HIMSS

Implementation of Real-time COVID-19 Vaccines Tracking

with Integrated Medication Management Technology

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Executive Summary

Texas Children's Hospital (TCH) provides immunizations to employees and patients throughout the enterprise in the Houston and Austin greater metropolitan areas of Texas. The SARS-COV-2 pandemic initiated rapid mobilization of vaccine research, production and implementation. Vaccine ultra-cold storage and distribution added layers of complexity for tracking and administration. The TCH pharmacy informatics team was tasked with the development of tools to track vaccine procurement, distribution and administration of vaccines.

The project was designed to leverage existing medication management technology to capture data in each step of the medication use process for COVID-19 vaccines. Data from multiple sources were integrated to provide real-time insight into inventory and patient vaccination statuses to drive decision-making by leadership. TCH COVID vaccine applications and workflows provided 98% vaccine utilization, placing TCH in the top 5% of vaccine providers in the United States. Furthermore, TCH had a 92% primary series completion rate, showcasing effective follow up workflows within the vaccine administration process.

Clinical Problem and Pre-implementation

In the fall of 2020, TCH was asked to be a provider of vaccinations locally, starting with healthcare workers. The regulations of receiving, storage, preparation and administration were quite specific. The vaccine at the time was a very precious commodity.

The goal was to maximize use and reduce wastage, while providing the highest quality of service. TCH looked at all possible options to solve this complex problem and leaned on what has been successful in previous advances to solve clinical problems— data and technology. The goal was zero waste and 100% documentation. The goal was a lofty standard, but the team knew that TCH needed to do its part to ensure that patients get the right dose at the right time. The pillars of medication management were applied at every minute level. Each step was designated to provide a clinical outcome that was attainable and measurable. The timeline was designated to coincide with the first day the vaccine was administered to the day one year of vaccinations was completed, December 2020 to December 2021. The data collected provided us with an overarching view of inventory, quantity used, quantity wasted and inventory at hand.

The challenge of ordering vaccines when there were multiple options as well as assurances that a second dose was readily available was a major hurdle. After three months, TCH attained 100% documentation and only 0.01% wastage. Coverage expanded across the enterprise. At six months and nine months, 100% documentation remained with 0.3% waste. The data on inventory was used to schedule appointments and to order more vaccine as needed. The Texas Department of State Health Services tracked usage through Immtrac and TCH continued to be successful, avoiding gaps in documentation.

Governance and Development

At TCH, providing any vaccines involves a stringent process, which includes various departments including but not limited to clinical leadership, executives, and IT leadership. Working together, a safe efficient process is established while putting the patient as the central focus. The COVID task force includes the following and provided below is a process flow for the multidisciplinary committees.

COVID Task Force

a. Human Resources
b. Clinical Leadership
c. Pharmacy Informatics
d. Pharmacy Operations
e. Information Services

