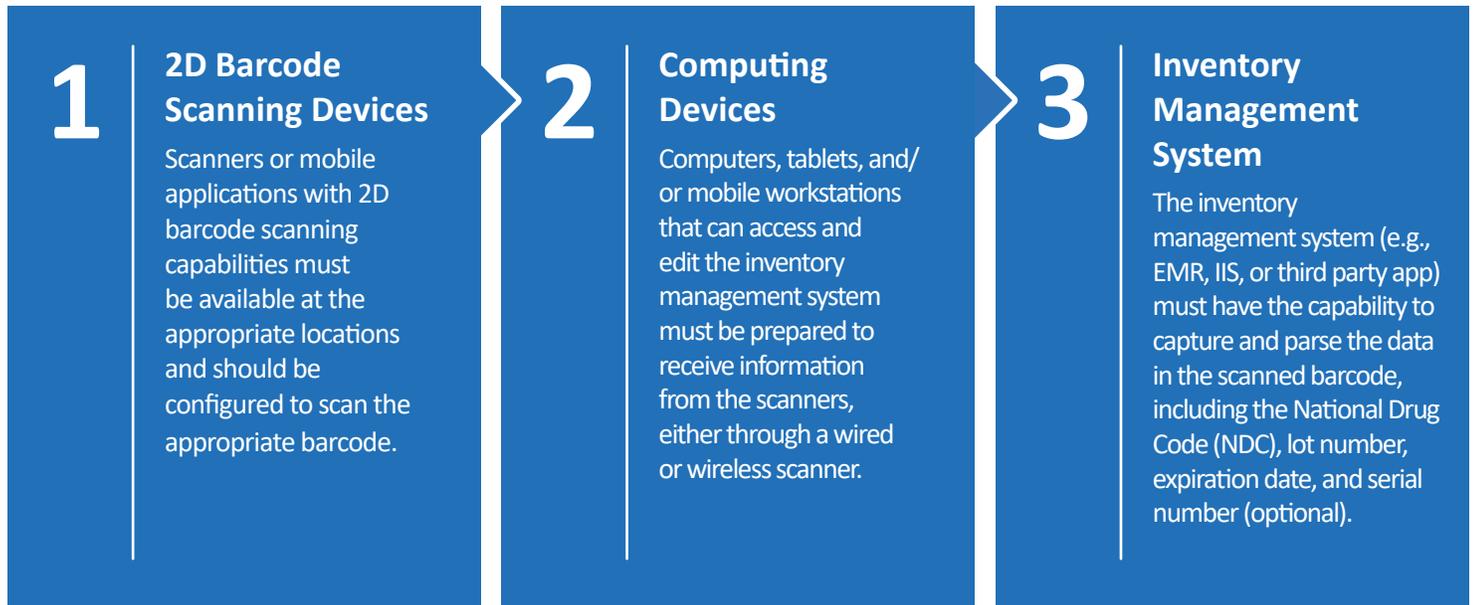
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Overview of Technology Components

Scanners cannot work independently—they must communicate with computing devices to transmit data to an inventory management system. The scanners, computers, and inventory management systems must be properly configured for smooth implementation and seamless integration of 2D barcode scanning into the vaccine inventory workflow.



Technology Considerations for Workflow Decisions

The Project Lead, IT personnel, and/or inventory management system personnel should discuss the feasibility of scanner installation in the desired location(s) identified by inventory managers and determine if additional equipment is needed to integrate 2D barcode scanning into the workflow. Hardware purchasing and installation decisions directly affect workflow, so it is important that the Project Lead and IT/inventory management system personnel collaborate during this stage.



Suitable Scanner Locations

(e.g., central prep station, point of inventory receipt)



Number of Scanners

(e.g., number of primary and backup scanners)



Types of Scanners

(e.g., wired, wireless)



Additional Equipment

(e.g., mobile workstations, computers, stands, mobile devices)

Sample process flows and suggested questions for the project lead can be found in the appendix.

Scanning Devices: Procurement

The revised inventory workflow should determine the number and type(s) of scanners needed in the clinic. There are several scanners in the market that are suitable for use in a clinic setting. Below are some considerations to review before purchasing scanners. If implementing in a health system, procurement decisions may be made centrally.

- Ensure that the chosen scanner is compatible with both your hardware (e.g., computers, workstations) and software (e.g., EMR, IIS, other inventory management system).
 - **Reminder:** 2D barcodes require camera-based scanners and cannot be read by traditional laser scanners.
- Determine the number of wired or wireless scanners needed.
 - Wired scanners cost ~\$135 to \$300 each, with wireless options from ~\$260 to \$800 (as of May 2020).
 - Wired scanners may be easily moved from one computer to another. Wireless scanners may rely on Bluetooth connections, which can make switching computers to be more time-consuming and cumbersome.
 - If installing a Bluetooth scanner, confirm that computers have Bluetooth capability and consider any additional security requirements.
 - Confirm that the wire length of wired scanners supports the previously selected scanner location(s).
- Account for stands or wall mounts, if needed. Note that the preferences of the inventory managers should be considered while determining location and set up of stands and wall mounts.
- If your clinic uses a scanner or mobile device for another purpose and wishes to use this device for vaccine 2D barcode scanning, confirm that the scanner:
 - Has 2D barcode scanning capabilities.
 - Is placed in the proper location or can be relocated to the proper location.
 - Can be configured to the EMR/IIS/inventory management system using the configuration barcode.

