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# HL7 Version 3 Domain Analysis Model: Immunization, Release 1 May, 2012

# **HL7 Informative Document**

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### Foreword

Publication of this document that has been registered as a Technical Report with ANSI has been approved by Health Level Seven International (HL7), 3300 Washtenaw Avenue, Suite 227, Ann Arbor, MI 48104-4261. This document is registered as a Technical Report according to the Procedures for the Registration of Technical Reports with ANSI. This document is not an American National Standard and the material contained herein is not normative in nature. Comments on the content of this document should be sent to the HL7 Public Health and Emergency Response Work Group 3300 Washtenaw Avenue, Suite 227, Ann Arbor, MI 48104-4261 or hq@hl7.org.

### Introduction

Immunization is an important component of preventive health care. Immunization information may be found on many different health information systems. Successful interoperable communication between these systems is required to optimize timely and appropriate immunization. HL7 has developed a number of artifacts, which support this interoperability. These include Version 2 Implementation Guides, Version 3 messages, services and documents. This DAM will provide a reference for mapping between these and facilitate support of the needs of the clinical community regarding immunization. Like immunization, public health is linked to many areas of health care the associated health information systems. For this reason, the Public Health and Emergency Response (PHER) work group is leading this effort to develop a Domain Analysis Model (DAM) of the broad range of areas related to immunization.

### Scope

The PHER Immunization Domain Analysis Model is a UML model representing the structural and behavioral requirements of PHER sponsored projects in the immunization domain. It will illustrate the information and processing requirements of the immunization domain from a variety of perspectives. The DAM does not include information about vaccine development. Additionally, the product information pertaining to vaccination comes from the perspective of vaccine administration. Vaccine inventory management is in scope because it is a critical function of Immunization Information Systems (IIS). The sections that follow include:

- Storyboards that are intended to illustrate real-world scenarios in order to support identification of the actors and their goals related to immunization.
- Actors (entities involved in immunization)
- Domain Information Model, which documents the types of data, involved in immunization activities.
- Use Cases that further document the goals and actions involved in managing immunizations and immunization information.
- Activity Diagrams illustrate the workflow and interactions between systems.

### **Story Boards:**

These storyboards were collected from a number of sources. Some are extracted and reformatted from the HL7 POIZ V3 Immunization Message specification (DSTU). Another group were developed with input from the American Immunization Registry Association (AIRA). The final group was extracted from requirements documents produced by Immunization Registry program in New South Wales, Australia. Our goal was to cast a wide net to assure that we had a view that reflects the wide range of immunization efforts. We realize that there is overlap between some storyboards, but feel that they enrich our view.

The storyboards we have collected are intended to illustrate both real-world scenarios and potential future scenarios. Some of these scenarios are true for one jurisdiction and not for others. Some scenarios cover similar activities but may be different. Our goal is to capture the actors and the activities in both situations so that we can assure that the DAM is able to be useful into the future.

These storyboards have not been modified to meet HL7 recommendations for names.

# Record immunization mstory

#### **Story Board:**

Susan Q Public has moved from Portland, Maine to Augusta, Georgia. She brings her son to his new pediatrician on 1/1/2011. The clinic staff enters his demographic information into the office EHR and requests an immunization history from the State IIS. No record is found. Susan has a paper record from the previous pediatrician. The record includes the following:

Date of birth: Feb 2, 2009

Vaccine group	1	2	3	4	5
Hep B	2/2/2009	4/2/2009	8/3/2009		
DTAP	4/2/2009	8/3/2009			
Polio	4/2/2009	8/3/2009			
HIB	4/2/2009	8/3/2009			
Rotavirus					
MMR	2/1/2010				

Clinic staff enters this information into the EHR and transmits it to the State IIS. They request an evaluation of this history based on the ACIP schedule and request a forecast of what doses are due next from the State IIS. The State IIS returns an evaluated history and forecast of next doses due. They determine that they will administer a Pentacel (DTAP/HIB/IPV) dose, Lot number Q234sw in the right deltoid intramuscularly. The manufacturer is Sanofi Aventis. This administration is recorded in the EHR system. The EHR system transmits this to the IIS. The IIS incorporates this new information into its data store.

- Clinician
- Patient
- Parent
- IIS

• EHR System

#### Actions/Interactions:

- Request patient records
- Record immunization history
- Transmit immunization history
- Request evaluation and forecast
- Receive immunization history

#### Concepts:

- Vaccination event
  - Lot number
  - Vaccine type
  - Vaccination date
  - Vaccine expiration date
  - Manufacturer
  - 0
- Patient/client
  - Patient identifiers
    - Id
    - Name
    - Date of birth
- Evaluated history
- Forecast
- ACIP schedule
- Historical immunization record

# HIE Immuniz

This HIE Immunization Story Board describes immunization registry reporting and data retrieval when a Health Information Exchange (HIE) serves as an intermediary between the provider system and the IIS

HL7 Domain Analysis Model: Immunization, Release 1 May 2012 (immunization registry). The HIE contains a Public Health Gateway. The Public Health Gateway is a component of the HIE which is identified as having a special function within it. It serves as an intermediary between providers and public health. It simply pass messages through, or it may perform such services as routing, data caching, parsing, transformation, translation, and data quality checks.

In this use case, nothing is said about how the HIE assembles the information it uses to respond to provider queries. The HIE may query the IIS to obtain this information; alternatively it may cache immunization records in a document repository or other data store which it uses to respond to queries. Multiple HIEs or multiple IISs may also be involved. A submission or query may be routed or cascaded by the HIE as appropriate. For example, a regional HIE, failing to find a record locally, may query a state-wide HIE; a state-wide HIE may query an HIE in a neighboring state. These details and special cases are beyond the scope of this story board.

#### Step 1: An EHR queries the HIE for immunization information

The 4-year-old patient and the parent visit the provider, who uses an Electronic Health Record (EHR) system. Although the provider may have immunization records for the patient, his EHR nevertheless queries the Health Information Exchange (HIE) for the most up-to-date information. The HIE finds that the patient's records are available and returns the immunization history and care plan (sometimes called "vaccine forecast") to the EHR. The response may be in the form of a CDA, of an HL7 Version 2 message, or another format. The provider reviews the immunizations and the vaccine recommendation. The provider administers vaccines and enters the records in his EHR.

#### Step 2: The provider submits immunization records to the IIS via the HIE

The EHR submits the newly entered immunization records to the IIS via the HIE Public Health Gateway. The submission may be in the form of a CDA, an HL7 Version 2 message, or another format. The Public Health Gateway transforms the submission into HL7 Version 2 and updates the IIS.

#### Step 3: Another EHR queries the HIE for immunization information

In getting the child ready for school, the parent uses notices from his PHR that one vaccine is missing. In a rush, the parent makes an appointment at a different clinic. The patient is new to this provider. The EHR queries the Health Information Exchange (HIE) for the patient's immunization history and care plan. The HIE returns the immunization history and care plan to the EHR. The response may be in the form of a CDA, of an HL7 Version 2 message, or another format. The provider reviews the immunizations and the vaccine recommendation. The provider administers vaccines and enters the records in his EHR. Step 2 now repeats.

- Provider
- Patient
- Parent
- EHR system
- HIE
- HIE Public Health Gateway
- IIS

#### **Actions/Interactions:**

- Request immunization history
- Return immunization history
- Request care plan
- Return care plan
- Submit immunizations to IIS

# Vital Records Interfac

#### **Story Board:**

Samuel Q. Public is born on 1/1/2011. The Birth Information Specialist enters Samuel's birth information into the jurisdiction's web-based Electronic Birth Registration System (EBRS). He receives a Hepatitis B immunization the following day in the newborn nursery. Although this is not a standard practice in the U.S., some jurisdictions capture newborn immunization information in their EBRS. Newborn nursery staff in this facility are authorized users of the EBRS. They pull up Samuel's record and add the immunization administration information, including the type of immunization, the lot number of the vaccine, the administration date and the individual who administered the vaccine. The birth record update is then saved.

#### Option 1:

Once the birth record is completed, the Birth Information Specialist releases the record to the jurisdiction's Vital Record Office for review and registration. Once VR receives and registers Samuel's birth (usually within 5 days), Samuel's immunization data and other vital records information including parent names, birth certificate number and address is extracted from the vital record data repository on a scheduled basis and transmitted via the State and Territorial Exchange of Vital Events (STEVE) System to the state immunization registry program. IIS staff extract the birth record from their STEVE mailbox and initiate a new record in the IIS for Samuel with the data provided by VR. Updates to birth records are transmitted on a routine basis to the Immunization Registry Program via STEVE. Samuel dies on 6/1/11 in this jurisdiction. A death record is registered and his birth record is matched and marked 'deceased.' Samuel's death record is transmitted via STEVE to the Immunization Registry mailbox. IIS staff update Samuel's immunization record status to 'permanently inactive.'

#### Option 2:

In this particular jurisdiction, the EBRS is linked to the state Immunization Information System (IIS). When the birth record is completed, the Birth Information Specialist releases the record to the jurisdiction's Vital Record Office for review and registration. Simultaneously, the EBRS transmits an electronic message to the IIS containing basic newborn identification information and the immunization record. The IIS automatically generates a new record for Samuel and populates it with these data. Samuel dies on 6/1/11. VR system automatically sends a fact of death notification to the IIS, indicating that Samuel is deceased. The IIS updates Samuel's immunization record status to 'permanently inactive.'

- Electronic Birth Registration System
- IIS
- ERBS user

#### **Actions/Interactions:**

- Record birth data
- Record immunization record
- Send birth record
- Send immunization record
- Receive birth record
- Receive immunization record

- Vaccination event
  - $\circ$  Lot number
  - Vaccine type
  - Clinician
    - Orden
    - Administering
- Patient/client
  - Patient identifiers
    - Id
    - Name
    - Date of birth
    - Mother's maiden name
  - Home address
  - o Parents
    - Names
    - addresses
  - o Birth state
  - Birthing facility
  - Birth registration number

o Death date

### Vital Records Interface with IIS—Adoptions and Name Changes

#### **Story Board:**

Samuel Q Public was born on 1/1/2011. His birth and newborn immunization information were previously sent to the Immunization Information System (IIS). On 2/3/2011 he is legally adopted. His original record is sealed in the VR system and a replacement record is issued showing Samuel's adoptive name and his adoptive parents' information as shown on the court order. Following jurisdictional policy, the VR office electronically transmits key items from the replacement record to the IIS via the State and Territorial Exchange of Vital Events (STEVE) System. The IIS matches the replacement record with the original record using the State File Number, which is the unique identifier on the birth record that remains unchanged on the replacement record. The IIS changes the status of the original record to 'permanently inactive' and replaces the active record with the adoptive record data.

#### Actors:

- Electronic Birth Registration System
- IIS
- ERBS user

#### **Actions/Interactions:**

- Record adoption data
- Send adoption record
- Receive adoption record
- Update IIS records

#### **Story Board:**

Sally Public has a daughter on 2/3/2011. She has not decided on a name before she leaves the birth hospital. The birth hospital has recorded her name as Baby Girl Public in the EBRS. (Option 2) Her birth record is transmitted to the IIS without a full name. On 2/14/2011, Sally names her newborn Suzy Q by applying in the VR office for a name change. In this jurisdiction, the addition of a name to a birth record is treated as a correction instead of an amendment (requiring a court order) if added within 6 months of the birth. The VR clerk pulls up the registered birth record and accesses the correction function. The name change is entered and the record is saved. The EBRS records the name change from Baby Girl to Suzy Q. Sally Public pays for and is issued a new certification with the name of Suzy Q. Public for her baby daughter. The ERBS sends an updated record to the IIS with the new name via STEVE on a scheduled basis.

- Electronic Birth Registration System
- IIS

- ERBS user
- Patient's mother

#### **Actions/Interactions:**

- Record birth data
- Send birth record
- Receive birth record
- Update IIS records
- Record update
- Send update
- Receive update

#### **Concepts:**

- Patient/client
  - Patient identifiers
    - Id
    - Name
    - Date of birth
    - Birth registration number
  - Patient address
- Birth parents
- Adoptive parents
- ERBS

# Manage Vaccine Inver

#### **Story Board:**

The inventory clerk of a state Immunization Information System (IIS) orders 1000 doses of MMR vaccine from the national distribution system (NDS). The order is received by the NDS. Vaccine is packaged and shipped. An electronic packing slip is sent to the IIS. When the IIS receives the vaccine, the inventory clerk examines the shipped vaccine and determines that it is all there and intact. He uses that electronic packing slip to update the IIS inventory system. (vaccine, lot number, expiration, number of doses) A nurse in the state clinic administers a dose of MMR from this batch of vaccine and records this in the

IIS. The IIS updates the inventory management system, decrementing one dose.

