



**HL7 Domain Analysis Model: Occupational Data for  
Health (ODH), Release 1 - US Realm**

May 2023

**HL7 Comment-Only Ballot**

**Sponsored by:  
Public Health Work Group**

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## **HL7 Domain Analysis Model for Occupational Data for Health**

**Sponsored by: Public Health Work Group**

**March, 2023**

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## Preface

The Occupational Data for Health (ODH) Domain Analysis Model (DAM) serves as a guide for incorporating work data in the Electronic Health Record (EHR). It is designed to guide health information technology system designers and developers and has two parts. First, it provides class models and descriptions of the various ODH data classes and elements. Second, it provides use case diagrams and stories.

Feedback is requested on the DAM in this draft form; known gaps include cardinality and optionality of data elements (where needed), terminology binding, and field identifiers (LOINC codes). Input is especially requested on the flow of information, the various systems and users involved, and whether adequate information is provided (i.e., completeness). More specifically, input is requested on:

1. The overall organization of the document
2. The models, use cases and activity diagram
  - a. Particularly, input is sought on how best to model voluntary work
3. The user stories and the proposed use of ODH data

## **Data for Health (ODH) Domain Analysis Model**

### **I. Introduction**

Work is an important social determinant of health (1,2). Introducing structured and standardized work data in the Electronic Health Record (EHR) may help healthcare providers improve patient and population care. These data can be used to determine whether patients' conditions are associated with the type of work that they do, and help in the management of other health conditions, since most workers in the U.S. spend over half their waking hours at work (4). Additionally, this may facilitate the management and effective transfer of patient data between systems. Occupational Data for Health (ODH) is a framework that requires patients to self-report structured and unstructured work data, and supports patient care, population health and public health (7). In July 2022, the Office of the National Coordinator for Health Information Technology (ONC) included ODH data elements to the patient demographics/information data class of the United States Core Data for Interoperability Version 3 (3), a major step in affirming the relation between work and health. The initial ODH information model was created by the CDC's National Institute for Occupational Safety and Health (NIOSH) in response to the need and opportunity to add structured and standardized work data to EHRs (4). The ODH model was designed to enable clinical care and support public health and population health activities (5,6).

The objective of this Domain Analysis Model (DAM) is to serve as a guide for the successful implementation of work data topics in the EHR, according to the preferences of each healthcare organization, for making the routine collection, use, and exchange of ODH data elements between systems easier.

## II. Scope

This DAM describes the functional and information specifications of ODH and serves as a guide for health information technology designers when incorporating ODH in the EHR. The intended audience is health information technology designers and implementers with interest in collecting and using ODH. This DAM consists of two viewpoints: (1) the information viewpoint and (2) the behavioral viewpoint. The information viewpoint describes class specifications for two models—a model for a worker and a model for a household member of the worker as the subject of the EHR record, e.g., a child. Class specifications characterize each ODH topic and include descriptions of the elements for the respective topics within each class (see Appendices A, and B (4, 7)). The behavioral viewpoint provides a description of some of the roles performed by human and non-human entities (actors) within the DAM, tasks that are completed (uses case), and activities related to the collection and use of work data. Storyboards for different work data scenarios are also included in this viewpoint. Enterprise Architect software (Sparx Systems Pty Ltd, Victoria, Australia) was used to create the models in this DAM.

## III. Information Viewpoint

This viewpoint describes the structure of the ODH data and includes two pertinent class models. One class model describes work information for a worker and the other describes work information of a worker in the record of a household member, e.g., a child. The two class models are different as a worker may be exposed to health risks that are directly related to their job and a household member (in this DAM, described as a minor, though not restricted only to a minor) may be indirectly exposed (secondary exposure) to risks from the worker's job. For this indirect exposure, information about the worker's job is described.

In this DAM, a person's voluntary work is categorized into regular voluntary work of 20 or more hours per week (excluding emergency/first responders) and emergency voluntary work (emergency/first responders) and is not described as part of their past or present job, as noted in previous literature (4). This change was made to clarify that the ODH framework suggests collecting fewer data elements about non-emergency/first-responder voluntary work.

Each class model in this viewpoint is depicted as a class diagram that is used to specify information relevant to a person's work that would be a part of the record's social history. Each class diagram includes descriptive texts and class specifications such as cardinality, data type, class name and elements. The description for elements in specific classes is listed in appendices A and B (4,7).

a. Class specifications

i. Cardinality

In this DAM, information flows from a source to a destination. The logical flow of information may be unidirectional or bi-directional and is usually labeled to further describe the relationship. The relationship between each class in this DAM may be described as:

Zero or one	0..1
Exactly one	1..1
Zero or more	0..*
One or more	1..*

ii. Data type

Data types describe the value that is specified for each element associated with a topic. These data types may be found in the class model used to describe each topic. Table 1 provides a description of the ODH data types used in this DAM based on HL7 FHIR Data Types v4.3 (8)

**Table 1.** Description of ODH Data Types

Name	Code	Description
Boolean	BL	A Boolean value can be either <i>true</i> or <i>false</i> , or, as any other value may be NULL.
Character String	ST	A string data type stands for text data used for names, symbols, and formal expressions.
Concept Descriptor	CD	A concept qualifier code with optionally named role. Both qualifier role and value codes must be defined by the coding system.
Telecommunication Address	TEL	A telephone number (voice or fax), e-mail address, or other locator for a resource (information or service) mediated by telecommunication equipment.
Entity Name	EN	A name for a person, organization, place, or thing. A sequence of name parts, such as given name or family name, prefix, suffix, etc.
Address	AD	A character string that may include street, house number, or post office box, postal code, city, country. Others may be defined regionally, nationally, or may be a military address.
Date	Date	Calendar date.
Integer Number	INT	Integer numbers include positive and negative whole numbers (-1,0,1,2, 100, 3398129, etc.). Integer numbers are discrete, the set of integers is infinite but countable.
Real Number	REAL	Fractional numbers. Typically used whenever quantities are measured, estimated, or computed from other real numbers. The typical representation is decimal, where the number of significant decimal digits is known as the precision.

iii. Class name

In this DAM, class names refer to work data (ODH topics) and are used to organize and define applicable ODH information. Each topic includes one or more data elements. The topics for a worker are as follows (4,7):

- Employment status
- Retirement date
- Jobs (past or present)
- Longest-held (usual) work
- Voluntary work
- Combat zone periods

The topics for a working household member, in the record of another household member e.g., a minor, are as follows (4,7):

- Past or present job
- Longest-held (usual) work

b. Class model for information about a worker

The class model for a worker is depicted in Figure 1 and is followed by descriptions for each of the classes within the model (see Appendix A for definitions of each data element).