American Academy of Pediatrics (AAP) outlines other [considerations](#) for choosing a scanner.

Scanning Devices: Configuration

Configuration barcodes provide instructions to the scanner for how to parse the data contained in the 2D barcode. The scanner will follow those instructions until configured otherwise. For example, if the UoS configuration barcode is scanned, that scanner will be prepared to receive and parse UoS barcodes into the appropriate fields of the inventory record until a different configuration barcode is scanned. Configuration barcodes may also be rescanned to “reset” the scanner if any issues arise with configuration to the inventory management system, EMR, or IIS. Note that configuration barcodes will be different from the setup barcodes provided by the scanner manufacturer, which may also need to be rescanned if a reset is needed.

Some inventory management systems or EMRs may provide configuration assistance and some scanner manufacturers may provide information on configuration. Reach out directly to confirm available services and information.

Configuration barcodes will be unique for the type of barcode (e.g., UoU, UoS) and for your inventory management system. However, once created, the same UoU and UoS configuration barcodes can be used for all scanners within the health facility or across health system locations (if applicable) using the same inventory management system.

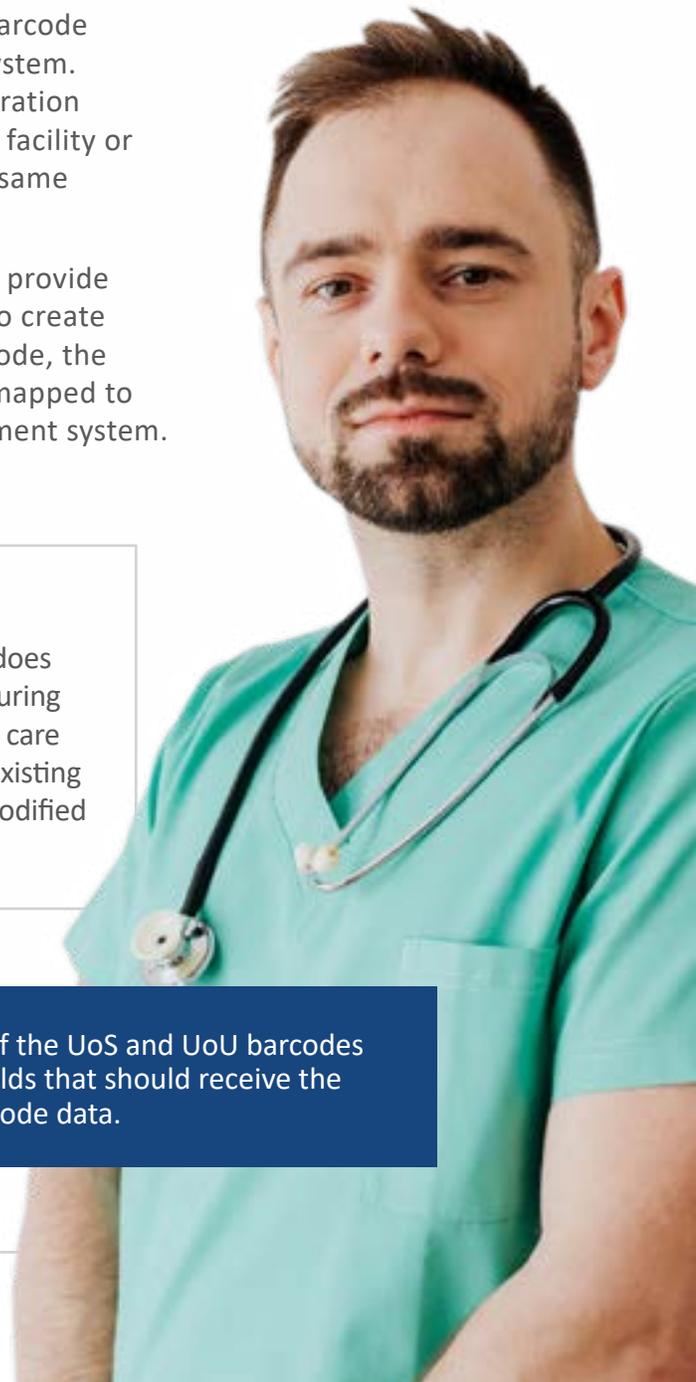
If your inventory management system or EMR does not provide configuration technical assistance (TA), you may need to create a configuration barcode. To create a configuration barcode, the characters in the barcode’s data string will need to be mapped to the corresponding data fields in the inventory management system.



Tip from the field:

If your inventory management system, EMR, or IIS does not provide configuration barcodes or TA for configuring your scanner, consider reaching out to other health care systems that use the same system to discuss their existing configuration barcodes, which may be able to be modified to fit your needs.

Refer to pages [22](#) and [24](#) for the data strings of the UoS and UoU barcodes (respectively) and a representation of the fields that should receive the scanned and imported barcode data.



Scanning Devices: Installation

After procurement, scanners must be connected to the computing device, configured to the inventory management system, and tested. To configure the scanner to the inventory management system, a configuration barcode should be obtained or created for each type of barcode (UoS for inventory, and possibly UoU for decrementation) that will be scanned. Installation, configuration, and testing instructions are listed below. Note that the order of these steps may vary at your organization or some steps may be bypassed depending on configuration services provided by your inventory management system.