The inventory clerk responds to a request from a local health department and transfers 10 doses to them. The IIS inventory management system subtracts the doses from the state inventory and adds it to the local public health inventory.

#### Actors:

- IIS system manager
- IIS System
- Inventory clerk

#### Actions/Interactions:

- Count doses used by vaccine
- Inventory management system is implied
- Transfer doses and inventory
- Accept inventory
- Record immunization
- Decrement inventory
- Increment inventory

- Vaccination event
  - Lot number
  - Vaccine type
  - Clinician
    - Ordering
    - Administering
- Inventory clerk
- Patient/client
  - Patient identifiers
    - Id
    - Name

- Date of birth
- Vaccine distributor
- Packing slip (electronic)

### Managing Publicly Funded Vaccine Inver

#### **Story Board:**

Publicly funded vaccine usage must be tracked to assure appropriate usage and to forecast future needs. Some IIS require that clinics, which use EHR-S, provide supporting data when sending immunization records to the IIS. This storyboard describes some of the possible interactions, but should not be considered definitive.

My Local Clinic receives 100 doses publicly funded MMR vaccine from the distributor. The inventory clerk logs this into the EHR-S (including lot number, vaccine, expiration date). Later in the day, Bob Nurse administers one dose of MMR vaccine from this lot of publicly funded vaccine. He records this vaccination from that lot in the EHR-S. The EHR-S sends the update immunization history to the IIS. Included in this information is lot number and patient funding source for publicly funded vaccine. The record also includes information about the patient's eligibility for publicly funded vaccine. The IIS updates its records with this data.

At the end of the month, the IIS runs a report for My Local Clinic comparing the funding source and eligibility of all immunizations given at My Local Clinic for the month.

#### Actors:

Inventory clerk EHR-S IIS Provider organization

#### **Actions/Interactions:**

Update inventory Record immunization Transmit immunization history Create report

- Vaccination event
  - Lot number
  - Vaccine type
  - Clinician
    - Ordering
    - Administering

- Funding source
- Funding program eligibility
- Administering clinic
- Patient/client
  - Patient identifiers
    - Id
    - Name
    - Date of birth
  - Patient address
  - o Responsible adult
  - Registry status
- Vaccine distributor



#### **Story Board:**

The Local Health Department is concerned because analysis shows the number of children in schools up to date for MMR is only 84%. They decide that they want to reach out to the parents of these children. They determine that they wish to send a post card to the parents for all children that are overdue for the MMR. They enter the reference date into the report request page and generate a set of mailing labels to be sent. Children who are contraindicated for MMR vaccine are not included in the recall. (In Immunization Information Systems, contraindications are recorded at the vaccine group level.) Children who have previously refused the vaccine are included in the recall.

#### Actors:

- Public health agency
- IIS
- CDS service

#### Actions/Interactions:

- Create report
  - o Reminder letters
  - Request list of patients

- Overdue on a date
- Not contraindicated

#### **Concepts:**

- Vaccination event
  - Lot number
  - Vaccine type
  - Vaccination date
  - Vaccine group
  - Clinician
    - Ordering
    - Administering
    - Public health
- Patient/client
  - Patient identifiers
    - Id
    - Name
    - Date of birth
  - o Patient address
  - o Responsible adult
- Coverage report
- Recall/reminder
- Contraindication
- •
- •

# Tracking funding program eligib

#### **Story Board:**

George Pediatric, age 12, goes to MyClinic for a well child visit. The nurse reviews his immunization

history in the EHR system and notes that he is due for a Tdap vaccine. In addition, George's mother reports that they will be travelling to a country with a risk of yellow fever. After consulting with the travel specialist, the nurse administers a dose of Tdap and a dose of yellow fever vaccine. The nurse determines that George is Native American. The nurse records the child is eligible for vaccine funded by the Vaccines for Children (VFC) due to his being Native American. The Tdap vaccine is eligible for VFC funded vaccine, while the yellow fever vaccine is not. The nurse captures this in the EHR. The EHR sends the updated immunization history, including the eligibility status to the IIS. The IIS accepts the updated immunization history, tracking eligibility for each immunization.

Note that VFC is a US vaccine-funding program.

The IIS generates a report summarizing the number of immunization events where the patient qualified for VFC.

#### Actors:

Clinician EHR-S IIS Patient

#### **Actions/Interactions:**

Record immunization Transmit immunization history Accept immunization history

- Vaccination event
  - Lot number
  - Vaccine type
  - Vaccination date
  - Clinician
    - Ordering
    - Administering
    - Public health
- Patient/client
  - Patient identifiers
    - Id
    - Name
    - Date of birth

- Patient address
- o Responsible adult
- Funding program eligibility per immunization
- Eligibility status report

### Public Health Tracking Vaccine Information Sheet (

#### **Story Board:**

The VIS is a document that providers are required to share with persons being immunized. The document highlights why the immunization is important and lists potential side effects. Providers must record the date the VIS was shared with the patient, the target diseases that are covered and the version of the VIS document.

Suzy Patient (DOB 12/12/2009) is due for an MMR immunization. Her mother is shown the VIS document (Version date 1/1/2010). The nurse reviews the contents to assure that Mom understands the information. The Mom consents to allow Suzy to get immunized. The nurse records the date the VIS was shared, the document type identifier and the version date in the clinic's EHR-s. The EHR-s transmits the VIS information, along with the updated immunization record.

Two weeks later, Mom is concerned about a possible side effect from the immunization. The clinic determines which VIS sheet was given and the date. Mom is shown the VIS again.

Actors:

- Clinician
- Patient
- IIS
- EHR
- Parent

#### Actions/Interactions:

- Record VIS date
- Record consent
- Request patient record
- Review VIS date

#### Concepts:

• Vaccination event

- Lot number
- Vaccine type
- Vaccination date
- Vaccine information sheet
  - Version date
  - Delivery date
- o Clinician
  - Ordering
  - Administering
  - Public health
- Patient/client
  - o Patient identifiers
    - Id
    - Name
    - Date of birth
  - Patient address
  - Responsible adult

# NSW-Manage Immunization 🗮 gister

#### **Story board:**

The manager of the NSW Immunization Register adds a new vaccine and attendant rules to the NSW IR. These rules and metadata will inform users of the IR on what vaccine to give and when. A new Immunization Unit has been formed. The manager of the NSW IR creates a new organization in the register, entering:

- Organization type and Area Health Service
- Contact information (address, phone, etc.)
- Organization Name
- Managers name

• Contact person

An immunization team leader is informed by the school office that the principal and school hours have changed since their last immunization clinic held at the school. The record for the school is updated when the team returns to the Public Health Unit.

#### Actors:

- IIS manager
- Immunization team leader
- Immunization information system (Immunization registry)

#### **Actions/Interactions:**

- Manage CDS engine
- Manage entity data in IIS
  - o Immunization unit
  - School data

- Organization type and Area Health Service
- Contact information (address, phone, etc.)
- Organization Name
- Managers name
- Contact person
- Vaccine type
- Validation rules
- Forecasting rules
- Immunization clinic
  - o Date
  - $\circ$  location



#### **Story Board 1:**

100 students in year 7 at Sydney Girls High School were vaccinated with HPV dose 1 and Hepatitis B dose 1. The user enters data into the immunization registry from two bundles of consent forms, with one bundle consisting of 100 HPV consent forms and the other bundle consisting of 100 Hepatitis B consent forms. (Note: a bundle consists of all completed consent forms per vaccine per school per grade e.g. HPV, Mosman High School, Grade 7).

The User selects form from bundle and requests "search for person on register" and enters first name, last name, date of birth. If the person is not found, User adds demographics and address. Otherwise User views returned matches which list first name, middle name, last name and date of birth and selects person record. User adds vaccination consent data. User adds person's vaccination data

#### Actors:

- IIS user
- Students
- Immunization registry (IIS)

#### **Actions/Interactions:**

- Find person query
- Return person response
- Update demographics
- Record immunizations

#### **Story Board 2:**

Amy Theresa Scarfe has moved from Wollongong High School to Hornsby Girls High School, and has a twin sister whose name is Amy Angela Scarfe. Amy Theresa received HPV dose 1 at Wollongong and HPV dose 2 at Hornsby Girls High. Her form is in the bundle of HPV consent forms returned to the PHU after the second immunization clinic. The nurse who verified the consent by phone, marked up a new form with Amy Theresa's demographics and consent details, parent/guardian address and school name and dose 2 data.

User requests "search for person on register" and enters first name, last name, date of birth for Amy Scarfe. Two patient records are returned, one for each twin. The user selects the one for Amy Theresa and updates demographics. If consent data has not been entered, then User adds consent data. The User adds person's vaccination data, which includes name of new school.

- IIS user
- Patient
- clinician

• Immunization registry (IIS)

#### **Actions/Interactions:**

- Find person query
- Return person response
- Select person
- Update demographics
- Record immunizations

#### **Story Board 3:**

Sue received HPV dose 1 at Sydney Girls High. Her form is in the bundle of 95 HPV consent forms returned after the second visit with a notification pro forma from the principal that consent was with drawn. The immunization nurse marked the consent form with a note that consent was withdrawn and dose 2 was not administered.

The User requests "search for person on register" and enters first name, last name, date of birth. The User views returned matches which list first name, middle name, last name and date of birth and selects person record. The User enters the consent withdrawn date and consent status as withdrawn. The User adds vaccination status (not completed : withdrawn consent) to person's HPV vaccination data corresponding to the dose that was missed.

#### Actors:

- IIS user
- Clinician
- Immunization registry (IIS)

#### **Actions/Interactions:**

- Find person query
- Return person response
- Select person
- Update demographics
- Update consent status

- Vaccination event
  - $\circ$  Lot number
  - Vaccine type

- o Vaccination date
- o Clinician
  - Ordering
  - Administering
  - Public health
- o Administered dose number
- o Vaccine series
  - status
- Patient/client
  - Patient identifiers
    - Id
    - Name
    - Date of birth
  - Patient address
  - o Responsible adult
  - Registry status
  - o Gender
  - Consent to administer
  - o School
  - Grade in school

# NSW—Genera

#### **Story Board:**

An Immunization team has returned from a visit to Dubbo High School on August 28, 2009 where HPV dose 3 and Hepatitis B dose 2 was administered. The forms are bundled separately as 60 HPV consent forms and 120 Hepatitis B consent forms. Due to absence on the day of the clinic, fifteen girls missed their HPV dose 3 and twenty-five students missed their Hepatitis B dose 2. The consent form data is entered after the clinic (by vaccination) and the vaccination status for those who missed doses is flagged as "not completed-missed dose". Missed dose letters are then generated for all students at Dubbo High

School who missed their scheduled dose on August 28 - 15 letters regarding girls' missed HPV missed dose 3 and missed Hepatitis B dose 2 and ten letters regarding boys' missed Hepatitis B dose 2. User modifies the template to make the generated letter tailored for this specific event.

#### Actors:

- IIS User
- Clinician
- Immunization Information System

#### **Actions/Interactions:**

- Find patient records
- Record immunization records
- Record consent status
- Record up to date status
- Create report
  - Reminder of missed dose letter
- Modify report output

- Vaccination event
  - Lot number
  - Vaccine type
  - Vaccination date
  - o Clinician
    - Ordering
    - Administering
    - Public health
  - Administered dose number
  - Vaccine series
    - status
- Patient/client
  - Patient identifiers
    - Id
    - Name
    - Date of birth

- o Patient address
- Responsible adult
- o Registry status
- o Gender
- Consent to administer
- o School
- Grade in school
- Vaccine distributor
- Recall/reminder
- Missed dose

# NSW—Generate vaccination history for a patient

#### **Story Board:**

An Immunization Coordinator has received a letter from a parent requesting a copy of their child's vaccination history. The parent has provided their email address, and the Co-coordinator updates the 'parent/guardian email" data field, and will email the vaccination history. User requests "search for person on register" and enters first name, last name, date of birth. User views returned matches (first name, middle name, last name and date of birth) and selects person record. User enters parent/guardian name, and adds their address if this is not already stored on the Register. User adds email address to parent/guardian information. User requests "display vaccination history template" selecting source from "register template folder" (see Appendix A4.1 for generic template) or from "my organization's template folder". User may tailor vaccination history template. If User has tailored letter, then User can requests "save template" in "my organization's template folder". User may request "attach consent forms". User may select "print" for mailing, or select "email" to generate an email to parent/guardian's email address.