i. Class model for a worker

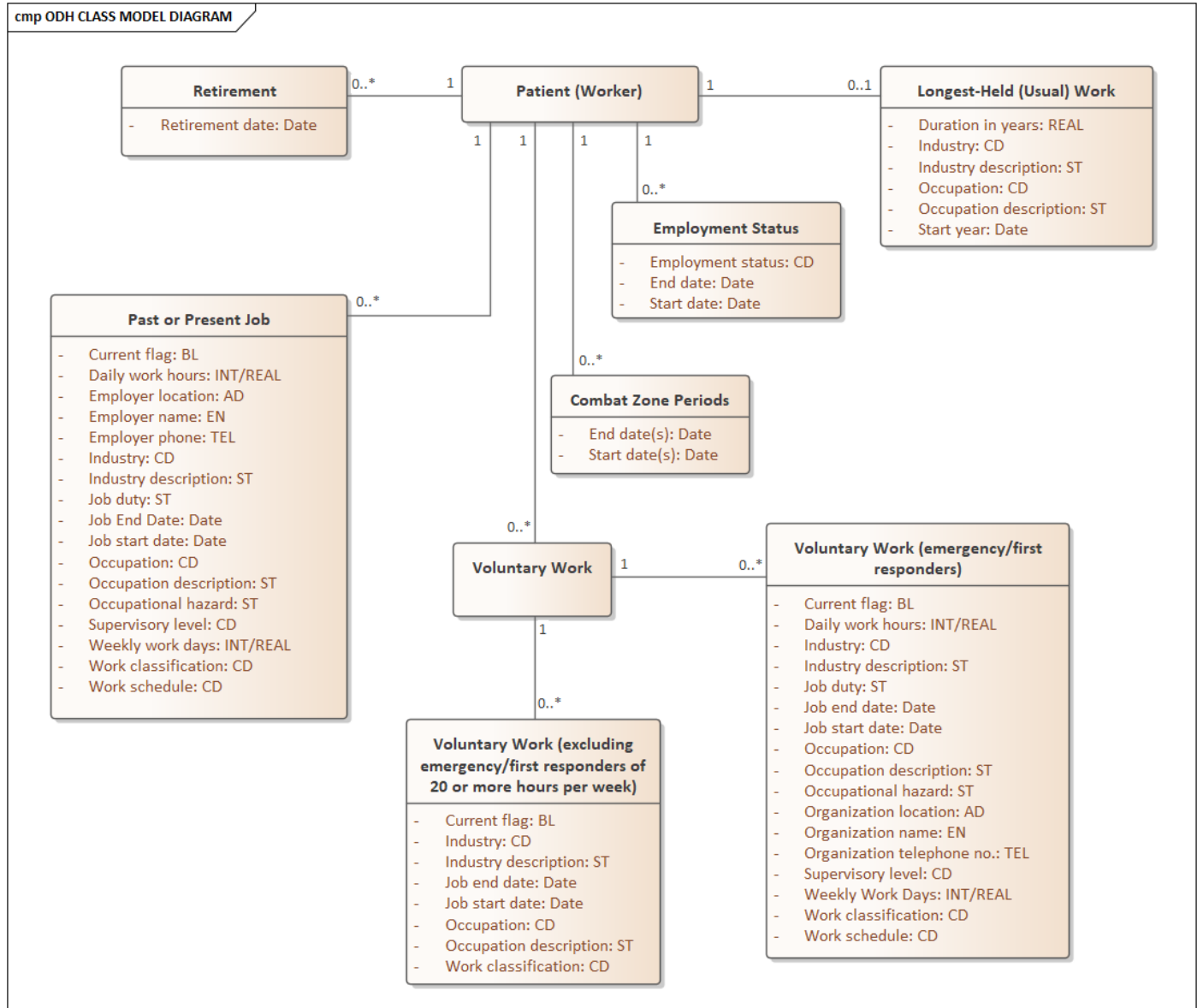


Figure 1. Class Model for a Worker

ii. Class 1: Employment Status

Employment status is someone’s relationship to work for pay, family earnings or training (7). Employment status and employment status start date are required for this topic. End dates may also be collected. Start date, however, is sufficient for this topic. The observation date may be collected instead of start date. A person’s employment status is independent of their retirement.

Employment status periods cannot overlap with start or end dates when these data are collected. The system shall provide the ability to manage one and only one employment status for a given time. Example: A person may have multiple jobs but will only have one employment status. The elements and data type associated with employment status are shown below.

Employment status
- Employment status: CD
- End date: Date
- Start date: Date

iii. Class 2: Past or Present Job

A job is defined as a work situation or position (6). Multiple data may be collected about a person’s job. Text values are recommended when coded occupation or industry values cannot be determined, and for occupational hazard and job duty entries. Multiple job duties and occupational hazards can be collected for each job as individual entries. A history of jobs may be collected.

Data for at least two current/most recent jobs should be collected. The elements and data type associated with each are illustrated below.

Past or Present Job
<ul style="list-style-type: none"><li>- Current flag: BL</li><li>- Daily work hours: INT/REAL</li><li>- Employer location: AD</li><li>- Employer name: EN</li><li>- Employer phone: TEL</li><li>- Industry: CD</li><li>- Industry description: ST</li><li>- Job duty: ST</li><li>- Job End Date: Date</li><li>- Job start date: Date</li><li>- Occupation: CD</li><li>- Occupation description: ST</li><li>- Occupational hazard: ST</li><li>- Supervisory level: CD</li><li>- Weekly work days: INT/REAL</li><li>- Work classification: CD</li><li>- Work schedule: CD</li></ul>

iv. Class 3: Longest-Held (Usual) Work

Longest-held (usual) work is information about the type of work done by someone for the longest amount of time during that person's lifetime (4).

Longest-held (usual) work does not include voluntary work and may include more than job.

When coded values for industry or occupation cannot be determined, text values may be collected.

For this topic, duration refers to the total amount of time a person spent in an occupation that they held for the longest time over the course of their life.

This value does not include intermittent time not working in the longest-held occupation. Elements and data type associated with longest-held (usual) work are listed below.

Longest-Held (Usual) Work
- Duration in years: REAL
- Industry: CD
- Industry description: ST
- Occupation: CD
- Occupation description: ST
- Start year: Date

v. Class 4: Retirement Date

Retirement date refers to the month and year that a person self-identifies as retired (4). A person may have more than one retirement date and it should be possible to enter at least two dates. Retirement dates should not be considered as a person's employment status, as a person could be retired from one job and employed in another. Also, a retirement date does not imply that the person is no longer employed or is not seeking employment. The element and data type associated with retirement are listed below.

Retirement
- Retirement date: Date

vi. Class 5: Combat Zone Period

Combat zone period refers to time(s) when someone was in a place where combat forces operated, or military combat was in progress (4). Data on someone's combat zone experience may be helpful to assess their exposure to potential hazards and or any risks that may be uncommon. This information may be used to inform services at the point of care or suggest referrals for specialized care. For example: Data for this topic are collected for both those with military service and civilians who have worked in or are currently working in combat zones. The elements and data type associated with combat zone periods are listed below.

Combat Zone Periods
- End date(s): Date
- Start date(s): Date

vii. Class 6: Voluntary Work

Voluntary work is work that someone chooses to do for others without pay or other benefits (4). This topic was previously included as part of a person's past or present job. In this DAM however, voluntary work is identified as a separate topic so that the distinct data elements can clearly be illustrated.

Non-emergency/first responder voluntary work is defined as work for 20 or more hours per week and excludes emergency/first responders.

If codes are not available for voluntary work, text entries may be entered for occupation and industry.

Data associated with the classes for voluntary work for emergency/first responders and voluntary work non-emergency/first responders are illustrated below.

Voluntary Work (emergency/first responders)
<ul style="list-style-type: none"><li>- Current flag: BL</li><li>- Daily work hours: INT/REAL</li><li>- Industry: CD</li><li>- Industry description: ST</li><li>- Job duty: ST</li><li>- Job end date: Date</li><li>- Job start date: Date</li><li>- Occupation: CD</li><li>- Occupation description: ST</li><li>- Occupational hazard: ST</li><li>- Organization location: AD</li><li>- Organization name: EN</li><li>- Organization telephone no.: TEL</li><li>- Supervisory level: CD</li><li>- Weekly Work Days: INT/REAL</li><li>- Work classification: CD</li><li>- Work schedule: CD</li></ul>

Voluntary Work (excluding emergency/first responders of 20 or more hours per week)
<ul style="list-style-type: none"><li>- Current flag: BL</li><li>- Industry: CD</li><li>- Industry description: ST</li><li>- Job end date: Date</li><li>- Job start date: Date</li><li>- Occupation: CD</li><li>- Occupation description: ST</li><li>- Work classification: CD</li></ul>

c. Class Model for Information About a Working Household Member in the Record of a Patient (e.g., Minor)

The information of a household member who works that is included in the record of another person, e.g., a minor, is based on the worker's past or present job and longest-held (usual) work. The focus is on the most important elements for understanding take-home exposures and all the elements for these two topics are not included. The role and nickname of the worker are also collected so that each person is uniquely identified, similar to identifying family members in a family history.

The following class model (Figure 2) depicts information of a worker who is a household member of the subject of the record, e.g., a minor.

