

White Paper



Integrated Public Health Solutions

A Case Study: Utilization of a Statewide Immunization Registry in Support of a Mass Immunization Exercise - Louisiana 2007

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Overview

In 2007, the state of Louisiana conducted a statewide drill for Emergency Preparedness simulating a Mass Immunization event. An objective of this drill was to utilize the existing statewide immunization registry to support this event by providing on-line information to decision makers in emergency command centers. The goal was to determine the value of real time data and specifically how the statewide registry could support these efforts.

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The event was designed to exercise staff at specific Points of Distribution (POD) within the state to provide necessary services to individuals seeking care—in this case an immunization.

This White Paper presents an overview of the state immunization registry, the specific drill, and a summary of the lessons learned. Most notably, to include specific requirements for enhancing a statewide registry to support the needs of the emergency operating center to better manage the activities specific to vaccine inventory and immunization workflow within all deployed PODs.

Background

... reduce “over-immunization” of patients due to lost or incomplete hand-carried vaccination records.

... reduce total doses used of publicly/private supplied vaccine.

... reduce costs to the taxpayers and private individuals.

Public health mass immunization or dispensing responses to outbreaks of communicable disease has been greatly aided with the advent of secure network or Internet accessible, population-based databases. Many states are successfully tracking child- and adulthood immunizations through access by both private and public providers to the statewide database. These immunization management systems (IMS) have proven to reduce the “over-immunization” of patients due to lost or incomplete hand-carried vaccination records. A second important result of this has been to reduce the total doses used of publicly or privately supplied vaccine inventories, thus reducing costs to the taxpayers and private individuals.

Statewide registries such as the Louisiana Immunization Network for Kids Statewide (LINKS) have evolved to a robust suite of applications catering to the needs of the patients, parents, the private and public providers, and the US Centers for Disease Control (CDC). These registries are feature-rich with the ability to capture hundreds of data elements related to patient demographics, vaccines, inventory, information about the participating medical organizations, and the users. They are designed to provide standard and customized reports, reminder/recall processes, automated and manual patient record matching, and algorithms to forecast vaccinations for which a patient may be due or past due.

In contrast these registries are not currently utilized effectively to support public health emergencies such as a measles or flu outbreak, or for preparing for the influenza season. In these cases, the event/emergencies may require mass immunization of patients from deployable points of distribution. The use of electronic information systems that provide information and support data collection is not the norm. Data collection historically



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has been accomplished through hand-written forms followed by electronic data entry after the event. Manual counts of on-site inventory levels, volumes of patients being served, and staffing levels at the Points of Dispensing are common. Reporting to decision makers at emergency operation centers (EOC) through mobile communications is the mode for information flow.

With a paper-based data collection process, not only is the tracking of general-population patients not shared in a real-time manner with the EOC, but data about those considered to be first responders, essential healthcare support staff, critical infrastructure workers, public health emergency response workers, and high risk patients are not efficiently categorized with aggregated data made available to the EOC decision makers at the time of the encounters. Furthermore, after dispensing medicine or an immunization, there is no opportunity to easily monitor an adverse reaction or to contact an individual at a later date for follow-up.

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The Louisiana Experience

As a result of the post-Katrina response (2003), the value of electronic data capture of patient services specific to immunizations was established within the refugee shelter environments. Since this time, the Office of Public Health (OPH) has proactively enhanced the capability of the statewide immunization registry to further support real-time data capture and real-time information for EOC management decision support. Various statewide preparedness drills such as the Plague Drill (2005), the Statewide Mass Immunization (2006), and the most recent Mass Vaccination Event drill (2007) in preparation for influenza season, have continued to illustrate the value of real-time data collection and information.

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Both the 2005 and 2006 drills demonstrated increasing levels of preparedness for public health responses to emergencies. Notably, the rapid setup of data collection resources along with the efficient distribution of vaccine and other pharmaceutical product inventories among the PODs, have proven Louisiana's continued progress. Past experience has also pointed to needs for continual improvement in electronic system capabilities.