#### Actors:

- Immunization coordinator
- Parent
- IIS User
- Immunization Registry (IIS)

#### **Actions/Interactions:**

• Update parent information

- Find patient record
- Return patient record
- Update patient demographics
- Modify template
- Create report
  - Letter and vaccination record

- Vaccination event
  - Lot number
  - Vaccine type
  - Vaccination date
  - o Clinician
    - Ordering
    - Administering
    - Public health
  - Administered dose number
  - Vaccine series
    - Status
- Vaccination history
- Patient/client
  - o Patient identifiers
    - Id
    - Name
    - Date of birth
  - Patient address
  - Responsible adult

- email
- o Registry status
- o Gender
- Consent to administer
- o School
- Grade in school
- Consent to vaccinate form

# NSW—Manage an Imanization Clinic

#### **Story Board:**

An Immunization Co-coordinator plans to hold three immunization clinics at Duval High School during 2010. Clinic 1 is for Year 7 to receive HPV dose 1, and Hepatitis B dose 1, and for Year 10 to receive dTpa vaccine; Clinic 2 is for Year 7 to receive HPV dose 2 and Varicella; Clinic 3 is for Year 7 to receive HPV dose 3 and Hepatitis B dose 2. The Co-coordinator creates a record about a clinic location with suggested dates and may generate a letter to the school principal requesting confirmation of the suggested dates and school data.

An Immunization Co-coordinator plans to hold three immunization clinics at Duval High School during 2010. Confirmed dates for the clinic and up-to-date school data, including contact persons and projected enrollments, have been returned. The Co-coordinator will update school details (e.g. projected enrolment numbers) separately as per use case 3. The Co-coordinator updates the clinic records with confirmed dates for all doses to be administered at the school during the year. The Co-coordinator updates the clinic records the clinic records with start and end time of clinic, and names of Nurse Immunizers who will be rostered on for each clinic.

An immunization team held an immunization clinic for Year 7 to receive HPV dose 2 and for Year 10 to receive dTpa vaccine. When the team returns to the PHU after the clinic, the immunization clinic record is updated with the following data for each vaccine administered at the clinic: vaccine batch number, dose number, grade, students vaccinated and wastage, and any notes.

- Immunization coordinator
- School official
- IIS
- Immunizers

#### **Actions/Interactions:**

- Manage clinic schedule
- Create report
  - Letter notifying of clinic
- Record immunization history

- Vaccination event
  - Lot number
  - Vaccine type
  - Vaccination date
  - Clinician
    - Ordering
    - Administering
    - Public health
  - Administered dose number
  - Vaccine series
    - status
- Patient/client
  - Patient identifiers
    - Id
    - Name
    - Date of birth
  - o Patient address
  - o Responsible adult
  - Registry status
  - o Gender
  - Consent to administer

- o School
- Grade in school
- Vaccination clinic
  - Location
  - o Staff
  - o date

# Utilizing and Accessing an Immunization Information System (Immunization Registry)

#### Note:

This storyboard highlights the types of interactions that can be expected in these types of transactions. It may be accomplished by a number of routes, depending on architecture.

#### **Story Board:**

Nurse Nightingale works at an immunization clinic. The following activities occur during the course of a typical day.

Nurse Nightingale receives an alert of a hepatitis B outbreak within her jurisdiction. She runs queries against the jurisdictional Client and Immunization Registries to identify individuals who are not fully immunized against hepatitis B. She begins by getting a list of eligible candidates from the Client Registry. The registry responds with a list of all eligible immunization candidates, who live within her jurisdiction. Next she gets a list of all of their immunization events from the Immunization Registry. By comparing the results, she is able to determine who has not yet received their hepatitis B vaccination. Nightingale administers an MMR vaccine to Kari Kidd and records the event on the jurisdiction's immunization registry.

Neville Nuclear has accepted a new job as a healthcare worker. His employer has asked for a copy of his hepatitis B vaccinations. Neville completed the entire 3 dose series six months ago at the public health travel clinic. Nightingale queries the Immunization Registry and is presented with the dates and details for each of the three hepatitis B doses. She then queries for greater detail against each of the listed immunization records. Nurse Nightingale prints an official vaccination report for Mr. Nuclear.

- Clinician
- Patient
- Immunization registry (IIS)
- Client registry (Master Person Index)

#### **Actions/Interactions:**

- Patient Registry Get Demographics Query
- Patient Registry Get Demographics Query Response
- Immunization Candidate Query
- Immunization Candidate Query Response
- Record Immunization Request
- Record Immunization Request Accepted
- Immunization Candidate Query
- Immunization Candidate Query Response
- Immunization Query
- Immunization Query Response
- Generate report (immunization record)

- Vaccination event
  - o Lot number
  - Vaccine type
  - Vaccination date
  - o Clinician
    - Ordering
    - Administering
    - Public health
  - Administered dose number
  - Vaccine series
    - status
- Patient/client
  - Patient identifiers
    - Id

- Name
- Date of birth
- Patient address
- Responsible adult
- Registry status
- o Gender
- Consent to administer
- o School
- Grade in school
- Vaccination history report

### Retrieving a list of immunization records

#### **Story Board:**

Neville Nuclear is traveling overseas and has an appointment with his public health nurse to determine what vaccinations he requires. Nurse Nightingale confirms Neville's identity by querying the jurisdictional client registry.

She then queries the jurisdictional immunization registry for a list of all the vaccine administrations that Neville has received.

#### Actors:

- Patient
- Clinician
- Person registry (MPI)
- Immunization Registry (IIS)

#### **Actions/Interactions:**

- Immunization Candidate Query
- Immunization Candidate Query Response
- Patient Registry Get Demographics Query
- Patient Registry Get Demographics Query Response

#### **Concepts:**

• Vaccination event

- Lot number
- Vaccine type
- Vaccination date
- Clinician
  - Ordering
  - Administering
  - Public health
- Administered dose number
- Vaccine series
  - status
- Patient/client
  - o Patient identifiers
    - Id
    - Name
    - Date of birth
  - o Patient address
  - o Gender
  - o Consent to administer
  - o School
  - Grade in school

### Report Adverse ent Associated with a vaccination

#### **Story Board 1:**

Susan Q Public is the mother of Sam, a three year old. Sam received immunizations on 2/1/12 at his pediatrician's office. Two days later, he developed a fever of 102 F, became lethargic during the afternoon. At 5:00 PM, he experienced a grand mal seizure, his first ever. His mother called 911 and he was transported to the ED at the local hospital. The ED clinician checked his immunization history by querying the state IIS. She noted that he had been immunized 2 days previous. He had received HIB-PRP-OMP, MMRV and DTAP-Hep B-Polio immunizations. The clinician determined that an adverse event may have been associated with one of these immunizations. She completed a Vaccine Adverse Event Report and submitted it to the national AE registry via fax.
### **Story Board 2:**

Susan Q Public decided to report her son's adverse events to the national AE registry. She went on line and found the telephone number for reporting an AE. A staff person at the AE registry interviewed Ms. Public and completed an AE report form on her behalf.

### **Story Board 3:**

The electronic medical record system at the local hospital uses a Clinical Decision Support (CDS) application to facilitate the identification and reporting of AEs to the national AE registry. Information received via the Health Information Exchange suggests a probable AE based upon an ED encounter record for Sam Public. He was seen in the ED during the day because he experienced seizures and a fever following vaccinations identified in his immunization history record. The EHR system compiles the information on the patient and any associated vaccination information for the patient's siblings if applicable. All information is compiled into an AE report and sent to the AE registry. The AE registry receives the report, assesses it for completeness and acknowledges receipt. The EHR notifies the clinician that an AE report had been initiated and transmitted.

#### Actors:

- Clinician
- Patient
- Parent
- IIS
- EHR System
- AE registry
- CDS engine
- HIE

#### Actions/Interactions:

- Request patient records
- Receive immunization history
- Transmit AE report

#### Concepts:

- Vaccination event
  - Lot number
  - o Vaccine type
  - Vaccination date

- Vaccine expiration date
- Vaccine dose or dose in series
- o Manufacturer

0

- Patient/client
  - Patient identifiers
    - Id
    - Name
    - Date of birth or age at vaccination?
- Evaluated history (patient and siblings, if applicable)
- AE symptoms and onset date
- AE outcome or current patient status (if known)
- Forecast
- ACIP schedule
- Historical immunization record

## **PHER Immunization DAM Use Case Actors**

Actors are the roles played by entities that have a stake in the successful operation of a use case or set of use cases. This document organizes actors in two ways. First there are entity-based actors. These represent things in the real world. Second there are role-based actors. Many entity actors play multiple roles. It is often simpler to refer use cases and activities to roles based actors, with the understanding that various entities may play these roles.

## **Entity based actors**

This package contains actors that reflect real-world entities.

### **A01: Immunization Information System**

According to the CDC IISSB: Immunization Information Systems are confidential, population-based, computerized information systems that attempt to collect vaccination data about all persons within a geographic area.

### A02: Patient

A patient is a person receiving health care. In our models, this is generally related to immunization.

### **A03: Patient Registry**

A patient registry is an information system with the goal of maintaining demographic information about a patient. Included in this function is tracking identifiers from different sources.

### A04: Provider

A provider is a person providing health care, that is a clinician.

### **A05: Regulator**

A regulator is a person or agency which promulgates regulations.

### **A06: Research Subject**

A research subject is a person who participates in research study as a target of the study.

### **A07: Researcher**

A researcher conducts research studies.

### A08: Manufacturer

A manufacturer makes products, vaccines in our case.

### **A09: Public Health**

Public Health (also known as population health) fulfills a number of roles related to immunization. It is concerned about promoting the health of the population.

### A10: Distributor

This actor distributes vaccine from manufacturer to end users.

### **A11: Provider Organization**

A provider organization is an entity that providers belong to.

### **A12: Electronic Health Record System**

An electronic health record system is an information system which contains patient's medical records.

### **A13: Health Information Exchange**

This actor acts as a hub to facilitate access to consolidated health records from multiple sources.

### A15: Vital Records system

The vital records system tracks birth and death events. They may also collect information on birth doses of Hepatitis B.

### A16: Relabeler

A relabeler repackages vaccines and sells them under their label.

### A17: PHR system

This is the Personal Health Record system. It houses a health record owned and maintained by the person it is about.

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### **A18: Government Payer**

Vaccine is often paid for with public funds. This actor is involved in both paying and assurance of correct usage of vaccines.

### A19: Adverse Event Registry

This actor represents the system intended to capture and track adverse events. It is typically a national effort.

### A20: Designated SME group

This is the group of clinical SME responsible for rule development. An example in the US would be the ACIP.

### **A21: CDS support SME**

This is a SME who integrates series rules into CDS engine.

### **A22: Responsible Person**

A responsible person is the parent or guardian of a patient receiving immunizations. This person makes medical decisions for the patient who is not old enough to make these decisions on his/her own.

### **PHER Role-based Actors**

This package contains role-based actors. Different entity based actors can plan the same role. Some entities play many roles. For instance, an IIS may be an immunization history consumer when immunization histories are being recorded into it. It can later be an immunization history supplier when another system requests an immunization history.

### **AR01: Immunization History Supplier**

This actor supplies immunization histories to other systems, particularly Immunization History consolidators.

Some of the immunization history suppliers include:

- Electronic Health Record systems
- Personal Health Record systems
- Immunization Information Systems
- Vital Records systems
- Billing systems

### **AR02: Immunization history consolidator**

The goal of this actor is to be a source for complete, consolidated immunization histories for individuals. These systems may maintain a centralized repository or may keep track of where primary data are and pull them together when needed. Some examples of immunization history consolidators include:

- Immunization information system (IIS)
- Health Information Exchange (HIE)

### **AR03: Immunization history consumer**

This actor is interested in using / getting consolidated immunization history for individuals. Actors who may play this role include:

- EHR
- PHR
- IIS
- Patient
- Provider
- Public Health
- Schools
- Daycare
- Camps
- Payer
- Employer
- Evaluation and forecasting provider
- Adverse Event registry

### **AR04: Immunization Report consumer**

This actor requests and uses immunization reports. Actors who may play this role include:

- EHR
- PHR
- Patient
- Provider
- Public Health
- Government Payer
- Non-governmental Payer
- Government agency
- Adverse Event registry

## **AR05: Immunization Report creator**

This actor supplies immunization reports. It requires participation of an Immunization History Consolidator in most cases. Actors who may play this role include:

• IIS

- HIE
- EHR
- Public Health

### **AR06: Evaluation/forecast provider**

This actor evaluates a patient's immunization history and other factors and produces a forecast of next doses due. It also returns the evaluation of the history. Actors who may play this role include:

- IIS
- CDS service
- EHR

### **AR07: Evaluation/forecast consumer**

This actor may represent any system, which requests and receives CDS services. Actors who may play this role include:

- EHR
- PHR
- HIE
- IIS
- School
- Day care
- Payer

### **AR08: Inventory Management supplier**

This actor tracks vaccine inventory. It tracks orders, shipments, transfers, wastage, usage. Some systems, which may play this role, include:

- IIS
- EHR
- Distributor

### **AR09: Inventory Management Consumer**

This actor uses the output of an Inventory Management Supplier. Actors who may play this role include:

- Government payer
- Distributor
- EHR
- Provider organization

- Public health
- Manufacturer
- Adverse Event Registry

### **AR10: Identifier Consumer**

The goal of this actor is to use the services of an identifier provider. Among the entities that are likely to fulfill this role are:

- EHR
- IIS
- PHR
- Public health information systems
- Health information exchange
- Adverse event registry

### **AR11: Identifier supplier**

The goal of this actor is to be a register of identifiers. Entities that may play this role include:

- Master patient index
- IIS
- HIE

### **AR12: Demographic consumer**

This actor consumes demographic information from demographic suppliers. Entities that may play this role include:

- IIS
- EHR
- PHR
- PH system
- Adverse Event registry

### **AR13: Demographic supplier**

The goal of this actor is to supply demographic information to other actors. Entities that may play this role include:

- IIS
- EHR
- PHR
- Vital Records System

### **AR14: format transformer**

This actor transforms a message or document into another format. For example, the transformer may take a Version 2 message and convert it to a Version 3 message or document.