INSTALL scanner

1. Use a USB cable to connect wired scanners to a computing device. Wireless scanners (or mobile devices) can be connected to a computing device through Bluetooth or other protocol in the scanner manufacturer's user manual.
2. Connect the power adaptor to a power source, if needed.
3. Power on the scanner and confirm that the scanner is functional.

SCAN configuration barcode

4. Log into the inventory management system and navigate to the relevant page and field.
5. Follow the steps in the scanning manual (provided by your scanner manufacturer) to properly set up your scanner and to ensure connectivity.
6. Scan configuration barcode to instruct the scanner how to parse the barcode data into the inventory management system fields.

TEST scanner on sample

7. Scan a sample UoS barcode found on a vaccine secondary packaging. You may wish to use a nonproduction environment in the inventory management system while scanning a sample barcode.
8. Confirm that the system properly reads the data elements in the 2D barcode on the UoS.
9. Confirm that the system accesses the appropriate mapping tables and inventory information in the back end by confirming the accuracy of the data in the populated fields.
10. Repeat steps 4 through 9 for UoU. Remember that when a configuration barcode is scanned, the inventory management system will follow that configuration until it is given alternate instructions through a different configuration barcode.



Key for success: Consider storing copies of all configuration barcodes by each scanning station. The barcodes are helpful to have available if there are issues with configuration and the scanner needs to be "reset."

For scanner troubleshooting tips, see [page 12](#).

Inventory Management System Functionality

Inventory management varies among health care organizations and facilities, and some EMRs have inventory modules available. The inventory management system or the EMR inventory module must be capable of capturing and processing the barcode data in order to leverage 2D barcode scanning for inventory.

Listed below are required and recommended inventory management system functionalities for successful 2D barcode scanning. Items are listed chronologically within each grouping.

Minimum Required Functionalities

- Monitor and establish connection with the barcode scanner.
- Receive and process incoming 2D barcode data from the UoS.
- Validate if the barcode is applicable to the inventory management system.
- Read the data elements present in the 2D barcode string.
- Display the scanned data elements and other key data in the respective fields.
- Allow users to verify scanned data and manually enter additional data that cannot be automatically imported.
- Allow users to manually edit fields after data has been imported.
- Notify users when a barcode is not identifiable.

Additional Recommended Functionalities

- Validate barcode data against the NDC, expiration date, and lot number stored in the inventory mapping table.
- Save original scanned values (if providing an option to modify them).
- Warn users that an expired or recalled vaccine has been scanned.



Third-Party Apps

If your inventory management system or EMR inventory module does not have 2D barcode scanning capability, reach out to your vendor to discuss compatible third-party applications with scanning functionality.



For more information on...

Required and recommended EMR inventory module functionalities, refer to the [EMR/ IIS 2D Barcode Functional Capabilities Guide](#).

Questions to ask your inventory management system vendor when determining compatibility and capabilities, refer to the [Inventory Management System Capability Guide](#) in the appendix.

Training

Train IT and Inventory Management System Personnel

All IT and inventory management system personnel should be properly trained to use 2D barcode scanners and equipped to support the staff that are 2D barcode scanning. A “train-the-trainers” training may be helpful for health systems implementing scanning across facilities to ensure that IT and inventory management system personnel are prepared to support personnel who may use the 2D barcode scanners.

Train Inventory Personnel

Additionally, IT and inventory management system personnel may be able to support the overarching training conducted for staff prior to implementation or go-live. The IT and inventory management system personnel should coordinate with the Project Lead to confirm the training plan and their role in delivering the technology-related aspect of training.

At a minimum, it is recommended that the training for scanner use covers the follow technology-related topics:

- Barcode data and the fields that are expected to populate upon scanning.
- Instructions for scanner use.
- Explanation of setup barcodes provided by the scanner manufacturer and how to use them.
- Explanation of configuration barcodes and how to use them.
- Scanner maintenance.
- Basic troubleshooting tips:
 - Confirm that scanner is plugged in to the appropriate outlets if needed.
 - Clean lens of scanner.
 - Rescan configuration barcode.
 - Restart scanning screen in software to restart scanning process.
- Procedures for escalating issues (help desk contact information, ticket creation, etc.).
- Instructions for scanning to IIS, if applicable.



Key for success: Hands-on experience of scanning in a training or nonproduction environment in the inventory management system can enhance training for inventory managers and other staff who may use the 2D scanners and may reduce the number of challenges and questions that arise after go-live.

For more guidance on training staff, refer to the [training materials](#).

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Technology Checklist for Go-Live

Complete the following checklist for go-live to ensure that everything is functioning properly and ready for use. You may wish to add additional items to this checklist as you prepare.

- Have all scanners and other hardware been **installed, properly set up, and tested for functionality?**
- Have all scanners been plugged in and set up in desired locations?
- Have all scanners been configured using the appropriate (manufacturer, UoU, VIS, and/or IIS) **configuration barcode?**
- Has a sample UoS or UoU barcode been scanned by each scanner to confirm proper configuration with the inventory management system?
- Have the appropriate configuration barcodes been stationed by each scanner or workstation for troubleshooting?
- If applicable, is a configuration barcode available for IIS configuration?
- Have scanning instructions and/or **troubleshooting tips** been made available by each scanning station?
- Has the **mapping table** been updated and confirmed to be accurate?
- Have monitoring and evaluation methods been put in place (if applicable)?