Improvements are needed at two levels: 1) the complete elimination of paper forms as backup processes to on-line information systems at each POD, and 2) the need for a consolidated view of the resources and event activity across all PODs at the EOC level.

2007 Louisiana Drill

In previous preparedness exercises, the immunization registry was accessed in real-time at each POD and a specific user interface that allowed for rapid web-based data entry was used to capture the minimal data set. Since there was no guarantee that on-line access could be provided or sustained, the backup system used was the paper form. The forms replicated the data elements collected in the rapid data entry tool referred to as the Mass Immunizations module. This data would then be electronically entered once connectivity had been restored and as the POD workflow allowed.

In the most recent drill, one of the nine statewide POD's lost connectivity for a period of several hours and the data entry personnel reverted to paper forms. This constituted only about 6% of the total data from the six-hour drill, and all data was in the central LINKS system within 24 hours. Experience has shown that in nearly every Louisiana mass vaccination event, especially where PODs are quickly established in community centers, network or Internet connectivity is lost for at least some period of time – typically for an hour or less. In those



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cases, data collection using paper forms has been the only recourse. Paper increases the workload, real-time information to support decision is not readily accessible, and the quality of data entered after the health care service is less accurate. As a result, it was identified that a paperless system should be utilized as the backup.

As this drill progressed, the value of the on-line data entry at time of service became even more apparent to the health professionals in the EOC. Real-time, accurate information is critical to EOC personnel charged with monitoring the activities of the PODs during mass events. Within a few hours of operation the EOC was able to determine from the patient flow and vaccine inventory information, that all the PODs would deplete their inventories of flu vaccine at their "then" current rate of use. As a result, the immunization registry was used to determine locations of additional vaccines near each POD. EOC staff were able to coordinate the transfer of flu vaccine to the PODs, thus preventing any of the PODs from running out of vaccine and having to turn away patients during the six hour drill.

Specific lessons focused on the fact that the EOC decision makers need access to information from all of the PODs in real-time as the event progresses. Decision makers required the ability to answer the following questions without the need for numerous voice communications or extensive manipulation of data gathered from running various reports:

- Facilities (PODs) – are the facilities located properly; do others need to be opened?
- POD staff levels – are the intake personnel, vaccinators and data enterers able to keep up with the patient flow?
- Patients – is the targeted population being served? Are there geographically (or other) defined groups not being served?

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- Pharmaceutical inventory – what is the current inventory? What is the rate of use? What/where are the sources of inventory restock?
- First responders and other essential personnel – how many and what categories of essential personnel have been vaccinated and are prepared to render services?

A key lesson learned was all of these “secondary” EOC activities should be automated.

During the October 2007 drill, the EOC staff found that they had sufficient information to determine vaccine levels and patient flow for each POD; the problem was that it required running several different reports to assemble the data in a manner that allowed accurate projections for inventory depletion times, patient demographics, and POD resource utilization. As this data was gathered during the event, it was then entered into spreadsheets to complete the picture needed to maintain the resource levels in each of the PODs, as well as to determine patient coverage across all 64 Parishes in the state. A key lesson learned was all of these “secondary” EOC activities should be automated.

The Solution

Two problems need to be solved to ensure 1) the greatest patient coverage rate and the protection of public health in a public health emergency and 2) the most efficient utilization of resources such as responders and vaccine inventories:

- Point of service data collection at the POD level must be done in real-time, or in the case of connectivity loss, the quality of the data must be maintained – that is, all the information should be entered electronically, not collected on paper forms.



The solution to the point of service back-up problem was to migrate the current Web-based Mass Immunization Module to a standalone tool for local and non-connected data entry. This application replaces the need for paper forms.