## Data Information Model Documentation

### **PHER Immunization DAM Information View Package**

*Notes:* The Immunization Domain Information View contains diagrams and supporting text which document the entities and data needed to support information systems which include immunizations.

### **Immunization History Package**

*Notes:* This package contains information related to a persons immunization records.

### Immunization History Diagram

The immunization history is collected clinical and demographic data related to a person's immunizations.



Figure: 1- Immunization History

### Immunization history (Class)

Notes: The Immunization history is the collection of data about a patient's immunizations. It includes demographic data and immunization event data.

### Funding program eligibility (Class)

*Notes*: The funding program eligibility captures what governmental program the person qualifies for that pays for vaccination. In the US the national program is the Vaccines for Children (VFC) program. In addition, there are state and local funding programs. This class does not specify who actually paid for a vaccination. That may be captured in funding source. In the US, the eligibility category relates to both patient specific characteristics (such as Medicaid) and vaccine type. (That is, does the type of vaccine used in this vaccination qualify for VFC?)

Attributes		
Name	Multiplicity	Notes
assessment date	1:1	The date the eligibility was assessed.
funding program	1:1	The categorical reason that the person qualifies for the funding
qualifying		program.
reason		

Relationships			
Connector	Associ	iation	Туре
		Patient.	Dependency
«impacts»		funding program eligibility.	
	01	funding program eligibility.	Association
«impacted by»	0*	Immunization event(vaccine dose	
	admin	istered).	

#### labeler (Class)

Notes: A labeler repackages vaccine for sale. In some cases a manufacturer is also the labeler.

#### Attributes

Name	Multiplicity	Notes
labeler name	1:1	The name of the company that repackages and labels a vaccine
		product.

#### **Relationships**

Connector	Associ	ation	Туре
	01	labeller.	Aggregation
	1	product source.	

#### manufacturer (Class)

Notes: This is the company that produces the vaccine.

Attributes

Name	Multiplicity	Notes
manufacturer	1:1	Code representing the manufacturer.
code		
name	1:1	The name of the manufacturer

#### target disease (Class)

*Notes*: The target disease is the disease that a vaccine is intended to prevent.

Attributes		
Name	Multiplicity	Notes

disease name	1:1	The disease which is intended to be prevented by the vaccine.
--------------	-----	---------------------------------------------------------------

#### vaccine lot (Class)

*Notes*: A vaccine lot is a packaged batch of vaccine.

**Attributes** 

Name	Multiplicity	Notes
lot number	1:1	The lot number is an identifier of the vaccine lot.
expiration date	1:1	The expiration date is the date that the vaccine lot is
		considered too old to use effectively.
NDC (National	1:1	This is the US Food and Drug Administration (FDA) product
Drug Code)		code.

#### adverse reaction (Class)

. ...

*Notes*: This is an adverse medical condition that is related in time to an immunization encounter and attendant immunization events.

Attributes		
Name	Multiplicity	Notes
adverse event	1:1	This is an adverse health condition.
adverse event	1:1	This is the date that the adverse event began.
date		
adverse event	1:1	The date the adverse event was reported.
report date		_

#### vaccine information document (Class)

*Notes*: A vaccine information document is an educational document intended to outline the risks and benefits of the vaccine. It outlines the impact of infection by the disease causing organism. A vaccine information sheet (VIS) is a US realm document example.

Attributes		
Name	Multiplicity	Notes
publication date	1:1	Date Vaccine information sheet was published. In effect,
<u>^</u>		version of VIS.
language	1:1	The language is the language the document is written in.
form identifier	1:1	The form identifier indicates which vaccine information
		document is shared.
delivery date	1:1	The delivery date is the date that the specific vaccine
-		information document is shared with the patient or patient's
		responsible person.

#### antigen (Class)

Notes: An antigen is the moiety which triggers an immune response in a recipient.

Attributes		
Name	Multiplicity	Notes
name	1:1	The name of the antigen.

#### Immunization encounter (Class)

Notes: The immunization encounter is the event when patient is seen by the clinician for the purposes of

vaccination.

Attributes		
Name	Multiplicity	Notes
encounter date	1:1	The date when the patient received medical care related to
		immunization.
encounter	1:1	The location of the medical encounter.
location		

#### Immunization event(vaccine dose administered) (Class)

Notes: An immunization event records the receipt of one dose of vaccine.

Attributes			
Name	Multiplicity	Notes	
* administration	1:1	The route of vaccine administration	
route			
* approach site	1:1	The body site where vaccine was administered.	
* date	1:1	The date vaccine was administered	
administered			
* record source	1:1	This field indicates if the record is from a historical source or	
		was administered by the provider.	
dose amount	1:1	The quantity of vaccine administered	
dose amount	1:1	The unit of dose amount (e.g. ml)	
unit			
funding source	1:1	This indicates who actually paid for the immunization.	
status code	1:1	This may indicate that dose was considered compromised.	

#### other vaccine components (Class)

Notes: includes diluent, preservative, adjuvant

Attributes		
Name	Multiplicity	Notes
adjuvant	1:1	This is an additive intended to improve the effectiveness of the
		vaccine.
diluent	1:1	A diluent is the solution that is used to reconstitute vaccines.
preservative	1:1	A preservative is a compound added to vaccines to prevent
		spoilage.

**Relationships** 

Connector	Association	Туре
	other vaccine components.	Aggregation
	vaccine.	

### vaccine (Class)

*Notes*: A vaccine is a product that is intended to induce immunity when administered.

Attributes		
Name	Multiplicity	Notes
* product code	1:*	code indicating the vaccine administered. must accommodate the recording of historical vaccines with unspecified

		formulations.
trade name	1:1	product name of the vaccine administered. can be derived
		from post-coordination of vaccine product code and
		manufacturer.

#### **Relationships**

Connector	Association		Туре
	1*	antigen.	Aggregation
	1*	vaccine.	
		other vaccine components.	Aggregation
		vaccine.	
	1	vaccine.	Association
«induces immunity to»	1	target disease.	
	1*	Immunization event(vaccine dose	Association
«uses»	admini	stered).	
	1	vaccine.	
	1	vaccine.	Association
	0*	vaccine lot.	

#### vaccine group (Class)

*Notes*: Vaccine group is a conceptual grouping of vaccines which reflects the way clinicians organize the goals for a person's immunizations. In most cases they reflect the goals to prevent a single disease. In a few cases for some of the early combination vaccines, they reflect the goals for several diseases. (e.g. MMR, DTaP)

#### Attributes

11111011105		
Name	Multiplicity	Notes
VG name	1:1	The class of vaccines associated with one or more vaccine
		preventable diseases that are the target of published rules for
		vaccination (ACIP, for instance). There are some vaccine
		groups which include more than one disease (MMR).

#### vaccine lot (Class)

*Notes*: A vaccine lot is a batch of vaccine. This class represents all units of a vaccine lot controlled by a clinic. It is a subset of all vaccine associated with a vaccine lot.

Attributes			
Name	Multiplicity Notes		
* expiration date	1:1	The date when vaccine should no longer be used.	
* lot number	1:1	The lot number assigned by the manufacturer or relabeller	
NDC code	1:1	US specific code which includes:	
		◀ product	
		▲ labeler/manufacturer	
		packaging	

Relationships		
Connector	Association	Туре
	1* Immunization event(vaccine dose	Association
«is drawn from»	administered).	

Connector	Associ	ation	Туре
	01	vaccine lot.	
	1	vaccine lot.	Association
«distributed by»	1	product source.	
	1	vaccine.	Association
	0*	vaccine lot.	
	0*	Provider Organization.	Dependency
«manages»	1*	vaccine lot.	
	1	vaccine lot.	Association
	1*	package.	
	0*	vaccine lot.	Association
«supplies vaccine for»	0*	Immunization event(vaccine dose	
	admini	istered).	
	0*	vaccine lot.	Association
«maintained at»	0*	provider clinic site.	

### **Patient Package**

Notes:

The patient is the central character who has an immunization history and receives immunization. This package includes information specific to the patient including demographics and responsible persons.

### <u>Patient</u> Diagram

This model documents the important data that support clinical care and public health around immunization.



Figure: 2- Patient

### address (Class)

Notes: Address is a postal location specification.

Attributes		
Name	Multiplicity	Notes
address type	1:1	Classification of address. for example home address or
		business address.

* street	1:1	Street address. NVAC core data element for patient
* city	1:1	NVAC core data element for patient
* state	1:1	NVAC core data element for patient
country	1:1	

#### **Relationships**

Connector	Association	Туре
	<b>0</b> * person.	Association
	<b>0</b> * address.	

#### **Organization** (Class)

*Notes*: This class represents any organization which has relationships to a person.

#### Org to patient relationship (Class)

*Notes*:

Attributes		
Name	Multiplicity	Notes
*identifier	1:1	includes MR #, *birth registration number
active status	1:1	Indicates if the relationship between the patient and the
		organization is active.
begin date	1:1	
end date	1:1	
service type	1:1	The nature of service provided from provider to patient.

#### patient (Class)

*Notes*: The patient is the person receiving care from a provider.

#### **Relationships**

Connector	Association		Туре
		patient.	Generalization
«Is a»		person.	
	0*	responsible person.	Association
«Is responsible for»	1	patient.	
	1	patient.	Association
«has»	0*	patient conditions.	
	1	patient.	Association
«scoped by»	0*	Org to patient relationship.	
	1	patient.	Dependency
«has»	1	Immunization History.	
		patient.	Association
«has a»		Immunization history.	
		patient.	Dependency
		Person.	

#### patient conditions (Class)

*Notes*: Patient conditions are observations about the patient which impact forecasting next doses. These include allergies, previous adverse reactions and special risk factors.

#### **Attributes**

Name	Multiplicity	Notes
condition code	1:1	The code which identifies the condition that was observed.
condition	1:1	Text describing the condition/observation
description		
observation date	1:1	The date the condition was noted.
onset date	1:1	The date the condition began

### person (Class)

*Notes*: A person may play a number of roles, including patient, responsible person and clinician. This class contains primarily demographic information.

Attributes		
Name	Multiplicity	Notes
* date of birth	1:1	NVAC core data element for patient
* gender	1:1	NVAC core data element for patient
* primary	1:1	NVAC core data element for patient
language		
*birth order	1:1	
*birth state	1:1	
*Mother's	1:1	
Maiden Name		
birth country	1:1	
death date	1:1	
ethnicity	0: *	The self-reported ethnicity
multiple birth	1:1	
indicator		
occupation	0: *	
race	0: *	

<b>Relationships</b>	\$		
Connector	Associ	ation	Туре
	0*	person.	Association
«has a»	0*	telecommunications.	
		patient.	Generalization
«Is a»		person.	
	1	person.	Association
«has a»	0*	address.	
	0*	person.	Association
	01	School.	
	1	person.	Association
«has a»	0*	person identifier.	
	1	person.	Association
«has a»	0*	person name.	
	1	person.	Association
«reports a»	0*	Race.	
	1	person.	Association
«reports a»	0*	ethnicity.	
	0*	person.	Association
«has a»	0*	occupation.	
		responsible person.	Aggregation

Connector	Associa	ation	Туре
«is a»		person.	
	0*	person.	Association
	0*	address.	
	1	person.	Association
	0*	person identifier.	

#### person identifier (Class)

*Notes*:

#### **Attributes** Name Multiplicity Notes assigning 1:1 This is the authority responsible for creating this identifier. authority (the identifier owner) Id type 1:1 classifies the identifier. For example medical record number, birth registration number identifier This uniquely identifies the person in the context of the 1:1 assigning authority.