Key for success: Confirm system administrators and inventory management system contacts are aware of implementation plans and the go-live date, and confirm that the necessary personnel are available for immediate questions and technical assistance.

Maintenance

Maintaining functional technology is critical for implementation of 2D barcode scanning and sustaining high scanning rates. While the bulk of the work is done in the Plan & Prepare phase, maintenance and ongoing tasks will be required after 2D barcode scanning is implemented to continue supporting the practice.

Mapping Table | The mapping table will only be useful if the data is accurate. It will need to be regularly validated and maintained. To determine what data elements should be included in your mapping table, see [page 23](#).

When a vaccine is restocked:

- Confirm that the scanned data elements in the mapping table are entered.
- Validate mapping table data to confirm that no changes have been made (e.g., quantity, dose, route of administration) since the last shipment.

If a new vaccine is ordered:

- Add data to the mapping table for the new vaccine. Some known information may be able to be entered prior to receipt of the shipment (e.g., vaccine name).
- Scan the 2D barcodes and validate the data in the mapping table.

Technology | If any one of the technology components—the scanning device, computing device, or EMR—changes or malfunctions, the scanning process will break down.

- Confirm scanners are functional. They may need to be reprogrammed or replaced after significant use.
- Monitor inventory management system updates. Review the release notes for updates that might impact scanning. For example, a system update may require a new configuration barcode.
- Be prepared to adjust technology and hardware according to changes in workflow. Identifying the best workflow can be an iterative process, so anticipate changes as 2D barcode scanning is implemented.

Training | Continuous and ad hoc training can improve staff performance. It is recommended that technology-focused training be conducted as needed. Below are a few instances where continued or ad hoc training may be required:

- The scanning workflow is revised.
- A new employee is onboarded.
- There is a reduction in scanning adoption and practices.

Confirm that all parties are aware of their responsibilities, including the cadence for monitoring and maintenance.

Troubleshooting Tips

ISSUE	RESOLUTION
<p>The scanner is not working at all.</p>	<ul style="list-style-type: none"> • Verify that the scanner is properly connected to the computing device. <ul style="list-style-type: none"> ♦ Confirm wired scanners are firmly plugged into the computer. ♦ Confirm that the wireless scanner's Bluetooth is not disconnected from the computing device. If the scanner has a battery, confirm that the battery is sufficiently charged.
<p>The scanner does not scan consistently.</p>	<ul style="list-style-type: none"> • Verify that a red beam of light is visible when a vial is placed underneath the lens (in mounted mode). If a red beam is not visible, verify that the scanner is securely attached to the computer. • Confirm that the scanner lens is clean. If you are not sure, clean the scanner lens with an alcohol prep pad or a moist clean cloth and then dry with a clean cloth. Water droplets severely degrade scanning efficiency. • Check the scanner lens to see if it is scratched. If so, it will need to be serviced/replaced. Please call or email the scanner manufacturer or call the number on the base of your scanner. • Try to scan the barcode with another scanner. If successful, then the problem is with the first scanner and it should be serviced. Try resetting the scanner to factory settings, scanning the setup barcodes from the manufacturer, and rescanning the configuration barcode.
<p>Sometimes, the scanner has trouble reading barcodes.</p>	<ul style="list-style-type: none"> • Vaccine manufacturers have tried to address readability of vaccine barcodes in terms of barcode label quality. However, if you still have trouble reading certain barcodes please report to CDC at iissb2dbarcode@cdc.gov, after escalating appropriately within your organization. CDC regularly works with vaccine manufacturers to ensure all packaging meets regulatory requirements and usability standards. • If you need to reconfigure your scanner to a different system (EMR, inventory management system, and/or IIS) and have trouble reading the scanner configuration barcodes provided to you, repeated copying might have degraded the barcode quality. Try printing a fresh copy from the electronic copy to reinstate optimal quality of the barcodes.
<p>The wrong fields are being populated with the barcode data.</p>	<ul style="list-style-type: none"> • Confirm the scanner is properly configured by rescanning the scanner manufacturer's standard setup barcode and your organization's configuration barcode. • Confirm the configuration barcode is correct (e.g., confirm the UoU configuration barcode is scanned prior to scanning the UoU barcode on the vaccine). • Encourage quality assurance checks and allow for manual entry to adjust if data parsing is problematic, due to situations such as the lot number beginning with the same number as the GS1 application identifier.
<p>The mapping table is not populating the expected fields.</p>	<ul style="list-style-type: none"> • Confirm that the data in the mapping table are up to date. CDC's NDC Crosswalk tables may be useful resources when updating mapping tables, though they are not comprehensive and additional data sources may be needed.