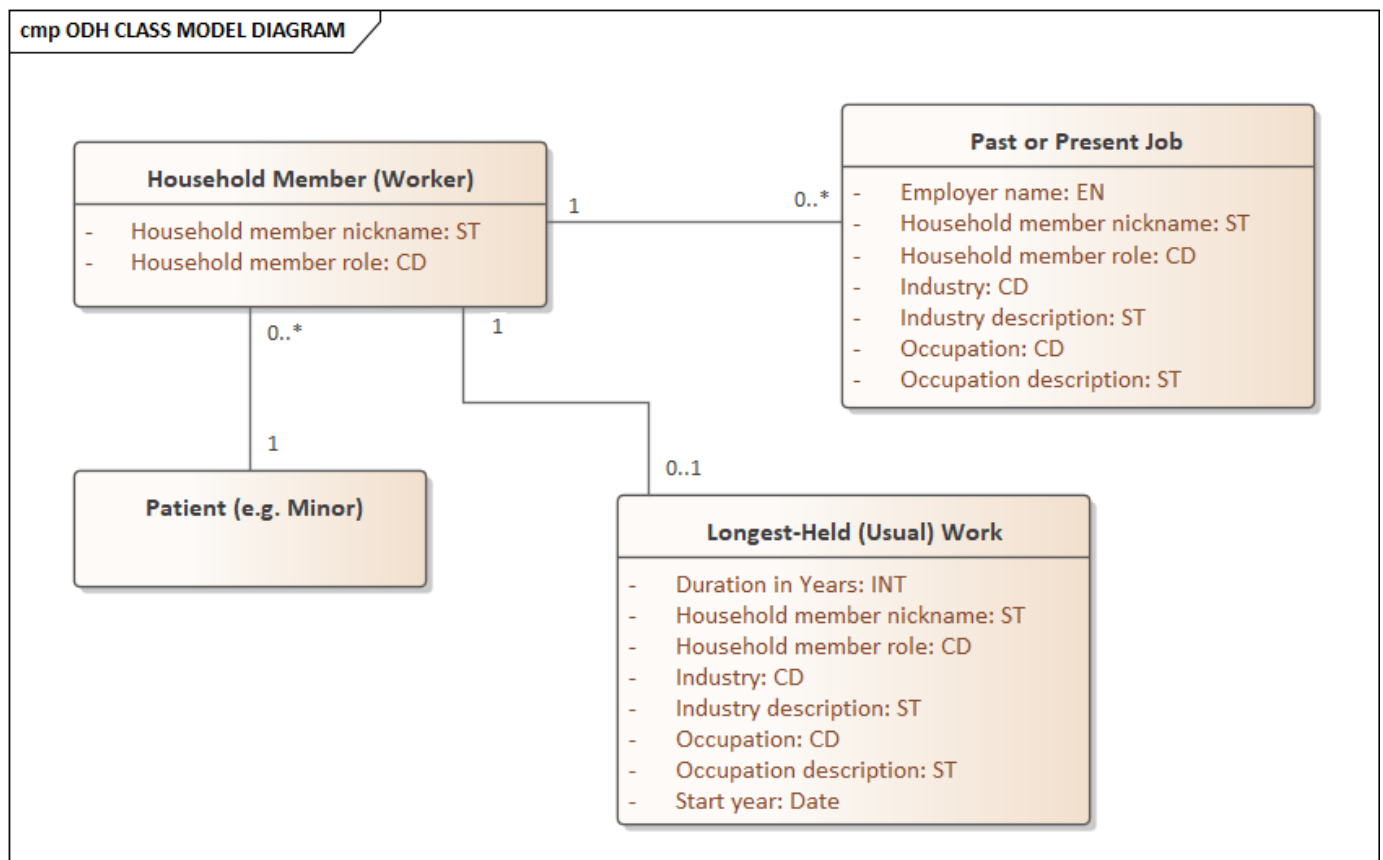


Figure 2. Class Model for Work Information of a Household Member

The topics and elements with data types that are associated with each class in the model for information about a worker in the record of a household member are listed below.

i. Class 1: Household Member (Worker)

Household member role specifies the relationship of the patient to the household member (e.g., worker as parent, spouse, etc.) as it is recommended that the relationship of the worker to another household member (e.g., minor) should be collected. Household member nickname is used to distinguish different individuals, e.g., brother named Fred vs brother named George. It is not used to link to the household member's medical record.

Household Member (Worker)
- Household member nickname: ST
- Household member role: CD

ii. Class 2: Past or Present Job of a Working Household Member in the Record of Another Person (e.g., a Minor)

The data associated with a past or present job of a household member in the record of another person are illustrated below. The current/most recent job or jobs are to be recorded.

Past or Present Job
<ul style="list-style-type: none"> <li>- Employer name: EN</li> <li>- Household member nickname: ST</li> <li>- Household member role: CD</li> <li>- Industry: CD</li> <li>- Industry description: ST</li> <li>- Occupation: CD</li> <li>- Occupation description: ST</li> </ul>

- iii. Class 3: Longest-Held (Usual Work) of a Working Household Member in the Record of Another Person (e.g., a Minor)

The data associated with the Longest-Held (usual) work class of a household member in the record of another person are illustrated below.

Longest-Held (Usual) Work
<ul style="list-style-type: none"> <li>- Duration in Years: INT</li> <li>- Household member nickname: ST</li> <li>- Household member role: CD</li> <li>- Industry: CD</li> <li>- Industry description: ST</li> <li>- Occupation: CD</li> <li>- Occupation description: ST</li> <li>- Start year: Date</li> </ul>

#### IV. Behavioral Viewpoint

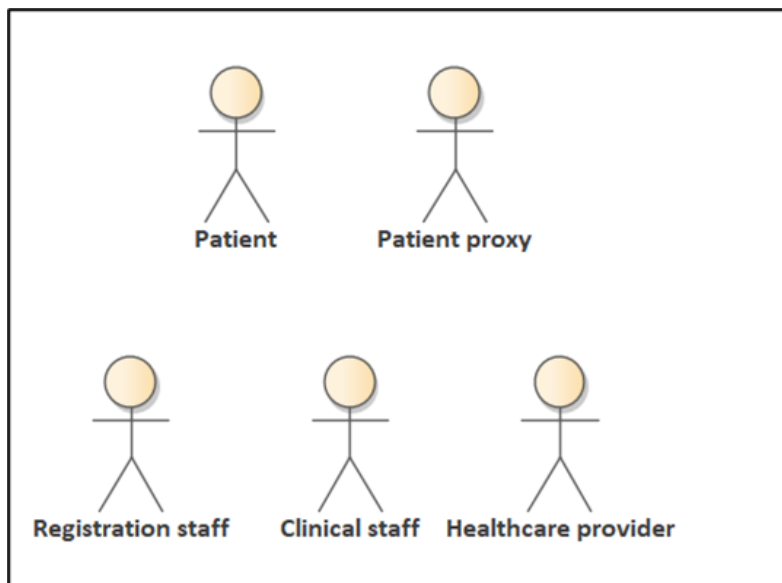
The behavior viewpoint describes the collection and use of ODH data as described in the information viewpoint. It describes actors, use cases that describe the actors and their roles, activities that describe the information flow and use cases, and user stories that describe scenarios that highlight the relevance of ODH in clinical care.

a. Actors

This DAM may consist of several actors, both human and non-human. Actors are the entities that perform the various roles within the DAM.

i. Human actors

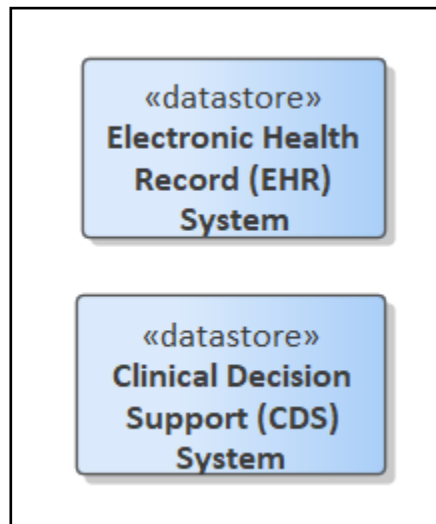
Human actors have roles that include the collection, entry, and use of ODH data, and may include the patient, patient proxy, registration and clinical staff and healthcare provider, for example. These actors are depicted in use cases by a stick figure. Similarly depicted would be other actors that may use ODH data such as public health personnel, population health personnel and researchers. Figure 3 shows some examples of human actors.



*Figure 3. Examples of Human Actors*

ii. Non-human actors

Non-human actors may include systems such as the EHR. The EHR stores patient data and is a source from which ODH data about patients may be accessed. Other non-human actors may include the clinical decision support system and systems within public health agencies that are needed for various roles such as use of the data for surveillance or vital records activities, for example. Two examples of non-human actors are shown on Figure 4.