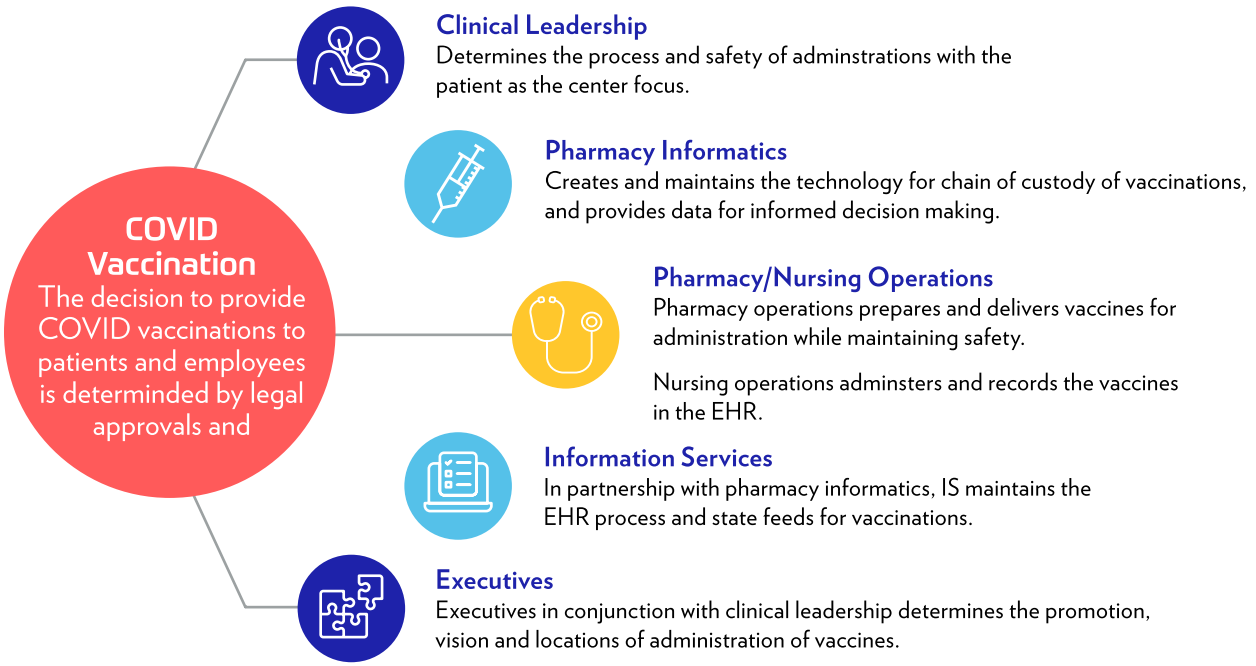
TCH utilized technology tools including the Epic electronic health record (EHR), Codonics Safe Label Systems (Codonics SLS), Microsoft PowerApps and Qlik Sense to establish a process for vaccine chain of custody and support accountability.

The team sought to design a system able to maintain chain of custody from vaccine procurement to dose administration, while also tracking vials-on-hand (VOH) at each of multiple sites. TCH collaborated with Codonics SLS to develop a variation on their drug labelling system that could be used to label prepared doses with lot and expiration in barcoded batches. Codonics was chosen because the system already had the ability to generate barcodes and track lot numbers. In addition, the flexibility of the platform would allow rapid updates and additions as additional vaccines, vial sizes, formulations and dosages were approved.

A PowerApp (CovidVacTrac) was developed with the Microsoft Power Platform, using Microsoft SharePoint as the back-end database. Power Platform and SharePoint were chosen for development for their open-ended design, ability of all users to access the applications, and relative simplicity in interfacing with other systems.

A COVID Vaccine Tracker dashboard was created using the Qlik Sense data visualization platform to integrate and digest the various data sources in an automated fashion. In this way, the most up-to-date and accurate data could be available to COVID Task Force leadership without the burden of manual data

Figure 1. Process flow



Workflow and Processes

Each individual dose is barcoded as being part of a batch; batch containers are also barcoded. Codonics-labelled batches of prepared vaccine are logged by barcode scanning with CovidVacTrac when leaving the pharmacy prep site and again when delivering to the nursing administration site. Any unused doses are again scanned when returning to the pharmacy for disposal. Administered doses are entered into the Epic EHR, with its lot manager functionality enabled to ensure accurate lot tracking for state reporting requirements.

CovidVacTrac has additional functionality for tracking vial movement across the institution. Any receipt, transfer or waste of whole vials is logged with in the app. All newly procured vaccine is immediately scanned into inventory, and a check-out/check-in process in the app is used when moving inventory across sites. A single data source maintains consistency of location and vaccine formulation verbiage for the user across distinct functions of the app. All sites perform regular counts of vial inventory, which are entered into a simple web-based form.