FAQs

QUESTION	ANSWER
Will the scanner be damaged if it gets wet?	The sealed casing of your scanner protects it from minimal amounts of moisture. However, it should not be sprayed or immersed in liquid.
What are the software requirements and how does the system actually work?	No additional software is required, nor is there a “system” that is being added to yours. The scanner works in place of a keyboard. The user needs only to put the cursor on the field before scanning. The scanner is configured to read the 2D barcode from the vial or packaging and populate the lot # and expiration date fields into an EMR, IIS, or inventory management system.
Will the scanner be configured for my EMR, IIS, and inventory management system?	Yes, as long as the EMR, IIS, and inventory management system have the data fields to capture lot number and expiration date, the scanner should work with both systems. In some EMR, IIS, and inventory management systems, the lot number field is a dropdown menu and the lot number is appended by other fields. For example, a lot number, such as 12345Y, may display with other fields: 12345Y MCK 12302022. In such cases, scanning the 2D barcodes will not populate the right data fields and cannot be used.
Will the scanner be damaged if dropped on the floor?	The scanners are expected to survive a free fall of six feet onto a hard concrete floor. However, we encourage you to position it away from workplace settings that could damage its internal parts.
Can I detach the scanner any time or do I need to do something special first, such as a safe stop?	While it is advisable to “safe eject” attached devices, the scanners have not been shown to be adversely impacted if unplugged without doing so. However, please close out the EMR/IIS software menu if it is actively accessing the scanner to prevent potential data loss or interruption of workflow.

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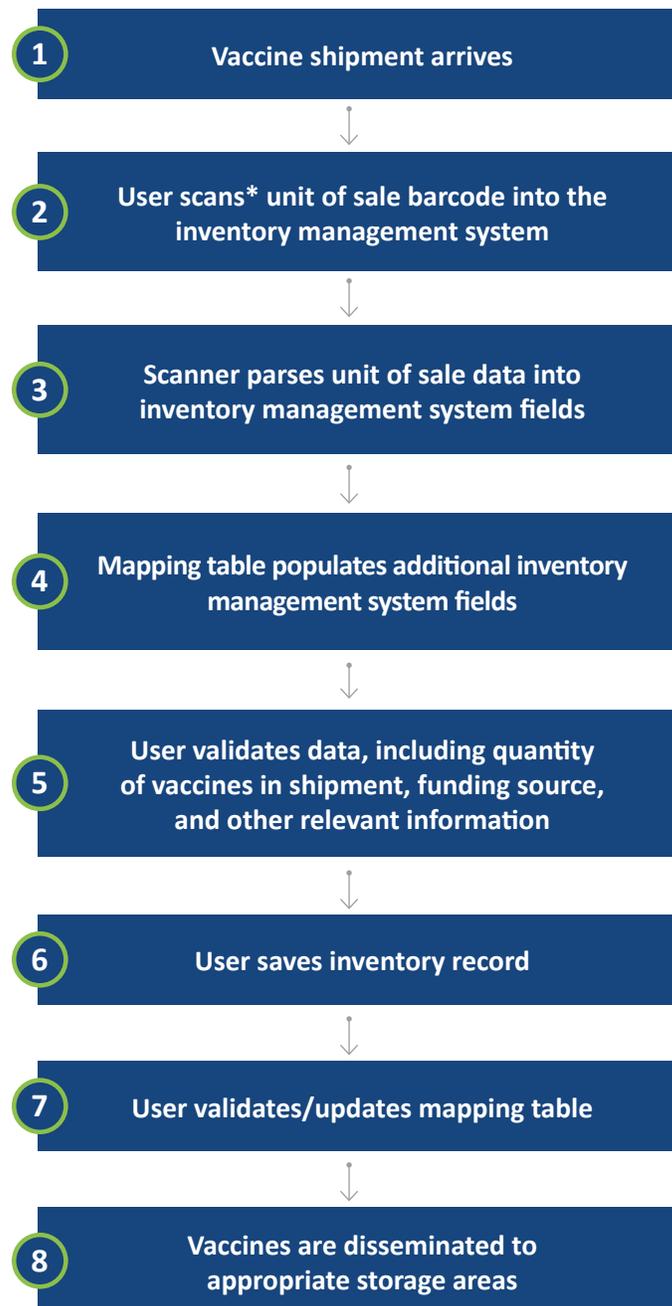
Acronyms

Acronym	Description
2D	Two-dimensional
AAP	American Academy of Pediatrics
EMR	Electronic medical record
ExIS	External Information System
GTIN	Global Trade Identification Number
IIS	Immunization Information System
IT	Information technology
NDC	National Drug Code
TA	Technical assistance
UoS	Unit of sale
UoU	Unit of use
VIS	Vaccine Information Statement
VTrckS	Vaccine Tracking System

A

Process Flow A: Inventory Receiving Documentation

Outlined below is the first of two sample process flows. In this scenario, 2D barcode scanning has been implemented to assist with accurate documentation of new inventory routinely received. This sample process flow assumes that the inventory management system accepts scanned data and stores information about received vaccine shipments. After vaccines are disseminated and administered, your clinic may choose the process for inventory decrementation (e.g., manual decrementation by the user or automated decrementation by the EMR). Process Flow A is a sample and may be adapted to fit your organization's needs if helpful for implementation.



*Unit of sale (UoS) data can also be imported or uploaded through alternative methods if scanning is not possible.

B

Process Flow B: Active Inventory Tracking

Outlined below is the second of two sample process flows. In this scenario, 2D barcode scanning has been implemented to assist with documenting new inventory and tracking based on lot number. This scenario assumes that the inventory management system is linked to the EMR or an administration module and decrements inventory count based on lot number by mapping UoU and UoS. See [pages 23 and 24](#) for more information. Process Flow B is a sample and may be adapted to fit your organization's needs if helpful for implementation.