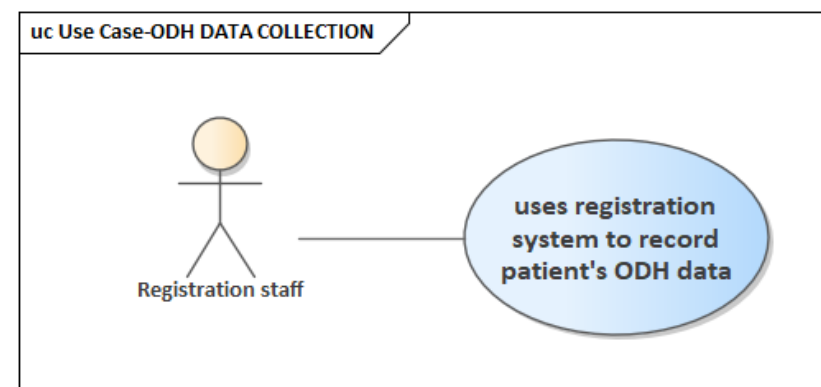
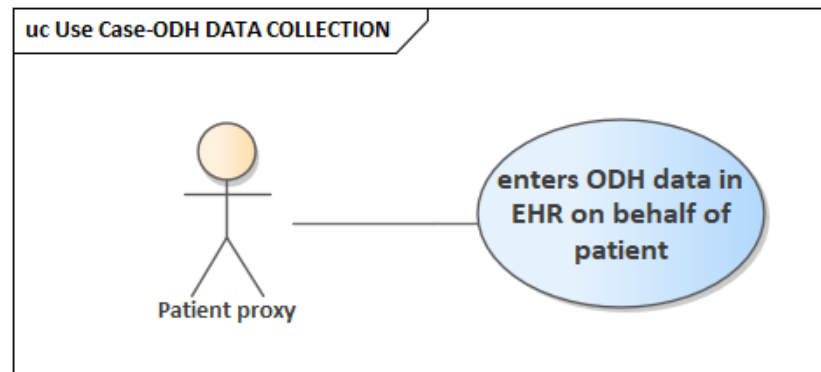
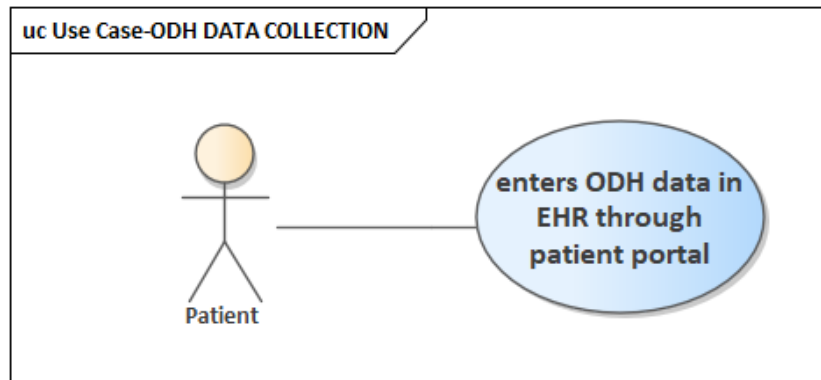


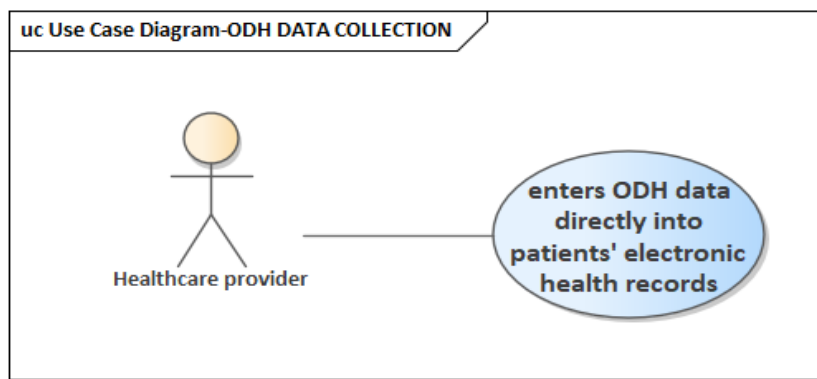
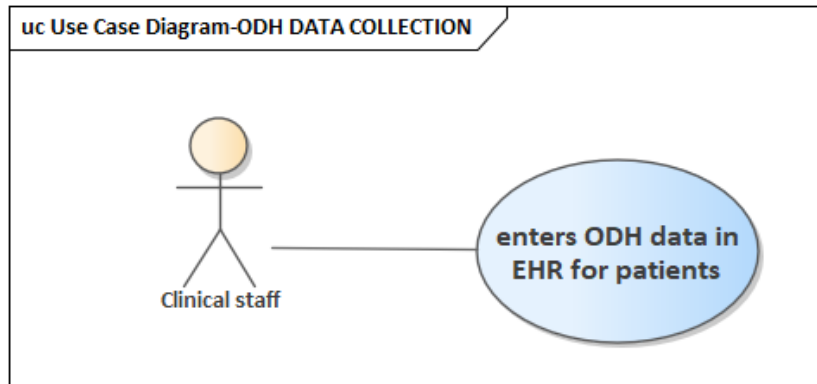
*Figure 4.* Two Examples of Non-Human Actors

b. Use Cases

Use cases are needed to visualize and identify the various actors and functions that are performed within the scope of the DAM. The actors that perform these functions are connected to the use case, depicted by an oval, with a straight line.

Use cases for ODH data entry by the patient, patient proxy, registration staff, clinical staff and healthcare provider are shown below.





i. Collecting ODH data

Patients or their proxy (someone who helps a patient who is unable to independently provide their work data) may choose to use a patient portal on a personal electronic device (tablet personal computer, cell phone) to enter data about the patient's health, including ODH, so it can be incorporated in the EHR. This may occur after the first visit since access to the portal may not be provided prior to them. Patients may also use a portal at the care facility via provided electronic devices such as tablets or kiosks.

The patient or proxy may also manage their health information in their personal health record (PHR) and allow their PHR to share the data with their provider's EHR.

Registration staff may use the registration system to enter patient work data in the EHR.

Clinical staff may enter patient data, on behalf of the patient, in the EHR.

Healthcare providers may enter patient data into the EHR based on their conversation during an encounter with a patient.

A use case diagram of how ODH may be collected and the flow of patient data (depicted by a broken arrow) to the EHR is shown on Figure 5.

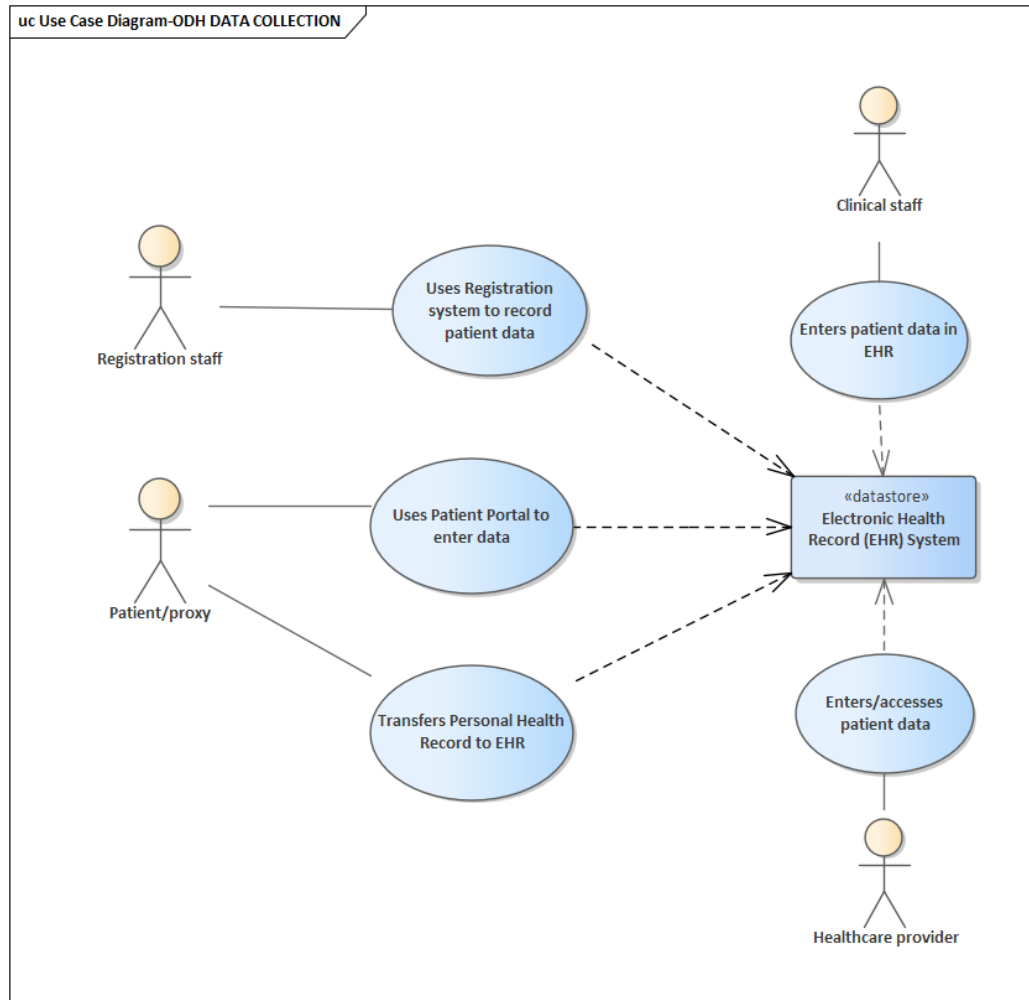


Figure 5. Use Case Diagram of ODH Data Collection

ii. Using ODH Data For Individual Patient Care

Patients' work data may be used by clinicians for assessing patients at the point of care. Work information in the EHR may be used to trigger the clinical decision support system (CDS). Clinicians may utilize the CDS to make decisions about diagnosis, follow up, tests, treatment, etc.