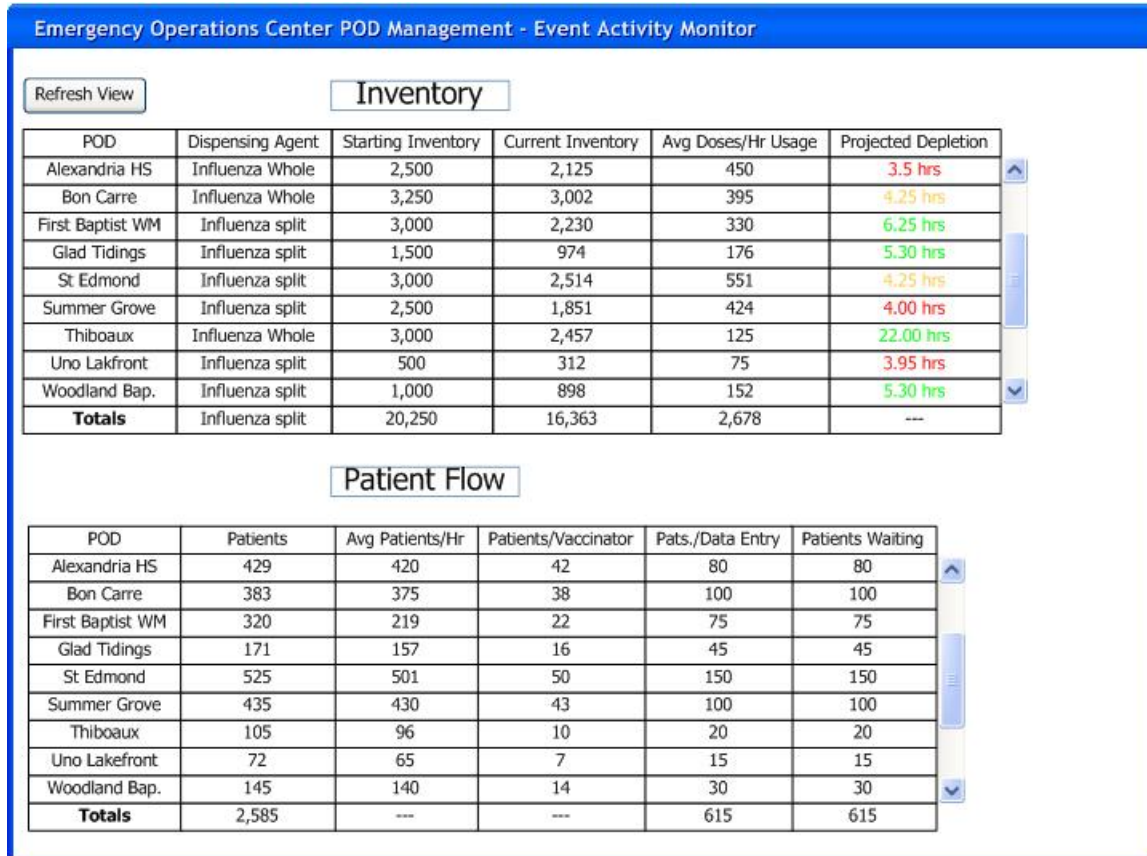
... an EOC immunization dashboard has been designed to derive and display information such as projected inventory depletion times as the data flows in from the event PODs.

- The systems in use by the EOC need to be enhanced to eliminate or reduce the need for manual manipulation to the lowest possible level.

The solution to the point of service back-up problem was the migration of the current Mass Immunization Module that is Web-based to a standalone tool for local and non-connected data entry. This tool was implemented in a USB to allow for connectivity to any computer such that the entire application and database resided on this device; thus, no software was required on the host computer, and no special connections or hardware was necessary. This application replaces the need for paper forms. All point of service data entry activity can thus, continue electronically and data is uploaded to the state registry at the time network or Internet access is restored. This will ensure the shortest possible lapse of real-time information for the EOC, but most importantly maintain the accuracy of the patient demographic and vaccination information.

A solution to the second problem has not yet been implemented. The recommendation was to establish an "EOC Immunization dashboard" that provides a consolidated view of the real-time data flowing from each POD. The proposed solution would eliminate additional data consolidation at the EOC, utilizing spreadsheets that are labor intensive to maintain. As a result of the most recent drill, an EOC immunization dashboard has been designed and is intended to derive and display information such as projected inventory depletion times as the data flows in from the event PODs. The following figure illustrates an example of a real time display that would be updated through information collected from each POD as data is entered into the state immunization registry.