*Unit of sale (UoS) and unit of use (UoU) data can also be imported or uploaded through alternative methods if scanning is not possible.

Immunization Information System

In addition to scanning for vaccine administration and inventory management, a third use case for scanning is for data entry to the [Immunization Information System \(IIS\)](#).

There are two scenarios in which 2D barcode scanning into the IIS may be of use:

1. If the EMR does not submit data directly to the IIS, and direct data entry to the IIS is required, or
2. If your site uses IIS to track, maintain and report on vaccine inventory information.

The IIS may be used for vaccine inventory management (i.e., ordering), reconciliation, and reporting by providers that receive publicly funded vaccines, such as Vaccines For Children (VFC) vaccines. When a vaccine shipment arrives, scanning the 2D barcode on a UoS can help ensure that accurate data is entered into the IIS. Other platforms that generate vaccine inventory data and order data from the IIS (e.g., [Vaccine Tracking System \(VTrckS\)](#) and [External Information System \(ExIS\)](#)) can benefit from the data accuracy of the IIS.

- If the IIS platform already accommodates 2D barcode scanning, reference the configuration instructions on [page 5](#) to create a unique configuration barcode. Though the same information will be imported, the IIS is a different interface than the EMR and will likely require a unique configuration barcode.
- If the IIS platform does not accommodate 2D barcode scanning, it may be helpful to discuss [system capabilities](#) with your IIS vendor, as the requirements for integrating 2D barcode scanning into the EMR are the same for the IIS.

Note: Integration with the IIS may be managed from the health system level. If the clinic is part of a health system, confirm how IIS is managed prior to following the steps listed above.

A sample process flow for scanning into the IIS can be found on [page 19](#).

Sample Process Flow for IIS

Outlined below is a sample process for 2D barcode scanning in a facility that has implemented scanning for inventory in the IIS. This process flow is a sample and may be adapted to fit your organization's needs if helpful for implementation.



*Unit of sale (UoS) and unit of use (UoU) data can also be imported or uploaded through alternative methods if scanning is not possible.

Questions for Project Lead

Hardware purchasing and installation decisions have direct implications on workflow. The Project Lead, IT personnel, and inventory manager should work together during this planning stage to ensure that the technology fits the workflow needs and vice versa. Below are questions to discuss with the Project Lead and inventory manager to understand hardware and technology needs.

- Where will scanners need to be installed?
- How many scanners are needed at each location?
- Are computers already set up near the desired scanner locations?
 - Can any computers be relocated?
 - How many additional computers may be needed?
 - Are mobile workstations or devices an option?
- Are wired or wireless scanners preferred in each location?
 - If a wire is needed, how long should the wire be?
 - If wireless, do any security issues need to be addressed?
- Is there enough space to install the scanner, or is rearranging needed?
 - Is a wall mount or stand needed?
- Will any scanners be used with mobile stations?
- Will the scanners be used with one or more processes (e.g., administration, inventory, IIS, VIS)?

After discussing with the Project Lead, refer to [page 4](#) for considerations to keep in mind while purchasing scanners and other equipment.

Inventory Management System Capability Guide

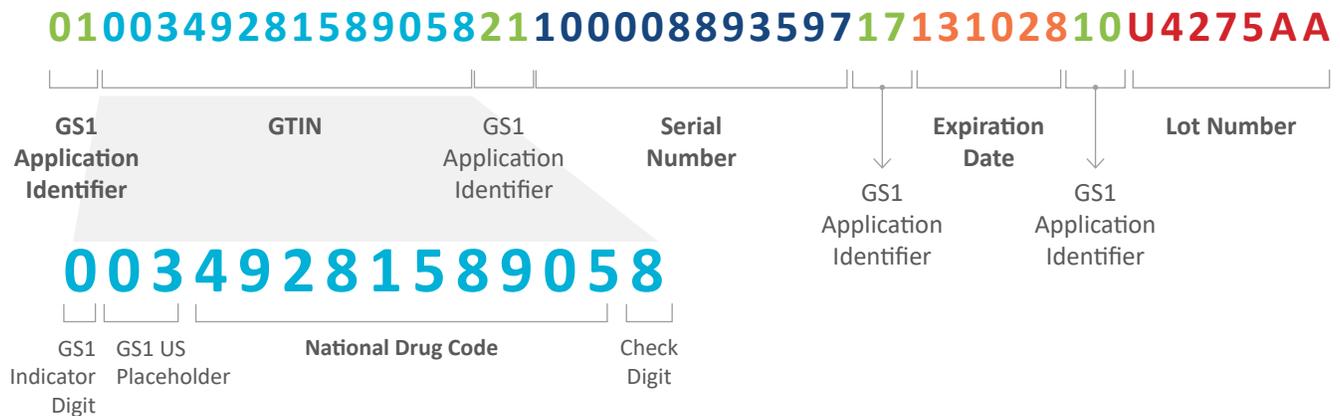
2D barcode scanning can play a role in recording vaccine inventory. Each use case requires unique functionalities from your inventory management system, IIS, or EMR. Below are some sample questions you can ask your vendor to help determine your 2D barcode scanning capability.