#### **Relationships**

Connector	Association	Туре
	1 person.	Association
	<b>0*</b> person identifier.	

#### person name (Class)

*Notes*:

#### **Attributes**

Name	Multiplicity	Notes
name type	1:1	
last name	1:1	
middle name	1:1	
given name	1:1	
name suffix	1:1	

#### provider organization (Class)

*Notes*:

Attributes

Name	Multiplicity	Notes
identifier	1:1	
name	1:1	

#### **Relationships**

Connector	Association	Туре
	provider organization.	Aggregation
«Is a»	Organization.	

### responsible person (Class)

*Notes*: This is the parent or guardian of the person who is the patient.

Attributes		
Name	Multiplicity	Notes
relationship	1:1	

### School (Class)

Notes: A school is an organization that some persons are associated with as students or teachers.

Attributes		
Name	Multiplicity	Notes
depart date	1:1	The date the student was no longer associated with the school.
enroll date	1:1	The date the student enrolled in the state.
grade	1:1	The grade in school of the person
school name	1:1	The name of the school

<b>Relationships</b>		
Connector	Association	Туре
	<b>0</b> * person.	Association
	<b>01</b> School.	

#### telecommunications (Class)

*Notes*:

Attributes		
Name	Multiplicity	Notes
telecommunicati	1:1	
on type		
* phone number	1:1	NVAC core data element for patient
email	1:1	

#### vital records organization (Class)

Notes: This class represents VR organizations.

Attributes		
Name	Multiplicity	Notes
name	1:1	
jurisdiction	1:1	
identifier	1:1	

#### **Relationships**

Connector	Association	Туре
	vital records organization.	Aggregation
«Is a»	Organization.	

### **Provider Organization Package**

*Notes:* This package contains information related to an organization with a relationship to a person.

#### **<u>Provider Organization</u>** Diagram



The provider organization is the entity that represents affiliated providers.

Figure: 3- Provider Organization

### address (Class)

Notes:

Attributes	1	
Name	Multiplicity	Notes
address type	1:1	
street	1:1	
city	1:1	
state	1:1	
country	1:1	

### Immunization event(vaccine dose administered) (Class)

Notes: An immunization event records the receipt of one dose of vaccine.

Attributes			
Name	Multiplicity	Notes	
* administration	1:1	route of vaccine administration	
route			
* approach site	1:1	body site where vaccine was administered.	
status code	1:1	This may indicate that dose was considered compromised.	
* record source	1:1	This field indicates if the record is from a historical source or	
		was administered by the provider.	
dose amount	1:1	quantity of vaccine administered	
dose amount	1:1	unit of dose amount (e.g. ml)	
unit			
* date	1:1	date vaccine was administered	
administered			
funding source	1:1	This indicates who actually paid for the immunization.	

<b>Relationships</b>				
Connector	Associ	ation	Т	уре
	01	provider.	А	ssociation
«orders»	0*	Immunization event(vaccine dose		
	admini	stered).		
	0*	vaccine lot.	A	ssociation
«supplies vaccine for»	0*	Immunization event(vaccine dose		
	admini	stered).		
	1	provider.	А	ssociation
	01	Immunization event(vaccine dose		
	admini	stered).		

### provider (Class)

*Notes*:

#### Attributes

Name	Multiplicity	Notes
credentials	1: *	provider licensing credentials
name	1:1	Name of provider
provider	1:1	Unique provider identifier
identifier		
provider type	1:1	professional type of provider

### provider clinic site (Class)

*Notes*:

<b>Attributes</b>		
Name	Multiplicity	Notes
name	1:1	Name of clinic site
provider clinic	1:1	Unique identifier of the clinic site
site identifier		-

#### provider organization (Class)

*Notes*: The provider organization is entity which represents one or more providers. It could be a large clinic system or a stand-alone provider.

#### Attributes

Name	Multiplicity	Notes
identifier	1:1	Unique identifier for the provider organization.
name	1:1	Unique text representation of the provider organization

#### telecommunications (Class)

*Notes*:

Attributes

Name	Multiplicity	Notes
telecommunicati	1:1	
on type		
phone number	1:1	
email	1:1	

### Schedule to immunization Package

*Notes:* This model shows the relationships between vaccines administered and the series defined in a schedule. The goal of the series is a to define a pathway to presumed immunity.

#### schedule to immunization Diagram

This model shows the relationship of vaccine doses administered and the rules used to validate and forecast.



Figure: 4- schedule to immunization

### antigen (Class)

HL7 Domain Analysis Model: Immunization, Release 1 May 2012 Notes: An antigen is the moiety which triggers an immune response in a recipient.

Attributes		
Name	Multiplicity	Notes
name	1:1	

#### Relationships

Connector	Association	Туре
	1* antigen.	Aggregation
	1* vaccine.	

#### adverse reaction (Class)

*Notes*: this is an adverse medical condition that is related in time to an immunization encounter and attendant immunization events.

Attributes		
Name	Multiplicity	Notes
adverse event	1:1	
adverse event	1:1	
date		

#### **Evaluation** (AssociationClass)

Notes: This represents the outcome of evaluation for the associated vaccine dose administered.

Attributes		
Name	Multiplicity	Notes
evaluation	1:1	Indicates the outcome of the evaluation of this vaccine dose
outcome		administered.
evaluation	1:1	Indicates any circumstances which impacted the validation of
reason		this vaccine dose administered.

### forecast (Class)

*Notes*: A forecast is a recommendation of when the target dose is due. This forecast is based on application of the rules of the series dose.

Attributes		
Name	Multiplicity	Notes
earliest date	1:1	date that is the earliest recommended date. this is not always
		the earliest date that a dose administered will be acceptable.
recommended	1:1	standard recommendation date
date		
Overdue date	1:1	Date when patient is considered behind schedule.
latest date	1:1	latest date patient should receive the vaccine

#### Immunization history (Class)

*Notes*: An immunization history is the record of a person's immunizations and the attendant information.

#### immunization schedule (Class)

*Notes*: The immunization schedule is the published rules for evaluating vaccines administered and for forecasting next doses due.

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Attributes		
Name	Multiplicity	Notes
schedule id	1:1	
name	1:1	
release date	1:1	

#### patient (Class)

*Notes*: the patient is the person receiving care from a provider.

Attributes		
Name	Multiplicity	Notes
*birth order	1:1	
multiple birth	1:1	
indicator		
*birth state	1:1	
birth country	1:1	
* Mother's	1:1	NVAC core data element
maiden last		
name		

#### patient conditions (Class)

*Notes*: Patient conditions are observations about the patient which impact forecasting next doses. These include allergies, previous adverse reactions and special risk factors.

Attributes		
Name	Multiplicity	Notes
condition code	1:1	The code which identifies the condition that was observed.
condition	1:1	Text describing the condition/observation
description		
observation date	1:1	The date the condition was noted.
onset date	1:1	The date the condition began

<b>Relationships</b>			
Connector	Associ	ation	Туре
	1	patient.	Association
«has»	0*	patient conditions.	
		patient conditions.	Aggregation
		Immunization history.	

#### **Patient series (Class)**

*Notes*: Patient Series is an instantiation in time of the Series that represents one path towards the goal of protection against a disease. It consists of a number of Target Doses.

Attributes		
Name	Multiplicity	Notes
series name	1:1	
number of doses	1:1	
status	1:1	
(complete/not		

complete)		complete)		
-----------	--	-----------	--	--

#### series (Class)

Notes: A series is one path to meet the goals for assuming protection against a target disease.

Attributes		
Name	Multiplicity	Notes
name	1:1	
number of doses	1:1	
series rules	1:1	see schedule domain model

<b>Relationships</b>		
Connector	Association	Туре
	series. target disease.	Association

#### Series Dose (Class)

*Notes*: A series dose is specification of how to determine if a particular dose administered meets the goals for that dose in the series.

Attributes		
Name	Multiplicity	Notes
dose number	1:1	

#### target disease (Class)

*Notes*: The target disease is the disease that a vaccine is intended to prevent.

#### Attributes

Name	Multiplicity	Notes
disease name	1:1	The disease which is intended to be prevented by the vaccine.

#### Relationships

Connector	Association	Туре
	series.	Association
	target disease.	

#### target dose (Class)

*Notes*: Each target dose is one step in a patient series.

**Attributes** 

Name	Multiplicity	Notes
dose number	1:1	
dose status (eg	1:1	
satisfied)		

### vaccine (Class)

Notes: A vaccine is a product that is intended to induce immunity when administered.

Attributes		
Name	Multiplicity	Notes
Name	Multiplicity	Notes

* product code	1:1	code indicating the vaccine administered. must accommodate the recording of historical vaccines with unspecified formulations.
trade name	1:1	product name of the vaccine administered. can be derived from post-coordination of vaccine product code and manufacturer.

#### **Relationships**

Connector	Assoc	iation	Туре
	1*	antigen.	Aggregation
	1*	vaccine.	
		target disease.	Association
		vaccine.	
		vaccine.	Association
		vaccine dose administered.	
		antigen.	Aggregation
		vaccine.	

#### vaccine dose administered (Class)

*Notes*: The vaccine dose administered is record of the actual immunization event.

Attributes		
Name	Multiplicity	Notes
dose amount	1:1	quantity of vaccine administered

### vaccine group (Class)

*Notes*: Vaccine group is a conceptual grouping of vaccines which reflects the way clinicians organize the goals for a person's immunizations. In most cases they reflect the goals to prevent a single disease. In a few cases for some of the early combination vaccines, they reflect the goals for several diseases. (e.g. MMR, DTaP)

Attributes		
Name	Multiplicity	Notes
VG name	1:1	The class of vaccines associated with one or more vaccine
		preventable diseases that are the target of published rules for
		vaccination (ACIP, for instance). There are some vaccine
		groups which include more than one disease (MMR).

## **Dynamic Model:**

The dynamic model captures the tasks and behaviors around immunization. The use case models show how the needs of various actors are met. The Activity diagrams show the high level work flow and system behavior. There are numerous architectures deployed today. These models seek to be neutral to these differences. The point to take away is that regardless of architecture, there are important use cases which need to be considered and accommodated in any of these architectures.

## Package: PHER Immunization DAM Use Case

Notes: This package contains the Use Cases developed for Release 11 of the PHER Immunization Domain Analysis Model.

# Use Case System View (Use Case Di

This diagram illustrates the relationships between major systems and activities. Each package contains diagrams, which include the actors and use cases required to support the goals of the parent package. Note that the major actors are those with primary association with the packages and use cases in this diagram. Other actors not shown in this diagram will be found in the sub-diagrams.



Figure: 1--Use Case System View

## Package: P01:Manage Patie \_\_\_\_\_nformation

Notes: This package contains use cases related to managing patient identify and demographics.

Parent: PHER Immunization DAM Use Case

### UC01: Manage Patient Information (Use Case Diagram)

This diagram shows the use cases and actors participating in Patient demographic data and identity management.



Figure: 2--UC01: Manage Patient Information

### UC01.2: Manage Patient Demographics (Use Case Diagram)

This diagram shows the actors and tasks associated with recording patient demographics.



Figure: 3--UC01.2: Manage Patient Demographics

### UC01.1.1 Manage Identifiers (Use Case Diagram)

The goal of this use case is to support recording and management of personal identifiers.