The following activity diagram (Figure 6) shows how clinicians may use the CDS, once it is triggered (an action or set of actions in the EHR that initiate a response) by ODH data in the EHR.

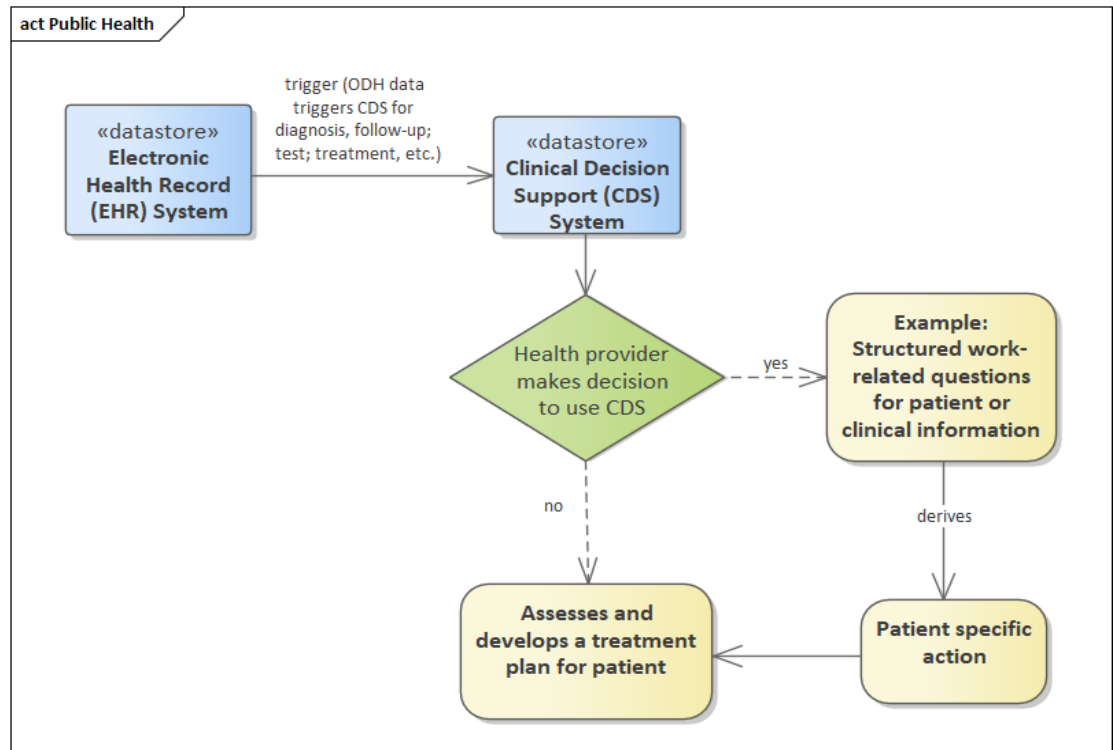


Figure 6. Activity Diagram for ODH Use with Clinical Decision Support System

### iii. Using ODH For Population Health

Work data stored in patients' EHR records may be used for population health activities that are conducted by the healthcare organization. For rapid data access, rules and triggers need to be built in.

For example:

- Rules may be built to apply triggers at certain times for the purpose of identifying groups for follow-up care.

- These triggers may identify group members based on one or more ODH data elements.
- Triggers may also help to identify and remind individuals of appointments or for medical follow-ups.

Population health activities may benefit organizational and patient care priorities. Data may be accessed and used by case managers, quality care managers, administrators, informaticians, epidemiologists, and medical researchers. Once accessed, data may be used for activities such as preventive care, quality improvement, case management, patient outcome improvement, and performance evaluation. Educational materials, care procedures and policies may be developed based on the data and shared with patients, clinicians, and other interested persons.

#### iv. Sharing ODH Data With Public Health

Reporting to public health is required by state, tribal, local, and territorial (STLT) laws. Electronic reporting from EHRs helps to rapidly inform STLT public health agencies and provide higher quality data. These data may come from ambulatory care, hospitals, and other care facilities. The data may be used by public health agencies for activities such as surveillance, informing vital records, and monitoring disease trends.

The data may also be sent from the STLT public health agencies to the Centers for Disease Control and Prevention (CDC); for example, CDC tracks

“notifiable diseases” using data provided by the STLT public health agencies (Ref: <https://www.cdc.gov/nndss/about/index.html> ).

Primary users of the public health data include epidemiologists, informaticians and public health managers. Some of the use and benefits of the data at the public health level include early identification of outbreaks to initiate response efforts, developing educational materials for healthcare providers and the public, intervention and research activities, and studies of disease risks or trends.

Examples of data flows to STLT public health agencies include:

- Syndromic surveillance, for providing timely information about emerging health risks.
- Vital records reporting, to capture data that help to determine trends for monitoring important public health events.
- Case reporting, that helps to inform early disease detection and intervention, monitor trends, and identify and mitigate health risks.
- Reporting to cancer registries and other public health registries, to determine disease trends.

v. Sharing ODH Data With Researchers

Patients’ work data may be used to conduct research by entities such as health care organizations, public health, research institutes, and universities.

Research activities may focus on care efficiency, data collection and standardization, and health service research, for example.

Aggregate ODH data for conducting research may be obtained from EHRs with the proper data use agreements and privacy protections. Upon querying the data, researchers may need to clean, link, standardize and analyze the data prior to conducting research activities, and subsequently sharing the findings.

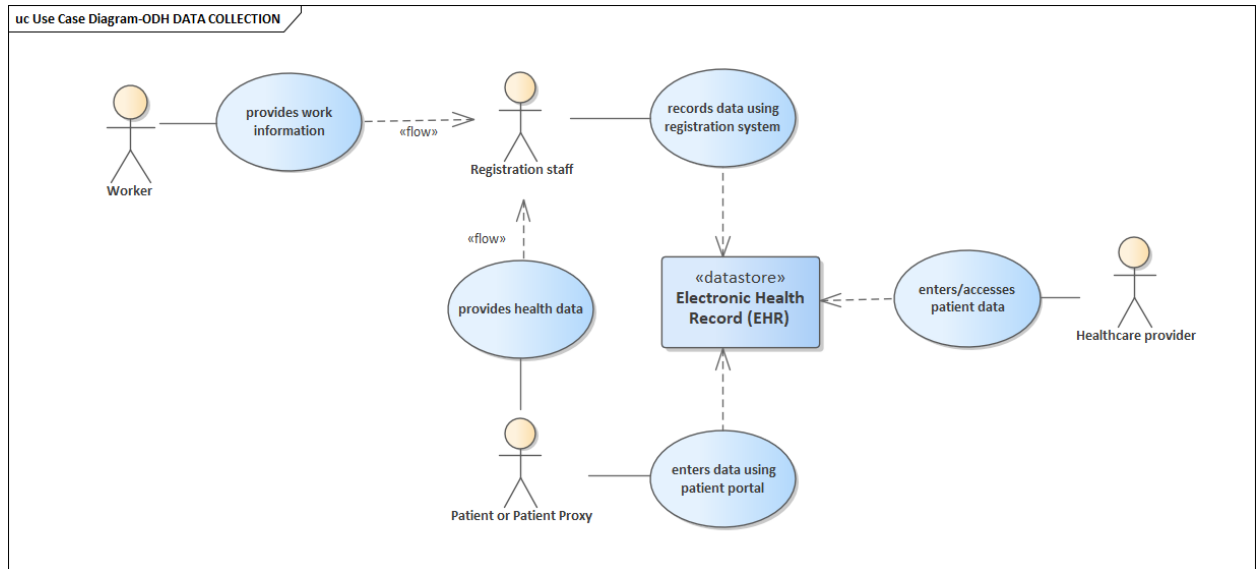
Research findings may influence change and improvement that impact work data health burden, and the collection of timely and accurate data.

c. Work data of a Working Household Member in the Record of a Patient (e.g., Minor)

These data may be collected similarly to data collected for the worker. Data about the work of a working household member may inform care for a patient due to secondary exposure. For example, exposure to lead on a working household member's shoe from their work. Health staff such as registration or clinical staff, or healthcare providers, may collect as well as used the data for assessing the patient. The worker, patient, or patient proxy may also provide the data.