Figure 2. Inventory tracking steps

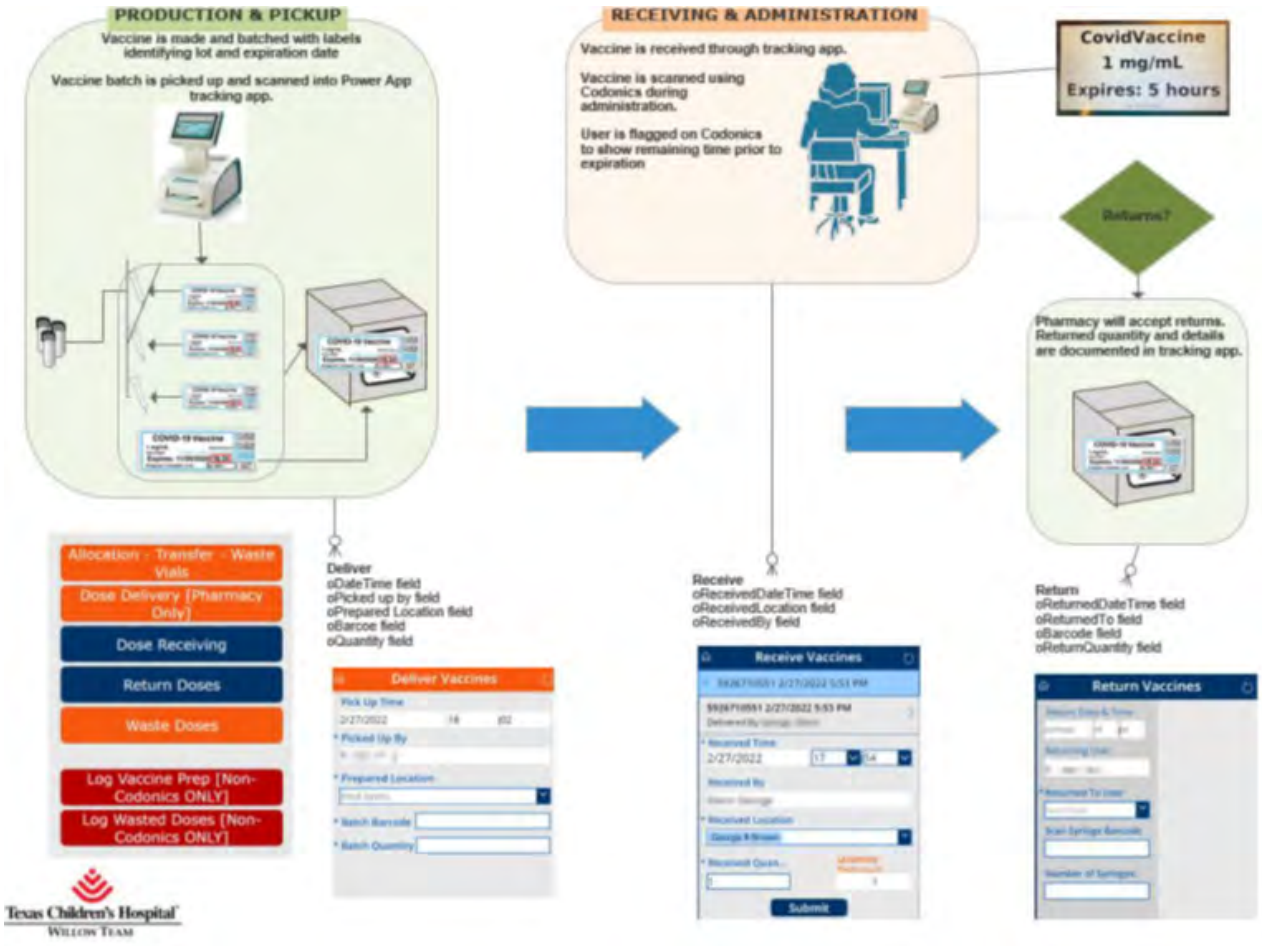
STEP 1 **Allocation/Transfer**
COVID vaccinations received from manufacturers and/or transferred from a different approved location.