Figure: 4--UC01.1.1 Manage Identifiers

Element Type	Name	Notes
Actor	A01: Immunization Information	According to the CDC IISSB:
	System	Immunization Information Systems are
		confidential, population-based,
		computerized information systems that
		attempt to collect vaccination data about
		all persons within a geographic area.
Actor	A03: Patient Registry	A patient registry is an information
		system with the goal of maintaining
		demographic information about a patient.
		Included in this function is tracking
		identifiers from different sources.
Actor	A12: Electronic Health Record	An electronic health record system is an
	System	information system which contains
		patient's medical records.
Actor	A17: PHR system	This is the Personal Health Record
		system. It houses a health record owned
		and maintained by the person it is about.
Actor	AR10: Identifier Consumer	The goal of this actor is to use the

		<ul> <li>services of an identifier provider. Among the entities that are likely to fulfill this role are:</li> <li>EHR</li> <li>IIS</li> <li>PHR</li> <li>Public health information systems</li> <li>Health information exchange</li> <li>Adverse event registry</li> </ul>
Actor	AR11: Identifier supplier	<ul> <li>The goal of this actor is to be a register of identifiers. Entities that may play this role include:</li> <li>Master patient index</li> <li>IIS</li> <li>HIE</li> </ul>
Actor	AR12: Demographic consumer	<ul> <li>This actor consumes demographic information from demographic suppliers. Entities that may play this role include:</li> <li>IIS</li> <li>EHR</li> <li>PHR</li> <li>PH system</li> <li>Adverse Event registry</li> </ul>
Actor	AR13: Demographic supplier	<ul> <li>The goal of this actor is to supply demographic information to other actors. Entities that may play this role include:</li> <li>IIS</li> <li>EHR</li> <li>PHR</li> <li>Vital Records System</li> </ul>
Use Case	UC01.1 Manage Identifiers	The goal of this use case is to manage
Use Case	UC01.1.1.1: register identifiers	Identifiers of patients.The goal of this use case is to registerpatient identifiers with an identity

		resolution system/service.
Use Case	UC01.1.1.2: request identifiers	The goal of this use case is to get
		identifiers for a patient based on
		specified parameters. The parameters
		may be demographic or may rely on
		cross-referencing identifiers.
Use Case	UC01.1.1.3: Cross-reference	The goal of this use case is to maintain a
	identifiers	cross reference of patient identifiers.
Use Case	UC01.1.1.4 Return identifiers	The goal of this use case is to return
		patient identifiers in response to a
		request for identifiers.
Use Case	UC01.1.1.5 Receive identifiers	The goal of this use case is to receive
		identifiers from id source in response to a
		request for identifiers.
Use Case	UC01.1.1.6: Accept registrations	The goal of this use case is to accept new
		and updated registration of identifiers.
Use Case	UC01.2: Manage patient	The goal of this use case is to manage the
	demographics	demographic data of a patient.
Use Case	UC01.2.1: Record patient	The goal of this use case is to record
	demographics	patient demographic information in an
		information system. It includes updating
		patient demographics. this use case may
		be accomplished by a direct user
		interface or by system to system
		communication.
Use Case	UC01.2.2: Request patient	The goal of this use case is to request
	demographics	demographic information on a patient
		based on selected parameters. These
		parameters may be demographic or
		identifier. the identifier may be
		previously known by the consumer or
		obtained from an identifier supplier, such
		as an MPI.
Use Case	UC01.2.3: Return patient	The goal of this use case is to return
	demographics	patient demographics in response to a
		request.
Use Case	UC01.2.4: Receive patient	The goal of this use case is to receive
	demographics	patient demographics. This may occur
		after sending a request or be unsolicited.
Use Case	UC01.3: Deduplicate patients	The goal of this use case is to assure an
		unduplicated registry of persons
		(patients). This may be part of an MPI or
		other information system, including IIS.

# Package: P02: Manage Imm

Notes: This package contains use cases related to recording, updating and retrieving immunization history.

Parent: PHER Immunization DAM Use Case

### UC02 Manage Immunization History Use Case (Use Case Diagram)

This diagram shows the use cases and actors participating in management of Immunization Histories.



Figure: 5--UC02 Manage Immunization History Use Case

UC02.01 Record Immunization History (Use Case Diagram)



Figure: 6--UC02.01 Record Immunization History

UC01.1.1 Manage Identifies (Use Case Diagram)


Figure: 7--UC01.1.1 Manage Identifies

Element Type	Name	Notes
Actor	A01: Immunization Information	According to the CDC IISSB:
	System	Immunization Information Systems are
		confidential, population-based,
		computerized information systems that
		attempt to collect vaccination data about
		all children within a geographic area.
Actor	A12: Electronic Health Record	An electronic health record system is an

	System	information system which contains patient's medical records.
Actor	A17: PHR system	This is the Personal Health Record system. It houses a health record owned and maintained by the person it is about.
Actor	AR01: Immunization History Supplier	<ul> <li>This actor supplies immunization data to other systems, particularly Immunization History consolidators</li> <li>Some of the immunization history suppliers include:</li> <li>Electronic Health Record systems</li> <li>Personal Health Record systems</li> <li>Immunization Information Systems</li> </ul>
Actor	AR09: Identifier provider	<ul> <li>The goal of this actor is to be a register of identifiers. Entities that may play this role include:</li> <li>Master patient index</li> <li>IIS</li> </ul>
Actor	AR10: Identifier Consumer	<ul> <li>The goal of this actor is to use the services of an identifier provider. Among the entities that are likely to fulfill this role are:</li> <li>EHR</li> <li>IIS</li> <li>PHR</li> <li>Public health information systems</li> <li>Health information exchange</li> <li>Adverse event registry</li> </ul>
Use Case	UC01.1 Manage Identifiers	The goal of this use case is to manage identifiers of patients.
Use Case	UC01.1.1.1: register identifiers	The goal of this use case is to register patient identifiers with an identity resolution system/service.
Use Case	UC01.1.1.2: request identifiers	The goal of this use case is to get identifiers for a patient based on specified parameters. The parameters may be demographic or may rely on

		cross-referencing identifiers.
Use Case	UC01.1.1.3: Cross-reference	The goal of this use case is to maintain a
	identifiers	cross reference of patient identifiers.
Use Case	UC01.1.1.4 Return identifiers	The goal of this use case is to return
		patient identifiers in response to a
		request for identifiers
Use Case	UC01 1 1 5 Receive identifiers	The goal of this use case is to receive
0.50 0.450		identifiers from id source in response to a
		request for identifiers
Use Case	UC01 1 1 6: Accept registrations	The goal of this use case is to accept new
ose cuse		and undated registration of identifiers
Lise Case	UC02.01.1: Record immunizations	The goal of this use case is to record
Use Case		individual immunization records
Lice Case	UC02.01.2: Pagard alignt conditions	The goal of this use area is to record.
Use Case	0C02.01.2. Record cheft conditions	alient conditions, such as allergies and
		immunities
Line Cone	LICO2 01 2: record reactions	The cool of this was ease is to record
Use Case	UC02.01.3. record reactions	The goal of this use case is to record
		potential adverse events related in time
U. C		with an immunization.
Use Case	UC02.01: Record Immunization	The goal of this use case is to record
	History	immunization history in information
		system. An immunization history
		includes all immunizations, patient
		demographics and patient conditions. It
		may include functionality from record
		demographics use case. This use case
		may be accomplished by direct access
		via user interface or by system to system
		communication.
Use Case	UC02.02: Request Immunization	The goal of this use case is to request a
	History	complete immunization history from an
		information system, based on specified
		parameters. These could be demographic
		information or patient identifiers known
		or obtained from MPI.
Use Case	UC02.03: Receive Immunization	The goal of this use case is to receive an
	History	immunization history from another
		system. It could be unsolicited or in
		response to a query.
Use Case	UC02.04: Return immunization	The goal of this use case is to return an
	history	immunization history in response to a
		request for immunization history.
Use Case	UC02.06 Deduplicate immunizations	The goal of this use case is to
	· · · · · · · · · · · · · · · · · ·	deduplicate immunization records.
Use Case	UC02 07 Consolidate Immunization	The goal of this use case is to consolidate
2.50 2.450	History	immunization information from different
	110001	sources. It may accomplish this by
		storing them centrally like an IIS or it
		may keen track of where the original data
		are and get them when needed
1		are and get ment when headed.

# Package: P03: Clin Decision Support

Notes: This package contains use cases related to immunization CDS. It does not contain use cases related to schedule development. Those use cases are found in a separate package.

Parent: PHER Immunization DAM Use Case

#### UC03 Clinical Decision Support (Use Case Diagram)

This diagram shows the use cases and actors participating in Clinical Decisions Support. It does not contain use cases related to schedule development.



Figure: 8--UC03 Clinical Decision Support

UC03.2 Return CDS (Use Case Diagram)



Figure: 9--UC03.2 Return CDS

Element Type	Name	Notes
Actor	AR06: Evaluation/forecast provider	<ul> <li>This actor evaluates a patient's immunization history and other factors and produces a forecast of next doses due. It also returns the evaluation of the history. Actors who may play this role include:</li> <li>IIS</li> <li>CDS service</li> </ul>

		• EHR
Actor	AR07: Evaluation/forecast consumer	<ul> <li>This actor may represent any system which requests and receives CDS services. Actors who may play this role include:</li> <li>EHR</li> <li>PHR</li> <li>HIE</li> <li>IIS</li> <li>School</li> <li>Day care</li> <li>Payer</li> </ul>
Use Case	UC03.1: Request CDS	The goal of this use case is to request clinical decision support (evaluation and forecast) for a given patient. We assume that the pertinent immunization history is supplied to support this request.
Use Case	UC03.2: Return CDS	The goal of this use case is to return an evaluated immunization history and forecast of next doses due. We assume that an immunization history is available for the patient in question.
Use Case	UC03.2.1 Evaluate history	The goal of this use case is to evaluate the history based on the selected rule set/schedule.
Use Case	UC03.2.2 Forecast next due	The goal of this use case is to forecast the next doses due for the person based on the history and the specified rule set/schedule.
Use Case	UC03.3 Receive CDS	The goal of this use case is to receive the output of a CDS service.

# Package: P04: Manage verse Event Reporting

Notes: This package contains use cases to reporting of adverse events.

Parent: PHER Immunization DAM Use Case

UC04 Manage Adverse Event Reporting (Use Case Diagram)





Figure: 10--UC04 Manage Adverse Event Reporting

Element Type	Name	Notes
Actor	A01: Immunization Information	According to the CDC IISSB:
	System	Immunization Information Systems are
		confidential, population-based,
		computerized information systems that
		attempt to collect vaccination data about
		all persons within a geographic area.
Actor	A02: Patient	A patient is a person receiving health
		care. In our models, this is generally
		related to immunization.
Actor	A04: Provider	A provider is a person providing health
		care, that is a clinician.
Actor	A09: Public Health	Public Health (also known as population
		health) fulfills a number of roles related
		to immunization. It is concerned about
		promoting the health of the population.
Actor	A12: Electronic Health Record	An electronic health record system is an
	System	information system which contains

		patient's medical records.
Actor	A13: Health Information Exchange	This actor acts as a hub to facilitate
		access to consolidated health records
		from multiple sources.
Actor	A19: Adverse Event Registry	This actor represents the system intended
		to capture and track adverse events. It is
		typically a national effort.
Use Case	UC04.1: Report Adverse Event	The goal of this is use case is to report
		adverse events. This can be either via
		direct interface or by electronic
		transmission.
Use Case	UC04.2: Receive Adverse Event	The goal of this use case is to receive
		adverse event information.

# Package: P05: Manage V

Notes: This package contains use cases supporting Vaccine management. Includes manufacture, distribution and inventory management.

Parent: PHER Immunization DAM Use Case

#### UC05: Manage Vaccine (Use Case Diagram)

This diagram shows the use cases and actors participating in vaccine management.



Figure: 11--UC05: Manage Vaccine

#### UC05.4 Manage Vaccine inventory (Use Case Diagram)

This Use Case diagram includes the activities associated with managing inventory in an information system.



Figure: 12--UC05.4 Manage Vaccine inventory

Element Type	Name	Notes
Actor	A01: Immunization Information	According to the CDC IISSB:
	System	Immunization Information Systems are
		confidential, population-based,
		computerized information systems that
		attempt to collect vaccination data about
		all persons within a geographic area.
Actor	A08: Manufacturer	A manufacturer makes products,
		vaccines in our case.
Actor	A10: Distributor	This actor distributes vaccine from
		manufacturer to end users.
Actor	A12: Electronic Health Record	An electronic health record system is an
	System	information system which contains

		patient's medical records.
Actor	A16: Relabeller	A relabeller repackages vaccines and
		sells them under their label.
Actor	AR08: Inventory Management supplier	This actor tracks vaccine inventory. It tracks orders, shipments, transfers,
		wastage, usage. Some systems which
		may play this fole include.
		• 115
		• EHR
		• Distributor
Use Case	UC05.1: Manufacture vaccine	The goal of this use case is to make
		vaccine.
Use Case	UC05.2: package vaccine	The goal of this use case is package
		vaccine for distribution.
Use Case	UC05.3: Label vaccine	The goal of this use case is to label vaccine for distribution.
Use Case	UC05.4: Manage Vaccine inventory	The goal of this use case is to manage
		inventory of vaccine. This includes
		ordering, accepting, decrementing (use
		or waste) and transferring vaccine
Lice Core	UC05 4 1 Order vassing	The goal of this was easy is to order
Use Case	OC03.4.1 Order vacchie	vaccine from a supplier
Use Case	UC05.4.2; receive vaccine	The goal of this use case is to receive
		vaccine and record into inventory.
Use Case	UC05.4.3 Ship vaccine	The goal of this use case is to ship or
	-	transfer vaccine from one inventory to
		another.
Use Case	UC05.4.4 Reconcile inventory	The goal of this use case is to reconcile
		actual stock on hand with inventory.
Use Case	UC05.4.5: Record usage	The goal of this use case is record
		vaccine usage. When a dose is
		administered or wasted, it is recorded.
Use Case	UC05.5: Distribute vaccine	The goal of this use case is to distribute
		vaccine to provider organizations.It
		includes activiies such as relabelling.