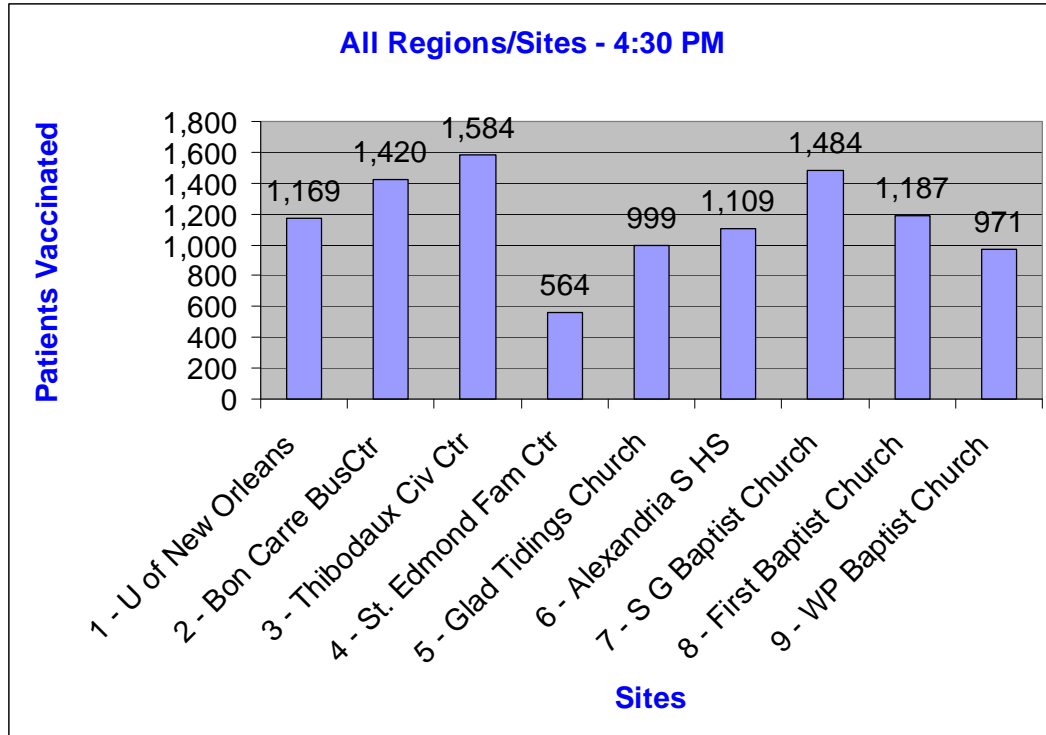
Figure 1: Example of the proposed Louisiana EOC Immunization Dashboard



The hours remaining prior to depletion of the vaccine inventory would be calculated based on beginning inventory levels, current patient volume, and the number of patients in queue at each POD.

In addition to the snapshot summary of activity at each POD, the recent preparedness drill illustrated the need for real-time reports to represent service delivery. For example, the following illustrates the numbers of patients serviced at each POD.