STEP 2 **Preparation**
Vials are prepared for patient dosing from different manufactured vials.

STEP 3 **Administration**
Patient doses are provided at the administration area for nurses to administer.

STEP 4 **Return/Waste**
Any patient doses that need to be returned and are not expired can be sent back. In addition, any doses that need to be wasted due to various reasons can be wasted.

Figure 3. An overview of the CovidVacTrac

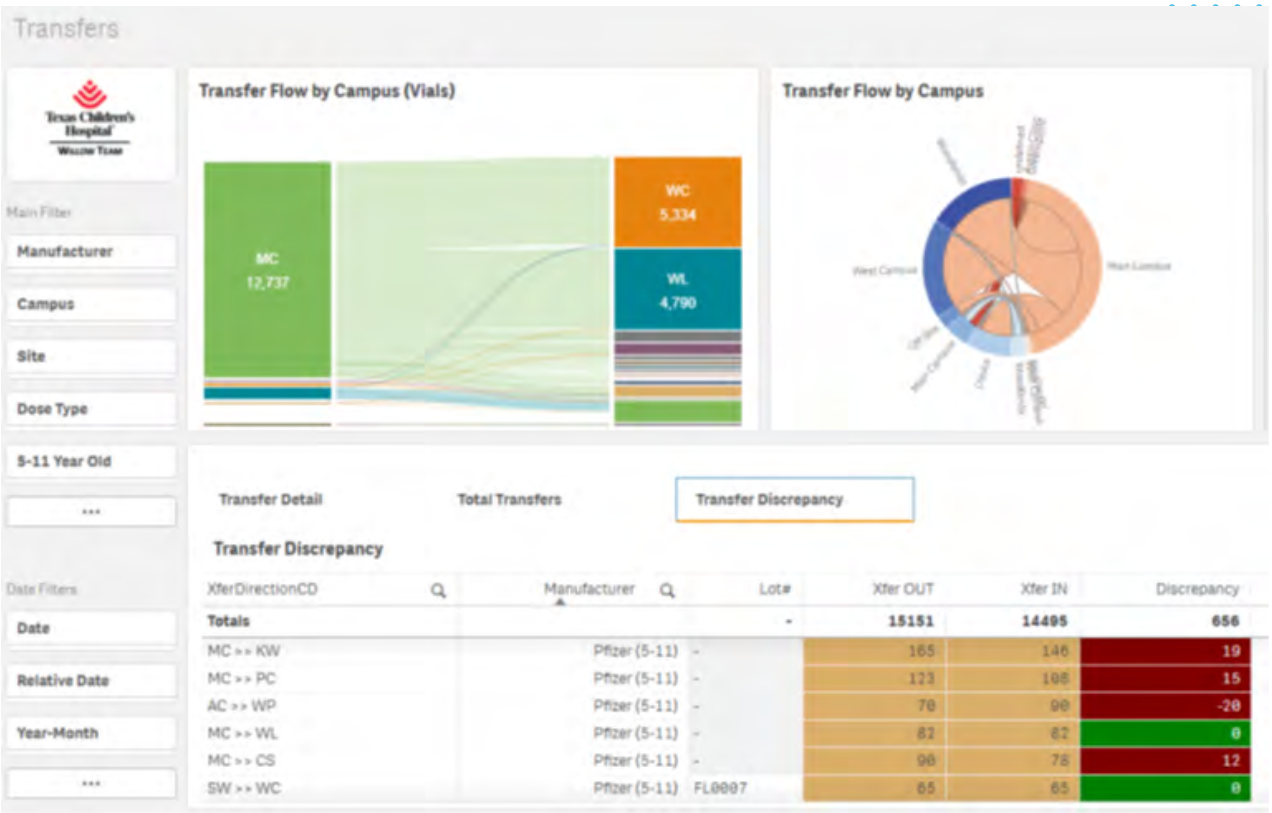


The interface for CovidVacTrac was designed to be intuitive for the end-user and to capture information automatically (such as username and date) to limit the time users need to spend on input. Therefore, education materials could effectively be limited to simple PDF guides. These were made available online and could be easily accessed by scanning QR codes distributed to all sites utilizing them

A progressively expanding set of administration sites and vaccine formulations could be rapidly updated by utilizing the ability to interface PowerApps with data sources maintained by the team in collaboration with IS and COVID Task Force leadership.