The collected work data should focus on the working household member's longest-held (usual) work and past or present job(s). The data must be identified as the working household member's work information, not the patient's work information.

An example of the flow of data collection is shown in Figure 7 below.



*Figure 7. Collection of secondary ODH data for a Patient*

i. Use of ODH data for patient care due to secondary work exposure

The use of collected ODH data to prevent, recognize, diagnose, treat, or manage the patient's health condition due to secondary exposure is similar its use for primary work exposure. This may be dependent on the presentation of the household member with secondary exposure.

ii. Use of ODH data for population health due to secondary work exposure

This would depend on the type of exposure and subsequent disease. Activities could focus on household members who may be at risk for exposure.

iii. Use of ODH data for public health due to secondary work exposure

Reports to public health for secondary work exposure or diseases must be indicated as such to accurately report primary versus secondary work data exposures or diseases. This would help research and intervention activities.

iv. Use of ODH data for research due to secondary work data exposure

Like the reporting of diseases or secondary exposure due to work to public health, research activities should distinguish diseases due to primary or secondary work exposure where necessary.

d. Activity Diagram

Activities include descriptions of tasks and processes done in the DAM and the entities responsible for them. Activities in the DAM include the flow and exchange of information. The following activity diagram (Figure 8) shows an example of the actors (human actors, systems, health provider, public health agency, population health personnel and researchers) and some of the activities that may be accomplished in the ODH DAM. A description of each activity follows.

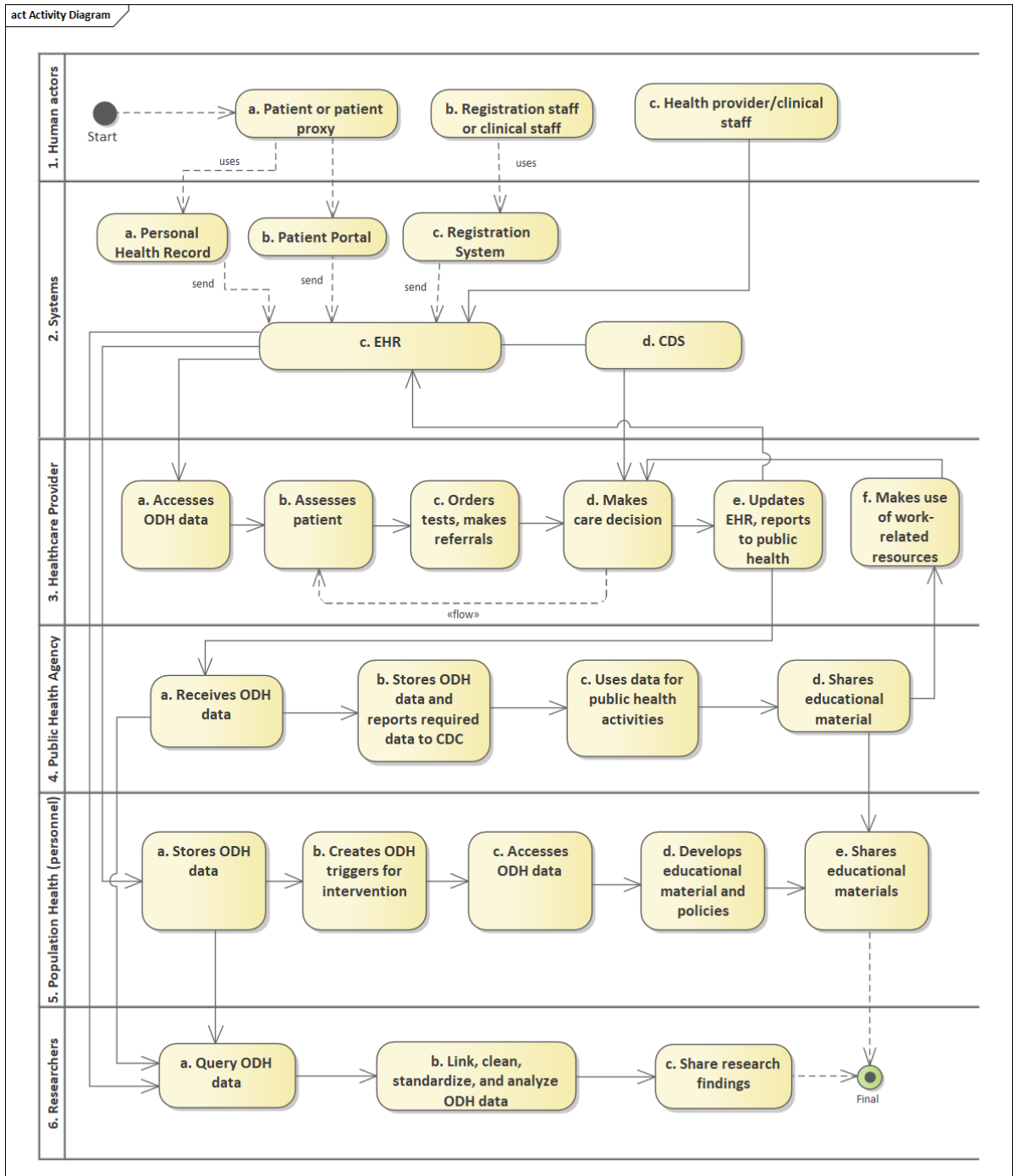


Figure 8. Activity diagram example for the collection and use of ODH

## **1. Human Actors**

- a. Patients or their proxy may send data from their personal health record to the EHR.
- b. As part of the data collection process, patients or their proxy may enter data into the EHR using the patient portal. This may be accomplished at patients' homes prior to clinical visit. In some instances, it may be done at the healthcare setting.
- c. Registration staff may use the registration system to enter patient data in the EHR. This usually occurs when patient or their proxy is unable to do so independently at home, using their personal devices such as tablets, computers, or smart phones, or with devices that may be provided at the healthcare setting. Clinical staff may also assist patients to enter their data in the EHR using tablets or desktop computers.
- d. Healthcare providers may enter patient data directly into the EHR. They may also access patient data that are already in the EHR for use in assessing patient and developing treatment plans.

## **2. Systems**

Systems store data and pertinent health information that may be used by health care providers.

- a. The patient portal allows patient actors or their proxy to enter data in the EHR.
- b. The registration system allows registration staff to enter patient information in the EHR.

- c. The EHR stores patient data and may be accessed by healthcare providers to retrieve information about patients. Stored data may also be used for research purposes.
- d. The clinical decision support (CDS) system stores health information that may support decisions made by healthcare providers when making clinical decisions for patient assessment, treatment, and disposition. Information in the EHR may trigger the CDS system.

### **3. Healthcare Providers**

- a. In addition to entering patient data directly in the EHR at the point of care, healthcare providers may also access patient data from the EHR.
- b. ODH data may be used by healthcare providers to assess patients. This may help determine patients' treatment plan, return to work orders, follow up recommendations and the type of educational material provided to patients.
- c. Based on the encounter with patients and their data, healthcare providers may order specific tests and procedures and make referrals as part of patients' care plan.
- d. Decisions about patient care plan and disposition may depend on ODH in the EHR. Such data may also trigger CDS that may be used to support the care plan.
- e. Healthcare providers may use the EHR to electronically transmit data to public health.
- f. Healthcare providers may use work-related educational resources provided by public health.

#### **4. Public Health Agency**

- a. Public health agencies (e.g., local, state) may receive ODH data from healthcare providers.
- b. Once ODH data are received, they may be stored in public health systems such as surveillance, vital records, and disease registries for use in various public health activities. All reportable data will be sent to the CDC.
- c. ODH data are used for various public health activities which may include surveillance, interventions, development of educational materials, and research activities.
- d. Educational materials are shared with healthcare providers and other interested persons through publications, reports, and announcements.