# Package: P06: Clinic

Notes: This package contains use cases related to clinical care and immunization. These use cases represent the actual care given to the patient.

Parent: PHER Immunization DAM Use Case

UC06 Clinical Care (Use Case Diagram)



This diagram shows the clinical care activities related to immunization. These use cases represent the actual care given to the patient.

Figure: 13--UC06 Clinical Care

#### UC06.04 Evaluate patient (Use Case Diagram)

The goal of this use case is to evaluate the immunization needs of a patient.



Figure: 14--UC06.04 Evaluate patient

Element Type	Name	Notes
Actor	A02: Patient	A patient is a person receiving health
		care. In our models, this is generally
		related to immunization.
Actor	A02: Patient	A patient is a person receiving health
		care. In our models, this is generally
		related to immunization.
Actor	A03: Patient Registry	A patient registry is an information
		system with the goal of maintaining
		demographic information about a patient.
		Included in this function is tracking
		identifiers from different sources.

Actor	A04: Provider	A provider is a person providing health
		care, that is a clinician.
Actor	A12: Electronic Health Record	An electronic health record system is an
	System	information system which contains
		patient's medical records.
Actor	AR01: Immunization History	This actor supplies immunization data to
	Supplier	other systems, particularly Immunization
		History consolidators
		Some of the immunization history
		suppliers include:
		Electronic Health Record systems
		Personal Health Record systems
		Immunization Information Systems
		5
Actor	AR06: Evaluation/forecast provider	This actor evaluates a patient's
		immunization history and other factors
		and produces a forecast of next doses
		due. It also returns the evaluation of the
		history. Actors who may play this role
		include:
		• IIS
		- 115
		CDS service
		• EHR
Use Case	UC06.1: Administer Vaccine	The goal of this use case is to administer
		vaccine to a patient.
Use Case	UC06.2: Record clinical care	The goal of this use case is to record
		clinical care, usually in EHR. We do not
		go into great depth here as that is part of
		another Domain Analysis Model.
Use Case	UC06.3 Evaluate patient	The goal of this use case is to evaluate a
		patient's condition in order to determine
		if immunization is appropriate. We will
		not elaborate as this belongs in another
		Domain Analysis model.
Use Case	UC02.02: Request Immunization	The goal of this use case is to request a
	History	complete immunization history from an
		information system, based on specified
		parameters. These could be demographic
		information or patient identifiers known
		or obtained from MPI.
Use Case	UC02.03: Receive Immunization	The goal of this use case is to receive an
	History	immunization history from another
	11100019	system It could be unsolicited or in

Use Case	UC02.04: Return immunization history	The goal of this use case is to return an immunization history in response to a request for immunization history
Use Case	UC03.1: Request CDS	The goal of this use case is to request clinical decision support (evaluation and forecast) for a given patient. We assume that the pertinent immunization history is supplied to support this request.
Use Case	UC03.2: Return CDS	The goal of this use case is to return an evaluated immunization history and forecast of next doses due. We assume that an immunization history is available for the patient in question.

Package: P07: Manageports
Notes: This package contains use cases related to a wide variety of reports.

Parent: PHER Immunization DAM Use Case

UC07.3 Create report (Use Case Diagram)



Figure: 15--UC07.3 Create report

#### UC07: Manage Reports (Use Case Diagram)

This diagram contains use cases related to a wide variety of reports. These use cases illustrate the basic process of report creation.



Figure: 16--UC07: Manage Reports

Element Type	Name	Notes
Actor	AR03: Immunization history	This actor is interested in using / getting
	consumer	consolidated immunization history for
		individuals. Actors who may play this
		role include:
		• EHR
		• PHR
		• IIS
		• Patient
		• Provider
		• Public Health
		Schools
		• Daycare

		<ul> <li>Camps</li> <li>Payor</li> <li>Employer</li> <li>Evaluation and forecasting provider</li> <li>Adverse Event registry</li> </ul>
Actor	AR04: Immunization Report consumer	<ul> <li>This actor requests and uses</li> <li>immunization reports. Actors who may</li> <li>play this role include:</li> <li>EHR</li> <li>PHR</li> <li>Patient</li> <li>Provider</li> <li>Public Health</li> <li>Government Payer</li> <li>Non-governmental Payer</li> <li>Government agency</li> <li>Adverse Event registry</li> </ul>
Use Case	UC07.1: Request report	The goal of this use case is to request a report.
Use Case	UC07.2: Deliver report	The goal of this use case is to deliver a report . This report may be in response to a request/query or be unsolicited.
Use Case	UC07.3.1 Gather data	The goal of this use case is to data of interest, based on specified parameters.
Use Case	UC07.3.2 package report	The goal of this use case is to package the report for return.
Use Case	UC07.3.3 prepare data	The goal of this use case is to prepare data for use by a report. This might include calculations, calls to CDS service, sorting or other processing.
Use Case	UC07.3: Create reports	The goal of this use case is to create reports (aggregate and list) based on specified parameters. It may include coverage reports, vaccine usage reports, vaccine availability reports, etc.

# Package: P08: Manage CDS Rul

Notes: This package contains use cases related to creating and maintaining immunization schedule rules.

Parent: PHER Immunization DAM Use Case

#### UC08: Manage CDS Rules (Use Case Diagram)

This diagram shows the use cases and actors participating in management of rules and supporting data required by Clinical Decisions Support.



Figure: 17--UC08: Manage CDS Rules

Element Type	Name	Notes
Actor	A01: Immunization Information	According to the CDC IISSB:
	System	Immunization Information Systems are
		confidential, population-based,
		computerized information systems that
		attempt to collect vaccination data about
		all persons within a geographic area.
Actor	A19: Adverse Event Registry	This actor represents the system intended
		to capture and track adverse events. It is
		typically a national effort.
Actor	A20: Designated SME group	This is the group of clinical SME
		responsible for rule development. An
		example in the US would be the ACIP.
Actor	A21: CDS support SME	This is a SME who integrates series rules
		into CDS engine.
Actor	AR05: Immunization Report creator	This actor supplies immunization reports.
		It requires participation of an
		Immunization History Consolidator in

		<ul> <li>most cases. Actors who may play this role include:</li> <li>IIS</li> <li>HIE</li> <li>EHR</li> <li>Public Health</li> </ul>
Use Case	UC08.1: develop series rules	The goal of this use case is to develop the rules used by CDS to evaluate immunization histories and forecast next dose.
Use Case	UC08.2: publish rules	The goal of this use case is publish the series rules developed to guide immunization practices.
Use Case	UC08.3 interpret rules	The goal of this use case is to interpret the published rules.
Use Case	UC08.4: integrate rules	The goals of this use case are to integrate the series rules as published.

# Package: P09: transform for

Notes: This use case moves data from one format to another. In the HL7 world, this might be from V2 message to V3 document.

Parent: PHER Immunization DAM Use Case

#### **P09: transform format (Use Case Diagram)**

This use case package transforms data from one format to another. For instance a CDA document may be transformed to a Version 2.5.1 message.



Figure: 18--P09: transform format

Element Type	Name	Notes
Actor	AR13: Demographic supplier	<ul> <li>The goal of this actor is to supply demographic information to other actors. Entities that may play this role include:</li> <li>IIS</li> <li>EHR</li> <li>PHR</li> <li>Vital Records System</li> </ul>
Use Case	UC09.1 transform data	This use case transforms data in one format to another.
Use Case	UC 9.2: read data	This use case reads the incoming data object.

Use Case	UC 9.3: write data	This use case writes the transformed data
		to the new format.

# **Activity Diagrams:**

## F01: Manage Patient Information (Package Diagram)



Figure: 1

# F02: Manage Immunization History (Package Diagram)



Figure: 2

## F03: Clinical Decision Support (Package Diagram)



Figure: 3

## F04: Manage Adverse Event Reporting (Package Diagram)



Figure: 4

### F05.4: Manage Vaccine Inventory (Package Diagram)





## F06: Clinical Care (Package Diagram)



Figure: 6

## F07: Manage Reports (Package Diagram)



Figure: 7

## F08: Manage CDS rules (Package Diagram)



Figure: 8

#### F09: Transform format (Package Diagram)



Figure: 9

F01.01: register identifiers (Activity Diagram)



Figure: 10

Element Type	Element Name	Notes
Activity	Validate data	This activity applies local
		business rules to validate the
		data.
Activity	create new record	
Activity	integrate data	This activity follows local
		business rules to integrate the
		new information into existing
		person record.
Activity	manage multiple matches	This activity follows local
		procedures for handling multiple

		matches.
Activity	resolve identity	Determine if this person already
		exists in the identity registry.
Event	receive acknowldegment	
Event	receive idetifiers	The identity manager receives the
		identifiers and parses them for
		processing.
Event	send acknowledgement	Notify the system attempting to
		register person of outcome.
Event	send person identifiers	This activity sends the identifiers
		for a person.
DecisionNode	matches	Do we find an exact match,
		multiple matches or no match?

F01.02: request identifiers (Activity Diagram)



Figure: 11

Element Type	Element Name	Notes
Activity	create request for id	This activity builds the request
		for identifiers according to agreed
		profile.
Activity	process multiple matches	Follow local procedures for
		handling multiple matches.
Activity	resolve identity	This activity finds the person of
		interest.
Activity	return requested ids	This activity returns the requested
		ids for the person.
Activity	validate request	This activity validates the request

		against local business rules.
Event	acknowledgement	send acknowledgement of
		outcome
Event	no matches found	return acknowledgement that no
		matches have been found.
Event	receive acknowledgement	
Event	receive ids	
Event	receive request for id	This activity accepts the request
		and parses it.
Event	return ids	
Event	send request for id	
DecisionNode	matches	

#### F01.03 cross reference identifiers (Activity Diagram)

This activity is a specialization of the register and request identifiers. It maintains a cross reference of identifiers. It returns an identifier for one system when another system requests an identifier for the first system. The request is based on the second system identifier being cross mapped to the first system identifier.



Figure: 12

Element Type	Element Name	Notes
Activity	F01.3.1: create identifier request	This request includes the identity
		consumer system identifier.
		Identity consumer system

		identifies the system who owns
		the identifier being requested.
Activity	F01.3.2: process request	This activity applies local
		business rules.
Activity	F01.3.3: get requested identifier	This activity finds the requested
		identifier of the system identified
		in the request.
Activity	F01.3.4: package data for return	
Event	receive identifiers	
Event	receive request	This event accepts the request
		and parses it into native format.
Event	return identifiers	
Event	send request	This event includes packaging the
		request into the appropriate
		format.

F01.04 record patient demographics (Activity Diagram)



Figure: 13

Element Type	Element Name	Notes
Activity	F01.04.1 record demographic	This activity may create new
	information	information or update existing
		information.
Activity	F01.04.2 process received data	This activity applies local
		business rules.
Activity	process multiple matches	Follow local procedures for
		handling multiple matches.
Activity	resolve identity	This activity finds the person of
		interest.
Activity	return requested ids	This activity returns the requested
		ids for the person.
Activity	validate request	This activity validates the request
		against local business rules.
Event	acknowledgement	send acknowledgement of
--------------	---------------------------------	-------------------------------------
		outcome
Event	no matches found	return acknowledgement that no
		matches have been found.
Event	receive acknowledgement	
Event	receive demographic information	This activity accepts the
		incoming artifact and parses it
		into native format.
Event	receive ids	
Event	receive request for id	This activity accepts the request
		and parses it.
Event	return ids	
Event	send demographic information	This activity formats the pertinent
		data into the correct artifact and
		sends to the receiving system.
Event	send request for id	
DecisionNode	matches	

F01.05: request patient demographics (Activity Diagram)



Figure: 14

Element Type	Element Name	Notes
Activity	Create request for demographics	This activity may call on an
		identity management service to
		cross reference ids. It will include
		the required request parameters
		expected by the demographics
		supplier.
Event	receive request	This event parses the incoming
		request.
Event	send request	



Figure: 15

Element Type	Element Name	Notes
Activity	Resolve identity/match	This activity determines if the incoming data belongs to an existing person in the immunization history supplier.
Activity	create new patient history	
Activity	integrate data into Immunization history	This activity integrates the incoming data into existing immunization history. This includes deduplicating

		immunization records.
Activity	multi-match process	Systems will have processes for
		dealing with matching more than
		one existing person.
Activity	process received data	This activity validates the
		received data and processes local
		business rules.
Activity	record patient care	This activity records current
		patient care activities, such as
		immunization in the health
		information system.
Activity	record patient history	This activity records patient
		health information from historical
		sources and patient report in the
		health information system, such
		as an EHR.
Event	receive acknowledgement	
Event	receive immunization history	This activity receives
		immunization history information
		from health information system.
		This includes authenticating and
		parsing the received data.
Event	send acknowledgement	
Event	send immunization history	This activity extracts pertinent
		data from the health information
		system and sends to the
		immunization history supplier.
		This information may be all
		immunization related information
		known to the sender or only the
		most current updates to the
		immunization history.
DecisionNode	indentity resolved	

F02.02 Request immunization history/ Return immunization history (Activity Diagram)

This activity shows both the request and return of immunization history.