Figure 4. Links to the CovidVacTrac app and accompanying documentation

Figure 5. A discrepancy tracking view



Clinical Decision Support

Efficient allocation of hospital resources already limited by the pandemic requires accurate data on how much vaccine inventory is on hand as well as accurate forecasting of how much can be used and how much must be held in reserve.

Procurement, preparation, administration and waste data were aggregated to track and predict the vials on-hand at each site in near-real time. Combined with frequent inventory counts, this allowed us to identify inventory discrepancies as soon as they occur and update workflows and education proactively.

TCH-administered doses, patient reported doses and administration history from data-sharing partners was used to categorize and identify dose types and frequencies. In this manner, patients who were, for example, missing doses or booster-eligible could be identified for outreach. This also allows us to identify and correct data errors as they occur, as well as take proactive steps to prevent similar future errors.

Automatically combining dose history, appointment data and vaccine inventory allowed us to forecast what portion of current inventory must be held in reserve and what volume of additional appointments can be opened at any given time.

The eventual availability of zip-code-level vaccination rate data allowed leadership to make informed decisions about what locations would be best for new administration sites and mobile vaccine clinics.

Figure 6. A vials-on-hand tracking view

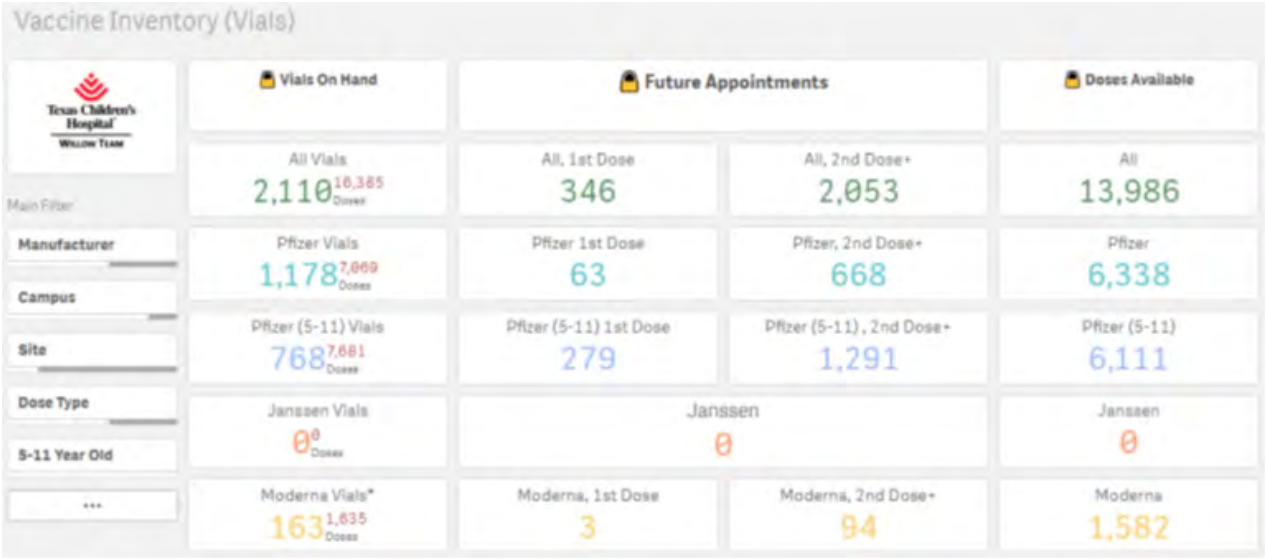
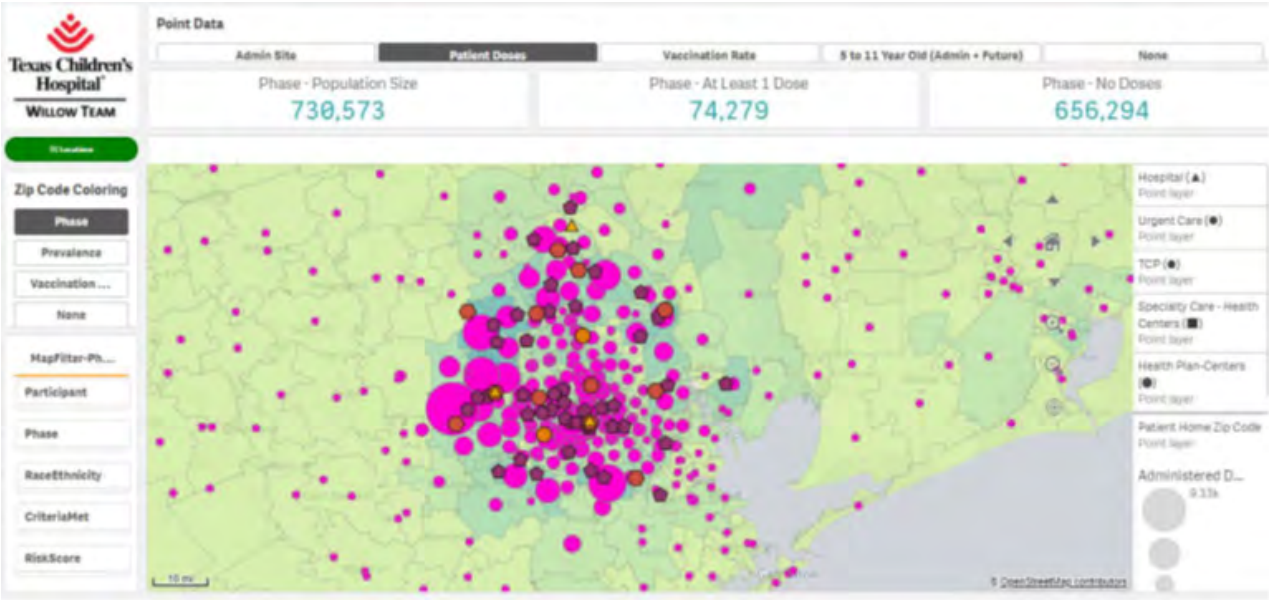


Figure 7. A data-mapping view



Patient Outcomes

The novel coronavirus required age-based vaccinations due to vaccine rollout on study design. TCH identified the need for vaccines to be color coded. The implementation of Codonics SLS within the vaccine administration workflow allowed labels to signify the color-coded manufacturer and age-based vaccines.

Per pediatric vaccination standards, providers are required to operate a tracking system and adhere to procedures for vaccine management. Communication between teams and process flows at TCH allowed for adherence measures to be accurate. Additionally, real time documentation allowed vaccine allocation to be procured and distributed efficiently.

Furthermore, color coding proved beneficial to prevent mis fills on vaccine dispenses. Per the National Alert Network, "Some errors are happening due to vial or syringe mix-ups. In other errors, healthcare providers incorrectly thought it was acceptable to give a smaller or diluted dose of the formulation intended for individuals 12 or older to children ages 5 through 11. Vaccine vials formulated for individuals 12 and up (purple cap) should never be used to prepare doses for the younger age group." Pharmacy preparations and color-coded labels reinforced age-based vaccinations when multiple manufacturers and doses were available to the public. Age and dose related mix-ups are avoided at TCH facilities.

References

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