#### **5. Population Health**

- a. For population health purposes, ODH data may be stored with other clinical data in repositories at health organizations.
- b. Population health personnel such as case managers, informaticians, and population health researchers may access the stored data.
- c. ODH data triggers created within systems at the organizational level may prompt the facilitation of population health activities such as screenings, case management, preventive care, quality assessment, and outcome improvement.
- d. ODH data may be used to inform development of educational materials, care procedures or policies.
- e. Educational materials may be shared with clinicians, patients, and other interested persons.

## 6. Researchers

- a. ODH data may be among data queried or otherwise accessed by researchers with appropriate privacy agreements using appropriate privacy safeguards.
- b. Data that have been queried may need to be linked, cleaned, and standardized prior to analysis.
- c. Research findings may be written and shared through reports, publications, at conferences, or with interested persons at health organizations.

### e. Storyboards

Storyboards describe scenarios that are specific to a domain such as work information and show examples of workflow that may be supported by the DAM. This section describes user stories that show examples of using work information, representing the conceptual topics and relationships.

*Examples of health providers' use of work information to assess, diagnose and treat a patient with support from the CDS through triggers*

A patient who works at a commercial bakery as a mixer revisits his primary care physician due to a new onset of respiratory symptoms. The physician enters information in the patients record of a new onset of coughing and wheezing. This information triggers a pop up that informs the physician that the patient's work exposures might be contributing to his symptoms and asks if additional information is required. The physician indicates interest by clicking on an information button and is provided with information about baker's asthma and additional structured medical history questions to collect information about possible work exposures. If the patient answers "yes" to the work exposure questions the physician will be given additional information related to the evidence-based guidelines for diagnosis and treatment of this work-related asthma.

(Ref.[https://journals.lww.com/joem/Fulltext/2017/11000/Recommendations\\_for\\_a\\_Clinical\\_Decision\\_Support.22.aspx](https://journals.lww.com/joem/Fulltext/2017/11000/Recommendations_for_a_Clinical_Decision_Support.22.aspx)).

[https://acoem.org/Guidance-and-Position-Statements/Joint-Statements-Summit-Recommendations-Proceedings/Enhancing-Worker-Health-Through-Clinical-Decision-Support-\(NIOSH-Resource-Reports\)](https://acoem.org/Guidance-and-Position-Statements/Joint-Statements-Summit-Recommendations-Proceedings/Enhancing-Worker-Health-Through-Clinical-Decision-Support-(NIOSH-Resource-Reports))).

A patient in his mid-30's visits his doctor and presents with sporadic coughing and wheezing. His history of current industry and occupation as well as usual industry and occupation were recorded. When the physician sees the patient, diagnostic codes related to the symptoms of coughing and wheezing are entered into the EHR. The physician is presented with literature describing the link between flux fumes/isocyanates and asthma as well as evidence-based guidelines for the diagnosis and treatment of work-related asthma.

(Ref.[https://journals.lww.com/joem/Fulltext/2017/11000/Recommendations\\_for\\_a\\_Clinical\\_Decision\\_Support.22.aspx](https://journals.lww.com/joem/Fulltext/2017/11000/Recommendations_for_a_Clinical_Decision_Support.22.aspx)).

[https://acoem.org/Guidance-and-Position-Statements/Joint-Statements-Summit-Recommendations-Proceedings/Enhancing-Worker-Health-Through-Clinical-Decision-Support-\(NIOSH-Resource-Reports\)](https://acoem.org/Guidance-and-Position-Statements/Joint-Statements-Summit-Recommendations-Proceedings/Enhancing-Worker-Health-Through-Clinical-Decision-Support-(NIOSH-Resource-Reports))).

*Example of ODH data being used to request a special test or procedure to help with patient's diagnosis*

A 28-year-old woman arrives for her first prenatal appointment and provides intake and personal history data, including current employment status, job industry, and job occupation. Based on the patient's work as a registered nurse in a nursing care facility, the EHR provides an information tab on potential pregnancy hazards in the patient's workplace. A review of the patient's vaccination history notes shows no indication of varicella vaccination, nor has she been infected with varicella. Upon questioning, the patient is not certain that she had varicella as a child. The information provided in the information tab shows that varicella infection during pregnancy can cause more severe illness in pregnant women or harm the fetus, and that vaccination with varicella is

contraindicated during pregnancy. The obstetrician orders a varicella titer to determine whether the patient is immune to varicella or not. When the titer result enters the EHR a few days later, the titer result (not immune to varicella) and occupation (healthcare worker) trigger an advisory that the healthcare organizations' infection control advisory committee recommends that only immune healthcare personnel provide direct care to patients with varicella/shingles. The obstetrician communicates these results to the patient and provides a work accommodation note containing his recommendation that the patient should not provide direct patient care to patients with active shingles infections during her pregnancy.

*Examples of work information being used to provide personal treatment options and educational materials to patients.*

A 45-year-old male patient who works as a greyhound bus driver was evaluated for type 2 diabetes. When the physician explained the results of the diagnostic tests and started to discuss diabetes, the patient immediately started to ask questions about how this diagnosis might affect his ability to work. The physician doesn't know the answer to this question but finds an information button associated with the patient's occupation. The button links to basic information about regulations for commercial drivers with diabetes and learns that patients who are on insulin may have restrictions on access to commercial driver license, but other persons with diabetes do not. This information helps the physician consider treatment options for the patient. The physician also refers the patient to a nutritionist. The nutritionist sees in the patient record that he works very long shifts and tailors the discussions to ways to eat healthily on the road and during long shifts.

A 35-year-old worker presented to her physician with a sprained ankle. She has been under the physician's treatment with rest, anti-inflammatory medication, and physical therapy. She is recovering well and wants to return to work but tells the physician that she needs a return-to-work letter explaining what, if any, work limitations are needed. The physician has information in the EHR about her job,

but doesn't really know physical requirements for that job and which work tasks she can or cannot do. The EHR has an information button related to return-to-work guidance. It provides a list of questions the physician can ask the patient about her job and then makes suggestion to the physician about wording for the return-to-work note. The physician fills in a few items in a template and the EHR generates a letter for the patient.

(Ref.[https://journals.lww.com/joem/Fulltext/2017/11000/Recommendations\\_for\\_a\\_Clinical\\_Decision\\_Support.22.aspx](https://journals.lww.com/joem/Fulltext/2017/11000/Recommendations_for_a_Clinical_Decision_Support.22.aspx).

[https://acoem.org/Guidance-and-Position-Statements/Joint-Statements-Summit-Recommendations-Proceedings/Enhancing-Worker-Health-Through-Clinical-Decision-Support-\(NIOSH-Resource-Reports\)](https://acoem.org/Guidance-and-Position-Statements/Joint-Statements-Summit-Recommendations-Proceedings/Enhancing-Worker-Health-Through-Clinical-Decision-Support-(NIOSH-Resource-Reports))).

*Example of ODH data used during patient assessment followed by request for specialty care while taking advantage of the interoperability feature of the EHR.* A male patient who believes that he has the 'flu' called his neighborhood clinic to request a same-day appointment. He presents to the clinic with upper respiratory symptoms and extreme fatigue. During triage, the nursing assistant takes the patient's weight, height, temperature, and blood pressure and asks him about his current job occupation and job industry. The patient asks about the reason for providing his work information. The nursing assistant tells him that someone's job can affect their health and the information can help the doctor/nurse take care of him. The patient states that he is a house painter and works on 'private homes.' The nursing assistant enters the patient's work data and vital records data in the 'intake' entry screen in the EHR. The health provider notes that the patient paints houses. He had recently attended an in-service about occupational lead poisoning. At the grand rounds, clinic providers were also reminded by the Medical Director at the clinic about blood lead testing for these workers.

When asked by the health provider whether he had a blood lead test since he started working as a house painter, the painter said no. The patient agreed to the blood lead test recommended by the health provider. Results of the patient's blood lead test were above the normal range. That prompted the health provider to

inform the patient and refer the patient to an occupational health physician within the network for further care.

*Examples of ODH data being used during patient assessment and reporting of a condition to public health authorities.*

A patient in his late teens presents with flu-like symptoms at a hospital emergency department in mid-August. The emergency room physician interviews the patient regarding the presenting symptoms and notes the patient is a farm worker. The physician inquiries more about the activities of the patient prior to the onset of the symptoms and learns that the patient was picking fresh fruit at a nearby orchard. Based on the symptomology and work activities of the patient, the physician suspects acute pesticide poisoning. This information is noted in the EHR. The EHR indicates to the physician that pesticide poisonings are a reportable condition within his state and that he is to indicate if the current case is confirmed, probable, or possible. The physician marks the case as probable and continues to treat the patient for the likely poisoning. The case information is electronically forwarded to the state health department based on the information that has been entered in EHR.