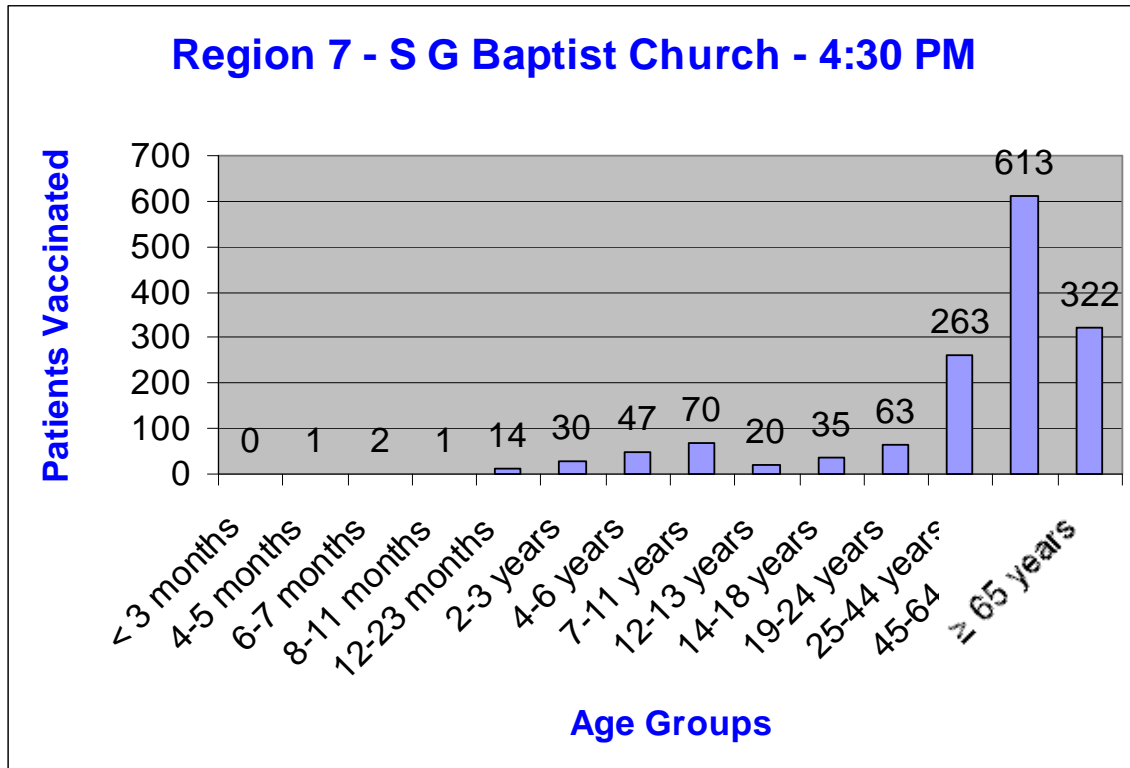
Figure 2: Example of a Real Time EOC Report within the Proposed Dashboard



Of interest is that Site 4 – St. Edmond Family Center, lost network connectivity and reverted to collecting data on paper forms. This was reflected in the lagging number of vaccinations even though the patient volume was high at that POD.

A second display illustrates a breakdown of the individuals being served at a specific POD which also proves valuable for the types of vaccines and staff required.

Figure 3: Example of a Real-time EOC Report for a Specific POD



A third real-time report suggested EOC staff value patient coverage for each of the 64 Parishes in the state as the event progressed. The following chart represents the number of patients residing in five of the Parishes who received influenza vaccinations during the event.



Figure 4: Aggregated Numbers of Patients Vaccinated by Parish of Residence (Sample of 5 out of 64 Parishes)

	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM
Parish	# of Vaccs	# of Vaccs	# of Vaccs	# of Vaccs	# of Vaccs	# of Vaccs	# of Vaccs	# of Vaccs
St. Mary	0	11	22	29	51	62	76	89
St. Tammany	3	25	55	80	102	124	141	152
Tangipahoa	40	221	469	719	981	1,277	1,535	1,572
Terrebonne	0	61	143	266	347	565	596	696
Union	1	5	9	20	42	54	67	72

Louisiana Mass Immunizations Event Outcome

The recent drill continued to validate the usefulness of the state's immunization registry. The need to further eliminate paper utilization at each POD location was emphasized and an automated solution created. The need to integrate POD information at the EOC to support decisions demonstrated that the EOC staff was empowered with information critical to decisions on vaccine distribution and patient coverage. This information ultimately prevented all of the PODs from running out of vaccine prior to the end of the drill. Although, the integration of POD data was labor

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intensive, the lessons learned allowed the creation of a concept for an EOC Immunization Dashboard.

Prior to the drill, it was estimated that each POD would experience a workload of approximately 200 patients per hour resulting in 11,000 vaccinations statewide for the six hours. Surprisingly, the actual workload was more than double this number and the 27,000 vaccinations were delivered with over 90% of the data recorded in a paperless process. This drill further demonstrated the likelihood that in any event, the demand will outweigh the expected workload. Resources will be challenged, and only through rapid and real-time data collection, can a decision support staff maximize the use of these resources, while minimizing the burden on their time to process and analyze data.