Task	Questions for Vendor
<p>Inventory management system or IIS</p>	<ul style="list-style-type: none"> • Can the EMR/vaccine administration record be connected to the inventory management system or IIS? <ul style="list-style-type: none"> ♦ If yes, can the inventory management system/IIS automatically receive administration records? ♦ If yes, is the inventory count automatically decremented when administration of a vaccine is recorded? • Can the inventory management system alert health care providers if vaccine inventory is low? • Can the inventory management system alert health care providers if the vaccine ordered by the physician is not available in inventory?
<p>EMR inventory module</p>	<ul style="list-style-type: none"> • Is there a module available for vaccine inventory management? • Can the administration module be connected to the inventory module? <ul style="list-style-type: none"> ♦ If yes, is the inventory count automatically decremented when administration of a vaccine is recorded? • Can the inventory management system alert health care providers if vaccine inventory is low? • Can the inventory management system alert health care providers if the vaccine ordered by the physician is not available in the inventory?

For additional list of questions, please visit the [AAP website](#).

UoS Barcode Specifications

A configuration barcode will be needed to parse the UoS data into the inventory management system. The data string pictured below is a sample UoS barcode, which can be referenced when [creating a configuration barcode](#). The NDC, serial number, expiration date, and lot number can be parsed to populate their respective fields in the inventory management system after proper scanner configuration.



The sample inventory record below includes several fields that may be found in inventory management modules or systems. Based on your inventory management system's data fields, the lot number, serial number, and expiration date fields may be populated when the UoS 2D barcode is scanned. Note that the displayed fields will be dependent on your inventory management system, so some data will be captured and processed only in the back end.

Inventory Record

Product <input style="width: 90%;" type="text"/>	Serial Number <input style="width: 90%;" type="text"/>
NDC <input style="width: 90%;" type="text"/>	Exp. Date <input style="width: 90%;" type="text"/>
Manufacturer <input style="width: 90%;" type="text"/>	Quantity <input style="width: 90%;" type="text"/>
Lot Number <input style="width: 90%;" type="text"/>	

Mapping Table for Vaccine Inventory

A mapping table with stored vaccine data enables the population of additional fields in the inventory record when a 2D barcode is scanned. Even though the UoS barcode contains only four data fields, additional fields in the inventory record, such as the product name and manufacturer, may be populated upon scanning. The sample inventory record below portrays sample data fields that may be able to be populated by the mapping table.

Inventory Record

Product <input style="width: 90%;" type="text"/>	Serial Number <input style="width: 90%;" type="text"/>
NDC <input style="width: 90%;" type="text"/>	Exp. Date <input style="width: 90%;" type="text"/>
Manufacturer <input style="width: 90%;" type="text"/>	Quantity <input style="width: 90%;" type="text"/>
Lot Number <input style="width: 90%;" type="text"/>	

If a similar mapping table is not already in use in your EMR, a one-time setup may be needed. Once the mapping table is set up, it is important that the data are accurate and up to date. Data should also be validated upon receipt of a shipment as well; for example, if vaccine vials are damaged during shipment, the quantity of vaccines in the inventory record should be validated to accurately reflect the number of usable vaccines received.

If the inventory management system is linked to the EMR, the mapping table may be able to support automatic decrementation of inventory based on administration. If the mapping table crosswalks the UoS and UoU data, decrementation based on lot number may be possible. See [page 24](#) for more details.

Basic recommended data elements are listed to the right, but additional data elements may be helpful and applicable to your clinic's needs. CDC's [NDC Crosswalk Tables](#) may be a useful source for populating the table, though it is not comprehensive and additional data sources may be needed.

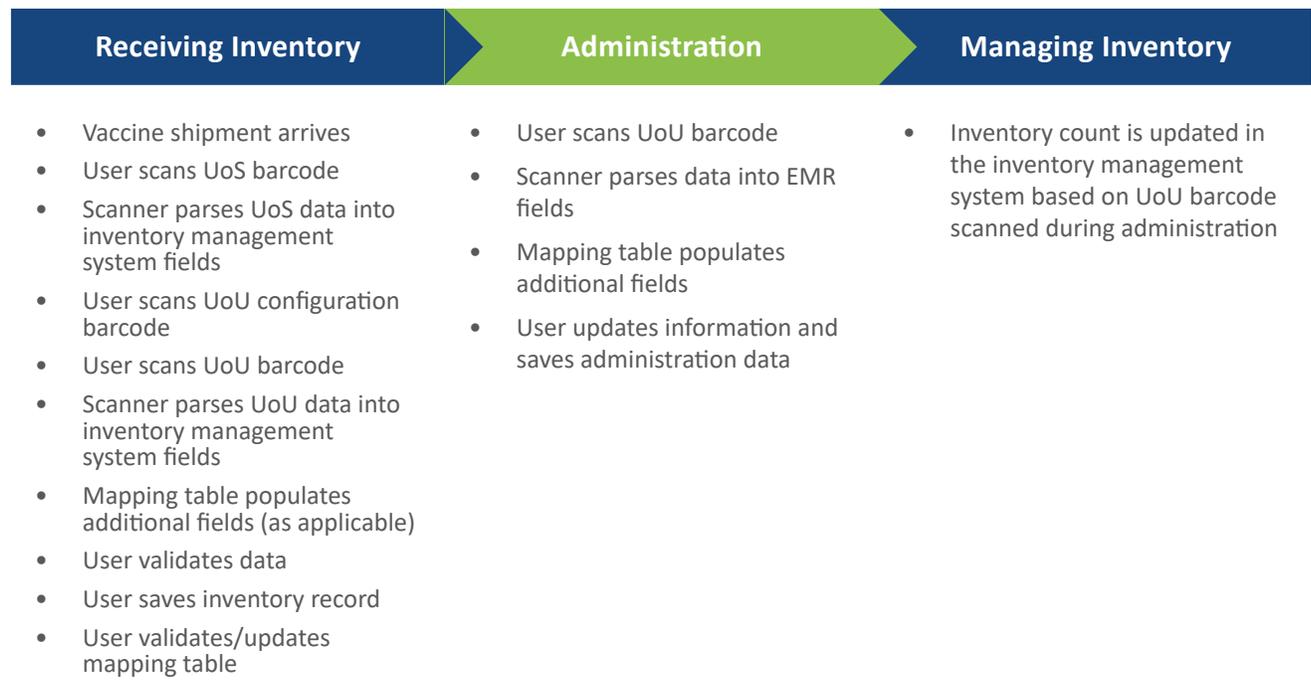
Recommended Data Elements for Mapping Table	
UoS NDC*	Product name
UoS GTIN*	Manufacturer
UoS lot number*	Quantity of vaccines
UoS serial number*	Cost
UoU NDC	Expiration date*
UoU GTIN	CVX code
UoU lot number	Funding source