A 50-year-old man presents to his primary care physician with symptoms of fatigue, weight loss, chest pains and shortness of breath. He tells his physician that he had been trying to lose weight and was running 4 miles daily. Although he said that his weight loss could be from his exercise, he said that his shortness of breath was not just after his run but was throughout the day. He said that he noticed the symptoms began about three weeks prior. His EHR record indicates that he is currently a realtor and that his usual work was in s a sand cutter operator in an automotive foundry for 15 years. Upon further questioning, the physician suspected that his patient may have been exposed to silica sand in his previous work. Results from chest x-rays confirmed silicosis which prompted the physician to develop the appropriate treatment plan for his patient and a notification to public health to report the case.

*Example of how ODH data of a household member can be used for assessing a minor*

A 6-year-old boy with a year-long history of poor attention span, restlessness, fidgeting, and difficulty in school was given a preliminary diagnosis of attention deficit/hyperactivity disorder (ADHD) by his pediatrician and was referred to a specialist for further evaluation. When the boy and his parents arrived at the specialist's office, they filled out an intake form which included information on all household members' jobs. This information was entered into the boy's EHR before the specialist saw the patient.

The specialist reviewed the information in the EHR and noticed that an uncle who lived with the family worked in a lead battery recycling facility, a job at high risk for lead exposure. Because the boy's symptoms were consistent with both ADHD and lead poisoning, the specialist ordered a blood lead level for the boy to rule out the possibility of lead poisoning. The uncle's blood was also tested to assess the lead level. He was provided with educational resources to help him begin mitigating behaviors before coming into the home in addition to how he could work with his employer to reduce lead exposure (9).

A healthy infant comes to a pediatrician for a first well-child visit. The medical assistant asks the parents for information about their social history, including current job occupation and job industry for both parents and any other members of the household. The father works as manager of a local accounting business. The mother reports that she quit her job during the last trimester of pregnancy and plans to stay at home with her child until he is older. The medical assistant asks for the mother's usual occupation and industry, and the mother reports working as a police officer for the city for 8 years. Later in the interview with parents, the pediatrician asks about infant feeding and the mother reports that she is breastfeeding and hopes to continue for the child's first year of life. After entering information on current breastfeeding, a CDS hook is triggered by the combination

of the mother's usual occupation as a police officer and breastfeeding. The CDS tool brings up information reporting that the mother's usual occupation is associated with high risk of lead exposure and provides guidelines on management of lead exposure in lactating women (<https://www.cdc.gov/nceh/lead/publications/leadandpregnancy2010.pdf>). The doctor asks the mother if she has ever had a blood lead screening, and the mother is uncertain, so the pediatrician orders a blood lead test for the infant. The result of the infant's testing reveals a blood lead level (BLL) of 10.1 µg/dL, which is above the normal level and triggers an alert in the EHR. The alert includes the recommended schedule for additional testing: confirmatory venous sample in 1 week to 1 month, and follow-up testing at 3 months.

Since the mother is breastfeeding, the alert also recommends that she have a blood lead level test. The pediatrician discusses the recommendation with the mother. They agree that she should pause breast feeding until she has the results of her own test. The mother consults her healthcare provider, who orders the test. The mother's BLL exceeds the reference level for an adult and her care provider starts appropriate therapy. She informs the pediatrician, who, based on the CDS information, recommends that she stop breastfeeding altogether and discusses alternate feeding plan.

Both the infant's BLL and the mother's BLL prompt an alert at the testing laboratories to report to public health; the mother's report is sent to the Adult Blood Lead Epidemiology and Surveillance (ABLES) system (10, 11, 12).

## V. Appendix

Appendix A. Descriptions of elements for Occupational Data for Health topics about a worker

Topic	Element	Description
Employment status	Employment status	Self-reported economic relationship to work for pay, family earnings, or training, a specific time
	Employment status start date	Date employment status started or observation date
	Employment status end date	Date employment status ended. NULL if current or observation date captured.
Retirement	Retirement date	Date a person self-defines as being retired, usually from a job or occupation
Combat zone	Combat zone period start date	Date a person self-reports starting military service or employment in a combat zone
	Combat zone period end date	Date a person self-reports ending military service or employment in a combat zone
Longest-held (usual) work	Occupation	Self-reported type of work performed for the longest amount of time during a person's life, regardless of the job currently held and regardless of whether the person performed this type of work for a continuous time
	Occupation description	Self-reported brief description or title for usual occupation; only captured if a value set term is not identified.
	Industry	Self-reported kind of business (i.e., primary business activity) in which a person has worked the longest while in the usual occupation
	Industry description	Self-reported brief description or title for usual industry; only captured if a value set term is not identified.
	Duration in years	Self-reported total of all periods of time a person has spent in their usual occupation as of the date recorded, not including any intermittent period(s) where the person was not working in that occupation
	Start year	Self-reported year that a person started working in their usual occupation.
Past or present job	Job start date	Date that this job started
	Job end date	Date that this job ended. NULL if current
	Current flag	Identifies present job

Appendix A. Descriptions of elements for Occupational Data for Health topics about a worker  
(continued)

Topic	Element	Description
	Occupation	Self-reported type of work done in this work situation or position
	Occupation description	Self-reported brief description or title for this job's occupation; only captured if a value set term is not identified
Past or present job cont.	Industry	Self-reported kind of business (i.e., primary business activity) conducted by the employing organization for this work situation or position. For voluntary work, this is the primary activity of the organization that engaged the person
	Industry description	Self-reported brief description or title for this job's industry; only captured if a value set term is not identified
	Employer name	Company, organization, or individual that provides compensation (either direct or indirect) for this job, as reported by the person. For military, this is the name of the home base. For voluntary work, this is the organization that engaged the person
	Employer location	Legal mailing address of the employer for this job, as reported by the person
	Work classification	Type of compensation and sector for this job
	Supervisory level	Indicator of responsibilities for directing work and personnel management as part of this job, as reported by the person. For military jobs, this is pay grade
	Work schedule	Typical arrangement of working hours for this job, as reported by the person
	Daily work hours	Average number of hours per day or shift worked at this job, as reported by the person
	Weekly workdays	Average number of days in a week worked at this job, as reported by the person
	Job duty	Brief description of a regular action performed at this job, as reported by the person; multiple job duties can be listed
	Occupational hazard	Brief description of a hazard specific to the work or work environment and with which the person might come in contact at this job, as reported by the person. Multiple hazards can be listed. A hazard is a source of potential harm to a person's physical or mental health. Hazards can be biological, physical, psychological, chemical, or radiological in nature
	Organization Name	Company, organization, or individual that provides compensation (either direct or indirect) for this job, as reported by the person. For military, this is the name of the home base. For voluntary work this is the organization that engaged the person
	Organization Location	Legal mailing address of the organization for this job, as reported by the person

Appendix B. Descriptions of elements for ODH topics about a working household member in the record of a patient (e.g., in the record of a minor)

Topic	Element	Description
Household member	Household member role	Designates the relationship between the patient and the person whose job or work is identified
	Household member nickname	User defined nickname or description of a unique household member
Past or present job	Occupation	Self-reported type of work done in this work situation or position (i.e., job) by the household member
	Occupation description	Self-reported brief description or title for this job's occupation; only captured if a value set term is not identified.
	Industry	Self-reported kind of business (i.e., primary business activity) conducted by the employing organization for this work situation or position (i.e., job) of the household member. For voluntary work, this is the primary activity of the organization that engaged the household member.
	Industry description	Self-reported brief description or title for this job's industry; only captured if a value set term is not identified.
	Employer name	Company, organization, or individual that provides compensation (either direct or indirect) for this job of the household member, as reported by the person. For military, this is the name of the home base. For voluntary work this is the organization that engaged the household member
Longest-held (usual) work	Occupation	Self-reported type of work performed for the longest amount of time during the household member's life, regardless of the job currently held and regardless of whether the person performed this type of work for a continuous amount of time
	Occupation description	Self-reported brief description or title for usual occupation; only captured if a value set term is not identified.
	Industry	Self-reported kind of business (i.e., primary business activity) in which the household member has worked the longest while in the usual occupation
	Industry description	Self-reported brief description or title for usual industry; only captured if a value set term is not identified

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