Figure: 1	6
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Element Type	Element Name	Notes
Activity	find requested patient	This process finds the requested
		patient. It may do identity

		resolution internally or request
		from an external source.
Activity	formulate request	This activity formulates the
		request for a specific patient's
		immunization history. It may
		include a call to an identity
		resolution service, such as a
		Master Person Index.
Activity	gather data	This activity gathers the relevant
		data for the patient. It may rely
		on an HIE to pull data from a
		number of sources.
Activity	prepare immunization history	This activity prepares the
		immunization history for return
		to the requester. It is packaged
• · · ·		into a message or document.
Activity	process request	This activity processes local
	· · · ·	business rules.
Event	receive request	This activity accepts the request
		and includes authentication and
		parsing of the request.
Event	receive response	
Event	send No matches	
Event	send immunization history	
Event	send request	This activity sends the requesting
		query to the immunization history
A stimited	initiata na avast	Some extendelse for or
ActivityInitial	initiate request	Some actor asks for an
DesisionNede	actions formal	Immunization history.
DecisionNode	patient found	
DecisionNode	privacy required	If the person does not allow
		then the immunization history
		supplier may not return on
		supplier may not return an
		minumization history.

F02.03 Receive immunization history (Activity Diagram)



Figure: 17

Element Type	Element Name	Notes
Activity	display data	
Activity	integrate data	This is a multifaceted process which follows local business rules to deduplicate immunization events and integrate into any existing history. In the case where the received data is a document.
		the data may be harvested or the document may be stored intact.
Activity	process received history	This activity applies local business rules and validates the data.
Activity	resolve person identity	This activity determines if the person is the one of interest. In an automated this is determined by business rules. It may call on external resources such as an MPI.
Event	receive immunization history	This event accepts an

		immunization history. It authenticates and parses the data.
Event	send immunization history	This activity follows a set of
		activities which gather and
		package the information.
ActivityFinal	ActivityFinal	
DecisionNode	identity resolution	This resolution may be automated
		or may involve human review.
		For example, if a clinician
		working on an EHR may request
		immunization records for a given
		patient. He/she may review the
		returned history and determine it
		is not for the patient of interest.
DecisionNode	integrate data	Some systems may only display
		the data, while others may
		incorporate it into local data
		stores.

## F03 Manage CDS (Activity Diagram)

This activity gathers the relevant data, identifies the appropriate rule set and parameter. It includes this in a request to a CDS supplier. Note that the actual architecture may vary. It then generates the evaluation and forecast and returns to the requester.





Element Type	Element Name	Notes
Activity	Evaluate history	This activity evaluates the

		immunization history of the
		person and determines whether
		the doses received are
		appropriately given. It also
		identifies the specific series that
		will be used for the forecasting
		step.
Activity	Return evaluated history and	This activity packages the results
	forecast	from the evaluation and the
		forecast and returns to the
		requester.
Activity	Select rule set	This activity identifies the
	~	schedule (rule set and supporting
		parameters) that will be used by
		the CDS Note that the CDS may
		support only one schedule
Activity	create request	This activity packages the data
<i>i</i> totivity	create request	and forwards it to the CDS
		provider
Activity	forecest payt doses due	This activity applies the relevant
Activity	Torceast next doses due	rules and parameters to a forecast
		af next decas due
		Of next doses due.
Activity	gather relevant data	Gather the relevant immunization
		history data, including patient
A	1.	conditions.
Activity	prepare data	this step organizes the
		immunization history into a
		useful configuration in
		preparation for processing.
Activity	utiliize CDS	This activity may incorporate into
		the display of the consumer
		system. It may also make other
		use of the information, like
		supporting creation of reminder
		reports.
Event	receive CDS	
Event	receive request	
Event	return CDS	
Event	send request	
ActivityFinal	ActivityFinal	
ActivityInitial	ActivityInitial	

F04: Manage Adverse Event Reporting (Activity Diagram)





Element Type	Element Name	Notes
Activity	F04.1: gather clinical information	This activity gathers information
		from patient report, clinical
		records and immunization
		history. It may require receipt of
		this data from various sources.
Activity	F04.2: create adverse event report	This activity composes the report
		into the prescribed format.
Activity	F04.3: process report	This activity applies local
		business rules and prepares the
		report for incorporation of the

		data into the registry.
Activity	F04.4: incorporate into registry	
Event	receive adverse event report	
Event	send adverse event report	
ActivityFinal	ActivityFinal	
ActivityInitial	ActivityInitial	The trigger for adverse event reporting may come from patient report, clinician report or other source.

F05.4: Manage Vaccine Inventory (Activity Diagram)



Figure: 20

Element Type	Element Name	Notes
Activity	create current balance request	This activity creates a request for
		current balance on one or more
		vaccines.
Activity	create inventory report	This activity creates the report on
		current inventory for the
		requester and specified vaccines.
Activity	decrement inventory	This activity decrements the

		vaccine inventory.
Activity	reconcile report	This activity compares the
		reported vaccine inventory with
		physical inventory.
Activity	record immunization	This activity records the
		immunization event in the
		vaccine user information system.
Activity	waste vaccine	This activity records vaccine
		wastage.
Event	receive event record	
Event	receive report	
Event	receive request	
Event	send event record	
Event	send report	
Event	send request	

## F05.4.1 order vaccine (Activity Diagram)



Element TypeElement NameNotes
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Activity	accept order	This activity determines that the order will be filled. It may approve the whole order, reject the whole order or approve parts of the order. Inventory on hand and business rules will drive this decision. It records the order in the vaccine supplier system.
Activity	create order	This activity creates an order for vaccines.
Activity	fill order	This activity packages the requested vaccines in preparation for shipping them.
Activity	process order	This activity applies local business rules.
Event	acknowledge order	This activity informs the requesting system of the status of the order.
Event	receive acknowledgment	This event receives the acknowledgment. The requester will be aware of the status of all requested items.
Event	receive order	This activity receives the order from the vaccine user and parses it.
Event	send order	This event formats the order for sending and sends it to the distributor.

F05.4.2 receive vaccine & F05.4.3 ship vaccine (Activity Diagram)

This activity illustrates the activities involved in shipping and receiving vaccines. These activities may be chained to order vaccine and support reconcile vaccine inventory.



Figure: 22

Element Type	Element Name	Notes
Activity	create manifest	This activity documents the
		vaccines being shipped.
Activity	determine vaccinest	This activity list of vaccines
		being shipped. It may be in
		response to an order.
Activity	gather vaccine	This activity gathers and
		packages the vaccines for
		shipment.

Activity	receive vaccine	This activity receives the physical
		vaccine shipment.
Activity	reconcile shipment	This activity reconciles the
		shipment with the manifest. It
		also determines any vaccines that
		are unacceptable due to damage.
Activity	ship vaccine	This activity ships the physical
		vaccine.
Activity	update inventory	This activity updates the
		inventory records, adding the new
		vaccines to the inventory.
Event	receive inventory update	
Event	receive manifest	
Event	send inventory update	
Event	send manifest	

F06: Clinical Care (Activity Diagram)



Figure: 23

Element Type	Element Name	Notes
Activity	Get Immunization history and	
	forecast	
Activity	Get consent	
Activity	Interview patient/parent	
Activity	Review medical record	
Activity	administer vaccine	This is the act of giving the
		patient the immunization.
Activity	capture consent	
Activity	display medical record	
Activity	give consent	
Activity	record consent	
Activity	respond to interview	
ActivityFinal	ActivityFinal	

ActivityInitial	ActivityInitial	
ActivityInitial	Begin Evaluation	The goal of this activity is to
		determine the immunization
		needs of a patient.
DecisionNode	Consent given	
DecisionNode	Needs Immunization	
ActivityFinal	No immunization	
ActivityFinal	No immunization	
ActivityFinal	give immunization	

F07: Request report (Activity Diagram)



Figure: 24

Element Type	Element Name	Notes
Activity	F07.1 process request	This activity applies local
		business rules to request.
Activity	F07.2 Gather data	This activity gathers the relevant
		data to be used in the report. This
		data may come from more than
		one data supplier.
Activity	F07.3 Prepare data	This activity prepares the data for
		the report. This may include

		calculations, sorting and filtering.
Activity	F07.4 package report	Package the report for return to
		requestor.
Event	acknowledge request	The event reports request
		rejection.
Event	receive acknowledgement	
Event	receive report	
Event	receive request	
Event	request report	
Event	return report	
ActivityFinal	ActivityFinal	
ActivityInitial	ActivityInitial	The parameters of interest are
		known.
DecisionNode	accept request	supplier accepts request for report

## F07.5 Create Reminder Report (Activity Diagram)



Figure: 25

Element Type	Element Name	Notes
Object	Report parameters returned	This is a list of typical parameters

		returned by this report request.
Object	report parameters in request	
Activity	Accept report	
Activity	create candidate list	This activity returns a list of people who may need to have an immunization.
Activity	create forecast	This activity creates a forecast for each candidate. If a vaccine group is specified, it only returns that forecast.
Activity	generate report	This activity generates the report in the format requested. This may be an electronic report to support automated calls or post cards to be sent to patients.
Activity	get candidates	This activity gets a list of people meeting the input parameters of age, geography, etc. This list will supply candidates who need CDS.
Activity	get immunization history	This activity gets the immunization history, including patient conditions for each candidate.
Activity	make request	The requestor indicates who (age, location, school, etc), the reference date and the list of vaccine groups of interest.
Activity	return report	This activity returns the requested report to the requestor.
Activity	select candidates	This activity selects those patients who need immunization in the time frame specified.
ActivityFinal	ActivityFinal	
ActivityInitial	ActivityInitial	

F07.6 Create vaccine usage report (Activity Diagram)





Element Type	Element Name	Notes
Object	report request parameters	
Object	report return parameters	

Activity	create request	This activity prepares the request
		for a vaccine usage report. It
		indicates the time frame of
		interest, the vaccines of interest
		and any other parameters to
		control the report.
Activity	generate report	
Activity	get immunization events	Get immunization events of
		interest.
Activity	process request	This activity process local
		business rules.
Event	acknowledgement	reject request
Event	receive acknowledgement	
Event	receive report	
Event	receive request	This activity parses the request.
Event	request report	
Event	return report	
ActivityFinal	ActivityFinal	
ActivityInitial	ActivityInitial	
DecisionNode	request accepted	

F07.7 Create vaccine coverage report (Activity Diagram)



Figure: 27

Element Type	Element Name	Notes
Activity	create report request	
Activity	determine status	Determine status for each target disease of interest for each recipient.
Activity	gather recipients	Gather the recipients of interest.
Activity	generate aggregate report	
Activity	process request	This activity processes local

		business rules.
Activity	request evaluation	
		Request immunization history
		evaluation for selected patients.
Event	accept report	
Event	acknowledge	Acknowledge request rejection.
Event	receive acknowledgement	
Event	receive request	this event parses the request
Event	return report	
Event	send request	
ActivityFinal	ActivityFinal	
ActivityInitial	ActivityInitial	
DecisionNode	accept request	

Manage CDS Rules (Eriksson-Penker Diagram)



Figure: 28

Element Type	Element Name	Notes
Resource	Vaccine administration rules	
Information	scientific research	published scientific research
		regarding immunology and safety
Process	Develop rules	SME consider scientific research
		and clinical practice to define the
		rules and supporting parameters.
		The goals of these are to

		maximize the likelihood that a recipient will be immune to an infectious disease.
Process	Interpret Rules	
Process	Publish rules	Publish the rules and supporting parameters.
Process	integrate rules and parameters into CDS engine	

F09 transform data format (Activity Diagram)



Figure: 29

Element Type	Element Name	Notes
Activity	package data	This activity packages data in a
		specified format.
Activity	receive data	
Activity	transform acknowledgement	
Activity	transform data	This activity transforms the data
		to the desired format.
Event	receive acknowledgement	
Event	receive acknowledgement	
Event	receive data	This event receives the data and parses it. It may apply business
		rules.
Event	send acknowledgement	
Event	send acknowledgement	
Event	send data	
Event	send data	This event sends the packaged
		data and requests transformation.
		It also indicates a data receiver.