**Indicates which elements are found in UoS barcodes. If the scanned data elements match the data found in the mapping table, the corresponding data elements may populate the inventory record fields.*

Inventory Management with UoU and UoS

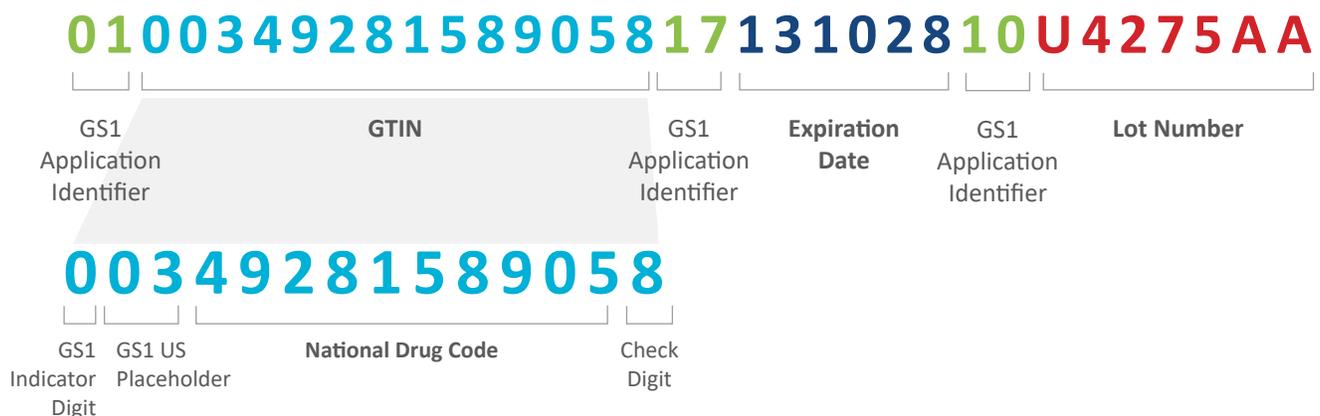
To maximize the use of 2D barcode scanning for vaccine administration and inventory management, the inventory management system must have a back end [mapping table](#) that can crosswalk the UoS and UoU data. The mapping table is critical because the product identifiers in the UoS barcode may not match the product identifiers in the UoU barcode. For example, the UoS barcode on a shipment may not have the same NDC and lot number as the units of use within the shipment.

The process flow below depicts the process for how inventory is updated upon vaccine administration using the mapping table to map the UoS and UoU.



UoU Barcode Specifications

The data string pictured below is sample data for a UoU barcode. This diagram should be referenced when [creating a configuration barcode](#).



Resources

[Immunization Information Technology: A Guide for Pediatricians on Immunization Information Systems and Two-Dimensional Barcoding](#), AAP

[Functional Capabilities Report](#), CDC

[NDC Lookup Crosswalk](#), CDC

Below are other resources available in the Implementation Toolkit, listed roughly in the order that they may be referenced during implementation.

Resource	Description	Intended User
One-pager: Vaccine 2D Barcode Scanning	Informational one-pager with overview of vaccine 2D barcode scanning and benefits to implementation	Health care leadership, site-level administrator, personnel unfamiliar with or new to 2D scanning
Guide for Project Lead	Guide for all aspects of planning the implementation of vaccine 2D barcode scanning	Health care leadership, site-level administrator
Technical Implementation Guide: Vaccine Administration	Guide for technology and hardware needs for implementing 2D barcode scanning for vaccine administration	IT/EMR Personnel
Workflow Determination Tool	Workflow process maps for identifying where and how to add scanning into the vaccine administration workflow	Health care leadership, site-level administrator, inventory manager
One-pager: Vaccine 2D Barcoding for Mass Vaccinations	Informational one-pager on the benefits of vaccine 2D barcode scanning in a mass vaccination scenario	Health care leadership, site-level administrator, inventory manager

For more information, contact CDC
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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

